NATURAL HYGIENE

A · TREATISE · FOR ·
PHYSICIANS · & · THEIR · PATIENTS

H. LAHMANN, M.D.

THE AUTHOR'S CHILDREN.
(Ages: 5 1/4 years; 6 1/4 years; 8 months; 1 year and 10 months)
brought up on his system.

NATURAL HYGIENE

OR

HEALTHY BLOOD THE ESSENTIAL CONDITION OF GOOD HEALTH AND HOW TO ATTAIN IT

A TREATISE FOR PHYSICIANS AND THEIR PATIENTS ON THE PREDISPOSITION TO AND PREVENTION OF DISEASE

BY

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AUTHOR'S PREFACE

OUR success in curing disease is recognized by many; but, they say, "the man has his secret." Very well, in this book you will find a part of the secret, and indeed the most important part.

To treat a disease successfully, we must first form a correct idea of its cause; and it is the object of this book to discuss what we consider to be the real or fundamental cause of all disease.

I would ask my readers to remember that my theories have already been put into practice and have been proved to be correct in thousands of cases, so that should possible errors be discovered, those should be attributed to the present imperfect condition of the science of physiological and pathological chemistry.

The subject of this book has been treated from a practical as well as from a scientific standpoint; it may therefore be as useful to the ordinary individual as to the physician or hygienist.

It is true that I have found it difficult to do justice to both sides of the question; but the practical side would have been as incomplete without the scientific as the reverse. Thus, those who have not studied physiology and pathology will not be able to run through the book on a Sunday afternoon, but will have to study it, and in doing so will have no difficulty in grasping its principles and in applying them to their families and themselves.

To benefit others in this way is the real aim of the book. The author scarcely dares hope that the principles laid down in it will have an immediate reforming influence upon hygienic and medical theory; and he shares Alexander von Humboldt's opinion that it takes two centuries for a new "truth" to be recognized and acted upon.

The purely scientific matter has been printed in small type and need not to be studied by the ordinary reader.

DR. H. LAHMANN.

TRANSLATOR'S PREFACE

THE object of publishing an English translation of Dr. Lahmann's "Dietetische Blutentmischung" is to introduce to English and American readers a work of the greatest practical interest to everyone, treating, as it does, the all-important question of good health.

Dr. Lahmann proves by arguments, convincing alike to the scientist and to the ordinary reader, that our present system of living is based on entirely wrong principles, and that men will never be able to attain a condition of universal health, until they recognise the mistakes of the past and adopt a system resting on a more reasonable and thoroughly scientific basis.

Dr. Lahmann's work has been most favorably received by the German public; since its publication in 1891 seven editions (eighteen thousand copies) of the book have been called for; and it has also been translated into French, Russian and Dutch.

If this English translation assists any of its readers to maintain or recover their health, as the original has assisted so many other readers, the translator will feel his labours have not been in vain.

DR. H. BÜTTNER.

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HEALTHY BLOOD

HOW OUGHT HYGIENE TO BE TAUGHT?*

I OFTEN say, "It is sad that men must have parents." The sentence sounds strange, but I will try to make my meaning clearer by the following example.

Some days ago, when taking a walk with my boys, we met a deformed child, whom I had often seen about during the last three years. Two years ago, when my eldest boy, who is the same age, could walk pretty well, this child lay flat in its carriage, was neither allowed nor able to sit up, was pale and bloated in appearance, had thickened bone-extremities and incipient hydrocephalus.

"You are fortunate in having such children," said his aunt to me; "our little one suffers from a touch of rickets."

I thought to myself: "The touch is a pretty heavy attack," and further, thinking the word "fortunate" misapplied, I answered: "If my children thrive, the

* From a lecture delivered before the society of lady-teachers at Dresden, on April 23rd, 1892.

credit is due to me, for I have expended a great deal of thought and care in bringing them up."

"But we dare not experiment with our children as you do with yours," she replied.

"You dare not!" I answered. "Do you not see that, in bringing up and educating my children, I simply act according to reason and nature?"

Last year this poor child could not walk, and now it shows signs of deformity which may perhaps last for the whole of its life. Is not this pitiable condition due to the unfortunate ignorance of its parents?

And how many sensible parents are to be found? Most of them simply follow the example of their mothers and grandmothers, and holding fast to old customs, are deaf to new suggestions.

It is considered necessary to study every subject at school; gardeners (plant growers) and cattle rearers are taught their subjects thoroughly; but as to the rearing and education of children, how many parents consider it worthy of study?

The results are what we should expect. Half of mankind die in early childhood, owing to the ignorance of their parents, whilst a very considerable percentage of young adults are sacrificed to phthisis and similar diseases, from the same cause. These conditions will not improve until the children themselves are taught more reasonable ideas as to the conditions necessary for life and health; for to instruct the children, is the only way to influence a nation. *Hygiene ought to be taught in such a way that every child can understand it.*

Hygiene as taught at our universities to-day, is merely the art of working with the microscope and retort. The knowledge which the nation as a whole derives from this, is next to nothing. An animal possesses an inborn hygienic instinct, to guide it; why, therefore, should this instinct remain uncultivated in man?

My little son, who is at present three and a half years old, knows more about practical hygiene than many a professor who has worked with the microscope or test-tube all his life and has nevertheless become gouty and diabetic.

Books on hygiene mostly commence with anatomical and physiological introductions. When the reader arrives at the hygienic part, he is wearied and discouraged. How foolish this arrangement is! Anatomy and physiology are difficult sciences requiring a great deal of study, and if hygiene could only be understood and practised by those who had first studied physiology and anatomy, mankind, with the exception of the comparatively few medical men, would be badly off. Fortunately this is not so; a child of three is quite able to grasp the essentials of practical hygiene.

Hygiene must be taught from a philosophical rather than from a scientific standpoint: we must try, by exercising our power of thinking logically, to awaken the knowledge dormant within us; in short our instinct.

The first question which we have to answer is: What does our *health*, that is the normal performance of the various functions of our complicated organs, depend upon?—It depends upon the natural life-factors common to all creatures: air, light, water, food and drink, exercise and rest. To these, some conditions of life created by man himself must be added, such as clothing and bedding, dwelling, care of the skin—and finally, social influences.

If these life-factors are natural, that is correspond to human requirements in quality and quantity, and if the conditions of life created by man himself correspond to natural conditions, then we can say that the conditions of health are fulfilled; if the opposite be the case we must not be surprised if illness overtake us.

How far has man, yielding more and more to the ever-increasing demand of civilization, and thinking himself too high to take a lesson from the unreasoning animals, drifted away from nature and his own natural conditions and surroundings! How unnatural are the present social conditions of mankind!

Let us commence with the air.

Every large animal (and these alone can really be compared with man) shuns any place shut in and lacking sufficient ventilation. To these animals, open air in all weathers is a condition of life. But civilized man, and especially the German, dreads fresh air more than anything in the world. Before going out for a walk, he carefully ascertains from which quarter the wind is blowing; he sits during the greater part of the day in badly ventilated working or dwelling rooms, the air of which he still further vitiates with tobacco-smoke etc., and yet, he thinks that this does not do him the slightest harm.

Whilst railway travelling, one has often to fight for fresh air and the opening of a window, even in a full compartment where the air is thoroughly vitiated in a hour. Perhaps the best way to overcome this popular prejudice would be occasionally to smash a window. Nowadays it may also be useful to say: "But, ladies and gentlemen, you don't mean to say that you wish to breathe my tubercle bacilli?"

Nobody seems to mind inhaling his neighbour's breath, although this breath is really a gaseous excrement; for most of the bowel gases are absorbed by the blood-vessels of the bowels and are excreted through the lungs. And this foul stuff the people think more healthy than fresh life-giving air blowing in through an open window.

During the night these people sleep with closed windows, for "night air is dangerous"; and after a couple of hours, they begin to breath the air infected by their own excretions. An offensive, disgusting smell reigns in nine-tenths of all the bedrooms into which a doctor has the misfortune to be called during the night or early in the morning.

In public halls, or assembly rooms, the ventilation is so poor that our mucous membranes are over-irritated by the vitiated air and rendered subject to catarrhs. The public, who on leaving the hall feel the contrast between the inside and outside air, blame the fresh air for the cold which is sure to be caught.

As long as our students are so uneducated hygienically that, at the beginning of a lecture, they salute their professor by scraping or stamping with their feet, so creating a cloud of dust, we must suppose "hygiene" non-existent. People of the present day seem to have no noses, their sense of smell is so blunted. Any child brought up according to the laws of nature will develop an acuteness of smell as well as of the other senses, which will far surpass theirs, and this is a greater guarantee for happiness on this earth than any book or pulpit wisdom. My youngest son, who is two and a half years old, and whose perceptive faculties are normal, owing to proper care of the body, is at once struck by the smell of an unventilated room. "The air is bad here," he says, on entering such a room, and he goes to the window to open it, being strong and active enough to do so.

Now, what ought those to do who have lost this instinct? Well, they should try to imagine that they can see their exhaled air, as one can see tobacco smoke. I believe, if this were the case, everybody would be a friend to the open window.

Windows should be kept open day and night during the summer. In the winter a window should be opened every half hour for some minutes during the daytime, whilst at night-time a window should be kept constantly open in the bedroom, which should also be warmed, if possible, during the day. Children can be kept from kicking the blankets off by fastening them with safety pins. There is little danger of catching cold in a well-ventilated bedroom; for the fresher the air, the greater is the heat produced in our bodies by the freer oxidation which takes place in our lungs, and the less do we feel the cold. It is a good plan to heat the bedrooms once during the day in winter, to produce a free interchange between the colder fresh air outside and the warmer air inside the room, and to prevent the formation of mould on the walls of the room.

But I hear some creature of habit say: "Open the windows in winter, let out the heat produced by expensive coal, and even heat the bedrooms! This is too much to expect!" Now, you will not require more fuel if you ventilate properly, the combustion heat of the body being increased, owing to the abundant supply of oxygen. And if you really require a little more fuel, smoke a cigar less, drink a glass of whisky or some cups of coffee less, and you will easily make up for the slight extra expense.

Air is to us, what water is to the fish: we ought not only to breathe it, but to bathe in it. Our skin is an excretory organ, consequently it should be allowed to come into contact with the air. But man wears **clothes,** partly from custom and partly for protection. We will not discuss his reasons here; but we must point out that the clothing should not hinder the evaporative and excretive action of the skin. We excrete used-up body-material through the lungs, the kidneys, the liver, the bowels, and through the skin. If the excretion through the lungs is hindered, death ensues by carbonic-acid poisoning. If the action of the kidneys ceases, we become poisoned by urine constituents. If the formation of bile in the liver is disturbed, grave diseases and even death may be the consequence. If the excretion of those substances which should escape through the skin, is rendered impossible, *e.g.*, by covering it with a layer of varnish, death ensues owing to the so-called "self-poisons", partly unknown as yet, such as leucomaines, ptomaines, toxins, etc. Now, it is true that our closely woven linen and cotton shirts and the dressed calico lining of our outer garments are not absolutely air-tight like the layer of varnish; one does not, therefore, die from wearing such clothing; but it is unquestionable that it gives rise to a host of diseases connected especially with the respiratory system, and to many chronic rheumatic conditions. *

We civilized men, who are surrounded by so many disease-producing influences, are not fit subjects for experiments concerning the disadvantages of an impermeable clothing. But the observations made by Frithjoff Nansen † on his expedition to Greenland amongst a people living in a state of nature, may assist us. Nansen noticed that the heathen Esquimaux on the East coast of Greenland undressed in the evenings in their skin tents, and so unconsciously took regular air baths, although the tents were but poorly warmed by cod-liver oil lamps. Nansen rightly observes that this instinctive air bathing while in the tents, was a necessary compensation for the harm done by the impermeable fur clothing.

This opinion of Nansen's has been shown to be correct by the condition of the Esquimaux on the West coast of Greenland, who for some time now have been under Danish rule and influenced by Christian missionaries. The latter naturally teach their followers that this air bathing in tents occupied by several families in common is indecent and wrong; whilst in other cases, owing to the adoption of many of the European vices, the people have become so poor that they can no longer build skin tents, but

* Comp. "Dr. Lahmann's Reform" (A. Zimmer, Stuttgart).

† "On Skies through Greenland," 1891.

are compelled to live in caverns. The result of these changes is an increased mortality, principally owing to phthisis, and Nansen believes that the whole of the Esquimaux population on the West coast will in a short time be destroyed.

Let us take a lesson, therefore, from the Esquimaux!

The reform of clothing is no trifle, but one of the most important departments of hygiene. Unfortunately the industrial spirit of our time, in connection with the thoughtlessness of the public, seems to look upon it chiefly as a matter for trifling. Innumerable systems of clothing have appeared and have been recommended by one or another, who have perhaps never considered the importance of the question, but have thought only of making money.

It is quite depressing to me, to think that I also have advocated, and even given my name to, a reform of clothing; but I console myself with the fact, that I have worked as a pioneer of science. *

The first point to be considered, when we come to examine the different kinds of clothing, is whether they are porous or not; but we must also take into account other points, such as irritation of the skin, the activity of its functions etc.

As regards **bedding,** that is our night clothing, we are again affected by the same principle—porosity. We must do away with the feather-beds, which are so

* Comp. "Dr. Lahmann's Reform."

thick that the exhalations cannot pass through them; we must do away with closely-woven bed-sheets, which feel damp and cold to the body and cause rheumatic conditions. We should sleep on hard mattresses (horse-hair, sea-grass or straw mattresses, according to our means), between tricot-woven cotton sheets and under woollen or cotton blankets. The feet should be covered up warmly, and a small swan-down coverlet may be used for this purpose. In using blankets we have the advantage of adding to, or taking away from, their number according to the season, whereas the old feather-bed was always too hot in summer.

The **clothing of our feet** is also a very important question. Half of mankind suffer from cold feet, a very considerable number from sweating feet. The consequences of these conditions as regards the whole organism cannot be overlooked; for many who suffer in this way, are predisposed to catarrhs of the air passages and often fall victims to phthisis, to eye and ear diseases, neuralgia, and later on to apoplexy etc. These facts are worthy of careful consideration. Boots and shoes, owing to a foolish fashion, gradually become a source of injury and danger to civilized man. The foot is so squeezed by the stocking and boot, that a free circulation of the blood in it is simply impossible. Besides this, the impermeable leather boot hinders all evaporation, the consequence of which is that the stocking becomes damp. To dry up this moisture, heat is required, and this heat can only be obtained from the blood acting through the medium of the feet. Now, if the circulation of the heat-giving blood is hindered, the feet must remain cold and the stockings damp. The result of all this is chronic cold feet (Pettenkofer).

If we would only wear wide and easily fitting boots and loose comfortable stockings, we should always have warm feet, even when sitting in a cold carriage or sleigh. According to Nansen, the Laplanders and Esquimaux use no stockings, their boots being filled with dried grass; and surely, these people who have to support a winter cold of —30 ° and more, ought to know how to keep their feet warm.

Hygiene demands that our boots and shoes must be thoroughly reformed. The tyranny maintained by fashion and shoemakers is becoming more intolerable every year, and must soon bring about a change. Let us hope that it will lead to the reinvention of a sandal-like foot covering, which will offer no hindrance to the circulation of the blood. The feet will then become as brown, warm and comfortable as the hands, instead of, as under the present system, deadly pale, deadly cold and bad smelling.

From the clothing of the skin it is no great step to the so-called **care of the skin.** Many think they have reached the height of wisdom when they advocate daily washing, rubbing, douching, or bathing of the body. It is true that this does good to some, or rather does not do them any visible harm; but many suffer greatly from this amphibious mode of living. The great excitation of the nerves, caused by the shock cold water produces, is beneficial, if continued for six or eight weeks only, but acts injuriously, producing an over-excitation, if continued for years. It is evident that the deprivation of heat does not do good to everyone, nor is it difficult to understand that, when the skin is constantly rubbed, it is deprived of the natural oil which renders it soft, and which is of greater importance in helping it to perform its functions than the cleaning effect of the bath.

No animal acts like the water fanatic. The larger animals, such as the cow and the horse, when out at pasture, wade into the water up to their knees, or at most to their bellies, and so only take a foot or leg bath. Once or twice a week, they take a rain bath; but they are constantly taking air baths.

The rationally clothed man can do just as these animals do.

Stout people, who cannot easily get rid of the heat generated in their bodies, may with advantage take a cooling bath daily. Those who are wrongly clad, and whose skin has been rendered delicate, owing to the gaseous excretions retained by the impermeable clothing, may use a stimulating cold bath as a corrective, or still better an air bath as the Esquimaux do. But to make everybody an amphibian, is unreasonable.

Other factors which help in producing disease, are undoubtedly the **habit of sitting too much** and **want of bodily exercise.** We are very glad to see that the youthful games and sports of England are beginning to be introduced into Germany. Unfortunately the sitting habit commenced at school and continued on the office stool and after-office hours, while drinking beer and smoking, has become so much a part of the German nature, that the bodily education of youth cannot make much progress in the near future.

The most important factor, however, as regards the maintenance of health, is **food.** Here the greatest mistakes can be made. The reader, therefore, must not be surprised, if we devote the whole of our book to this department of hygiene.

I prefer to leave out of this book any discussion on the various injurious social influences at work. They will, however, be touched upon in the section on "Dysæmia and Nerve Diseases".

EXPLANATION OF "DIETETIC DYSÆMIA"

> The cause of any disease from the standpoint of natural science is always internal and termed by us empirically the predisposition.
>
> Microbes or germs [and the atmospheric influences], are only the special exciting (secondary) cause, and cannot therefore be regarded as the cause from the standpoint of natural science. To these two causal factors must be added a third: the conditions which impel the exciting (secondary) cause to act with the primary cause. If one of these factors is absent, no disease can develop in the body.—From the report of a lecture by Prof. Hueppe, bacteriologist, Prague, in the "Allgem. mediz. Zentralzeitung" of April 1st, 1891.

NOWADAYS we hear rather too much of micro-organisms as possible causes of disease; we know less of the atmospheric influences, which were in former times looked upon as causes of disease, but, at any rate, we know something about them; and we understand to some extent the conditions which impel the exciting (accidental) causes to act with the primary (fundamental) cause in giving rise to disease: but the *fundamental cause* itself, the constitutional predisposition, is entirely unknown to us.

The want of a system of therapeutics which treats the real causes of disease (our present system is almost entirely restricted to treating symptoms), the want of a proper system of prophylactics, the want of success of our present system of therapeutics, and the rapid growth of quack medicine, are all explained by our ignorance of the primary cause of disease.

How little, how very little, compared with the search after the exciting (secondary) causes of disease, have we studied the predisposition, and what is necessarily connected with it—namely, the differences between individual constitutions, the so-called constitutional disturbances, and their explanation!

What does "anæmia" mean? Nothing at all. What does "scrofula" mean? Nothing at all. What does an "apoplectic tendency" mean? Nothing whatever. We can individually form many different ideas from these words, but cannot explain them, and therefore cannot treat the causes; for if we could, so many medical men would not, for example, die of apoplexy.

In this branch of our science almost everything has to be accomplished, the A B C to be put together; and this book may be considered as a contribution towards the preparation of this A B C.

What is the meaning of "to be in good health"? A stupid question! But let us have an answer!—We will here be satisfied with a circumlocution: Health is the normal performance of all the functions of life and the normal capability for work of all parts and organs.

If we then ask, what is necessary to sustain the complicated normal process of living or, in other words, our health, the answer drawn from experience is: air, light, water, food, exercise and rest. But our knowledge at once ends when we come to consider the quantity and quality of these factors necessary to keep us in good health. Animals, more lucky than ourselves, have at least their instincts to guide them.

Science must, therefore, replace this lost instinct in man.

How does illness arise? The most natural answer to this question is doubtless: Because we do not make the right use of the above hygienic and dietetic factors, as regards their quantity and quality.

How is it possible, one must ask, that any one who follows out this train of thought logically, can miss this conclusion (that the cause of disease and the nature of predisposition is to be found in our dietetic and hygienic mistakes, that is so to speak in ourselves and in our way of living) and still continue to seek for the cause of disease apart from ourselves?

The chief reason for this is to be found in human self-sufficiency, which is always on the look-out for a scape-goat and will never say like the prodigal son: Pater, peccavi. A second reason is the want of a philosophical spirit: we are always content with facts and therefore with the fact of existence; we only observe, but never think.

Because a man who swallows oysters and champagne, lives, and because another who eats potatoes and curds, also lives, most people think that it makes no difference what we eat or drink. We learn as children from our teachers that the stomach is, so to speak, a self-thinking and acting organism, a faithful servant, which separates what is bad from what is good, unmindful of what we put into it. This naïve idea is still held by many physiologists or at least by people who pretend to physiological knowledge.

Now, we have learnt several things during the last few years (which are not yet fully taught at our universities), for instance, that many illnesses are connected with bad domestic sanitation, want of fresh air, wrong clothing, etc.; but we have still to learn that illnesses are above all dependent upon unsuitable feeding, although as gourmands we may dislike to acknowledge it.

All the tissues of our body are nourished by the blood. Now, is its composition always the same? Can it always be trusted to supply a sufficient nourishment to all the tissues? To this we must answer, No! We know that the corpuscles show considerable differences both in quantity and quality, and it has been proved by Peiper, Copemann, Schmaltz, and others, that the specific gravity of the blood also varies. The blood of hæmophiliacs (bleeders) coagulating with so much difficulty shows that its physical and chemical condition *must* change; and physiological chemistry will some day prove to us that the chemical composition of the blood (apart from the amount of hæmoglobin contained in it) may vary very much.

Now, is it of no consequence to the organism, when the composition of the blood deviates from the normal? Certainly it is! We know how injurious the so-called anæmia may be: but we have yet to learn that "*dysæmia*" (an abnormal composition of the blood) *is the principal origin of all predisposition to disease.*

The blood is formed from what we eat and drink. Is it then all the same what we eat? Strange to say, people, nowadays, mostly answer with an uncertain yes. But the answer ought to be a decided no. Food physiology has proved that man needs albumen, carbohydrates (sugar), fats, and mineral substances for his growth and support. Scientists have occupied themselves very largely with the chemistry of albumens, and yet we do not know how much man really needs of this substance for his existence, but only how much he can digest and assimilate, or, more correctly speaking, how much he can excrete through the urine and fæces. About fifteen years ago it was thought necessary to consume 130 grammes of albumen daily, about ten years ago the quantity fell to 80 grammes, and since (Hirschfeld) even to 40 grammes, because even upon such quantities men can live in good health.

Of the carbohydrates we know that they are to our body what the fuel is to a machine: the working material; of the fats we know that, if necessary, they can be dispensed with; whilst the mineral substances, placed last in any of the ordinary classifications, seem, like the fats, to be considered of little value.

But as it is generally supposed that the so-called anæmia is connected with want of iron in our blood, rickets with want of lime, etc., would it not be advisable to pay the mineral substances, say, even the tenth part of the attention which has hitherto been given to the albuminous substances?

Besides, the albumen theory is now played out. In case of kidney disease, a person can excrete immense quantities of albumen, and yet we cannot trace what is the especial influence of this loss of albumen to the body. An invalid may get as thin as a skeleton, but, provided that the strength of his bones remains unimpaired, he will very soon regain a sufficient amount of organic albumen from any food, even if it be theoretically unsuitable, that is poor in albumen. But how very different is the case if the strength of his bones has been impaired by a want of lime-salts: he will probably remain a cripple for ever.

Now, is it not conceivable that the mineral substances may be of more importance than the albuminous substances?

Let us first take an example, in order to understand this better.

It is not only the science of human diet which suffers from the albumen theory, but also the science of agriculture. In the first case we call for albumen and animal food, in the second case for animal and nitrogenous manure, in addition to which slag ("Thomasslag") containing phosphoric acid, and some chemical manures containing potash, are recommended. The only reason for the latter is that in all plants phosphoric acid and potash have been recognised as the most abundant mineral substances—of course they must also be the most important (post hoc, ergo propter hoc).

Now, plant diseases and parasites appear one after the other and find an easy prey in these plants, which, owing to their abnormal chemical composition and diseased saps, can offer no effectual resistance. As epidemics rage among wrongly fed men, so they rage among wrongly fed plants: amongst the former we find diphtheria and tuberculosis, amongst the latter diseases of carrots, potatoes, vines, etc.

What is wanting in the plants? Mineral substances. These have in many places been entirely drawn out of the soil, which has been exhausted through generations, and which is only from half a foot deep, for neither the spade nor the plough will penetrate deeper. And yet these mineral substances are absolutely indispensable for the formation of healthy cells and tissues (see later).

To remedy the present degenerative condition of agriculture we should plough and dig deeper and use mineral manure, that is supply to the soil, in natura, those mineral substances which are wanting in it. Hensel's * manure theory is right in principle, and it is a pity that, on account of his naive theory of spontaneous generation, many people do not take him in earnest.

And now let us return to man.

We know that the food of a full-grown working man should contain according to Moleschott:

albumen	fats	carbohydrates
130 grammes	84 grammes	404 grammes

inorganic substances (salts)
32 grammes,

and supposing that these numbers are absolutely right, we must at once protest against simply saying: "inorganic substance or salts 32 grammes", we ought to say: potash, soda, lime, iron, etc., each so many grammes. For if we simply say: inorganic substances, it is the same as if we were to say for albumen, fat and carbohydrates together: organic substances 618 grammes. And just as a man who eats carbohydrates alone, or albumen alone, or fat alone, will die, so also will the person who chiefly or exclusively eats potassium salts, but avoids sodium salts, die, or become ill. Somebody may here bring forward the objection that the proportion of the different mineral constituents, more properly

* Hensel, "Mineralische Düngung." Selbstverlag, Hermsdorf unterm Kynast.

speaking food-salts, is the same or at least nearly the same, in all foods; but we shall see later how very great the differences really are in this respect.

The simple collective name "inorganic substances or salts," which only serves to cover a deficiency in our knowledge, has also given the public the foolish idea that by the term salt we always mean common salt. Thus the indigestible mineral common salt (sodium chloride) is parallel as an excellent food on our tables; many people even believe that common salt forms bone, for which reason large quantities of it are often added to children's milk. The greater part of the medical and lay public altogether overlook the fact that the food-salts are tissue-elements and are thus subject to decay and replacement. Nor need we be astonished at this fact, as even some physiologists do not know what to make of the food-salts. In all medical works this subject is treated very briefly. They all say, we have no exact knowledge.

Let us, for example, see what Bunge * says:

"As to the developed organism, we do not, a priori, understand why it should need the constant ingestion of salts. The purpose served by the inorganic salts is totally different from that served by the organic food substances.... The organic food substances are, therefore, of use to us through their very decompo-

* G. Bunge, "Lehrbuch der physiologischen und pathologischen Chemie," 2nd edition, Leipzig, 1889, pages 102 and 103.

sition . . . The case is quite different when we turn to the inorganic salts. These are fully saturated oxides, or chlorides which cannot combine with oxygen. As they are not subject to decomposition or oxidation, they can develop no working power in the body, they cannot possibly be used up so as to become unserviceable. What is therefore the good of renewing then?"

Now, experiments show that animals die after a short time when fed on a food deprived of food-salts (ashes). In the same way animals die if in feeding them "we add to the same artificial mixture of organic food substances, (artificially deprived of food-salts) all the *inorganic* salts of milk in exactly the same proportion in which they are found in the ashes of milk, and in the same proportion to the quantity of the organic substances as in milk." In this experiment the animals which were fed exclusively on cow's milk, remained in good health long after the animals used for the experiment had died.

With reference to this, Bunge says further: "This is a very remarkable fact. On milk alone animals can live. But if we put together all the constituents of the milk which, according to the present teaching of physiology, are required for the preservation of life, the animals die very soon. Is it possible that the inorganic salts of the milk, the author of all foods, should be chemically combined with the organic substances and only be digestible in this combination?"

Truly, one feels tempted to quote here from the author of "Rembrandt als Erzieher" where he says: "For a long time now, we have required that artists should be able to think, and lately that even servants should use their thinking powers: how much more, then, should we require that our savants should be able to think rightly!" And further: "Has the scientific, specialist, microscopic culture of our days made much difference in the development of the human soul as a whole? Our answer to this must be: No. Do not let us close our eyes to this fact; may science rather try to rise again to the macroscopic standpoint of Goethe: it need not give up the spirit of exact observation, it ought only to subject that spirit to the spirit of contemplation. Facts are subordinate; and a mere science of facts is, therefore, also subordinate—it means hardly more than a mere science of doctrines. Only a science of laws, a science of the spirit, a science of life, can be really called science."

We seem to be forbidden to think, for only facts and numbers count in our department of science (therefore this work, in which there are many thoughts, and but few facts, will not be called a scientific one). If Bunge had only *dared* to think at this point (and he does usually dare to think more than the majority of our physiologists), he would have answered "Yes" to the question put by himself.

These quotations may at the very outset meet possible objections. In the whole territory of biology, the doctrine of life, the decision lies in *philosophical deduction* founded on facts. The facts alone are subordinate.

The albuminous substances, fats and carbohydrates found in the human and animal organism, as well as the vegetable acids found in plant organisms, are just as much composed of inorganic elements (carbon, hydrogen, nitrogen and oxygen) as those unknown and partly known compounds which are principally composed of other inorganic elements. The fact that the latter often occur actually, or seemingly, in such compounds as are found in the mineral kingdom, or can be produced in the chemical laboratory, can give us no right to consider them as inorganic compounds.

If, for example, Henkel has shown citric acid to be a constant constituent of cow's milk, and F. Söldner * has found potassium citrate, magnesium citrate and calcium citrate in cow's milk, these compounds are organic and not inorganic.

Perhaps we had better say, they are "*organised*" and as such subject to the same changes as the tissues (metabolism). Similarly the phosphate of lime and carbonate of lime found in the bones, the iron contained in the blood-corpuscles, the simple carbonate

* Maly's "Jahresberichte über Tierchemie," 19th vol., 1890, page 153 ff.

and phosphate of sodium found in the blood serum, with all of which other substances may be combined, are "organised."

Do you, for example, believe, as regards the two latter compounds, that you could perform by aid of mineral products of the same chemical composition that eternal, constant change, namely, the formation of carbonic acid in the tissues and the excretion of carbonic acid by the lungs? Well, I cannot believe it! And even if it were possible, I believe that the molecules would sooner or later become fatigued and require replacement by fresh material. A lightly-worked lime molecule in the bones and teeth would in that case, of course, be longer before requiring replacement than a hard-worked sodium molecule. This is philosophy, and I believe it is also the truth.

To turn to sulphur, is it not true that without it some of the albuminous substances of the organism would not be complete; and as regards phosphorus, is it not a fact that lecithin (a chief constituent of the brain) would not be lecithin without phosphorus? Now just as these "inorganic" constituents, in consequence of their being united to substances subject to tissue-change, are also subject to tissue-change, or, more properly speaking, to a limited life-duration in the body, so all so-called "inorganic" substances, after becoming organised by assimilation in a plant and incorporated in our bodies either directly or through the medium of an herbivorous animal, must also be subject to the same change and decay.

Again, just as the so-called organic substances have very different life-durations in the tissues, the carbohydrates, for example, being comparatively quickly used up, whilst the albuminous substances according to their quality have various life-durations in the organism, so also will the organised mineral substances, according to the purposes they serve, have a longer or shorter duration of existence in the animal organism. This existence is at an end when the *vitality* of the molecule imparted to it by the organism of the plant is used up, just as death of the whole organism occurs when its vitality is used up.

We, therefore, maintain the limited vitality of the so-called inorganic constituent of the animal organism and their participation in the same changes: decay and replacement, as take place in the tissues (metabolism). Further we are of the opinion that generally speaking, the fully developed organism needs the same inorganic food substances as the growing one, or at least in the same proportion.

Now we do not know how much of the mineral element we require for our organism, any more than we know the *exact* quantity of albumen, etc., which we require. But we can get some assistance from a normal food-mixture, human or cow's milk, as a human organism can both be built up and sustained on this food alone. Absolute numbers can, of course, never be used here; it would be a mistake to say, man requires so much of such a food-stuff. All that we ought to say, is that man requires *so much per cent* of such and such a food-stuff in his food.

For instance, if one child consumes a litre of milk a day and another a litre and a half, N° 2 will consume more in *absolute* quantity and according to its constitution perhaps build up a larger body; but relatively N° 1 consumes quite as much food-stuff and is, therefore, also normally fed; and if we were to force N° 1 to consume the same quantity as N° 2, N° 1 would certainly become ill.

Many grown-up people become ill because they are fed according to the absolute numbers given in our text books, and we seem to forget altogether that a man does not live on what he eats, but on what he digests, a fact proved by experience.

At the first glance it appears strange that we should compare the almost entirely solid food of grown up people with the normal food-mixture milk; but if we consider their percentage compositions, they compare better than one would think.

Let us take, for instance, the composition of

	water	albumen	fat	sugar	food-salts
Human milk	87·02	2·36	3·94	6·23	·45
Cow's milk	87·42	3·41	3·65	4·81	·71

and compare with it the food required by a full-grown working man, according to Moleschott and Vierordt * in 24 hours:

water	albumen	fat	carbohydrates	salts	
2818	130	84	404	32	grammes.

It is true that these numbers are of no use to us in this form; but if we divide each by 34, we get the following numbers:

83 3·8 2·5 11·9 ·9.

As the sum of these numbers is 102, we can round it off to 100 and say: the percentage composition of the food mixture for a grown-up person is:

water	albumen	fat	carbohydrates	food- and common salt
83%	3·8%	2·5%	11·9%	·9%

As, according to our experience, fats and carbohydrates can take one another's place within certain limits, in which case fat is equivalent to about four parts by weight of carbohydrates, the above numbers are very much like those of milk, so that we can say that the daily quantity required by a person consuming solid and fluid food has nearly the same percentage composition as milk. If too much solid food has been taken, a thirst is created which causes so much

* Comp. Landois, "Physiologie." 2nd edition, 1881.

water to be consumed as to equal the average amount of water in the normal food-mixtures, about 85 %. The quantity of food consumed differs according to the individuals and is of no consequence; for, just as in the case of the above-mentioned children, No 1 and No 2, the percentage composition is the principal point. There are persons who consume 3,436 grammes (water 2818 grammes + solids 618 grammes) of a normal food mixture within 24 hours; I myself, on the contrary, consume at most 2,500 grammes and am fully capable of work and in good health.

Therefore, we must reject altogether these absolute numbers in food physiology, as they can only be right for single cases, *and must put in their place the percentage numbers.*

Now that we have ascertained approximately the percentage quantities of the organic substances and also the total amount of the so-called inorganic substances required in our food, let us consider the different constituents of the latter; let us try to find out in what proportion to each other and to the organic substances they ought to be present in a normal food-mixture. To guide us, we have again the analysis of milk, and I choose as a makeshift cow's milk, as I cannot consider most of the analysis of human milk normal, on account of the unhealthiness of mankind generally. Cow's milk contains on an average ·7 % of food-salts (ashes), which in their turn have the following percentage composition:

Potash K_2O	Soda Na_2O	Lime CaO	Magnesia MgO	Oxide of iron Fe_2O_3	Phosphoric acid P_2O_5	Sulphuric acid SO_3	Silicic acid SiO_2	Chlorine Cl
24·67	9·70	22·05	3·05	·53	28·45	·30	·04	14·28

To be normal, therefore, a food-mixture should contain about the same relative amount of food-salts and the same percentage composition of the latter.

Let us now examine from this point of view the food-mixtures commonly used by man. The principal food-mixture used by civilised European nations consists of meat, cereals, and potatoes, to which the pulses may be added. Green vegetables are generally eaten in summer only and are, as a rule, artificially depriv-ed of their easily soluble food-salts by a wrong pro-cess of cooking (using too much water), being thus rendered inferior for nutritive purposes. Fruits are looked upon as a luxury and eaten only in limited quantities and at certain seasons, and sometimes even avoided as harmful (as are also vegetables by some people).

Now, as the different foods contain very different amounts of water, we can only compare their "dry substance" with respect to the amount of salts con-tained in them. And since in calculating with larger numbers there is less change of making mistakes, we shall adopt the method given in E. Wolff's "Analyses of Ashes," * namely, to compare the quantities of ashes contained in 1,000 parts by weight of dry substance.

It is very significant that we have to take these data from analyses of ashes of agricultural products.

The following table shows the percentage composition of the salts contained in 1,000 grammes of the dry substance of

	Total ashes	Potash K_2O	Soda Na_2O	Lime CaO	Magnesia MgO	Oxide of iron FeO_3	Phosphoric Acid P_2O_5	Sulphuric Acid SO_3	Silicic Acid SiO_2	Chlorine Cl
ow's milk....	48·8	12·04	4·73	10·66	1·49	.26	13·88	·15	·02	6·97
eat..........	40.6	16.76	1·47	1.15	1·30	·28	17·27	·63	·45	1·56
hite flour....	4·7	1·69	·04	·13	·39	—	2·45	—	—	—
ye flour......	19·7	7·57	·34	·20	1·57	·50	9·51	—	—	—
tato.........	37·7	22·76	·99	·97	1·77	·45	6·53	2·45	0·80	1·17
a............	27·3	11·41	·26	1·36	2·17	·16	9·95	·95	·24	·42
rrot.........	54·7	20·20	11·58	6·20	2·40	·55	7·00	3·53	1·30	2·51
inach.......	164·8	27·29	58·16	19·58	10·51	5·52	16.89	11·32	7·45	10·22
bbage-lettuce.	180·3	67·85	13·60	26·47	11·76	9·39	16·57	6·78	14·68	13·79
ple	14·4	5·14	3·76	·59	1·26	·20	1·96	·88	·62	—
awberry.....	34·0	7·16	9·68	4·83	—	2·00	4·70	1·07	4·10	·48

Nowadays the food physiologist is satisfied if a person consumes 130 grammes of albumen, 84 grammes of fat and 404 grammes of carbohydrates. If we make up a food-mixture containing this proportion of organic sub-

* E. Wolff, "Aschenanalysen von landwirtschaftlichen Produkten, Berlin 1871 and 1880.

stances, for convenience' sake from equal parts of the dry substance of flesh, flour (bread), potatoes, and peas, we have, in order to find the proportion of food-salts, only to add together the numbers indicating the amount of food-salts in each and divide the result by four. We find then in 1,000 grammes of dry substance of such a food-mixture :

Total ashes	Potash K_2O	Soda Na_2O	Lime CaO	Magnesia MgO	Oxide of iron Fe_2C_3	Phosphoric acid PO_5	Sulphuric acid SO_2	Silicic acid SiO_3	Chlorine Cl
31·3	14.6	·76	·92	·70	·35	10·42	1·00	·37	·8

If we compare this table with the corresponding table relating to milk, our normal food-mixture (see page 32), we see that

Firstly, a food-mixture may correspond perfectly to the normal food-mixture with regard to the organic substances contained in it, but may differ from it very much with regard to the inorganic substances.

Secondly, the total amount of food-salts contained in the ordinary food of European nations in not only altogether too small, but the relative proportion of the food-salts to each other also differs widely from that of the normal food-mixture.

The table on page 33 shows that this lack of food-salts can easily be made up by adding root and leaf vegetables, salads, and fruits to our ordinary food. *But unfortunately the majority of people do not make this compensation, or at least only periodically*, and are, therefore, not fed normally: their bodies must have an abnormal chemical composition because the blood which is formed from the abnormal food, is chemically of poor quality, abnormally mixed, **dysæmic.**

Dysæmia (an abnormal composition, a degeneration of the blood) may indeed be caused by other influences, *e.g.*, by an excessive consumption of fluids, even when the mixture of the solid food-stuffs is normal, or by an insufficient supply of oxygen (fresh air); but these minor forms of dysæmia are quite secondary when compared with the principal form, whilst conditions described by the names dyscrasia, diathesis, etc., expressions by which we can understand everything or nothing, are really conditions resulting from dysæmia in one way or the other.

Now, we might say that a wrong system of diet is the cause of dysæmia; but the expression "a wrong system of diet" is too indefinite. Hygienists both of the old and of the new school, speak of dietetic mistakes, but understand different things by it; vegetarians as well as the advocates of temperance talk of a wrong system of diet, and yet many of them fall victims to dysæmia just as much as those whom they wish to convert.

To decide whether a diet is the cause of disease, or not, we must first decide whether it has produced dysæmia, "dysæmia" being used to denote an abnormal proportion of the food-salts in the blood and especially a deficiency of those salts which are absolutely necessary to maintain us in good health.

As long as dysæmia is not set up, any influence, though seemingly harmful, cannot be considered so from our point of view. To explain this better, let us use an exaggerated illustration: even an arsenic eater, who otherwise feeds rightly from our point of view, may be healthier and less disposed to illness than a man who feeds on meat, potatoes, and bread, coffee and beer, or a so-called vegetarian, * who thinks that he is feeding rightly on wholemeal bread, rice, lentils, and beans, barley, coffee and water, but is in reality rendering himself dysæmic. The following letter may with advantage be quoted here:

"Dear Doctor, I have read your highly praiseworthy book "Dietetic Dysæmia," and have accordingly changed my vegetarian mode of living. The effect has been remarkable. Since the beginning of December, when I commenced the new régime, my urine has shown a deposit of gravel every morning (*i.e.*, uric acid, brought into solution owing to the greater abundance of soda in this food), and the same thing occurs to my wife. I, therefore, feel constrained to express my sincere thanks for the publication of so important a book. Having eaten no flesh for two years, I was perfectly convinced that I should be cured of my anæmia, nervousness, throat disease, etc., by the fleshless food; but I should have been miserably disappointed if your book had not been recommended to me. The fact that I was suffering more and more from cold hands and feet, led me to think that my food could not be altogether right. We seldom eat salads and green vegetables, our principal food consisting of cereals and pulses, etc. Yours, Dr. A. B., Headmaster. M. 27 Dec., 1892."

Now we have still to meet the objection that the proportion of food-salts in milk is perhaps not a correct

* From vegetus = healthy, thriving well.

guide for the proportion of mineral substances required by the human body.

But if the proportion of food-salts in our body does correspond to that of milk, does not this show that our food should consist of the same elements mixed in the same proportion as are found in the body? Indeed, there can be no question about this, for out of nothing we can get nothing, and if the body requires a certain quantity of such and such a substance for its existence, that quantity must be provided by the food.

Now, we can see from the following table that the percentage composition of the ashes of the body (we have only analyses made from the rabbit and dog by Bunge) does pretty well correspond to that of milk:

	Rabbit	Dog	Dog's Milk	Cow's milk (Bunge)	Cow's milk (Wolff) Average of 9 analyses
Potash	10·84	8·49	10·47	22·14	24·67
Soda	5·96	8·21	6·13	13·91	9·70
Lime	35·02	35·84	34·44	20·05	22·05
Magnesia	2·19	1·61	1·49	2·63	3·05
Oxide of iron	·22	·34	·14	·04	·53
Phosphoric acid	41·94	39·82	37·49	24·75	28·45
Chlorine	4·94	7·34	12·36	21·27	14·28

The somewhat smaller quantities of lime and phosphoric acid in milk are easily accounted for by the theory which we have already expressed above, that the change and decay of the phosphate of lime molecules in the bones is so slow (about $^2/_3$ of that of the other salts) that there is less need for replacement.

We may therefore draw the conclusion: in order to build up, and sustain, blood, flesh, and bones—in short, body material which contains a certain proportion of salts, we require a food-mixture containing an equivalent proportion of food-salts, that is a food-mixture, the quantitative and qualitative composition of which corresponds to that of milk.

If we now continue the comparison of the proportion of food-salts contained in our common food-mixture, flesh, bread, potatoes, and pulses (see page 34) with the proportion of food-salts contained in milk, our idea of dysæmia will become somewhat clearer.

This food-mixture, compared with cow's milk, is

poorer in:	richer in:
soda (6 times)	potash
lime (11 times)	iron
phosphoric acid	sulphuric acid
chlorine	silicic acid.

If we turn to the food-mixtures given in the various books on food and feeding, we find exactly the same disproportion of food-salts.

Let us take the first day's ration (and even a comparatively expensive one) for a full-grown working man, from König's "Chemie der menschlichen Nahrungs- und Genussmittel" (2nd edition, Berlin 1882), page 310:

1. Day's ration.	Albumen gr.	Fat gr.	Carbohydrates gr.
1) 500 g. of brown bread	31·0	2·0	254·0
2) 230 " " beef from the butcher = 212 gr. of meat without bones	39·2	26·3	—
3) 250 " " fresh milk for puddings etc.	8·3	9·0	12·0
4) 250 " " coarse flour	28·7	2·4	183·5
5) 300 " " potatoes	5·5	—	61·5
6) 150 " " green peas	8·5	1·0	16·0
7) 30 " " butter	—	25·0	—
Sum...	120·1	65·7	527·0

Certainly, the quantities of albumen, fat, and carbohydrates correspond with the requirements of food-physiology; but what about the *food-salts? They are not even mentioned*, nor will you find them in any table of this kind. If, however, we take the trouble to calculate them from Wolff's "Analyses of Ashes," we find:

Nº	Total ashes	Potash	Soda	Lime	Magnesia	Oxide of iron	Phosphoric acid	Chlorine
1.	4·0	1·3	·03	·21	·51	·03	2·12	—
2.	2·1	·8	·21	·05	·07	·01	·90	·10
3.	1·7	·4	·16	·35	·05	·01	·46	·23
4.	2·5	·8	·02	·13	·31	·02	1·25	—
5.	2·5	1·5	·06	·06	·12	·03	·43	·07
6.	·9	·4	·01	·04	·07	·005	·33	·01
7.	—	—	—	—	—	—	—	—
	13·7	5·2	·49	·94	1·13	·105	5·49	·41

An equivalent quantity (3,500 grammes) of cow's milk contains:

Albumen	Fat	Sugar	Food-salts
119	126	168	24·85 grammes.

The salts show the following proportion:

Total Ashes.	Potash.	Soda.	Lime.	Magnesia.	Iron.	Phosphor. acid.	Chlorine
24·85	6·02	2·36	5·83	·74	·13	6·94	3·48.

We have underlined the numbers under soda and lime: a commentary is superfluous.

Let us further take the first example from the "Volkswohlschrift": "Wie nährt man sich gut und billig?" ("How to feed well and cheaply"), Leipzig 1892. The following is given as a day's ration for a family consisting of man, wife, and 2 children from 8 to 12 years old, who are considered to eat about as much as three men:

	Foods	Quantities grams.	Amounts of Albumen grams.	Fat grams.	Carbo-hydrates
For the first and second breakfast, afternoon tea and accessories to the other meals.	1. Brown bread ...	1,800	81	9	756
	2. Skinned milk ...	1 litre	35	5	20
	3. Suet	60	—	59	—
	4. Roasted coffee...	15	·5	1	3
	5. Roasted barley ..	30	3·5	—	20
	6. Common salt....	75	—	—	—
Dinner: Rice soup and beef with parsley potatoes.	7. Beef	350	56	17·5	—
	8. Rice	100	6	—	77
	9. Potatoes	2,000	30	4	380
	10. Fat	60	—	59	—
	11. Flour	20	1·8	—	14
	12. Parsley and onion	—	—	—	—
Supper: Bread and cheese	13. Cheese	250	90	13·7	5
	Daily quantity for 3 men =		303·8	168·2	1275
	" " " 1 man =		101·3	56 1	425

If we calculate the proportions of the food-salts, we obtain the following result:

No	Total ashes	Potash	Soda	Lime	Magnesia	Oxide of iron	Phosphoric acid	Chlorine
1.	22·00	8·00	·40	·10	1·70	·50	10·60	—
2.	6·80	1·60	·64	1·40	·20	·04	1·84	·92
3.	—	·50	—	—	—	—	—	—
4.	·70	—	·01	·05	·08	—	·21	—
5.	1·50	·20	·05	·01	·17	·02	·44	—
6.	—	—	—	—	—	—	—	—
7.	3·50	1·30	·36	·08	·11	·01	1·50	·17
8.	4·00	·85	·22	·13	·44	·05	2·09	—
9.	16·00	9·60	·32	·32	·72	·16	3·04	·40
10.	—	—	—	—	—	—	—	—
11.	·20	·06	—	·01	·02	—	·10	—
12.	·70	·20	·02	·14	·03	·03	·10	·02
13.	8·75	1·10	·10	3·00	·20	·05	3·30	·60
	64 15	23·41	2·12	5·24	3·67	·86	23·22	2·11

Therefore, the day's ration for one man contains:

	21·38	7·80	·71	1·75	1·22	·29	7·74	·70

If we again compare these numbers with those obtained from an equivalent quantity of cow's milk, we must come to the following conclusion: *The quantities of soda and lime contained in our ordinary food* (the right food according to the present physiological teaching) *are far below the quantities necessary to maintain a healthy existence, whereas the quantities of potash, iron, and phosphoric acid are generally too high.*

We can say, therefore (and examinations of the blood of so-called anæmic persons have corroborated) that *anæmia has nothing to do with a want of iron in the blood;* for any food-mixture you like contains, as the table on page 33 shows, quite enough iron. What conditions, then, do we find in anæmia and chlorosis? A hypervenosity of the blood, that is too large a quantity of carbonic acid in the blood, and the conditions occasioned by this. This has been known for a long time; but it was thought that an insufficient oxidation of the blood was the cause of these conditions, although we also know that the absorption of oxygen by the blood and the excretion of carbonic acid from the blood in the lungs have nothing whatever to do with each other. The absorption of the oxygen depends upon the hæmoglobin of the blood and the iron contained in it; the excretion of carbonic acid, upon the sodium carbonate and sodium phosphate contained in the blood. Blood which contains too little soda cannot regulate the gas exchange of the blood and of the tissues; an excessive accumulation of carbonic acid takes place in the body, the oxidation, that is the manufacture of carbonic acid being comparatively * unhindered, whilst the excretion of carbonic acid is rendered difficult.

That there is really a want of soda in human blood

* See later: Hydæmia.

is shown by the following table. The percentage proportion of soda (not sodium chloride) in the ashes of

ox's blood is	12·41	to	31·90 %
sheep's blood			13·33 "
calf's blood			10·40 "
pig's blood	5·33	to	7·62 "
dog's blood	2·02	"	5·78 "
human blood	2·03	"	6·27 " *

(We should like to call attention to the fact that the percentage of soda in human blood is very much the same as it is in the blood of the dog and pig, the two animals which are most subject to disease.)

Now let us turn to the fact that there is such a large deficiency of lime in our ordinary food. May we not conclude from this that the wide prevalence of *rickets* and of *stunted, irregular teeth*, the insufficient resisting power of so many teeth, the frequency of *osteo-malachia* (softening of the bones), and *osteoporosis* (breaking of the bones), and the tendency towards *diseases of the bones* generally, may be traced to the *deficient supply of lime salts* to the body?

This may be taken exception to on the ground that infants fed exclusively on milk, that is on a normal food-mixture containing a normal amount of food-salts, may also suffer from rickets.

True, but only those who are fed on cow's milk

* Gorup-Besanez, "Physiological Chemistry", 4th edition.

diluted with two or three parts of water, and who consequently consume only one-third or one-fourth of the quantity of food-salts contained in a normal food-mixture, as well as those infants who are fed by a dysæmic mother, or wet-nurse.

The fact that there seems to be a connection between want of lime and *rickets* has given rise to most contradictory theories. As rickets is often preceded by diarrhœa containing considerable quantities of phosphate of lime, some have even held the opinion that an over-abundance and not a want of lime might be the cause of rickets. But can we not give another explanation of this? The human organism doubtless possesses the faculty of retarding the decay of the tissue-elements, when the very existence of a tissue is threatened in consequence of a deficient supply of these elements in the food. And so in the case of a child receiving an insufficient supply of phosphate of lime in its food, all the phosphate of lime which it already possesses in its bones etc. will be retained until the last possible moment, and this task is rendered easier to the organism by the fact that lime molecules are replaced at longer intervals in the body than perhaps any other molecule. At length, however, the vitality of the phosphate of lime having been completely used up and its organic character lost, the time arrives when it *must* be thrown out of the system, and quite suddenly large quantities begin to appear in the excretions of the bowels.

Another illustration of this can be seen in the case of pregnancy: "The urine of pregnant women often contains hardly any traces of calcium phosphate, and this is due to the large amount of calcium phosphate required by the child for its development; for the same reason bone-fractures in such cases unite with great difficulty or not at all." * Why is this? Because these women have no organised, vital phosphate of calcium left in their bones, but only used-up calcium phosphate, which has become devitalised and dead. They may have had sufficient phosphate of calcium in their bones to last for some time; but the child first claims all that is supplied by the food, and if this supply continues only to be large enough for the child, the time will arrive when the organism of the mother must throw off the dead and used-up calcium phosphate stored up in the bones etc., and we may then look for a softening of the bones, an osteo-malachia, which is, as regards its cause, equivalent to the rickety softening of children's bones.

This is corroborated by the examination of the blood in a case of osteo-malachia which is given by G. Kobler in the "Wiener Klin. Wochenschrift" 1888,

* Liebig, quoted in Gorup- Besaner, ibid. page 98.

No 22 and 23. The ashes of the blood taken from the dead body contained in 100 parts:

	Osteo-malachia	Normal
Phosphoric acid.	7·25	8·49
Sulphuric acid...........	16·04	6·85
Chlorine................	19·925	29·59
Potash..................	34·16	25·565
Soda...................	9·35	23·169
Lime...................	·35	·872
Manganese......	—	·512
Oxide of iron...........	12·85	7·86

Kobler adds the following remark: "The considerable increase of sulphuric acid in the blood is very striking, and also the decrease of soda, which in normal blood is found in equal quantity with potash.

To us this is, of course, interesting, but only what we should have expected, as it is merely another instance of the importance of soda which we have all along maintained. The soda contained in the mother's blood has extra work to perform, as it has to help in excreting the carbonic acid formed in the tissues of the child. On account of this its vitality is more rapidly exhausted, and it is thrown out of the system sooner than usual. It is all the more difficult to replace, as the child claims so much of the soda supplied in the food. Now, as we know that soda is also needed to combine with the sulphuric acid set free in the system by the decay of albumen, we can easily see that a large quantity of sulphuric acid must be left uncombined and free, and this free sulphuric acid may eventually eat away the lime of the bone tissue. This "actually" present sulphuric acid, I think, deserves more notice than the "hypothetical" lactic acid which is supposed to be found in the blood of pregnant and osteomalachic women, but which has never been proved to be present either in the blood or in the urine. *

Kehrer † says that, "in opposition to those who consider bad feeding to be the cause of osteo-malachia," he must mention that "about one-third of his patients have been the wives of butchers, bakers, and inn-keepers, who are certainly in a favourable position as regards feeding." This observation in our opinion helps, after all, to prove the theory which Kehrer opposes; for we know that the families of butchers, bakers, and inn-keepers exhibit to a great extent anæmic disturbances, more especially fat dysæmia, in consequence of their wrong system of feeding.

It is therefore easy to understand why rickets is so often present when the teeth are forming, a larger quantity of phosphate of lime being used up during those periods. *Rickety teeth* show by their irregular

* E. Heuss, "On the occurrence of lactic acid in the human urine." Archiv für experimentelle Pathologie und Pharmakopie, volume 26, page 147 ff. (quoted from Maly, volume 19, 213). "The author examined the urine of a female patient in an advanced stage of osteo-malachia for lactic acid with a negative result."

† At the 66th meeting of German natural scientists and physicians in Vienna.

surfaces that their growth has been intermittent, and this is, of course, due to the fact that the lime-salts are not supplied with sufficient regularity and in sufficient quantity by the food. It can therefore hardly be contested that the frequent absence or early loss of the wisdom teeth, the ugly, soft, yellow crowns of some molar teeth, and the small power of resistance of so many teeth, must be put down to the irregularity in the supply of lime-salts.

The *osteo-porosis* (or bone fragility) of old age is another condition most naturally explained by the want of organised phosphate of calcium in the bones. A juvenile organism with strong digestive organs can consume larger quantities of food than it needs in order to obtain the necessary amount of food-salts, in which our ordinary foods are so poor; but an aged person with weaker digestive organs can only manage smaller quantities of food, and so has great trouble in obtaining the quantity of calcium phosphate necessary to replace what is worn out. Hence the rarified, porous bone tissue of aged people. Bone fractures in old age unite with as much difficulty as fractures during pregnancy.

It may be of interest to refer here to the researches of Gabriel, * according to whom the bones and teeth differ from the other tissues in containing far more

* Gabriel, (S.), "Chemical researches on the mineral substances of the bones and teeth." Zeitschrift für physiologische Chemie, XVIII., p. 257.

soda (8—12 %) than potash (1—3 %). Now, if soda is an important constituent of the bones, we can conclude that bone and tooth tissue which has been formed by blood poor in soda, must be inferior in quality, and secondly, that acids can more easily attack such tooth and bone tissue, as it does not contain sufficient soda to neutralize acids, and thus a direct destruction of the bone substance can take place.

Recently Wachsmuth of Berlin has supposed an accumulation of carbonic acid in the blood to be the direct cause of rickets.

The carbonic acid contained in the blood, increased in amount owing both to the condition of the body itself (compare our theory) and to its bad hygienic surroundings (bad air and unsuitable dwellings) redissolves too much of the lime-salt deposited at the growing ends of the bones, or actually prevents the precipitation of the lime-salts.

This theory appears natural. Rickets is known to exist, in spite of good feeding, owing to bad air, etc. The carbonic acid poisoning, caused by a wrong diet, which, as we have shown above, exists in dysæmic organisms, then becomes still more important.

And now, before we go any further, let us be quite sure that it is possible to choose one's food so that it will contain the amount of albumen, fat and carbohydrates required by the physiology of to-day, as well as the amount of food-salts thought necessary by us.

We have only to remember what has been said on page 31, and what is taught by the table on page 33 to see that a sufficient quantity of salads, leaf vegetables and fruits should be included in making up our food-mixture.

On the following we have given a list of the different constituents which, we think, should be included in such a food-mixture, using milk as our standard.

Let us compare this table with those given on pages 39 and 40—41, and the differences are at once evident.

We may still further increase the quantities of soda and lime in this food-mixture, if we can only free ourselves from the old-fashioned idea that so much *albumen* is needed in our food. Let us turn for a moment to the experiments which are supposed to prove this. In the majority of these experiments meat is the food that has been used. Now in meat half of the constituents, including of course the albumen and food-salts, are as good as useless; their molecules are deprived of *vitality*, having in the body of the animal, when alive, already performed their work, and only waiting to be excreted sooner or later. (In the table given on page 33 the amount 40·6 grammes of the food-salts in meat appears almost to equal the amount of food-salts in cow's milk; but from our last remark it will be seen that half of them are devitalised and, therefore, useless as food). *In vegetable foods*, on the

DAY'S RATION.	Albumen.	Fat.	Carbo-hydrates.	Total ashes.	Potash.	Soda.	Lime.	Magnesia.	Oxide of iron.	Phosphoric acid.	Chlorine.
	grams.	grams.	grams.	grams.	grams.	grams.	grams.	grams.	grams.	grams.	grams.
200 grams. of bread (rye bread or brown bread)........................	12·20	.85	98	2·89	1·06	·05	·03	·22	·06	1·41	—
{212 grams. of meat, or...............	39·20	26·30	—	2·10	·80	·21	·05	·07	·01	·90	·10
{160 " " lentils................	41·20	3·20	86	4·86	1·68	·64	·32	·12	·10	2·00	·24
250 " " milk................	8·30	9·00	12	1·70	·40	·16	·35	·05	·01	·46	·23
100 " " flour................	11·50	1·00	72	1·00	·30	—	·06	·12	—	·50	—
250 " " potatoes...............	4·90	—	52	2·00	1·20	·04	·04	·09	·02	·38	·05
200 " " spinach..............	5·00	1·16	10	4·18	·70	1·45	·50	·25	·13	·42	·25
40 " " chocolate, or cocoa.....	2·00	7·00	35	1·00	·40	·02	·05	·17	—	·40	·01
150 " " cabbage-lettuce.........	2·00	·50	5	1·55	·66	·13	·26	·10	·09	·15	·13
200 " " gooseberries (or straw-berries, or bilberries)..........	1·56	—	12	2·04	·80	·22	·28	·13	·10	·44	·01
100 grams. of dried figs.............	4·01	—	50	2·86	·80	·80	·51	·25	·04	·04	·08
50 " " milk curds............	12·52	2·55	1·8	1·75	·22	·02	·60	·04	·01	·66	·12
50 " " radishes...............	·60	·07	2	·37	·11	·07	·05	·01	·01	·04	·03
40 " " butter.................	—	33·00	—	—	—	—	—	—	—	—	—
Mixed food (the figures opposite meat only are counted)...............	103·79	81·43	349·8	23·44	7·45	3·17	2·78	1·50	·48	5·80	1·01
Purely vegetarian food (the figures opposite lentils only are counted)	105·79	58·33	435·8	26·20	8·33	3·60	3·05	1·55	·57	6·90	1·15

contrary, *the different constituents superabound in vitality.*

Another point to be noticed, is, that a blood rich in food-salts profits more by all foods, digests and burns them more completely, so that the quantity of carbohydrates in our table may also be lessened without hesitation.

If we have therefore left the amounts of albumen, fat, and carbohydrates equal to the amount given in the commonly used books on food, it is only to prevent possible objections on this point here. Personally we cannot really regard this list as a standard. *

* According to investigations made by Dr. Gmelin jun. in my physiological-chemical laboratory, the quantities of nitrogen absorbed by, and thrown off from my own body, are as follow:

Weight 66·5 kilos.

23 July,	9·185	nitrogen in the urine	=60·8 grs. of absorbed albumen.
24 „	8·654	„ „ „ „	=57·3 „ „ „ „
25 „	6·809	„ „ „ „	=45·1 „ „ „ „

The amount of nitrogen excreted in the fæces, has been allowed for in these calculations. Now, as according to experience about 13% of the albumen contained in the food is not absorbed, 13 % must be added to the amount of absorbed albumen in the above table, to obtain the amount of albumen contained in the food. For some time before this investigation was undertaken and on the days themselves, my food (as a rule fleshless) was as follows: Early in the morning porridge or cocoa with bread and butter, and some fruit. About ten o'clock some fruit and usually some bread and butter with white curds. For dinner: vegetables, salad, potatoes or rice (once pulses), and fruit. For supper: sometimes warmed up vegetables, salad, fruits, and sour milk, with a glass of beer an hour later.

I may add that I eat only a small quantity of food altogether, and that I have often very little appetite in summer, owing to the hard work of the busy season. I regularly lose about 2—3 kilos during

We may very well replace some 100 grammes of meat or lentils, as well as bread and flour by fruits or green vegetables, and we can then easily see that the amount of lime in the food-mixture will be further increased, whilst the amount of potash will be somewhat lessened. The proportion of the salts will then be exactly equivalent to that of the milk-salts.

We ought, however, to be sure that the food-salts contained in the raw products really pass into the stomach. Vegetables, as ordinarily cooked, are almost entirely deprived of their food-salts, so that a *reform of the present system of cooking* is most necessary. Compare chapter on cooking reform.

* * *

After having shown that dysæmia is due chiefly to a deficiency of certain important mineral substances in the blood, we have now to consider two other factors which help to increase the dysæmic condition of the blood: the overabundant consumption of *water* and the overabundant consumption of *common salt.*

The *consumption of common salt* (sodium chloride) is unnecessary if we choose our food rightly. In a

the summer, *but in spite of this have maintained the above mentioned average weight for the last ten years.* In other words: I am in a condition of nitrogen-equilibrium and—capable of work.

Dr. Gmelin, who feeds on our usual cure-diet (meat once a day, plenty of vegetables, salad, and fruit), and whose weight is 63·8 kilos, has from 8·5 to 14·5 nitrogen in the urine, which is equal to 56—95 grammes of absorbed albumen. He is as well and strong as myself.

normal food-mixture the proportion of the food-salts (comp. p. 51), as in the normal food-mixture milk, corresponds perfectly with the proportion of the salts in the human organism. (Comp. p. 37.)

G. Bunge, it is true, has advanced the theory that vegetable food, which makes up the larger part of the food of people living on a mixed diet, calls for the consumption of common salt on account of the excessive quantity of potash contained in it, the potassium salts forming with the sodium chloride of the blood potassium chloride and sodium salts, which, as abnormal products, would be excreted through the kidneys. This theory can only be applied in the case of a vegetable food-mixture which is wrongly composed.

There is no doubt that the food of carnivorous animals, which consume flesh and blood, is more favourably constituted as regards the relative proportion between potash and soda than the food of a man consuming bloodless flesh, cereals, pulses, and potatoes, or of one living on cereals, pulses and potatoes only; but we ought not to draw strange teleological or morphological conclusions from this, as Bunge does; the only conclusion that we can draw is, that a vegetable food containing an excessive quantity of potash, is not the proper food for man. Bunge knows of only one plant (the beet-root) so rich in soda that it will compare favourably with flesh and blood as regards the relative proportion of soda and potash; we are in a position to mention a good many more. We must take into consideration here the fact that the carnivorous animals * consume about five parts of flesh

* The following facts, taken from a paper entitled "Diet in the Polar Regions," may be of interest to us here. Dr. W. H. Neale, was in 1851, physician to the expedition under Leigh Smith to Franz Joseph's land. The ship was crushed in the ice, and the crew only succeeded in saving enough food for two or three months. They managed to keep in good health for 10 months by adding to their food 36 polar bears, 29 walrusses and 2,000 guillemots. Acting on the suggestion of Dr. Neale, as much blood as possible was taken from the animals after killing them, and preserved in a frozen condition. A pound of this blood (the only food rich in soda and food-salts generally) was used daily in the soup. There was not a single case of illness during the expedition.

As the advocates of the use of common salt often deny the possibility of living without common salt, it may be interesting to quote from a letter addressed by Herr A. Wocikoff, professor of physical geography at St. Petersburg, to the editor of the "Hygieia" (December, 1895):

"The Transactions of the Geographical Society, No. 6, contain a paper by E. Steinbach on the Marshal Islands, a group of Islands in the Pacific Ocean under German protection, whose inhabitants have long been acquainted with agriculture. The author says amongst other things: 'The natives never salt their food, not even with sea-salt; not a grain of common salt has to this day been sold for that purpose by the dealers settled on those islands—a fact of great physiological importance.' He further mentions that the natives live principally on cocoa-nuts, fruits of the pandance tree, bread-fruit and roots of the taro, but that they also eat plenty of fish and molluscs. Hitherto only the Sudanese and some other tribes whose occupation is hunting had been known to live without common salt. Amongst the former, common salt is said to be very expensive. In the case of the Marshal Islands common salt is imported by sea and cannot be dear; its not being used is therefore a very remarkable fact, especially if we consider the harm done by the over-consumption of common salt in Europe."

to one part of blood, and that, therefore, their food-mixture contains in 1,000 parts of dry substance:

Potash		Soda
16	:	5·7.

As compared with this the following plants contain (according to Wolff):

	Potash	Soda
Beet-root	39·58	12·33
Carrot	20·20	11·58
Asparagus	17·45	12·40
Radish	23·17	15·31
Cabbage	48·14	18·55
Spinach	27·29	58·16
Lettuce (summer endive)	33·17	46·28
Apple	5·14	3·76
Strawberry	7·16	9·68
Orange	11·22	4·15

Thus, if the food is properly selected, *we shall certainly not find a "superabundance of potash in vegetable food."*

But why should we not be allowed to add a little salt to our food, since we often consume it in a mineral inorganic form in our drinking-water? If we only took it in small quantities, it certainly would not matter much, but man, especially civilised man, consumes immense quantities. As he usually lives on food which is poor in mineral substances (or comparatively too rich in potash, according to Bunge), he has a craving for salt, to satisfy which he uses the mineral sodium chloride. The quantity of common salt which he takes with his food, is often larger than the whole of the organised mineral salts contained in the food itself. An average of 25 grammes of common salt a day for one person is not too high a reckoning, as it is found in all popular cookery books.

To pickle the body with common salt in this manner, is equivalent to poisoning it. The salt dissolved in the blood passes into all the tissues, and a *process of osmosis* takes place, that is an exchange of the dissolved constituents between the blood corpuscles and tissue cells on the one side and the plasma of the blood containing too much salt, on the other. Through the cell membranes the salt enters the cells, and the cell contents pass out. The process is exactly the same as that which Gorup-Besanez * (speaking of the nutritive value of unsalted and salted meat) describes as follows: "We know that 3/4 by weight of fresh meat consists of water; but the amount of salt water that can be retained by meat, is much less; and this is the reason why fresh meat in contact with common salt, its water gradually becoming salt water, loses some of its water. But this water, the brine, carries out with a considerable part of the effective organic and inorganic constituents of the meat, which are of course not compensated for by the common salt.

* Gorup Besaner, loc. cit. page 680.

The following table may serve to illustrate these facts:

In 100 parts of ashes	Pork		Beef	
	Unsalted	Salt Ham	Unsalted	Salted
Potash	37·79	5·30	35·94	27·70
Soda	4·02	—	—	—
Magnesia	4·81	·54	3·31	1·90
Lime	7·54	·41	1·73	·73
Sodium	—	34·06	—	16·28
Chlorine	·62	53·72	4·86	25·95
Oxide of iron	·35	—	·98	—
Phosphoric acid	44·47	4·71	34·36	21·41

These changes do not take place in the living organism to the same extent, as the living tissues defend themselves better against the process of pickling; but there is no doubt that the cells and tissues are actually deprived of organic and inorganic constituents in case of over-consumption of common salt. These constituents being loosened from the organic connection with the tissues, must be excreted through the kidneys as waste material. Thus a degeneration of the blood and tissue fluids takes place, a dysæmia through abuse of common salt. *

* E. Harnack ("On the composition of human sweat and the comparative amount of salt contained in the fluids of the body," Fortschritte der Medicin, No. 3, 1893) has collected and examined the sweat of rheumatic persons taking sweating baths. Specific gravity = 1·005—1·006, solid ·9 % (water 99 : 1 %), of which ·2—·24 % were organic

Now, is it not probable that, owing to the constant action of the unnatural process of osmosis * set up by the abuse of common salt, some of the tissues may become abnormally permeable? As an example of this we may refer to the generally accepted idea that scurvy, which is chiefly characterised by an abnormal permeability of the capillary vessels (compare section on Hæmophilia), is connected with the consumption of common salt.

substances, ·65—·67 inorganic substances. In the latter there was ·52 % of common salt. Now, as the blood plasma retains its quantity of common salt = ·6 %, or replaces it at once from the tissues, the above quantity (·52 %) of salt, which forms more than half of the solid constituents of the sweat, must be derived from the tissues—is it not obvious that these tissues must be "pickled"?

* Experiments made by Ernest Schiff show how strongly this osmotic power acts (E. Schiff, "On the influence of injections of common salt upon the composition of the blood," Maly's Jahresbericht 1890, page 131). The author gives in several tables the result of his experiments on injections of sodium chloride, from which we learn that, when 4 grammes of a ·6 % solution of common salt were injected, the number of the red blood corpuscles decreased after an elapse of 3/4 of an hour; the amount of hæmoglobin also decreased by about 10 %. If more common salt was used, a still greater decrease in the number of the red blood cells and in the amount of hæmoglobin was noticed. The author was convinced by other test experiments that the decrease in the number of the blood-corpuscles is not caused by their solution, but by dilution of the blood. The dilution of the blood does not, however, correspond to the quantity of the solution of common salt injected; for the experiments showed that by using 4 grammes of the salt solution, a dilution of the blood was obtained which could only be produced by injecting five times the same quantity of water alone. (The surplus water has, therefore, been drawn osmotically from the tissues!—The author).

I must not omit to state here the opinion of Prof. Bunge, * a conditional defender of the consumption of common salt and the most industrious worker on this question. Bunge says:

"I consider that the quantity of salt which we add to our food, is much too large. Common salt is not merely a food-stuff, but also a stimulant, and like every stimulant it easily conduces to intemperance. A reference to table III (of Bunge's book, the author) shows us how small a quantity of common salt we need, to add to most foods in order to make the proportion of the alkalies equal to the proportion in milk. If, *e.g.*, we fed on cereals and pulses, from 1 to 2 grammes of common salt would be sufficient for a day, if we fed on rice, a few decigrammes; instead of which most people consume from 20 to 30 grammes a day and often much more. We must ask ourselves the question: Are our kidneys really designed to eliminate such large quantities of salt? Do we not give them too much work to do, and might this not give rise to pernicious consequences? In feeding on meat and bread without the addition of salt we do not excrete in 24 hours more than 6—8 grammes of alkali salts. In feeding on potatoes with the usual proportion of common salt added, more than 100 grammes of alkali salts are forced through the kidneys

* Ibid, page 118.

daily. Is there no danger in this? The consumption of alcoholic drinks, besides being one of the causes of chronic nephritis, also gives rise to an intemperate consumption of common salt; like all other intemperate habits it soon gives rise to a second. These are questions to which I should like to draw the attention of practical physicians. There is no organ in the body which is treated so pitilessly as the kidneys. The stomach reacts against overcharging; the kidneys must patiently suffer anything. Their diseased condition is only observed when it is too late to remedy the evil effects produced. I should like to mention here how small an amount of work the kidneys have to perform if rice alone is used as food. Only 2 grammes of alkali salts are excreted within 24 hours. The superiority of rice, on which for centuries the majority of mankind (Persians, Indians, Chinese, and Japanese) have lived, compared with the potato is evident. Is it not likely that rice might be a useful food in case of kidney disease and even in the case of stomach diseases, for the potash salts greatly irritate the mucous membrane of the stomach, and rice is poorer in them than any other food."

Man, devoid of instinct, has very little idea how much solid food to consume, but he is still more at a loss as regards the *fluid food*. The principal cause of this is the abuse of common salt. Children who are fed on foods containing little or no salt, know how much to drink; but where are these children to be found? At the present time I only know of my own. Most children have to wash out of their tissues from 10 to 20 grammes of common salt daily, and so, of course, crave for fluids. We have only to look into a school-yard during the afternoon recreation time, to be convinced of this.

Now, we have already mentioned that our food, in order to be normal, must contain 85–88 % of water. If we constantly exceed this amount, our health must suffer. To illustrate this, we know that children drinking milk which contains 87 % of water, are never thirsty, whilst on the other hand those who drink watered milk, nearly always become ill. * We also know that certain animals, *e.g.*, hares and rabbits, which feed on grasses and herbs containing about 85 % of water, never drink as long as they can find that food. Indeed physiological observations upon the excretions have shown that a full-grown man ought to consume 2,818 grammes of water daily in his food, a quantity which is equal to 83 % or roundly 85 % (see page 30) of the total amount of food taken daily.

We have, therefore, good reason to suppose that in ordinary cases not more than 85—87 % of the

* Comp. section: Dysæmia of Infants.

fluid and solid food together should consist of water; of course, in cases of an exceptionally great loss of water, the quantity taken to replace it, may and must be greater. We must, however, always remember that the quantity of urine decreases as the activity of the skin is increased; and experiments have shown me that one may take sweating baths daily and restrict the consumption of fluids (in solid and fluid foods) to 300 grammes a day for weeks, and yet there will be no disturbance of health. Indeed, the state of health during such a "dry cure" may be especially good, the reason for this being, that the quantity of water excreted, both by the skin and kidneys, is gradually adapted to the quantity taken in; the amount of water really required by the tissues thus remains absolutely uninfluenced. In this condition the functions of the body and especially of the nervous system are most easily performed.

A healthy man may, therefore, consume 2,818 grammes of water in 24 hours. Now, the day's ration given on page 40 already contains in the so-called solid food 1,000 grammes of water; the day's ration given on page 41, 1,334 grammes. Therefore, if we consume the quantities of solid food given in these tables, we ought only to add 1,818 or 1,484 grammes of water in the form of drinks. But there are few people who, in addition to these quantities of solid food, do not take

For breakfast and tea together 4 cups of coffee or tea, containing 150 grs. each	=	600 grs.
In soups and other dishes prepared with a good deal of water	=	800 ,,
In drink (water, beer, wine, cider, etc.)	=	2,000 ,,
	Sum...	3,400 grs.

of water, that is from 1,500 to 2,000 grammes more than the body really requires. And these persons are not intemperate, for there are people who drink without hesitation 10 litres, that is 10,000 grammes of fluid day after day.

Now, if a person consumes more than 87 °/ₒ of water with or in his (solid and fluid) food, he not only dilutes his food, but also the blood formed from this food. This dilution of the blood must be continuous, because firstly the consumption of fluid is spread over the whole of the day, whilst its excretion is also gradual, and because secondly the tissues fill themselves osmatically with water and keep on supplying abundant quantities of water to the lymph system, in spite of hard work on the part of the heart and kidneys. We have, therefore, not only a *dilution of the blood*, but a disturbance of the whole system: **hydræmia,** that is **watery condition of the blood.**

The *hydræmic (diluted) blood* must, of course, be *poorer in mineral constituents and corpuscles* than blood normally concentrated (see section on Corpulence and Infectious Diseases). The *corpuscles themselves deteriorate in quality*, for they cannot derive sufficient nourishment from the diluted fluids around them; thus they have a *lessened capability for work* and probably a shorter life duration. Indeed, it has been proved by experiment that a more rapid decay of red blood corpuscles takes places in a too watery blood serum.

* * *

We have now shown that dietetic dysæmia arises from the three following causes: *a wrong selection of food* (or a wrong preparation of it), *the abuse of common salt*, and *the excessive consumption of water*. The action of these three factors must give rise to a great variety of diseased conditions; for they may act singly, together, or two of them may act without the third, whilst the intensity of their action is also subject to great variation. We must further take into consideration the fact that the dysæmic condition may either be inherited, or due to dietetic mistakes on the part of the individual himself. Finally, one or other of the hygienic errors pointed out in the introduction to this book may co-operate with the above. In fact, the whole field of diseases may be thus accounted for. Now, owing to the great number of combinations possible, it is, of course, difficult to trace the connection between each single disease and dysæmia as its cause; but the correctness of our theory will appear more and more to those who will allow themselves to be guided by the above ideas, when seeking for the causes of disease. And if this book only helps to modify somewhat the present ideas as to the cause and prevention of disease, its purpose will be accomplished.

ANÆMIA (CHLOROSIS) AND RELATED CONDITIONS

The expression *anæmia* (bloodlessness) gives us no real idea of the disease, as an actual "bloodlessness" except the temporary want of blood after sudden great losses cannot be said to exist; nor is the so-called anæmia due to a want of iron in the blood: this has been proved by examination of the blood, whilst we have shown by the table on page 33 that all foods contain enough iron. To find the real cause of the disease, we must refer to dietetic dysæmia, for only the variety of the dysæmic factors can explain the variety of the anæmic symptoms.

There are both fat and lean anæmic people, there is the comparatively harmless form of anæmia known as chlorosis, and on the other hand the dangerous "pernicious" form of anæmia.

It will be sufficient for our purpose to discuss here the *fat* and *lean forms of dysæmia*, for we shall then be in a position to understand the other forms of the disease and the special conditions produced by them.

Having already learnt that, owing to the present system of dietetics, almost every individual suffers from a want of soda in the blood, is it not natural for us to suppose that in this we can find an explanation of anæmia? The whole of mankind would then be anæmic or, more properly speaking, dysæmic. To show that this is really the case, we have only to remind the reader how difficult it is to find a person who is not either too fat, or too lean, and to find a man with a figure corresponding to one of the ancient statues of Apollo, in which the ribs are just visible, or a woman with a figure like a statue of Venus, in which the outline is somewhat more rounded, is almost impossible nowadays.

Now, how is dysæmia connected with this?

We have seen (on pp. 42—43) that the want of soda causes a hyper-venosity of the blood or, more properly speaking, an accumulation of carbonic acid in the tissues and tissue-fluids, and this alone is sufficient to explain a great many of the anæmic symptoms.

The accumulation of carbonic acid in the blood is the cause of a deficient circulation of the blood in the skin, and this again hinders the escape of the volatile waste products through the skin, whilst the stagnation of the blood in the body generally, renders the process of oxidation more difficult, and thus gives rise to a formation of abnormal decomposition products in the tissues. All these conditions together with the accumulation of carbonic acid itself produce the most dangerous symptom of anæmia, the anæmic thirst. The organism endeavours to excrete these abnormally accumulated poisonous products, the so-called "self-poisons" (autotoxins), particularly the carbonic acid, and it instinctively makes use of the physiological means, the thirst. The thirst is, of course, unquenchable, as it is constantly being produced afresh by the action of the dysæmic factors. It, therefore, becomes morbid and itself gives rise to a hydræmia or watery condition of the blood (comp. Hydræmia).

Now, as we have already seen, a dilution of the blood means a smaller proportion of red blood corpuscles, which have also deteriorated in quality, and this is equivalent to saying that the oxidising power of the blood is lessened and therefore insufficient.

On account of this only a superficial combustion of a large part of the consumed food and of the body material destined for decay, will take place, the smaller amount of oxygen absorbed not being sufficient to burn up everything completely. The albuminous substances will be the first to be affected, as they need the largest quantity of oxygen for their combustion. They can, therefore, only be reduced to the stage of fat, a stage in the process of oxidation which is comparatively lasting and innocuous.

Whilst in a healthy organism fat may be formed from the fat of the food and from the carbohydrates, in morbid conditions albumen seems to be the principal source of fat, the morbid, that is dysæmic, blood being constantly claimed by the more easily oxidisable constituents of the food, and being unable ever to complete its work of oxidising the body material. That the decay of tissue elements is retarded, is also shown by the accumulation of abnormal urine constituents, and explains the disposition of obese persons to kidney disease and gout.

We have now traced the origin of "*fat anæmia*" and *corpulency* generally.

That the overdrinking is not absolutely necessary to produce this condition, is true, but it is present in the majority of cases; and at any rate some conditions of dysæmia must be present to produce corpulency. In one case the action of the heart is weak, the heart muscle being overcharged with carbonic acid and insufficiently nourished, and this causes an insufficient gas exchange in the lungs and an insufficient absorption of oxygen; in another case oxidation is prevented by an overabundance of acid in the blood (see diabetes); in a third case the formation of abnormal acids in the blood, which are left free owing to a want of alkalies, produces a decay of the red blood corpuscles * and thus lessens their number.

Let us now turn to the *lean form of anæmia*, more properly speaking dysæmia.

* Friedrich Kraus, Archiv für experim. Pathologie u. Pharmak., Vol. 26, pages 186—222.

This is in its simplest form found in children and young people of both sexes and indeed in all those who, combined with a lively temperament, possess a comparatively strong heart. The strong action of the heart drives the surplus water rapidly through the kidneys, thus preventing a dilution of the blood, and at the same time aiding and accelerating the process of tissue change. People thus constituted are, on the whole, the strongest and most useful to society. But the dysæmic factors acting for years do not allow them to retain their healthy normal figures; they become either too fat or too lean. As soon as they get somewhat better food and care, be it through marriage, or through the acquirement of wealth, they tend to become stouter. They have, it is true, an advantage over those naturally predisposed to fat dysæmia, owing to the stronger action of their hearts, and they preserve for some time a stronger appearance. But it does not last long. A fatty degeneration of the heart will develop sooner or later, whilst other disorders related to corpulency may develop at any time (comp. sections on Gout and Diabetes).

Lean dysæmia is generally artificially produced by a so-called generous diet. This generous diet consists of foods rich in albumen and poor in soda: meat, fowl, eggs, etc. The excess of insufficiently oxidised albumen gives rise to the formation of a considerable quantity of sulphuric acid which, unless it combines with alkalies, will attack the tissues (comp. gout and diabetes). Now, as there is a want of alkalies (bases), especially of soda * in the blood, the free sulphuric acid will attack the body material itself, to draw the necessary bases from it, and will thus destroy it. This is the process which takes place in the so-called Banting cure, in which the tissues are destroyed by the sulphuric acid formed from the excess of the albuminous food; a Banting cure is therefore constitutionally debilitating and cannot be called rational.

People suffering from lean dysæmia, worry themselves in their endeavours to get stouter by eating and drinking, and they obtain the very opposite result. No wonder! for what they eat only helps to poison them. The following experiment of Forster † illustrates this: He fed two dogs on meat deprived of its food-salts by soaking, together with fat, sugar, and starch flour, and three pigeons on starch flour and casein, which also contained very few salts. Now he observed that the animals fed on this food perished remarkably quickly. The three pigeons lived 13, 25, and 29 days respectively. The dogs were on the point of death after 26 and 36 days respectively. *Dogs which*

* Eggs, indeed, contain comparatively much soda, but at the same time a good deal of sulphuric acid, which claims the soda for itself.

† I. Forster, Zeitschrift für Biologie, Vol. 9, page 297.

are completely deprived of all food, live from 40 to 60 days!

Thus, animals die sooner when fed on food deprived of food-salts than when they have no food at all given to them.

Bunge * explains this apparently strange fact by means of another experiment. He proves that it is the sulphuric acid formed from the sulphur of albumen, which, finding no bases to combine with, destroys the living cells. "It seizes on the bases, which from integral parts of the living tissues, draws some of the constituents from the cells, and causes their destruction."

Those who suffer from lean dysæmia (that is, the bad cases) struggle hard for their existence. Not only do they fail to form fresh body material, but they partly destroy, by using wrong food, that which already exists.

The treatment of these bad cases of lean dysæmia is very difficult, they require a long time, and to obtain a successful result we must give up the senseless idea of the so-called generous food-stuffs, meat, eggs, broth, beer, pulses, cereals, etc. Such cases will not improve until they obtain a proper quantity of soda from their food, which should, therefore, consist principally of green vegetables, green salads, and juicy fruits.

* Ibid, page 140.

It is indeed difficult to make people understand that the same diet can produce corpulency in one person and leanness in another, but experience teaches that this is actually the case. How often do we see two married people, the one fat and the other lean, although they have lived on the same food for many years. The only difference originally was perhaps, that one possessed a more active heart than the other. This stronger heart causes the kidneys to excrete the surplus water more rapidly and so prevents a dilution of the blood. The oxidising power of the blood thus remaining normal, larger quantities of sulphuric acid are formed in the process of oxidising and splitting up the albuminous substances than in the case of the second. Here the blood is diluted owing to the weaker action of the heart, the albumen is transformed into fat and in this form protects the tissues against the attacks of the acids. Besides this, in these hydræmic cases the sulphuric acid is not so concentrated and, therefore, not so injurious; and some may even possess the power of forming ammonia, so providing a base for the sulphuric acid. According to Bunge, dogs possess this faculty to a certain extent, and they also seek to protect themselves against acid poisoning by drinking large quantities of water. (N.B.—I had a St. Bernard dog which drank large quantities of water when he first came into my possession, but which, after being fed rightly for some time, drank even less than his master. He very often drank nothing except his half litre of breakfast milk all day.)

We have, however, not yet exhausted all the causes of corpulency. We have to take into account the quantity of food consumed, the amount of work done and the amount of rest taken, as well as special chemical conditions of the blood. If, *e.g.*, the blood or tissue fluid contains an excess of acid, it is possible (as will be explained under diabetes) that the albuminous substances are more easily broken up than the carbohydrates (and fats?). In such a case fat might be formed from the carbohydrates and fats of the food.

That fat is readily formed from food of every description, provided that the blood is in a pretty good condition and that there is very little waste (little exercise etc.), is shown by the fattening of animals for market; that hard work hinders the formation of fat, is shown by the bodily appearance of our working men, that overstraining of the nervous system and mental excitement give rise to leanness, is shown by the type of the American neurasthenic, whose wife and daughters become fat on the same diet.

From all this we see that the question of the causation of anæmia is not so simple as it appears to be. The great variety of theories as to the cause of corpulency, shows how little is really known about it; and the cures of obesity and leanness founded on these theories are by no means rational.

One often finds that people suffering from fat anæmia, avoid potatoes and vegetables altogether because these foods are supposed to be fattening; and yet they make themselves more dysæmic with meat and tea, and do not become any thinner. A fat person will certainly become fatter on any of the ordinary foods when eaten to excess, just as a lean person will become still leaner on a generous albuminous diet. The latter condition is found chiefly amongst individuals who are working too hard. They live, like the neurasthenic American money-hunters, chiefly on "nutritious" meat and become more and more lean and nervous, till at last some disease of the brain is set up. We strongly advise all those suffering from nerve diseases to eat plenty of vegetables and fruits rich in salts. We cure three-quarters of our cases of lean as well as of fat neurasthenia by this diet alone.

The different forms of the "pernicious," that is dangerous, anæmias should be looked at from the same point of view: for I believe, it would be easy to produce in a dog (or in its offspring after some generations) one of the pernicious forms of anæmia, by daily depriving it of part of its proper amount of food-salts.

Man generally disregards all diseases which are not directly fatal, and it is almost impossible to convince him that pernicious influences kept up for years, may at last become fatal—and yet a degenerated, spectacled, toothless, hairless, ugly, spiritless generation stares him in the face.

ACUTE AND CHRONIC RHEUMATISM, GOUT (*uric-acid diathesis, arthritis*), APOPLEXY (*arterio-sclerosis*).

I still group together under the same heading all the diseases mentioned above, my theory being borne out by my clinical experience, although many doctors have lately classed rheumatism of the joints with the infectious diseases caused by bacilli, and Klemperer * even proposes to "give up the name of uric acid diathesis as a comprehensive name for gout and the uric acid formations in the kidneys, the two being of a totally different nature."

Recent researches show that uric acid arises from the decay of cell nuclei. That portion of uric acid which has its origin in the digestive organs is, like other alloxanic bases, changed into urea, or rather should be. But a diseased liver, or a healthy one which is overworked owing to an excessive ingestion of food containing cell nuclei and therefore an excessive amount of uric acid, is unable to transform all the uric acid formed into urea.

The quantity of uric acid arising from the normal

* "Aerztliche Rundschau" No. 28, 1896.

decay of the tissues, is small; in fever, when there is a more rapid decay of cells, the quantity of uric acid and other related alloxanic bodies is considerably increased. The greater the quantity of useless body-material, and the worse (more dysæmic) it is in quality, the greater is the danger of a more rapid decay of cells and a precipitation of uric acid and related products taking place.

Some organisms produce remarkable quantities of uric acid, whilst, as Klemperer remarks, "many have the power of destroying even the nucleins so that uric acid is transformed into urea." In other words: For the formation of uric acid in the human organism we must take into account not only the food ingested, but also the special behaviour of each individual organism as regards its metabolism (tissue-change). Many patients exhibit an abnormal formation of uric acid although they take care to avoid such food substances as thymus-gland, pancreas, liver, kidneys, brain, and flesh, which are rich in nuclein; whilst others may consume the above mentioned animal substances and yet excrete comparatively little uric acid. The chemical behaviour of the organism, its chemical quality, is the deciding factor, and we shall see that our theory receives further support from our lately increased knowledge as to the origin of uric acid. Hitherto the formation of uric acid has been traced in a general way to a flesh-diet, but we now know that it is formed from the cell nuclei of animal substances. My own opinion, that it is also formed by a cereal and pulse diet, has been confirmed by the above mentioned investigations; for these foods are rich in nuclein, as compared with the juicy vegetables and fruits.

The uric acid passing through the liver may perhaps be transformed into urea by a special action of the cells; but the uric acid drawn directly from the digestive canal and that formed from the assimilated food or from the body material, has to be oxidised, in order to be excreted in the innocuous form of urea. An organism possessed of this faculty of oxidation is protected against a precipitation of uric acid, but in a dysæmic organism the faculty of transforming uric acid into urea is lessened.

The most common form of dysæmia, next to the want of soda and lime in the blood, is the watery condition of the blood (hydræmia). This leads, as we have seen, to an insufficient oxidation of the albumen, that is to the formation of fat. There are, however, other decomposition products which are not completely oxidised, but which are left at some intermediate stage, *e.g.*, *uric acid.*

It is a fact well worth considering that the urine of carnivorous animals, *e.g.*, dog and cat, is often quite free from uric acid, whilst human urine varies in this respect according to the food taken: if vegetable food alone be consumed, the urine will contain, like the urine of herbivorous animals, only traces of uric acid (from ·2 to ·7 grammes in 24 hours); but if a large proportion of flesh food be taken, the urine will contain 2 grammes or more. Man is the only creature which suffers from the uric-acid diathesis; is it not likely that this arises from a wrong choice of food?

Now, if the excretion of the uric acid always took place easily, we should not have to trouble much about its formation, but it is this excretion which constitutes the difficulty.

Uric acid and the acid salts of the uric acid dissolve with difficulty in cold water, but more easily in warm; still, one gramme of uric acid requires from 7 to 8 litres of water at the temperature of the body for its solution. The acid urate of soda dissolves in 1,100 parts of cold and in 124 parts of boiling water. The ammonia salts and the salts of the alkaline earths do not dissolve nearly so easily. *

The "warm water" which keeps the uric acid and the uric-acid salts dissolved in the body, is the blood and tissue fluid. Serious disturbances must take place if this fluid becomes cooler or diminished in quantity; for a deposit of crystalline uric acid would occur in the body.

A person who has daily to excrete 2 grammes of uric

* Comp. Bunge, ibid. pages 293 and 294.

acid, is constantly liable to this precipitation, as he may at any time lose large quantities of water through perspiration. It is, therefore, undoubtedly safer to have the uric acid combined with soda as an acid urate; but where is soda to be obtained if it is absent from the blood owing to dysæmia?

The sulphuric acid, which is formed by the decay of the albumen compounds, together with chlorine, claims all the free alkaline bases in the body, * so that there are hardly any left for the uric acid. If the body could not produce ammonia, to combine with the acids, or if part of the sulphuric acid could not be changed from a diabasic to a monobasic acid by combination with aromatic compounds, the conditions would be still more unfavourable for the excretion of the uric acid.

The more acid the urine is, the more easily will a precipitation of the uric acid occur in the organism, for instance, in the kidneys or bladder.

The urine of a person eating flesh contains a large amount of uric acid, as we have seen above; it is also strongly acid in reaction, whereas the urine of herbivorous animals is generally alkaline in reaction.

Now Bunge † says: "The most important (?, the author) vegetable foods, the cereals and pulses, produce as acid a urine as meat, because they are rich in albumen and phosphorus compounds. From this some hints may be derived as regards the diet of patients predisposed to the formation of uric-acid gravel and uric-acid concretions in the bladder. We

* Comp. Bunge, ibid. page 315.

† Ibid. pages 315 and 316.

are, it is true, not yet clear about all the conditions necessary for the precipitation of uric acid; but we do know that besides the amount of uric acid present, the degree of acidity of the urine must be taken into account.

"We should, therefore, advise our patients to avoid such foods as are very rich in albumen and at the same time poor in bases which would combine with the uric acid and sulphuric acid formed from the albumen. In this respect the most harmful food seems to me to be cheese (fresh curds are not meant—the author). In the preparation of cheese, the basic alkali salts have passed into the whey, so that there are no bases left to combine with the large quantities of uric acid, sulphuric acid and sulphuric acid formed from the casein of the cheese during the process of oxidation. In certain parts of Saxony, in the Altenburg district, where the peasantry consume a good deal of cheese, bladder-stones formed of uric acid are said to be very frequent. In Switzerland, where cheese is also eaten in large quantities, bladder-stones are rare, perhaps because a great deal of fruit is also consumed.

"A very acid urine rich in uric acid is also produced by salt meat and salt fish, because in the process of salting, the basic salts (basic alkaline phosphates and carbonates) pass into the pickle water and neutral common salt takes their place. Russian physicians have told me that in certain parts of Russia, where the people eat a great deal of salt fish, urine stones are frequent. Now, if we wish to prevent by the use of alkalies the formation of uric-acid sediments or gradually to dissolve such concretions as have already formed in the bladder, it is certainly more rational to prescribe a diet of fruits and potatoes than to order alkaline mineral waters, which, when taken constantly, may produce all sorts of disturbances."

If, then, it is true that our ordinary diet consists chiefly of foods rich in albumen and phosphoric acid, but poor in soda, * and that in consequence of this a tendency towards the accumulation of uric acid in the body is pretty generally found, the very slightest extra strain on the system will be sufficient to cause a precipitation of uric acid and uric-acid salts in the body. This result is very often brought about by a chronic acid catarrh of the stomach, which in its turn depends upon dysæmia and is in 95 out of 100 cases the predecessor of gout. The fermentation acids, especially oxybutyric acid (which is found in the urine both in acid catarrh of the stomach and in diabetes mellitus), combine with some of the alkalies of the blood and thus lessen its alkalescence (basic character); and as a catarrh of the bowels and periodic diarrhœas are frequently associated with the acid catarrh of the

* Those foods rich in potash are of little value, as the acids cannot combine with the potash of the blood-corpuscles.

stomach, these bases may be even directly excreted in the stools, and thus the quantity of alkalies in the blood is further diminished.

Now, if we find that *men consuming vegetable food form only small quantities of uric acid, herbivorous animals as well as carnivorous hardly any*, but *men living on flesh food, very large quantities*, we must come to the conclusion that *men cannot properly manage flesh food.* The organism of the flesh-eating animal has the faculty of completely digesting flesh food, whereas the organism of man is unable to accomplish this. **Consequently man cannot be classed as carnivorous and cannot eat flesh unpunished.**

To illustrate this further, we may mention another important point here. Carnivorous animals have atrophid, inactive *sweat glands*, whilst man and herbivorous animals possess well-developed sweat glands. There is no doubt, therefore, that the herbivora must have preceded the carnivora in point of time, the carrion feeders being the connecting link between them. The carnivora have retained the sweat glands as atrophid (rudimentary) organs and as a sign of their origin, but have given up the habit of sweating, or, in other words, have adapted their skin to the changed conditions of feeding. An animal whose food contains large quantities of urea as well as of kreatin, kreatinin, xanthin, hypoxanthin, guanin, etc. (the early stages of uric acid), and thus increases the quantity of urea and uric acid already present in the body, must take care always to keep these substances in solution. But the urea and uric acid can only be dissolved in comparatively large quantities of warm (blood-) water. Such an animal must, therefore, be exempt from the possibility of suddenly losing $\frac{1}{6}$ to $\frac{1}{5}$ of its blood and tissue fluid by sweating, or else a precipitation of the above mentioned substance will take place. Nor should its organism allow of any sudden cooling down of portions of the skin, such as might be caused by evaporation of the sweat, or else a precipitation would again take place. In a word, such an animal must not be subject to sweating, or else it would be troubled with acute and chronic rheumatism, gout, etc.

Now, **as man is subject to sweating, it is evident that he was not intended to live on flesh, but on vegetables or rather on fruits,** for he was never meant to live on cereals, as we have seen above. Man *may* eat a limited amount of meat and cereals without doing himself much harm; but he must always remember that they ought never to form his principal food.

As soon as it is really understood that we were never intended to live on flesh and cereals, the uric-acid diathesis as a trouble of mankind will disappear. We must, of course, not forget to restrict the consumption of common salt and to use such vegetable foods as are rich in food-salts and not those which are rich in albumen; for a diet consisting of bread, pulses, cereals, and potatoes, will tend to produce gout just as much as a diet consisting of flesh, fish, and caviare.

Now, there are several other conditions produced by the presence of uric acid in the organism, namely, *rheumatic joints*, *inflammation of the interior of the heart* (endocarditis), *valvular disease of the heart* and further *degenerative conditions of the walls of the bloodvessels* (arterio-sclerosis), which generally end in *apoplexy*.

The precipitation of uric acid and uric-acid salts in the blood and in the tissues (probably assisted by other decomposition products such as leukomaines and ptomaines) causes under ordinary circumstances only rheumatic neuralgic conditions, for instance, *muscular rheumatism*, facial paralysis, trigeminal neuralgia. In certain cases some of the uric acid may be deposited in the joints. The uric acid and uric-acid salts deposited in the tissues are again dissolved by the blood when the circulation becomes freer. The joints, however, or their synovial membranes are favourite seats for the deposit of various kinds of harmful products, and for anatomical reasons these deposits cannot easily be redissolved, so that precipitations of uric acid may be found in the *joints* long after a normal condition has been re-established in the rest of the body.

I fully agree with Ebstein's opinion that "even dissolved uric acid can produce a harmful chemical irritation." According to Ebstein the precipitation of uric acid in the case of gouty joints is preceded by a degeneration of cartilage and tendons; for the dissolved uric acid sets up first an irritation and then an inflammation in them.

In acutely inflamed *rheumatic joints* there has been no time for this degeneration to take place, and this probably explains the fact that in these acute cases little or no precipitated uric acid is found.

The *inflammation of the heart* and the *diseased condition of its valves* as well as *the atheromatous condition of the vessels* are easily explained, when we remember how continuously the blood, carrying with it the irritating uric acid, comes into contact with the interior of the heart and the vessel walls. In young people suffering from an acute attack of uric acid poisoning, it is generally only the badly vascularised valves and their chordæ tendineæ which are affected, whilst in older people suffering from the chronic form of the disease, the uric-acid diathesis, the vessel walls are usually diseased. The irritation caused by the dissolved uric acid, sets up an inflammation at various points in the vessel walls. These inflamed points soon break down, forming the atheromatous ulcer, which may eventually develop into an aneurism (an expansion of the vessel walls), the predecessor of *apoplexy.* *

* For a full account of "apoplexy" see my book "Die wichtigsten Kapitel der natürlichen Heilweise," A. Zimmer, Stuttgart.

THE DEFORMING RHEUMATISM OF THE JOINTS

The deforming rheumatism of the joints of young persons, which cannot be classed amongst the other rheumatic diseases, must nevertheless be classed with the diseases caused by dysæmia. It completes the picture of the various ways in which the self-poisons produced by a dysæmic mode of living may act upon the organism. To find a typical example of juvenile deforming rheumatism of the joints, we must refer to cases occurring in women after delivery. Dysæmic women during pregnancy may not only suffer from eclampsia, owing to an acid poisoning; they may not only acquire a softening of the bones, owing to dysæmic influences (comp. pp. 45 *sqq.*); but this peculiar and almost incurable disease of the joints may also arise owing to the same factors. The particular form of the disease depends upon individual conditions and is not of much practical importance, as all seem to be equally fatal in their effects. *We* know that they are all avoidable.

DIABETES MELLITUS

The subject of this section is a very difficult one and cannot be discussed thoroughly here; we must, therefore, restrict ourselves to offering a few suggestions.

There are several different forms of diabetes, but we cannot speak of them all here. Thus we will not discuss the degenerative form of diabetes, which, like all degenerative diseases, *e.g.*, cancer, is nearly always fatal. (This form of the disease occurs even in children. Thus, in my practice, in the year 1893, a boy 14 years old died of this degenerative diabetes, and in the same year I heard of five more cases of children, 6, 9, 11, 16 and 17 years old respectively.)

Diabetes is doubtless nearly related to gout on the one hand and to corpulency on the other. This opinion is shared by many; but the relation between these diseases can only be really explained if we accept the theory of a common cause, namely, dysæmia.

To start with, we have the following facts to go upon:

1. "The appearance of sugar in the urine in diabetes is due to an abnormal increase of the quantity of sugar in the blood," and

2. "The increase of the quantity of sugar in the blood in diabetes is due to a lessened destruction of sugar."

All the rest is hypothesis. May we not, therefore be permitted to state our theory?

The most natural hypothesis would be to suppose the faculty of combustion or oxidation lessened in diabetes; but this hypothesis has been rejected, because a lessened oxidation of certain other substances could not be proved.

But unmistakable products of an incomplete oxidation, such as oxybutyric acid, aceto-acetic acid and acetone have often been found in diabetic urine.

Of course, "hindered oxidation" alone is not sufficient to explain the onset of diabetes; for there are diseases in which oxidation processes are considerably disturbed, and yet the quantity of sugar in the blood is never increased, nor can sugar be proved to pass into the urine.

Let us first turn our attention to the *alkalinity and acidity of the blood* (the latter condition has already been touched upon in the preceding section.)

In healthy persons the alkalescence amounts to ·187—·253 grammes of NaOH per 100 ccm. of blood, and the degree of acidity to ·173—·232 grs. of NaOH per 100 ccm. of blood. * Practically only the relation between the degree of alkalinity and the degree of acidity is of importance here. Under normal conditions the former surpasses the latter; in morbid conditions, however, considerable variations occur. We may point out here that the amount of carbonic acid in the blood also varies a good deal according to the preponderance of the alkaline or the acid character of

* Friedr. Kraus: "On the alkalescence of the blood in diseases." Zeitschrift für Heilkunde, Vol. 10, pp. 1—57 (quoted from "Maly" XIX).

the blood; under normal conditions it amounts on an average to 33 per cent.

In leucæmia, *diabetes mellitus*, chronic rheumatism of the joints, and in intense forms of anæmia, a great *decrease of the alkalescence* has been observed by Erich Peiper. * In rheumatism of the joints, for instance, the alkalescence amounted to ·176, the acidity to ·272 (Fr. Kraus).

The lower the alkalescence and the higher the acidity of the blood, the more the amount of carbonic acid in the blood is lessened. According to Kraus, in a case of diabetic coma a diminution of the amount of carbonic acid down to 9·83 volume per cent and at the same time an increase of the acidity up to ·347 °/₀ of NaOH has been found.

The way in which the acidity of the blood is increased and the alkalescence diminished, has been described in the preceding chapter: it is due to *dietetic dysæmia*, especially to the ingestion of foods rich in albumen and poor in food-salts.

Now, if we have proved that in diabetes the acidity of the blood and tissue fluids is increased and their alkalescence diminished, it follows that the *processes of oxidation must also be hindered.*

Bunge says: "It is well known that the oxidation of organic substances takes place more quickly in an alkaline solution than in a neutral or acid one." We should remember this particularly in the case of grape sugar.

* Virchow's "Archiv", Vol. 116, pages 337—352.

"Though this applies in the first place to free alkali, yet it has been proved by Nenki and Sieber that dilute solutions of carbonate of soda and grape sugar or albumen also absorb oxygen." Moreover, the simple carbonate of soda of the blood, which performs such wonderful chemical work, probably does not differ in its action from free alkali. The fact that the oxidation processes, at least the more difficult and complicated ones, are hindered by the increased acidity of the blood, gives rise to a morbid formation of uric acid, a formation of oxybutyric acid, an insufficient oxidation of sugar.

The ozone theory would only assist in explaining the incomplete combustion of grape sugar.

The formation of "active oxygen in the tissues" is explained by the supposition of "reducing substances", which play a part similar to certain metal protoxides, which combine with one of the two oxygen atoms and set the other free for the oxidation of other substances.

"We can suppose that these reducing and easily oxidisable substances are formed by a process of fermentation from the food, together with other decomposition products not easily oxidisable. But as soon as the easily oxidisable substances are oxidised by the inspired oxygen, a part of the oxygen acquires active qualities and also oxidises those not easily oxidisable." (Bunge.)

Now, sugar in a solution of certain strength is an anti-fermentative agent. Is it not possible that, perhaps aided by the acidity of the blood, it may counteract the fermentation processes and hinder the formation of the reducing substances necessary for the combustion of grape sugar, thus rendering impossible its own oxidation? We see no reason why this should not be possible.

But if this supposition were correct, it would only help us to explain the bad, incurable cases of diabetes.

The increase of acidity and the decrease of alkalinity in the blood are sufficient to explain the ordinary cases of diabetes as well as glycosuria.

That the acidity of the blood is the principal factor giving rise to these conditions is also shown by the fact that the excessive decomposition of albumen, which usually takes place in diabetes, is due to this acidity.

When there is a deficiency of alkalies in the blood, the acids attack the tissues and draw their bases from them. This occurs in persons abstaining from food, but it is even worse in those living on an almost pure albuminous diet, where the acidity is greatly increased by the decomposition of the albumen into acids. This excessive decomposition of the albumen also probably gives rise to the oxybutyric acid, aceto-acetic acid and acetone found in these cases.

E. Livierato * has found that the "quantity of carbonic acid excreted through the lungs is in inverse ratio to the amount of sugar found in the urine." Now, as the amount of carbonic acid excreted is influenced by a decreased alkalescence and increased acidity, it is evident that the decreased alkalescence and increased acidity of the blood is connected at least indirectly with the formation of sugar in the system.

The explanations of diabetic coma given by Stadelmann and Minkowski † also favour our hypotheses, as they not only agree with it, but help still further to explain it. We quote from Bunge the following: "They trace diabetic coma to a saturation of the alkalies of the body by the incomplete products of combustion which have an acid character like oxybutyric acid. The symptoms in diabetic coma are, indeed, similar to those observed by Fr. Walter in animals which he poisoned by mineral acids. If Walter introduced diluted hydro-chloric acid into the stomach of a rabbit, it gave rise to dyspnoe, the animal "lost the faculty of free movement, it remained quietly in any position into which it was placed," and perished in a state of collapse.

* Archiv für experim. Pathol. und Pharmak., Vol. 25, pp. 161—170.

† Comp. Bunge, ibid., pages 385 and 386.

If, however, after these symptoms of poisoning had appeared a solution of sodium carbonate was injected subcutaneously, the animals recovered. Walter found the amount of carbonic acid in the blood of the animals poisoned with acids to be only from 2 to 3 volume per cent. This is, as I have shown when speaking of the gases of the blood, the amount of carbonic acid which the blood can contain by absorption only. We must therefore suppose that there were no alkalies left for the carbonic acid to combine with, that they had been saturated with hydro-chloric acid. The blood having thus been deprived of its power of carrying its proper amount of carbonic acid, an accumulation of the latter took place in the brain, and this explains the symptoms.

"Walter has further shown that the introduction of acid into the body increases the quantity of ammonia in the urine. In diabetic coma we have very similar phenomena, the oxybutyric acid producing the same effect in diabetes as the hydro-chloric acid does in Walter's experiment. Thus, the same dyspnoe is present, and the quantity of ammonia in diabetic urine is also increased, and this increase reaches its highest point in the stage of coma. Minkowski measured the quantity of carbonic acid in the blood of a comatose diabetic and found only 3·3 per cent! The blood was taken from the radial artery shortly before the death of the patient. Blood from the dead body was clearly acid in reaction and contained large quantities of oxybutyric acid and lactic acid."

Now, the relation between diabetes and dietetic dysæmia has not yet been fully explained by the preceding remarks. We know that the soluble substances produced by the comparatively incomplete digestion in the stomach and bowels, pass into the blood; but the blood itself possesses digestive powers. Thus, it contains a diastatic (*sugar forming*) ferment, and even possesses the faculty (according to Lépine) * of converting peptone (digested albumen) into sugar. Side by side with this there is a constant destruction

* "Sur le pouvoir pepto-saccharifiant du sang et des organes." Compt. rend. Tome 117, p. 154.

of sugar going on in the blood, and under normal conditions this destruction of sugar exceeds the production. The abnormal quantity of sugar found in the blood of diabetics can only be explained by supposing that the diabetic blood converts more carbohydrates into sugar than it would do if normal, and (allowing that it can also change peptone into sugar) also converts the peptone formed from the albumen of the food partly into sugar.

Cavazzini * has made some observations respecting the faculty possessed by animals of converting starch into sugar by means of their blood. He found that the herbivorous animals (calf, cow, rabbit) produced the smallest amount of sugar, that the carnivorous dog and cat as well as the birds (fowl) produced an intermediate amount, but that by far the largest quantity (five times as much as the herbivora and three times as much as the carnivora) was produced by the omnivorous pig, which is dysæmic owing to a watery food poor in food-salts.

Compare with this the remark in brackets on page 43.

If, therefore, man's blood had the same composition as that of the herbivora, he would never be troubled with an overabundant formation of sugar.

The carnivora must possess in their blood a higher

* "Archives pour la science médicale" XVII, No. 6.

power of forming sugar, as they consume no carbohydrates; they must be able to produce from the peptone of their flesh food the quantity of glycogen or sugar necessary for muscular work and respiration.

But to a man who makes meat his principal food, the sugar-forming quality of the carnivore's blood becomes fatal, as he consumes carbohydrates as well. And as, according to Bial * the sugar-forming (diastatic) power of the blood becomes stronger if the alkaline reaction of the blood is neutralised by acids, we again see the importance of the two dysæmic factors: the *increase of acidity* and the *decrease of alkalinity* in the blood.

If our theory, that dysæmia, or in this case the deficient alkalinity (especially the want of soda) of the blood, is the cause of diabetes and glycosuria, is right, the latter condition at least ought to be found much more frequently, and particularly in such dysæmic conditions as depend upon the deficient alkalinity of the blood, namely, in corpulency, gout, and lean dysæmia. Now there is no doubt that this condition does occur frequently; for that small quantities of sugar (glycosuria) are frequently found in the urine, *e.g.*, of corpulent persons, is well-known to all those physi-

* Pflüger's Archiv, Vol. 55, page 434.

cians who have much to do with such cases. Diabetes is, however, no less frequent amongst lean persons, and very frequently ends fatally with them.

I should like to mention here, although I wanted to avoid remarks on therapeutics as much as possible, that I obtain very good results in the *treatment of diabetes and glycosuria* by placing the patients on the *diet* which we have already discussed and which we recognize as the proper diet for man.

I start by giving them an *early breakfast* consisting of milk or bitter cocoa and diabetic bread; for their *proper breakfast* they have fresh fruit according to the season, and radishes if possible, as well as eggs and wine in certain cases.

For *dinner*, green vegetables (spinach, various kinds of cabbage, beans), green salads, and a little meat if desired, occasionally rice (soaked for twelve hours and cooked for six hours), dried fruits (also soaked for twelve hours and cooked for from three to six hours); for dessert, radishes, fresh curds, and now and then cheese.

For *supper*, a green salad with eggs, or radishes, nuts and fruit, as well as a glass of whipped sour milk and some diabetic bread. *

* The diabetic bread of Fromm at Radebeul near Dresden, is a good substitute for ordinary bread.

They may drink water or lemonade in small quantities, and every two or three days I allow, or even prescribe, some wine.

The idea followed is the same as in the treatment of corpulency and the uric-acid diathesis, namely, to *increase the alkalinity of the blood*, in order to neutralize the acids and assist the process of oxidation. The following is an example to show our success:

Mr. S. from N. has been to Carlsbad three times to be cured of corpulency. During the last three months (before our treatment) he has been complaining of weakness of the eyes, and Prof. C. in B. diagnosed this trouble as being connected with diabetes mellitus. The patient states that the amount of sugar in the urine is said to have been from ·2 to ·5 % at that time.

Our examination on the 4th of April, 1891, gave the following result: Appetite and thirst normal, activity of the heart weak, background of the eye and the optic nerve papilla dirty and cloudy; urine contains 3·3 % of sugar and is free from deposit. (N.B. The patient stated that there had been a little red deposit in the urine occasionally.) His weight was 17 stone 5 lbs.

After keeping him on the above described diet for 3 or 4 days, the urine contained ·3 % of sugar and showed a large deposit on standing. During the next 26 days the urine contained an average of ·2 % of sugar and was constantly loaded with the same heavy deposit. His weight fell to 16 stone 2 lbs., the "weakness of the eyes" ceased altogether, and the general condition became excellent.

As I thought that the deposit which occurred in the urine during the first few days, would help us to trace the cause, I requested Dr. O. Schweissinger in Dresden to analyse it in his chemical laboratory. The microscopical examination showed that the sediment consisted chiefly of uric-acid salts as well as of uric acid. The chemical examination was made after the whole deposit had been dissolved by warming it. The following table shows the percentage amounts of the various constituents contained in the deposit:

		Average according to Gorup-Besaner
Specific gravity	1·031	
Urea	4·48 %	2·33 %
Uric acid	·089 "	·05 "
Phosphoric	·36 "	·23 "
Potash	·209 "	?
Soda	·130 "	?

The quantity of urea and uric acid is, therefore, considerably increased, while the amount of soda is decreased. Both potash and phosphoric acid are present in normal quantities.

As my own diet is almost exactly equivalent to that prescribed by me for the above patient, it may be of interest here to give the result of an examination of my own urine, for the sake of comparison:

Specific gravity	1·024
Urea	2·30 %
Uric acid	·05 "
Phosphoric acid	·19 "
Potash	·202 "
Soda	·405 "

My children ($2^1/_4$ and $1^1/_4$ years old) live on practically the same diet as myself, meat being excluded, the only difference being that half of their food is taken in the form of milk. Their urine shows the following composition (the specimen used consisted of equal parts of the urine of both children mixed together):

Specific gravity	1·015
Urea	1·73 %
Uric acid	·035 "
Phosphoric acid	·17 "
Potash	·178 "
Soda	·296 "

The urine of our patient always showed under the microscope plenty of uric-acid salts and uric acid, as long as it was cloudy and contained deposits. *These could not possibly be derived from the new diet, or else my urine ought to contain the same proportion of these substances; on the contrary, the uric acid and uric-acid salts had been stored up by the organism, but owing to the altered diet and greater alkalinity of the blood, they were redissolved and excreted. Their presence in the urine may also be partly due to the* *higher oxidising power of the more alkaline blood, which splits up the albuminous substances more readily.* That an increased and injurious decomposition of albumen took place in this case, can also be seen from the fact that the patient, when he was in his worst condition, just before the commencement of our treatment, decreased from 18 stone 12 lbs. to 17 stone 5 lbs. in weight, and yet lost no fat.

By means of the altered diet the processes of decomposition and oxidation were rendered normal; the patient lost weight more quickly than before, but at the cost of his fat and in favour of his muscles; for in a few weeks he was able to do a normal amount of work.

We must mention here that those examinations of the blood and urine which are made to ascertain the amount of alkali contained in them, are only valuable conditionally. The presence of abnormally formed ammonia and of abnormal acids due to the decomposition of the albumen will destroy the value of the examination in the case of the blood; as regards the urine, we are even more liable to make mistakes, as the kidneys are not the only means of excretion for used-up tissue elements, as certain substances which should be excreted in the urine, are often retained longer than they ought to be in the system. That a retention of soda in the system followed by an excessive excretion may take place in dysæmia, is shown by the case of a young woman suffering from corpulency.

The young woman came to me for treatment when she was 26 years of age. Some time before that, the corpulency had increased so rapidly as to cause a miscarriage, and since then menstruation had entirely ceased, and she had not again become pregnant. Her diet had consisted of meat (large quantities), potatoes, pulses, soups, and coffee.

We found on examination that her urine contained

Potash	·227 %
Soda	·695 „

She weighed 13 st. 7 lbs. After the treatment had been continued for five weeks, menstruation reappeared "more plentiful than ever", and in the sixth week her weight was 11 st. 12 lbs., having decreased by 1 st. 9 lbs., and her urine now contained only

Potash	·115 %
Soda	·210 „

The patient felt cured and left us. The treatment had been essentially a dietetic one (see pp. 50-51), and in addition to it we had only prescribed a few sweating baths, air baths, sitting baths, and a little exercise. (On the 18th of August, 1892, just a year after this, her husband wrote to me to say that his wife had been happily delivered of a daughter. I think this simple news will interest the reader as much as it interested me.)

To show that my theory works well in practice, let me quote from another letter, in which the writer, a Frenchman from Annecy, Haute Savoie, says: "I, my wife, and my child have been living for the last year on the diet recommended by you, and feel better now than we have ever done before. Our child, five years old, is the healthiest and strongest boy in the town and is very often admired. My wife has had no children for the last five years; she is now in the very best condition of health and again became pregnant three months ago."

Now, how can we account for the difference in the amount of soda and potash contained in the urine of the above-mentioned patient before and after her treatment by us? There are sure to be some very clever people who will say, "The Lahmann theory is wrong; for you see that the amount of soda in the body is not lessened in fat dysæmia, but on the contrary increased."

This reasoning is similar to the reasoning of those authors who imagine that rickets may be due to an excessive amount of lime in the body. And just as we have traced the excessive excretion of lime to a loss of vitality in the lime molecules in our chapter on rickets, so we must explain the excessive excretion of soda in this case.

The large amount of soda represented by the number ·695 °/₀ or, more correctly, by the relation between soda and potash of more than 3 : 1, had been retained in the body for the longest possible period, and was excreted because its vitality had become totally exhausted. The increase of the morbid symptoms at the same time is evidently connected with this. As soon as, under our treatment, the patient was put upon a suitable diet, a normal relation between soda and potash, namely, about 2 : 1, was soon established (comp. analyses on page 99). The absolute quantities of soda and potash in the urine were even below normal, the reason for this being that, immediately after the terrible drain of soda denoted by the number ·695 ‰, a fresh reserve had to be created.

We will give two more examples in which a similar relation (3 : 1) between the quantities of soda and potash excreted in the urine has been noticed by us.

	Mr. F. 42 years } fat dysæmia.	Mr. M. 56 years } lean dysæmia and skin cancer.
Specific gravity of the urine	1·025	1·022
Urea	2·81 %	2·50 %
Uric acid	·066 ,,	·005 ,,
Phosphoric acid	·31 ,,	·18 ,,
Potash	·128 ,,	·119 ,,
Soda	·396 ,,	·374 ,,

Again, therefore, we must be careful not to draw wrong conclusions from urinary examinations, for urine is not blood; and even if we could easily estimate the percentage amounts of the mineral substances in the blood (the quantities of blood needed for the analysis are so large that the patient would be injured by the loss), the results would only be of conditional value to us, as we cannot examine the vitality of the molecules. In this case, as in so many others, experiment is not sufficient and must be assisted by philosophical deduction.

That the mineral parts (food-salts) of our food are as much vitalised as the so-called organic parts, is an axiom which food physiology can no longer dispense with. We must, however, remember that vitality is not the same as chemical energy; for the latter is just as active in the used-up phosphate of lime found in the excretions of rickety children as in the phosphate of lime found in the soil. It is only through the life process of the plant that the chemical constituents of the soil become vitalised, and this property of vitality alone distinguishes the lime of our bones (as long as the vitality is not used up) from the lime of our houses. The necessity for this molecular vitality, will at last, we hope, banish for ever the absurd dream that mankind can be fed on artificial foods prepared in the chemical laboratories.

DYSÆMIA AND INFECTIOUS DISEASES

The hydræmic-dysæmic organism, containing an excess of water in the tissues, cannot possibly possess the same power of resisting infectious diseases, or any poisonous influence, as the healthy organism containing a normal amount of water. (As a somewhat parallel case we may here remind the reader of the way in which preserves are boiled down to a thick consistency, in order to render them less liable to be attacked by fermentation producers, etc.)

In fact, we are constantly learning by experience that fat and bloated-looking people are nearly always the first to be attacked by epidemic diseases. Such people also easily succumb to a local blood poisoning, the poisoning soon becoming general on account of the ready decomposition of the watery tissues; whilst the same local injury will produce in a healthy man only a local inflammation.

To explain this difference, we must first take into consideration the fact that the *leucocytes* as phagocytes protect the organism, absorbing and rendering innocuous everything injurious. Now, in diluted blood, the number of leucocytes (white blood corpuscles) is of course lessened and their power of action diminished (comp. what has been said before of the red blood corpuscles).

Secondly, we must take into account the *deficient amount of alkali in the blood*, which prevents the prompt oxidation of chemical poisons, and it is these chemical poisons (toxins, etc.) produced by the action of micro-organisms, and not the micro-organisms themselves, which must be looked upon as the dangerous element in these cases. That the power of the blood to resist disease depends upon its degree of alkalinity, has been proved by the experiments of Fodor and others. We may, therefore, say that a person who possesses a blood rich in alkalies, a serum containing a normal amount of soda (the most important alkali), is as able to resist disease and as proof against contagion as a man can possibly be. It is practically of no consequence whether this protection is afforded by the greater oxidising power possessed by a blood rich in alkalies, or whether other explanations may be discovered in the course of time.

The chief protective agents against infectious diseases are therefore the *white blood corpuscles (phagocytes)*, and perhaps the hypothetical "alexines" (Buchner), active albuminous bodies in the blood, as well as a *normal alkalescence of the blood,* or in other words, a *normal amount of soda in the blood.*

Now, as we can raise the protective power of our own blood, of our own serum, to the normal by feeding and living according to the principles laid down in this book, we shall never require the horse's, donkey's, and goat's serum prepared by a Behring or a Roux. *

Dysæmia not only renders people more liable to be attacked by disease, but also increases the *mortality*. For example, the probability of a fat, bloated, pasty-

* Those who are further interested in our theory of serum therapeutics, may be referred to my essay in the "Hygeia", November, 1894 (A. Zimmer, Stuttgart, publisher). Separately printed copies can be had at my office.

looking person succumbing to a feverish disease, is very high, whilst the healthy man, with his blood in normal condition, will overcome such a disease quite easily.

The chief factor which helps to produce this fatal termination in hydræmic constitutions, is the large formation of abnormal acids (especially sulphuric acid), originating in an increased decomposition of the albuminous substances. These acids combine with, and use up, all the alkalies contained in the blood, especially the soda, so that there is no soda left to combine with the carbonic acid and carry it to the lungs for excretion, and thus a kind of suffocation takes place in the tissues. The process is the same as that which has already been described on pp. 92-93 in Walter's experiment, in which animals were poisoned with dilute hydrochloric acid.

DYSÆMIA AND SCROFULA

If we thoroughly understand the section on "Dysæmia of Infants," which lays such stress upon the systematic dilution of the child's blood, we can picture a tissue abounding in water, a water vessel (lymph vessel) system unusually developed through overwork. The processes of oxidation and tissue change are impeded owing to the dilution of the blood and want of mineral substances, especially soda, in the blood. As a result of this we have the formation of abnormal decomposition products. We have already spoken of some of these products in the sections on Gout, Diabetes, etc.; but we have neglected a series of substances (chemically not well known), the existence of which cannot be doubted (leucomaines, according to Gautier). I mean, for instance, those substances which appeal to our sense of smell, which stain the washing, etc. We are so naïve that we never consider anything of importance, until it has been fully described and classified. How neglected, for example, is the condition known as sweating feet, and yet this condition and especially its cause is of the greatest importance; indeed, we must refer to it in order to understand scrofula.

How can we explain the abnormal sweating of the feet? Dysæmia being so widely spread, a weak heart and a poor circulation, especially in the legs, is one of the commonest ailments of mankind. Now, as the legs must be looked upon as a very important part of the body, owing to their bulk, a retarded circulation in them, and particularly in their skin, must give rise to serious disturbances in the processes of oxidation, especially as the evaporation of the gas-like decomposition products (leucomaines) is hindered by the coldness of the skin, and thus an accumulation of decomposition products requiring excretion takes place. But if we remember the smell in the case of sweating feet, a smell which can only be due to certain volatile substances (leucomaines), it is evident that these substances must also be decomposition products formed as a result of the abnormal conditions just described, and especially of an insufficient supply of oxygen. Now, the leucomaines, acting as "self-poisons," seem to have the faculty of paralysing the vascular nerves, in which case the sweat of feet would have to be considered as a "paralytic sweat."

These accumulating *products of decomposition* ("self-poisons") have to be removed from the body, but meanwhile the blood, loaded with them, carries them to those parts of the vessel system in which the circulation is freer. Now, where will the greater part of the blood collect, if its circulation in the extremities is impeded? *In those parts in which the terminal vessels are dilated owing to some irritation.* These parts are the skin of the head and neck, which is constantly exposed to the irritation of fresh air and of the cold caused by evaporation, and the mucous membrane of the pharynx and of the air passages, which is irritated by the constant draught of air in breathing. When we contrast the reddish colour of the skin of the face and neck with the white colour of the skin of the body generally (which is protected from the action of the air), we see how strong the irritating influence of the air really is even upon the coarse epidermis.

We can now understand why a cold in the nose, a bronchial catarrh, or even an inflammation of the lungs so often sets in after sudden cooling down of the feet (wet feet), or after any prolonged cooling down of the skin not compensated for by reaction; for the blood driven from the lower extremities or from the skin collects in the mucous membranes of the air passages, carries with it the decomposition products which ought really to have escaped through the skin, and through these "foreign substances" produces a chemical irritation to which the mucous membranes respond with a catarrh.

If in the case of chronic cold feet (which, of course, may at any time become still colder), the mucous membranes of the air passages are chronically overcharged with blood, we can again understand that all adjoining tissues must also be affected by this over-collection of blood; and it is the *lymph vessels* which, lying nearest to the mucous membranes, suffer most; they absorb the exuded blood water and some of the abnormal decomposition products, and carry them to the lymph glands, where an inflammatory irritation is produced.

Now, if, in addition to this, we have that *diluted condition of the blood (hydræmia)* which so often accompanies dysæmia, we can see that the lymph vessel system will have a great deal of extra work to do in carrying the greatly increased quantity of tissue water back into the general circulation. Indeed, a condition of hydræmia alone would be sufficient to explain the scrofulous swellings of lymph glands. In a watery blooded (hydræmic) or dysæmic body a great many morbid products of tissue-change (metabolism) arise everywhere; these act as foreign bodies and as chemical causes of inflammation in the lymph glands, where they are carried by the lymph stream. The lymph glands, which under normal conditions possess the faculty of rendering these foreign substances innocuous, can scarcely carry on this work at all under dysæmic conditions, as they themselves suffer from the dysæmia or hydræmia. They are already enlarged (pasty, bloated) owing to the hydræmia, and are kept in a chronic state of inflammation by the abnormal decomposition products which are constantly being carried to them.

THE RELATION BETWEEN SCROFULA AND TUBERCULOSIS

Many have investigated the relation between scrofula and tuberculosis. There is no doubt that these two diseases are closely related, but to explain the relationship seems difficult; for the tubercle bacillus, now usually looked upon as their common cause, is only found in a limited number of scrofulous cases.

Now, if the peculiar swelling or inflammation of the glands of the neck etc. is caused by chemically active decomposition products, which have been brought to the glands through the lymph vessel system, it is obvious that other parts of the body may be affected in the same way, and why not the lungs and especially their apices?—In children, scrofulous lymph glands, when much swollen, easily pass into a cheesy and suppurating condition. The cheesy condition is probably a direct result of the swelling itself, owing to which the pressure in the lymph gland becomes stronger and stronger, until the circulation in the nourishing vessels is so hindered that the gland decays and passes into a cheesy condition. To produce suppuration, only the addition of a special inflammatory agent is required, and this may enter the system through a scrofulous crack in the ear, nose, or angle of the mouth, and may be carried by the lymph vessels to the swollen glands.

Similar conditions exist in catarrh at the apices of the lungs, both in cases connected with scrofula, and in cases quite free from it.

In my opinion disease of the apices of the lungs is always preceded by some other ailment. In one case chronically cold or sweating feet precede the disease, in another chronically cold or sweating hands, in a third case we may not find peripheral stagnations of the blood, but a chronic disturbance of the circulation in the abdominal organs with temporary congestions in the head and, therefore, also in the mucous membranes of the air passages. Now, the decomposition products which are carried with the blood into the apices of the lungs, cause, as decribed above, swelling, suppuration, etc., of the lymph glands, which are also found in this situation, though they are generally smaller here than elsewhere. I believe that we have in these tiny lymph glands, which are found everywhere in parenchymatous organs, a physiological model of the tubercles. The tubercles are usually found quite close to the vessels and the branches of the trachea (perivascular and peribronchial) in the lungs, and this may easily be explained by the fact that lymph spaces and tiny lymph glands are found in the same positions.

We can, therefore, imagine *phthisis existing without special microbes*, or at any rate without tubercle bacilli, if a cheesy or suppurating decay of the lung tissue can be called phthisis; for if tubercle bacilli are not necessary to produce the cheesy and suppurating scrofulous glands of children, a chemical animal poison, or an ordinary putrefactive microbe being sufficient for this, why should they be necessary to produce cheesy or suppurating lymph glands in the lungs?

But if in addition to the above-mentioned causes, there is a specific bacillus, which seems to flourish best in the lymph-vessel system, as well as in the lungs and in serous membranes, we need not be astonished that it thrives well in a soil so well prepared as the apices of the lungs have been under the above conditions, and that it may seriously affect the already diseased lung and finally threaten the existence of the whole organism.

Now, there is no doubt that this specific microbe is represented by the *tubercle bacillus*, which may be carried into the lungs either directly through the respired air or by means of the blood or lymph stream, and which finds a ready soil in the mucous membrane injured by the catarrh, in the peribronchial lymph spaces and in the exudations of white blood corpuscles found in the lung tissue (exudations caused by venous stagnation and the catarrhal irritation due to the stagnant air). The disease of the apices of the lungs, hitherto merely catarrhal, now becomes tubercular. We must not, however, think that we can find out by examination the exact time when this transition takes place; if there is no expectoration, nobody can tell whether the disease is simply catarrhal, or complicated by the presence of the tubercle bacillus; nor would the knowledge be of any practical use to us, as any catarrh of the apices will lead to tuberculosis if not rationally treated. Owing to the decomposition products which arise from the action of the tubercle bacilli, and which act as poisons (toxins), the lung tissue, hitherto healthy, becomes paralysed, or inflamed, or at any rate is rendered less capable of resistance, and thus itself falls a prey to the bacilli. (From this point of view it is absolutely unintelligible, how Koch could suggest the ingestion of tubercle toxin, as the latter only facilitates the work of the tubercle bacilli present in the organism. And even if there was no perceptible inflammatory exudation (infiltration) at first, as soon as the tubercle bacilli find an entrance, rapid progress will take place, and owing to the anatomical and physiological conditions, those parts of the lungs which have not yet been attacked, will, as soon as this infiltration begins, also be affected and weakened. As the quantity of blood flowing to the lungs is the same as in health, or even greater, owing to the changed conditions, and as a certain number of the blood-vessels of the lungs are narrowed in calibre, or entirely blocked, owing to inflammatory exudations, the remaining vessels will become overfilled with blood, and thus the blood pressure will be raised, the exudation of serum and lymph will become increased, and the infiltration generally will become greater. The healthy and active lung tissue is encroached upon more and more, and so its power of excreting decomposition products is also lessened; the dysæmic blood, insufficiently freed from carbonic acid and insufficiently saturated with oxygen, in its turn insufficiently feeds the heart muscles; the contractions of the heart become weaker, though more frequent (palpitations), and even the circulation of the blood in the lungs is retarded on account of the insufficient moving force. The above facts show us that the blood in the lungs is in a more or less stagnant condition, so that all the morbid processes already described as due to blood stagnation will take place in the lungs. *

* For more particulars about tuberculosis comp. "Koch und die Kochianer", 1891. A. Zimmer, Stuttgart, publisher.

DYSÆMIA AND SHORT-SIGHT

1. Goethe, whom the Germans of the present day revere in a theoretical rather than in a practical way, could not stand spectacled people; but Germany is now full of real and mental spectacle wearers; when will she arrive at Goethe's standpoint?

The eye of the German scholar, which is generally armed with spectacles, is restricted too much to examining details, and he has thus lost the power of seeing the world as it really is.

From "Rembrandt als Erzieher", 33rd edition.

2. Men ought not to look at the world through spectacles, but with their own eyes....

Kaiser Wilhelm II. in his address to the School Conference in 1890.

THE great importance of prophylactic hygiene is shown by the fact that, although some diseases cannot be cured, they can be prevented.

Whilst some of the most deeply-rooted chronic diseases may be cured in course of time, short-sight can never be cured. Spectacles are but a poor consolation, considering that they do not arrest the fatal progress of short-sight, which may lead to detachment of the retina and thus to blindness, that they cannot do away with the sad fact that the same condition may be intensified in the descendants of short-sighted persons, and that short-sight is a symptom of physical weakness which cannot be considered unimportant from the social standpoint.

In such troubles as short-sight, from which civilised people especially suffer, to find out the cause would seem to be easy, as they must be due to one or other of the conditions of civilisation, yet it is most difficult.

At the present time it is usual to speak of civilisation *generally* as the cause of these troubles. And yet, the question whether they are necessarily connected with our civilisation at all, has never been asked.

Indeed, if we look at the subject from an unbiassed standpoint, we shall see that it is not necessary to blame civilisation itself, as many pessimists do; we must, of course, remember that the present structure of human society is not invariable, and that its various parts are not necessarily complementary to each other.

The disadvantages of our present social system are not a *necessary* result of the system, they are simply morbid products; they have the same causes as our personal troubles and diseases, but are by no means the causes of the latter.

Again, *certain institutions* of our civilised life are often blamed for being causes of diseases when they are not, or only in so far as they co-operate with other conditions. This is the case as regards the causes of *short-sight*.

The fact that short-sight is increasing, is disputed by many, but how can it be otherwise, if the supposed social causes are the real causes; for the eye is being taxed more and more as the individual has to work harder and harder in the struggle for life? How many suggestions have already been made as to the causes of short-sight, and yet these supposed causes are only factors favourable to its development, *predisposition being the essential cause.*

To understand this predisposition, we must take into consideration the real nature of short-sight. In almost all text-books on the treatment of the eye we read: "The fundamental cause of short-sight is a special shape of the eye, its length being too great from before backwards, so that parallel rays cannot converge on the retina, if the refractive power of the eye is normal." This elongation of the eye is certainly the reason why the individual can only see clearly near objects; but this difficulty is only a subjective symptom of the trouble, whilst the real nature of short-sight is to be found in the objective fact, the elongation of the eye, as diagnosed by the surgeon who examines the eye with the ophthalmoscope. The elongation of the eye can therefore only be used to define short-sight, but according to the above quotation this *definition* is supposed to be the *cause*, that is, short-sight is the cause of short-sight. It is evident that, reasoning in this manner, we shall never arrive at the real cause of short-sight. And yet, the actual condition necessary to produce the elongation of the eye has been known for a long time. We know that, when the pressure inside the eye is increased, the capsule of the eye may expand and, therefore, the diameter of the eye may be lengthened. But, considering the fact that many men are not short-sighted, it has been thought necessary to suppose a special predisposition of unknown character, and here science has stopped, contented with a mere supposition. The pressure of the fluid in the eye may certainly be increased by such habits as bending the head forwards when working, wearing too tight collars and thus causing congestion, applying the eye too closely to books etc., thus giving rise to an increased pressure due to over-action of the eye muscles. But how does short-sight originate, if these habits are avoided?

Donders states that short-sight occurs much more frequently amongst inhabitants of towns than amongst the country population, amongst students than amongst artisans, and is increasing more and more amongst the people generally, as popular education extends and develops. We cannot, however, conclude from this that a real connection exists between education and short-sight; for on the contrary, there are people who have devoted their whole lives to study and yet have remained free from short-sight. The latter fact has helped to originate the idea that a predisposition is necessary, and this predisposition has, for convenience' sake, been considered as hereditary and inborn. We will not altogether deny that this may be right, but it is only conditionally right: it is right because we *inherit dysæmia from our parents* and may thus be born dysæmic. The actual cause of short-sight is not inborn, but is produced by our bad method of bringing children up; short-sight itself is never inborn: in spite of all investigations a short-sighted new-born child has never been found.

The normal eye has the power of seeing clearly the most distant as well as the nearest objects, whilst the short-sighted eye can only see clearly to a limited distance, but can on the other hand (although this is no compensation) see still nearer objects. When the normal eye is fixed upon a very distant object, and thus is in the position of least strain, it may be compared to the frosted glass screen of a photographer's camera which is at such a distance from the lens, that it receives the picture clearly. The short-sighted eye, which has become too elongated through morbid expansion, may be represented by moving the glass screen backwards. An indistinct picture of the object is then obtained, and this will only become clear when the object is brought nearer.

Now, the infant's eye is not only theoretically normal, but hypernormal, being shorter than the theoretically normal eye; and owing to the adaptability of the lens, it has the same faculties as the theoretically normal eye, and has besides the advantage that it may be elongated a little without losing the quality of being able to focus objects at a distance.

Now, if all children's eyes have at first this hypermetropic form, and many of them afterwards become short-sighted owing to elongation, there can only be two reasons for this. The capsule of the eye may expand either through an *increase of pressure from within*, or through an *abnormal weakness of the capsule itself*, which allows it to yield to the ordinary pressure of the eye fluid; and of course, both these factors may act at the same time and together. The first factor points to a local disturbance of the circulation, the second to deficient nourishment of the eye capsule. The question is, to find out the local or general causes for these disturbances.

The first factor which may lead to an enlargement of the eye, is, as we have seen, an increase of the pressure of the fluid contents of the eye; but this is equivalent to an *increase of the fluid itself*, without which an increase of the pressure is impossible if the space remains the same. The second factor necessary for an elongation of the eye, is a yielding condition of the eye capsule; if this condition is not present, an increase of the inner pressure will push to one side the optic nerve at the point where it enters the eye, and total blindness (glaucoma) may result, as is so often the case with normal- and long-sighted persons in old age. Therefore we see that this second factor, an abnormal weakness of the tissues of the eye capsule must necessarily be present.

The fluid and semi-fluid contents of the eye are, like every tissue of the body, subject to tissue change; they are not directly fed by the blood, but by the lymph, so that the eye may be considered as a large lymph space.

An exudation of lymph constantly takes place at at the inner surface of the eye capsule, from the capillary vessels, especially from those in the ciliary bodies; any excess, together with decomposition products due to tissue change (metabolism) is carried away by a system of channels at the base of the iris. The more the vascular system is filled with fluid, the more plentifully is the lymph exuded everywhere in the tissues and organs of the body, consequently also in the eye. Now, an over-exudation is of no consequence, as long as an equivalent quantity is drained off; but if the quantity exuded exceeds the quantity drained off, serious consequences must ensue.

We can imagine that, if the blood constantly receives too large a quantity of fluid owing to over-drinking, this alone may be sufficient to disturb the equilibrium which should be maintained between the quantities of eye-fluid received into and drained off from the eye. The fact that attacks of glaucoma very often occur in older people directly after a drinking bout, and also that young people occasionally suffer from an acute increase of short-sight after drinking would appear to support this. But is not the pressure of the fluid inside the eye sufficiently strong to counteract the pressure of the entering lymph? It seems difficult to doubt this, unless we can find another factor, a factor which would increase and retain the fluid in the eye with some amount of force. *This force can only be that of osmosis,* for it alone possesses the required qualities.

Now, if we ask under what conditions osmotic processes take place, the most usual is the interchange of solutions of different concentrations, *e.g.*, salt solutions, through membranes. In this case, the closed eye capsule, or the walls of the small vessels in it, represent the membrane. But have we also salt solutions with different concentrations on the two sides of the membrane? Certainly, we have, owing to the *unnecessary consumption of common salt* (comp. pages 53 *sqq.*).

The common salt consumed daily, is not so regularly excreted as is usually thought. The amount excreted is not only influenced by all kinds of diseases, * but comparatively large quantities are retained by certain tissues, especially mucous and gelatinous tissue,

* *E.g.*, in inflammation of the kidneys and of the lungs the quantity of common salt in the urine is considerably decreased—as low as $^1/_7$ of the normal quantity. Comp. Ziegler, "Beiträge zur pathologischen Anatomie," 1884, I.

and the latter is the fluid tissue found in the eye. If one weighs a closed membrane, *e.g.*, a pig's bladder filled with water, and then leaves it for some time in a vessel filled with water, the weight of the bladder will remain the same; if, however, we fill the bladder with a solution of salt, both the weight and the size of it will increase considerably, showing that some of the surrounding water has passed into the bladder. According to the law of osmosis the surrounding water flows into the bladder, and the salt solution flows out of it into the surrounding water; but the inflow is greater than the outflow, owing to the great attractive power of the salt, and thus, if the osmotic force is greater than the elastic resistance of the bladder, a distension of the bladder will take place.

Now, the eye capsule represents the bladder, whilst the surrounding water is represented by the lymph in the little vessels of the vascular membrane, and the interchange between the lymph and the fluid salt contents of the eye can take place through the vessel walls. The process of osmosis commences, and an increased flow of lymph into the interior of the eye occurs. But to produce an extension of the eye capsule, its elasticity must be lessened. Now, a weakness of the eye capsule is almost as frequent, as deficient growth of the teeth, bones, and hair; for the cause of all these troubles is the same: *a disturbance of nutrition.*

The capsule of the eye consists of a coarse, fibrous tissue, the same as the sinews and ligaments. Now the latter frequently exhibit an abnormal weakness as shown by the frequent occurrence of flat feet, crooked joints, etc., and we are, therefore, justified in supposing in such cases a want of those nutritive materials in the body which belong especially to the ligamentous tissues. Dr. Schüssler, in his "Biochemische Therapie" supposes silicic acid to be a special constituent of the sinews etc.

Others also are commencing to contribute to the food-salt theory, as is shown from the following extract from the "Allgemeine Medicinische Central-Zeitung" LXII (1883):

Ricochon (Champdenier): "On tuberculous families."

The author, during the year 1887 was able to observe 53 cases of tuberculosis and to collect exact notes as to their antecedents as well as various facts regarding their families. As regards the diseases etc. from which the relations of these patients suffered, decided tuberculosis could be traced in 181 cases, neurosis, psychosis, epilepsy etc. in 83, congenital dislocation of the thigh in 38, deformities of the long bones of the extremities in 33, carcinoma in 28 cases, etc. The author is of the opinion that all these diseases arise owing to a *lessened resistance of the tissues* which is common to all and which seems to be caused by *a want of mineral salts*. The results of urinal examinations by Benecke and Senator appear to support the above: they have found considerable quantities of soda, phosphates and lime in the urine of patients suffering from the same diseases.

Now, if the elasticity of the capsule is lessened owing to a defective composition of its tissue, it is easy for the increased pressure in the interior of the eye, to produce an extension of the eye capsule. In rare cases the transparent front part of the capsule, the cornea, is pushed forward, as in weakly children and aged persons; usually the back part of the eye is the place affected, and exceptionally the whole eye is uniformly expanded.

The front part of the eye is somewhat protected against the action of the pressure by the iris, situated between the cornea and the body of the eye, and by the lens; the side parts (the equator) are strengthened by the eye muscles which are attached here, whilst the back of the eye is the thinnest part and therefore the weakest. The expansion must, therefore, take place at the back of the eye, and the sensitive retina is pushed from its normal position further backwards by the pressure of the extra fluid in the eye, so that its distance from the lens and cornea becomes greater. Now just as in the photographer's camera, a clear picture is only obtained when the screen is at a certain distance from the lens, and as it becomes confused if the distance is increased, so the retina at the back of the elongated eye will only receive a confused picture of a distant object; the eye has become short-sighted.

If this conception of short-sight as a complicated disturbance of nutrition be right, we ought to find this trouble occurring in all classes and in all individuals who live unhygienically in this respect, and this is actually the case *; for the same conditions can be traced pretty uniformly through all classes. The child's eye, which is originally long-sighted (hypermetropic) and which is so formed that it can, so to speak, bear a certain amount of extension without the child losing the faculty of viewing objects at a distance clearly, gradually becomes larger and larger; it remains to some extent long-sighted (that is normal-sighted) in a few children, in others it is changed into the so-called theoretically normal-sighted (emmetropic) eye, and in others again is so much enlarged that the axis of the eye becomes too long, and the eye becomes short-sighted. Long-sight is really normal, young children and most animals are long-sighted, the theoretically normal-sighted eye has already undergone morbid changes.

If we have thus proved *dysæmia to be the fundamental cause of short-sight*, there are, of course, *accidental causes* and factors which help to promote short-sight. Still, these must not be overrated; for though short-sight usually declares itself during the school age, and though over-reading and such habits as bending over books etc. also assist in producing it, yet it is just at this age that a wrong system of diet will produce the most disastrous effects. We must remember that a child not only eats almost as much

* I. Weissbach. "Uber hochgradige Kurzsichtigkeit in der Landbevölkerung." Laupheim 1888.

as a grown-up person, but eats at the same table. As the size of his body and therefore his quantity of blood is much smaller, he will form a far more concentrated salt solution from the same richly salted food, and the process of osmosis in the eye will be much stronger. (Any one who does not believe this, has only to look at the children with their feverish cheeks, after a meal, rushing to drink, to wash away from the body unsuitable food materials.)

Again, if in our higher-class schools short-sight is found to be on the increase both in severity and in extent, the relative over-taxing of the scholars with school work must certainly be considered as a promoting factor; but the fact that the constitutional strength generally decreases during school life under the present system of feeding, should render it unnecessary to look for special causes for the local "decrease of resistance". For how otherwise than by a weakened constitution can we account for the frequency of flat feet, of bow-legs and knock-knees (weakness of ligamentous tissues), the commencement of bald-headedness, deficient growth of the teeth, chlorosis, corpulency (almost all corpulent, bloated persons are short-sighted, that is have "bloated" eyes) etc.? But all these conditions originate in dysæmia.

DYSÆMIA AND GOITRE, DYSÆMIA AND OVARIAN CYSTS

If we apply what has just been said about the connection between dysæmia and short-sight to such diseases as goitre and ovarian cysts, the connection between these troubles and dysæmia will need very little further explanation.

The cause of goitre and ovarian cyst is a local "*hydræmia* (*watery condition of the blood*) *with osmotic processes*", just as is the case with short-sight. The only difference is that, owing to anatomical conditions the osmotic enlargement of the goitre cyst or of the ovarian cyst may increase to any extent, for neither the thyroid gland nor the ovary have any system to allow of the escape of superfluous fluid.

Somebody may here suggest that every short-sighted person ought to suffer from goitre (and ovarian swelling); but this is no more necessary than that every gouty person should suffer from gout in the foot, or be attacked by apoplexy.

We rarely meet with examples striking enough to show clearly the connection between dysæmia and short-sight or cystic degeneration of glandular organs, the harmful influence of a wrong diet being usually gradual in its action. The following example may, therefore, be interesting:

On May 16th, 1891, a lady, 49 years old, presented herself to me, complaining of chronic catarrh of the throat. She had always had some mild symptoms of anæmia, especially chronic cold feet, and belonged to the class of "lean anæmics." On account of her slight, but obstinate troubles, she had lived for $3^1/_2$ years as a vegetarian, but had kept almost exclusively to bread, cereals, and pulses, with only small quantities of milk and fruit: she had consumed especially large quantities of flour and semolina soups. Owing to this diet her dysæmia had increased rapidly (as long as she was on a mixed diet, she had a greater variety of food and was no doubt fed better). A year and a half ago, the patient, formerly normal-sighted, became suddenly short-sighted, and the short-sight increased so quickly, that she has been obliged to change her spectacles six times since. About nine months ago a moderate and somewhat sensitive swelling of the thyroid gland was noticed, and this has since grown to the size of a goose's egg (each lobe). During this year also the veins of the legs began to swell and gradually became varicose. There were indeed no palpitations of the heart or any considerable increase of the pulse rate; but in spite of this an incomplete "*Basedow's disease*" could be diagnosed, and there is no doubt that *this disease is also connected with dysæmia.*

The weakness and yielding condition of the blood-vessels mentioned above brings us to the next section.

HÆMOPHILIA, PURPURA HÆMORRHAGICA PELIOSIS RHEUMATICA, SCURVY

The strength of the vessel-walls doubtless varies very much in different people. The occurrence of varicose veins and aneurisms proves this as regards the larger veins and blood-vessels; the tendency of some people to lymphatic exudations and capillary hæmorrhages proves it as regards the capillary vessels. There are individuals who, after comparatively slight blows, exhibit a good deal of serous effusion under the skin. We find this tendency in lymphatic, or more properly speaking watery-blooded, constitutions.

In persons in whom the fluid part of the blood exudes so readily, an exudation of the blood corpuscles would not seem difficult.

We shall not trouble to investigate here the phenomenon of the exudation of white blood corpuscles; for it usually means only an inflammatory healing process; but we must enquire into the really morbid exudation of red blood corpuscles from the capillary vessels.

The most common examples of this may be seen in bleeding from the mucous membrane of the nose and of the gums, and in hæmorrhages which take place in the kidneys, whilst the hæmorrhoidal hæmorrhages are a coarser example of the same process.

Now, if the blood exudes through the walls of the capillary vessels, this may be due to

1. an increased permeability of the walls of the blood-vessels owing to change of structure, or over-extension;

2. a more watery condition of the blood, or an increased flexibility of the red blood corpuscles.

Both these factors probably act at the same time and are connected with *dysæmia*.

If we find that a wrong composition of the blood produces a wrong composition and therefore weakness of fibrous tissues, *e.g.*, of the eye capsule in short-sight, of the ligaments in flat foot, and a deficient growth, or weakness of horny tissues, *e.g.*, of the hair, we need not be surprised at finding that the delicate walls of the capillary vessels become weakened in their structure and abnormally permeable. As has already been mentioned in the section on short-sight, Schüssler's opinion, that these conditions must be traced to a *want of certain mineral substances,* is not unlikely to be correct; Gorup-Besaner * has shown by statistics that the amount of silicon contained in the hair and feathers of animals is dependent upon the amount supplied in their food.

It is also possible that abnormal products of decomposition (leucomaines, ptomaines, toxins) which are found in the tissues of dysæmic persons, cause a change in the structure, or a paralysis of the functions, of the finer blood-vessels. We can understand that an exudation of blood from the vessels may then occur, and

* Ibid. pages 660 and 661.

particularly in those places where the surrounding tissues (owing to hydræmia) are so lax that they give no support to the walls of the capillary vessels.

Now, experience teaches us that the *blood coagulates with difficulty*, or not at all, in hæmophiliac conditions. To explain this want of coagulability of the blood, we need only mention the *excessive acidity of the blood when dysæmic* (see previous sections). George Bonne * has found that a small quantity of carbonic acid is quite sufficient to cause a retardation, or even an entire want, of coagulation in proplastic fluids. Theoretically he also thinks it possible that the faculty of the living vessel-wall to hinder coagulation, may be explained by the fact that, owing to decomposition processes, it produces substances (especially carbonic acid) which have probably an acid reaction and act as anti-ferments, and which are absorbed by the blood.

The way in which tissues and cells may become *abnormally permeable* through chemical influences, is illustrated by the analagous change which may take place in the red blood corpuscles. As long as the blood is normal, containing ·6 °/o of salt, the red blood corpuscles remain unchanged. If the blood is diluted, the red colouring matter exudes from the corpuscles. According to experiments made by Ham-

* "Uber das Fibrinferment und seine Beziehung zum Organismus. Ein Beitrag zur Lehre von der Blutgerinnung, etc." Würzburg 1889.

burger,* it appears that alkalies so change the permeability of the blood corpuscles, that they retain their colouring matter in weaker solution of common salt than if no alkalies had been added, whilst acids have the very opposite effect and cause the colouring matter to exude more readily than if the blood were only diluted with water. Hamburger also found that if the blood be diluted with a solution of common salt of a certain strength, the blood corpuscles of the arterial blood will retain their colouring matter, whilst those of the venous blood [*rich in carbonic acid*] will allow some part of the colouring matter to be dissolved.

We have to fall back upon analogies like the above, for it is difficult to clearly prove by experiment an increased permeability of living vessels and tissues to blood.

Although recent researches (comp. the appendix to this section) have proved theoretically that a connection between dysæmia (excess of acid, want of soda and lime) and hæmophiliac diseases exists, yet it is of great importance to prove it *practically*.

In the first place, it has long been known that the simplest of the hæmophiliac diseases, namely scurvy, is cured by fruit and plant juices rich in food-salts, *e.g.*, lemon juice, *although citric acid alone does not cure it.*

* Archiv für Anatomie und Physiologie. Supplement, pages 153 and 157.

Secondly, I have myself observed a case of purpura hæmorrhagica in a young lady. Owing to a morbid desire, this lady had for a long time lived principally on beef-tea and bread and butter (white bread). She constantly excreted large quantities of uric acid in the urine. One day she was obliged to retain her urine too long, and was seized with (uræmic?) giddiness; soon after she suffered from severe hæmorrhages from the skin of the legs.

Another case worth mentioning is that of a lady who avoided all green vegetables and fruit for a long time on account of nervous dyspepsia and then underwent the cure at Carlsbad. She was suddenly attacked by purpura hæmorrhagica and the peculiar rheumatic symptoms (peliosis rheumatica) connected with it.

The connection between hæmophilia or purpura hæmorrhagica and scurvy is clearly shown by the following case. A lady, 40 years old, who suffered from severe hysteria brought on by dysæmia as well as from acquired purpura hæmorhagica, told me that all her children had suffered from scorbutic diseases in their youth. The same dietetic mistakes had produced acute disturbances in the children, corresponding to the comparatively short period of their action, but had produced a constitutional change in the mother, corresponding to the much longer period of their action.

Purpura hæmorrhagica is a disease related to dysæmia often overlooked, but very frequent. At the present time

I have no fewer than five lady patients who happen to suffer from this condition in addition to other troubles.

Dr. M. Böhm has recently observed several cases which help to prove the correctness of my theory as regards these diseases (comp. Dr. Böhm's in his journal, 1891, N°. 19). Under the heading "Schroth's dry diet, with some contributions to our knowledge of hæmophilia", the author makes the following remarks: "Though it is, on the whole, quite correct to prescribe a dry diet in many diseases, to improve the blood by overcoming its watery condition, yet we must not believe or hope that all diseases can be cured in this way. The physicians who still prescribe the Schroth cure, publish successful cases only and forget to mention their failures. Our own experiences as regards the Schroth cure may, therefore, be of interest. Some years ago I found it stated in an article by Tuergensen that scorbutic degeneration of the blood, followed by hæmorrhages in various places, occurred as a consequence of the Schroth cure. At first, I doubted this, as I had never seen such a case, and thought that the statement was due to prejudice. But my opinion soon changed. I became acquainted with a young physician who told me that he suffered from hæmorrhages from the lungs, although phthisis was not hereditary in his family, and although he had always been very strong and healthy. Upon inquiring into his mode of living, he informed me that he had lived for months almost exclusively on pulses. As there were no subjective or objective symptoms of phthisis, to explain the hæmorrhages, only one supposition remained, namely, that a scorbutic degeneration of the blood had taken place owing to a one-sided dry diet, lacking fruit and green vegetables. If this case had remained unsupported, I should not be entitled to make use of it against the Schroth cure. But another patient informed me that soon after adopting the Schroth cure, he was attacked by purpura hæmorrhagica. These two cases together cannot but startle every thinking physician, and it would be interesting if the medical disciples of Schroth were to publish their experiences openly and honestly.—If we remember that these blood diseases can only be due to a defective nutrition of the blood-vessel walls, the opinion held by several physicians, that scurvy and similar diseases of the blood are infectious diseases, must be wrong."

The following treatise, written by Dr. Glass, my co-worker and physician to my sanatorium, may be added as an appendix to this chapter. Dr. Glass shows that the results of his chemical investigations made in the year 1891, help to prove the correctness of my theory.

CONTRIBUTIONS TO THE ÆTIOLOGY AND THERAPEUTICS OF HÆMOPHILIA AND ALLIED CONDITIONS.

By Dr. Glass, Weisser Hisch, near Dresden. Extract from the "Allg. med. Zentral-Zeitung" 1892, No. 33 and 34.

ÆTIOLOGY.

It is not always possible to diagnose exactly *purpura hæmorrhagica* from *purpura simplex* and *purpura rheumatica*, *transitional forms* between these diseases evidently occurring. The different forms of "*hæmorrhagic diseases*" are so closely related to each other that the numerous names introduced into pathology for these diseases have only led to confusion.

Purpura simplex—purpura (peliosis) rheumatica—purpura hæmorrhagica—erythema nodosum—hæmophilia—bleeding from the nose—sweating of blood and *fatty degeneration of new-born children*, may all be looked upon as belonging to one class, of which *scurvy* may be taken as the best representative—(comp. W. Koch, *Alg. med. Zentral-Zeitung* No. 31, supplement I, 1890). As regards *hæmophilia* itself, it has no clinical peculiarities to justify one in separating it from the "scurvy" class of diseases. Although Grandidier * has found (up to the year 1877) 200 *families of bleeders*, consisting of 657 single persons, it has also been stated that characteristic cases of "bleeders" exist in which no family history of hæmophilia could be traced. I myself am a hæmophiliac, although my grandparents lived to an old age (a grandfather, 80 years of age, is still living) and knew nothing of a *hæmorrhagic disease* amongst their ancestors. "Hæmophiliac families" only prove the existence of certain bad hygienic-dietetic conditions which produce disease of a certain kind from generation to generation, just as in certain families all the corpulent members suffer from the same disease, namely gout, from generation to generation. One might, therefore, just as well speak of so many "gouty families," consisting of so many single gouty persons.

From the pathological and anatomical standpoint, the principal symptom of scurvy proper as well as of the other diseases mentioned with it above, is the *hæmorrhagic tendency*, the cause of which is to be found in the *vessel-walls*, which *rupture more easily* and *are abnormally permeable*. E. Wagner † found in several cases extensive fatty degeneration of the heart muscle in the bodies of individuals of different ages who had died of purpura hæmorrhagica, scurvy, bleeding from the nose and from the uterus, etc., but no changes in the mucous membranes were found on examination.—The changes found in the blood are principally a *watery condition* (*hydræmia*) and a *deficient power of coagulability*, or even an entire absence of this power (hypinosis).

Thus leuchæmic individuals, in whom the number of white corpuscles

* L. Grandidier, "Die Hæmophilie." Leipzig 1877.
† Wagner-Uhle, "Allgemeine Pathologie." Leipzig 1865. Page 235.

is considerably increased, often bleed very freely even from small wounds, and the bleeding can only be stopped with great difficulty, as the blood coagulates very slowly and imperfectly. The causes and nature of the coagulation of the blood (formation of fibrin) have, therefore, been made the subject of extensive investigations, especially during the last few years. Ten years ago, only certain points had been completely investigated. In 1857, the physiologist Brücke expressed his opinion that the blood coagulates under normal conditions only if removed from the influence of the living, uninjured vessel-wall. He also stated that, when a foreign body was introduced into the blood stream, it became covered with a deposit of coagulated material. Mantegazza further showed that, the rougher the surface of the foreign body introduced into the blood stream, the greater would be the deposit of fibrin, containing large numbers of leucocytes, upon it. Alexander Schmidt and his pupils have investigated very thoroughly the relation which exists between the white blood corpuscles and the process of coagulation. *

The result of their work may be stated as follows: The blood contains a substance called fibrinogen, and a so-called fibrinoplastic substance. Whilst the former is always present in solution in the blood plasma, the latter is derived from the red blood corpuscle ("paraglobulin", Brücke). If solutions of these substances are mixed together, and a third body, the so-called fibrin ferment, which seems to be derived from the leucocytes of stagnant blood, is added to them coagulation will take place.

Now, there are still two very important questions to be answered. Firstly, what agent is it that causes the fibrin ferment to separate out from the leucocytes? Secondly, how can the process of coagulation, due to this unknown agent, be chemically explained? Only after these two questions have been satisfactorily answered, can we really understand the nature of this process. According to E. Freund (Vienna) the agent acting upon the white blood corpuscles is the physical process of adhesion, the action of which gives rise to a chemical reaction. †

This conclusion entirely coincides with the views held by E. Wagner §

* All the literature relating to this question may be found in G. Bunge, "Lehrbuch der physiologischen und pathologischen Chemie" (p. 214).

† "Allg. Med. Zentral-Zeitung" No. 103, 1891.—Maly's "Jahresberichte über Tierchemie," Vol. XIX, page 112 sqq.

§ Wagner-Uhle, ibid. page 176.

as early as the year 1865. Wagner looks upon the process of coagulation of the blood as a purely chemical process, in no way differing from the formation of any other chemical deposit and produced by the combination of two bodies *in statu nascendi*. E. Freund, inquiring further into this chemical process shows that under the mechanical action of adhesion the dissolved phosphates and the potassium of the blood corpuscles combine with the dissolved lime salts and the sodium chloride of the blood plasma, producing a precipitation of phosphate of calcium and phosphate of magnesium, which are insoluble. Haykraft and Löwit have confirmed this, and Löwit gave the process of fibrin formation (coagulation) the significant name of "plasmoschism" (σχίζειν = to split). Examination of the ashes of fibrin actually show a certain invariable amount of earthy phosphates (Ca_3 2 PO_4 and Mg_3 2 PO_4), which cannot, therefore, be considered as a mere accidental addition to the fibrin. As to the opinion still held by some, *e.g.*, Latschenberger and Strauch, that a ferment is absolutely necessary for every process of coagulation, Green, Ringer, and others have shown that "peptonised blood", for example, which, according to all authorities, contains no ferment, can be made to coagulate by merely adding a solution of Ca SO_4, or Ca Cl_2. A further proof of the importance of calcium (Ca) has been furnished by Arthus and Pagès. * Both these investigators compared the conditions necessary for the curdling of milk and the coagulation of blood, and pronounced the opininon † that the fibrin ferment acts upon fibrinogen only in the presence of soluble lime salts, and further, that calcium (Ca) forms a necessary constituent of the fibrin. They also propose the name of "caseification" for both the curdling of milk and the coagulation of the blood. As regards the influence of gases upon coagulation, we know that venous blood, containing more carbonic acid, coagulates with greater difficulty, and that the blood of asphyxiated persons does not coagulate at all, for the phosphates of the alkaline earths which are precipitated, are immediately redissolved by the carbonic acid. Alkaline salts and certain organic bodies have also this dissolving power.

The theory of coagulation ("plasmoschism" according to Löwit or "caseification" according to Arthus and Pagès) can therefore be expressed shortly as follows:

1. When circulating through a healthy and intact vessel, the blood cannot coagulate because, owing to a lack of adhesion, there is no

* Maly's "Jahresberichte über Tierchemie", vol. XX, pages 107 and 108. † Cp. E. Freund, Green, Ringer and others.

opportunity given for a precipitation of more of the phosphates of the alkaline earths (Ca_3 2 PO_4 and Mg_3 2 PO_4) than the solvent (CO_2) present in the blood is able to dissolve.

2. In diseased vessels, or when separated from the body, the blood coagulates because, owing to the action of adhesion, the constituents of the blood corpuscles and of the plasma become mixed, giving rise to a precipitation of more of the phosphates of the alkaline earths than the solvent (CO_2) of the blood can dissolve.

3. *The blood coagulates imperfectly or not at all* (1. hæmophilia, 2. leucæmia, 3. hæmorrhagic diathesis etc.), if there is a *want of soluble lime salts in the blood*, or if the solvent of the blood, *especially* CO_2, *is present in excess*, or if both these factors are present together.

II. THERAPEUTICS.

Let us now pass on to the *treatment of hæmophilia*. Almost all books on this subject agree in confessing that the various internal remedies recommended from "mere theoretical reasons," possess in reality no influence whatever. *Suitable feeding* together with plenty of fresh air, is universally considered the most important part of the treatment. As an example of what is usually looked upon as suitable feeding, I will quote Strümpell: * "There is no reason to depart from this line of treatment which is *sanctioned by experience*, and which consists in prescribing a diet of green vegetables (salads, spinach, etc.), fruits, fruit juices etc., though we have often observed that a fresh vegetable diet is by no means a condition *sine qua non* for the rapid cure of scurvy, and that the same success may be obtained by feeding the patient *on any other good food*."

This is little better than the advice which I received in my childhood, when suffering from hæmophilia. The doctor then told me that the baker, butcher, and brewer were the only ones who could help me, provided also that I took plenty of fresh air and was well looked after. To-day, our treatment of hæmophilia should be based upon our increased knowledge of the causation of the disease. The two factors which give rise to this disease, and which have to be combated, are

1. *want of lime in the blood* (E. Freund, Arthus, Pagès);

2. *accumulation of carbonic acid in the tissues, in the tissue fluids, and in the blood* (hypervenosity).

To treat these conditions successfully, we have only to refer to Dr. Lahmann's book on "Healthy Blood."

* Strümpell, "Pathologie und Therapie," vol. II, part 2, page 229.

Lahmann begins by showing that there is generally both a want of lime and a want of soda in the human blood. According to the table on page 43 of his book 100 parts of the ashes of

ox's blood contain 12·41—31·90% of soda ($Na O^2$)
sheep's „ „ 13·33 „ „ „
calf's „ „ 10·40 „ „ „
human „ „ 2·03— 6·27 „ „ „

Owing to this want of soda the carbonic acid is excreted more slowly and, therefore, accumulates in the tissues.

He then points out the lack of the most important mineral substances in our ordinary food, which is considered quite suitable by the present school of physiologists, and shows the necessity of providing the blood with a sufficient amount of soda and lime by consuming a certain proportion of green vegetables, fresh salads, and juicy fruits or compots daily.

Compare the table on page 33.

	Total ashes	Potash $K_2 O$	Soda $No_2 O$	Lime Ca O	Magnesia Mg O	Oxide of iron $Fe O_3$	Phosphoric acid $P_2 O_5$	Sulphuric acid $S O_3$	Silicic acid $Si O_2$	Chlorine Cl
Normal ..... Food-mixture. Cow's milk..	48·8	12·04	4·73	10·66	1·49	·26	13·88	·15	·02	6·97
Meat..........	40·6	16·76	1·47	1·15	1·30	·28	17·27	·63	·45	1·56
White flour....	4·7	1·69	·04	·13	·39	—	2·45	—	—	—
Potato	37·7	22·76	·99	·97	1·77	·45	6·53	2·45	·80	1·17
Pea...........	27·3	11·41	·26	1·36	2·17	·16	9·95	·95	·24	·42
Carrot.........	54·7	20·20	11·58	6·20	2·40	·55	7·00	3·53	1·30	2·51
Spinach	164·8	27·29	58·16	19·58	10·51	5·52	16·89	11·32	7·45	10·22
Cabbage-lettuce.	180·3	67·85	13·60	26·47	11 76	9·39	16·57	6·78	14·68	13·79
Apple	14·4	5·14	3·76	·59	1·26	·20	1·96	·88	·62	—

By means of the table on page 56, which is also taken from E. Wolff's "Analyses of ashes of agricultural products," Lahmann shows that if we make a proper selection from the different vegetables, there is no necessity, as is usually supposed, for vegetable food so contain an over-abundance of potash. Whilst in flesh and blood the relation between potash (K_2O) and soda (Na_2O) is 16 : 5·7, in vegetables and fruits the table shows the following relations:

	Potash	Soda
Beet-root	39·58	12·33
Carrot	20·20	11·58
Radish	23·17	15·31
Spinach	27·29	58·16
Lettuce (summer endive)	33·17	46·28
Apple	5·14	3·76
Strawberry	7·16	9·68

Lahmann also strongly opposes the ordinary abuse of common salt, which induces an excessive ingestion of fluids, thus encouraging a watery (hydræmic) condition of the blood. There is no doubt that all food-stuffs are of equal value, albumen being just as important as carbohydrates; fats, or mineral substances (food-salts); but if we constantly consume far too little of the important food-salts (soda and lime), serious consequences are bound to ensue. It is, therefore, absolutely necessary that our food should contain a sufficient supply of food-salts (Ca, Na, Mg), and this supply can only be obtained by eating fresh leaf and root vegetables (properly prepared), salads, and fruits (compots). *Only Lahmann's food-salt theory*, in contradistinction to Liebig's albumen theory (a theory quite wrong, although at present universally accepted), *can show us how to cure the hæmophiliac diseases*, by combating the insufficiency of lime in the blood, and by preventing an accumulation of carbonic acid in the blood. Let us turn back for a moment to the sentence quoted above from Strümpell, that there is no reason to depart from the vegetable diet "sanctioned by experience", in treating hæmophilia, but that the same success may be obtained by feeding the patient on "any other good food". Now, this "vegetable diet" treatment is no longer only "sanctioned by experience", but has been proved to be correct scientifically by Dr. Lahmann's researches. Many other serious constitutional anomalies besides hæmophilia, when treated by "any other good diet" based on the albumen theory, become rather more than better. *Fresh air*, *care of the skin*, *suitable hydro-therapeutic measures*, as *active and passive gymnastics* (*massage*) must be included in our system of cure.

As regards my own case, I have now lived for $2^1/_2$ years according to Lahmann's system, and have not during that time had any attacks of bleeding. Formerly, when I lived on the ordinary (albuminous) diet, the simplest cold in the nose was accompanied by a severe hæmorrhage lasting five or six hours. These attacks had the greatest tendency to recur, and only by complete rest and the very greatest care for several days could I hope to be free from all danger of recurrence.

DYSÆMIA AND CHRONIC INFLAMMATION OF THE KIDNEYS

The three principal factors of dysæmia particularly influence the kidneys. This harmful influence on the kidneys is especially evident in the action of the first of these factors, the *lessened alkalescence of the blood,* (1) which is the chief cause of the formation of uric acid in the body. Now, the vessels and canals in the kidneys may be directly blocked by uric-acid deposits, or the walls of the vessels and cells of the kidneys may be chemically injured by an over-abundance of uric acid (analogous to atheroma).

The hydræmia (2) produced by an over-consumption of fluids, the constant extra strain thrown on the kidneys hereby, the increased quantity of blood in the kidneys required to excrete the excessive quantity of urine, all tend to weaken the power of the kidneys to perform their functions.

In addition to this we mustre member the disastrous effects produced by the *over-consumption of* *common salt* (3) upon the kidneys. Compare our quotation from Bunge on page 60.

There is a fourth factor which we should not overlook here, though it is really a condition produced by dysæmia: *the increased action of the "self-poisons"* which are formed in the body itself. If carbonic acid, uric acid, urea, etc., are normal "self-poisons" even in the healthy organism, it is easy to understand that any derangement of the vital functions of the organism due to dysæmia, may give rise to other abnormal "self-poisons" (comp. sections on Diabetes and Nervous Diseases). Although our knowledge is not yet complete as to the nature of these substances, yet there can be little doubt that some of them belong to the group of the poisonous albuminous bodies.

Now, these substances are not only nerve poisons, but also blood and kidney poisons. According to Semmola * they cause an abnormal diffusibility of the albumen of the blood and a condition of the blood which, for the layman may be called watery (comp. Freund) †; according to Spiegler they § render the

* Prof. Semmola (Naples, "Zur Frage der Pathogenese der Albuminurie," in "Wiener Klin. Rundschau," No. 4, 1895.

† Dr. Ernst Freund (Vienna): "Ueber chemische und physikalische Verhältnisse des Blutes bei Morbus Brightü."

§ Dr. Eduard Spiegler (Vienna): "Ueber die sogenannte physiologische Albuminurie." He says, "The increased excretion of decomposition products of the albumen, therefore, seems to produce albuminuria."

kidney epithelium permeable to the albumen of the blood.

Although Semmola and Freund scarcely hold the same opinion as I do regarding the cause of these phenomena, yet it is a help to me and a gain to science, to find that other people have arrived at the same conclusion in a different way, namely, that *albuminuria must originate in a diseased condition of the blood* (*dysæmia*).

Our theory of dysæmia not only explains why albuminuria may occur without any destruction of kidney substance (being due to the action of abnormal "self-poisons" [toxalbumins]), but also why the direct destruction of kidney tissue (being due to uric acid, overwork of the kidney, prolonged action of poisonous albuminous bodies—comp. Semmola), is only a further stage (corresponding to a higher degree of dysæmia) of the pathological albuminuria.

DYSÆMIA AND CANCER (CARCINOMA)

I do not intend to speak here of the "cancer bacillus," or of the inoculation experiments which have been tried lately, for they will not bring us any nearer to the fundamental cause, the predisposition to cancer.

The opinion which has always been held as to the cause of cancer, and which is based upon the observations and resulting conclusions of many physicians, is that *some irritation must be considered as the immediate cause*, whilst *a wrong composition of the fluids of the body, a cancer dyscrasia, must be looked upon as the actual or fundamental cause.* The frequency of cancer of the lip, or tongue, in smokers, and the relation between certain forms of cancer and certain occupations, are mentioned by most authors as proofs that cancer is due to some irritation. Strange to say, the latest authority (Virchow) does not recognise a cancer dyscrasia as forming a predisposition, the cancer being usually a merely local disease, but considers the dyscrasia a consequence of the tumour.

It is true that the cancerous tumour is usually merely local, but that is no reason why a predisposition should not exist; in fact, I believe that without a predisposition it is impossible for cancer to arise. As to the nature of this predisposition, there is no doubt that certain conditions, such as the age of the patient, former injuries, ulcers and cicatrices, ulcers of the stomach, inflammation of the breast, etc., are connected with it; but the present state of our hygienic and dietetic knowledge has rendered it hitherto impossible to find out more.

The following is my opinion: The organism being so complicated, it must be greatly influenced by the way in which it is treated. There must be a certain definite way of living for every species of animal and, therefore, for the human race; a transgression against this rightful way of living will and must in some way alter the normal chemical composition and, therefore, the reactive power of the body. There can be no doubt that a man living on milk and bread alone, must differ both in his outward appearance and in the condition of his tissues, etc., from one who consumes food seasoned with the hottest spices, drinks a good deal of irritating spirits and smokes, or chews, large quantities of strong tabacco (comp. as proof the urine analyses on pages 98 to 103).

We have all been brought up to the absurd belief that the stomach can create suitable nutritive elements out of any sort of food. Man is constantly mixing up cause and effect. He believes, for example, that very high cheese is quite a suitable food, simply because he does not become ill after consuming it. He should, on the contrary, congratulate himself, that his digestive juices are strong enough to counteract most of the poison of the rotten cheese, whilst what remains is so slowly absorbed by the mucous membrane of the stomach and bowels that the skin and kidneys have time to excrete it, thus preventing an accumulation of the poison in the blood.

Snake poison is not poisonous when swallowed, but nobody would suggest from that, that it should be used as a food.

It is a matter of daily observation that people who feed in a very simple manner, easily recover from attacks of fever and often exhibit a wonderful power of resistance to blood poisoning, whilst those who feed principally on rich and high meats, high cheese, wines, etc., show a strong tendency to inflammatory diseases and possess a very small power of resistance. As an illustration of this we might mention the extremely rapid and favourable manner in which the wounds of the Turkish soldiers healed in the last Russo-Turkish war, the Turkish soldier being sober like the Arab and half a vegetarian.

Now, if the body has suffered for years and years from the above-described wrong system of feeding, as well as from numerous other hygienic errors, we are surely right in supposing that the whole organism has undergone a chemical change.

Thus, owing to the life-long influence of continous dietetic and hygienic errors, the chemical composition of the organism may be so changed that a predisposition to cancer is set up.

Cancer is really nothing but an abnormal reaction, resulting from the chemico-pathological condition of the organism, to some *natural*, or more frequently *abnormal* irritation. The irritation caused by a sharp tooth on the tips of the tongue in a young healthy individual produces only a healthy and rapidly healing ulcer, whereas in older people with a predisposition to cancer, it may give rise to a cancerous tumour.

What is a *cancerous tumour?* It is an excessive formation of cells in the epidermis or mucous membrane. There is a tendency to growth which seems strange in old age, when a general retrogression is naturally looked for, and which can only be accounted for by a state of irritation. The consequence of the excessive accumulation of cells is the formation of masses which, pushing their way inwards, press upon the surrounding tissues or organs, causing more or less serious disturbances, and in this lies the principal danger of cancer. As the cancerous tumour consists of cells which should really be thrown off from the body (or changed into glandular secretion, etc.), but are prevented from being destroyed in this manner by their excessive augmentation and by the peculiar growth of the tumour inwards, it represents a mass destined to decay; and a decay, a putrefaction, may indeed easily set in, oxidation processes being hindered owing to a diminished supply of normal blood. The loss of vital fluid connected with this putrefaction constitutes the second danger of cancer.

Now, the irritation which gives rise to this abnormal and excessive growth of certain cells, arises rather from *internal* causes than from external.

External irritations may give rise to an abnormal growth of cells, *e.g.*, in the formation of callosities on the hands and feet after some mechanical irritation;

but a healthy tissue, which is free from an abnormal internal chemical state of irritation protects itself against such irritations, and when the layer of new-formed cells has reached a certain thickness as, *e.g.*, in the case of a corn, the very thickness of this layer protects the tissue underneath from any further action of the mechanical irritation. Thus the growth can never exceed a certain limit.

The conditions are altogether changed, if an *internal* irritation, an internal poison, is present. This chemical poison need not be a specific poison, as one is inclined to suppose. For is it not a fact that in uric-acid dyscrasia the cartilaginous ends of the bones may be destroyed and that excrescences may form in the joints, in the heart, and on the vessel-walls? and is it not also true that scrofulous glands may swell without tubercle bacilli being found, etc.?

It is not difficult to imagine a *disturbed chemical condition of the organisms*, if we remember what has been said about *dysæmia*. But it is very questionable whether we shall ever be able to prove the presence of a specific chemical poison produced by the body, as, *e.g.*, uric acid has been found in the case of gout.

Probably, as in the case of diabetes, there are various poisonous influences working together to produce cancer.

The principal chemical influence at work is perhaps the over-abundance in the body of potash and phosphoric acid, substances which, owing to the present system of feeding, are consumed in excess. Bunge * has proved that potash salts greatly irritate the mucous membrane of the stomach.

Others have stated that cancer is accompanied by a lessened alkalinity of the blood †; and Ricochon has even suggested a certain causal connection between a want of food-salts and cancer (comp. quotation on page 126).

Now, we know that our theory of dietetic dysæmia fully explains both the excess of potash and phosphoric acid and the want of soda in the organism, and this is almost as good as a proof that dysæmia is the fundamental cause of cancer.

If any external mechanical, thermal, chemical, or electrical irritation affects the tissues, the chemical composition of which is so altered, can it surprise us if a growth gradually forms which does not remain limited in extent, and if this morbid tissue gradually assumes an independent parasitic character?

And what if abnormal irritations act upon the chemically weakened tissues?

How is it that cancer usually occurs in such places

* G. Bunge, "Zeitschrift für Biologie," vol. 9, page 130.

† Erich Peiper, "Alkalimetrische Untersuchungen des Blutes, etc." Virchow's Archiv, vol. 116, pages 337—352.—William Rumpf, Inaugural-Dissertation. Kiel 1891.

as the lips, the tongue, the œsophagus, the stomach, the rectum, the breast and the genital organs of women, and that cancer of the skin occurs especially on the face, or on the back of the hand? *Because at these places physical and chemical influences can most easily act.*

One must be blind not to recognise this fact. The mucous membrane of the lips and mouth is constantly being burnt with hot food and irritated by strong spices and tobacco juice; the œsophagus which is unfortunately rather insensitive, and the stomach especially at its entrance and exit, are both irritated in the same manner; whilst the rectum is irritated by the products of putrefaction formed from the contents of the bowels.—We may mention here that old cicatrices of the stomach due to previous ulceration often become the starting-points of cancer.

The formation of cicatrices in glandular organs easily gives rise to a blocking of the ducts and a displacement of the cells of the epidermis into the deeper tissues, so that even the normal growth of the cells would cause an accumulation of cells in places from which they cannot be thrown off—how much more a growth abnormally increased! The same conditions may explain the frequency of cancer in the mammary glands of women; inflammation or surgical operations often lead to transposition of cells, when cicatrices form in the healing process.

Chronic catarrh of the uterus, which is usually treated by cauterisation or scraping, instead of by trying to find out and treat the cause, also often gives rise to cancer in later years. Nobody who has seen severe forms of this catarrh, can have failed to notice this. We must also remember here the uncleanly habits prevalent among certain classes, which favour decomposition processes, thus producing fresh irritation.

A slight wound, or an old crack on the face or hand of an old man of uncleanly habits, may give rise to a cancerous growth.

The other parts of the body are seldom attacked by cancer, but if cancer is found in other places, an *abnormal irritant* can generally be traced.

Thus, some years ago, I had under my care a case of cancer of the skin, which was at first about the size of half a hen's egg, and was situated on the chest near the apex of the heart, in the centre of a patch of shingles (herpes tonsurans). At the present time I have a similar case under my treatment: one of epithilioma on the side of the head, also arising in the centre of a patch of shingles. Here the irritation, the skin disease, is so evident, that one case alone (and we have here two) is of much more weight than numerous cases in which the irritating cause cannot be traced.

We conclude, therefore, that cancer belongs to the class of diseases which are due to degeneration (not to those due to reaction). They are doubtless avoidable, if the predisposition can be overcome and all abnormal irritations avoided.

The strongest man constitutionally is the one who reacts to all abnormal irritations in the simplest and shortest way. To explain this, let me give an example: Two men have a splinter of wood, more or less infectious, driven under the skin. The one will scarcely notice anything the first day: the place will just be slightly painful when touched; on the second and third day the pain will call attention to the spot, he will notice a slight redness in the neighbourhood, will find the splinter, extract it, and the wound will be healed by night-time. The other, possessing a morbid, bloated constitution, poor in blood-salts and rich in leucomaines and autotoxins (poisonous decomposition products of the body itself, as well as the food), will have a considerable swelling perhaps of the whole arm and the neighbouring lymph glands, and perhaps even erysipelas or tetanus may supervene, the body material of any one possessing a morbid constitution tending to decomposition.

Predisposition to this disease may be removed by rational diet, etc., (food rich in food-salts, rational clothing and dwelling, fresh air, etc.); the abnormal irritations, due to a wrong diet, which systematically poisons the blood, can also be avoided. **Cancer is, therefore, avoidable.**

DYSÆMIA AND NERVE DISEASES

Experiments made on animals prove that "it is the central nervous system which first suffers when there is a lack of mineral substances in the food: paralytic symptoms, muscular tremors, gradually increasing stupidity, and visual disturbances, may all be noticed. The vegetative functions are affected only comparatively late." *

The white matter of the brain, of the spinal cord and of the nerves is alkaline or neutral in reaction during life and when in a state of rest; it is acid in reaction after great exhaustion and after death (Funke, J. Ranke).

"The grey matter of the brain is always acid in reaction, and this acidity increases after death" (Gscheidlen).

"J. Ranke has tried to prove experimentally, that the process by which the nerves become acid in reaction after fatigue, corresponds exactly to a similar process which takes place in the muscles. He concludes that the fatigue of the nerves depends upon conditions similar to those found in the fatigued muscles, and that the process of recovery in both cases is due partly to the sweeping out of fatigue matter, and partly to the neutralisation of the acids by the alkaline blood." †

* J. Forster, Zeitschrift für Biologie, vol. 9, 1873. Quoted from Neumeister, "Lehrbuch der physiologischen chemie."

† According to Gorup-Besanez, ibid. pages 693—700.

But what if, owing to an *absence of alkalies*, this acidity is not overcome?

Let us refer to what has been said in the section on diabetic coma (page 87). The symptoms of coma are at first similar to the symptoms of an anæmic (hysterical) fainting fit, or a hysterico-epileptic attack. Uræmic and eclamptic cramps, which doubtless also arise from a poisoning of the central nervous system with "self-poisons" (autotoxins) and especially with acids, furnish us with another illustration, and we may conclude that the cramps of children due to rickets and teeth, the hysterical cramps of grown-up people, and the delirium of fever, are symptoms of irritation set up by an acid condition in the nervous system.

Where do we find the greatest tendency to such fainting fits and cramps? Amongst anæmic and hydræmic people, in fact amongst those in whom a lessened alkalinity of the blood can be shown to exist; in this class we must also place feverish patients, * for whom fruit juices rich in alkalies are the best medicine.

Now, as in connection with dysæmia we usually find a *hydræmic condition*, we must expect to find an abnormal quantity of water in the nerve substance. (I am of the opinion that most of the children fed on watery milk suffer to some extent from hydrocephalus,

* Fr. Kraus, "Uber die Alkalescenz des Blutes bei Krankheiten."

or hydrorickets). That this hydræmic condition produces a state of irritation of the nervous system, is shown by cases of hydrocephalus; that on the other hand it may produce a paralysing effect, is shown by the slower action of the nerves in performing their functions and the lessened efficiency of the central nervous system in hydræmic cases.

The third and last hydræmic factor which we have to consider, is the *over-consumption of common salt.* It is true that at present nothing is known concerning the injurious influence of common salt upon the nervous system; but this influence cannot be denied, considering the intense irritation produced by common salt upon nerves which have been exposed for the purpose of physiological experiment.

Abnormal decomposition products ("self-poisons"), arising from a deficient alkalinity of the blood and retarded processes of oxidation, must also be mentioned here. The presence of these almost unknown substances can be detected only by our power of smell; we must all have noticed the unpleasant smell of many hypochondriac, neurasthenic, and hysterical persons, a smell which passes away when the nervous symptoms are cured.

This variety of causes explains the variety of nervous disturbances.

That *dietetic dysæmia* (want of alkalies, particularly soda, excess of water and common salt in the blood and tissues) with the accumulation of "self-poisons" in the body resulting from it, is really the fundamental cause of all nervous disturbances, is absolutely proved in my opinion by the fact, that if we treat functional nervous diseases in the same way as we treat dysæmia generally, we almost always obtain a *complete and lasting success.* Under a rational system of feeding and hygiene, severe forms of neurasthenia cannot occur; only the simpler forms, mere conditions of fatigue of the nervous system, are met with.

The *destructive changes* in the nervous system may also be traced to dietetic dysæmia.

It is universally acknowledged that acids (sufficiently concentrated) can destroy the nerve matter: on being applied to a nerve, they at first generally cause muscular contractions, after which the nerve rapidly dies. When a nerve dies, processes of coagulation set in, which explain the greater density, the rigidity of the dying nerve; at the same time the nerve matter becomes acid in reaction, or its acidity is increased.

In the *spinal paralysis of children* (acute anterior poliomyelitis), which often accompanies symptoms of rickets, we probably have a simple acute self-poisoning owing to a deficient neutralisation of the acids. The acids act destructively on the nerve centres in the anterior horns of the grey matter of the spinal cord (the place most commonly attacked by this disease), which preside over the various movements of the constantly used arms and legs.

Strange to say, this disease has been placed by some authors among the acute infectious diseases, because it commences suddenly and with feverish symptoms, and because the disease frequently attacks *apparently* healthy children. But if it were so, we should also have to class rickets among the infectious diseases, because it often attacks *apparently* healthy children and commences with feverish symptoms and diarrhœa. Again, if the spinal paralysis of children were due to infection, how could we explain the ordinary course of the disease which commences with a more or less extensive paralysis followed by a gradual recovery of many of the muscles affected, particularly of the muscles of the trunk, while the muscles of either the arm or the leg may remain paralysed?

We know that the blood of a dysæmic child fed on watered milk, meat, beef-tea, bread, and puddings, contains a considerable amount of acid. Neither the uric acid, nor the sulphuric acid can be sufficiently neutralised, and they are, therefore, left free, to attack the tissues of the body in various places. Now, just as in disease of the kidneys the poisoning due to retained urine constituents may suddenly manifest itself in a uræmic attack, although even the day before the nervous system had given no hint that its power of resistance was nearly exhausted; and just as in diabetes the gradual poisoning of the nervous system by the acids also becomes suddenly apparent in an attack of coma: so we may look for a sudden attack in the spinal paralysis of children.

One can understand that those parts of the spinal cord which, on account of the great activity of the muscles, are especially strained, and which are, therefore, also especially liable to be attacked by chemical poisons (acids), may be injured and even destroyed, the more so as in those parts the effect of the acids in the blood or lymph may be enhanced by acids locally produced.

The gradual and in some cases complete recovery of the paralysed muscles is perfectly explained by our theory. In these cases the organism, by means of the blood, succeeds in rapidly removing the injurious poison from the parts affected, thus giving the nerves a chance of recovery. If the blood and lymph circulating in the brain and spinal cord were normal in condition, the latter would be much more capable of resisting the "self-poisons" produced in the organism. A muscle which is overtired, that is poisoned by acids, usually recovers very rapidly on account of the large number of vessels which it contains and the large amount of blood which constantly passes through it; death of a muscle is, therefore, practically unknown. The central nervous system and the nervous system generally are very much worse off in this respect.

Cases of sciatica, facial paralysis or even facial cramps due to "self-poisons" (comp. section on Rheumatism), are usually very slow in responding to treatment, because the circulation of the blood, etc., in the nerves, as well as the tissue changes are comparatively slow; whilst on the other hand, cases of rheumatic lumbago or rheumatism in the neck muscles, which are due to the same causes, are very easily cured.

In connection with these cases of self-poisoning due to increased acidity of the blood, we must further mention those rheumatic paralyses of the spinal cord (cases of so called myelitis, inflammation of the spinal cord) which in many cases are directly preceded by so-called colds (more properly speaking, self-poisonings due to an incapability of the organism to regulate, and compensate for, some disturbance). Cases of multiple scelerosis also seem to belong to this group. *

To show that our opinion as to the cause of these diseases of the nervous system (poisons due to over-fatigue, chiefly acids, but also leucomaines, ptomaines,

* The following report by Dr. E. Redlich (Wiener med. Presse, 1894, No. 9), concerning the pathological conditions found in a case of spinal paralysis in a child, clearly proves in my opinion that the disease is caused by "self-poisons" in the blood—for the "bacillary" idea of Dr. Redlich is rather far-fetched. Dr. Redlich says: "The result of an anatomical examination in the case of a child five months old, leads me to confirm the opinion of Marie and Goldscheider, who attribute to the vascular system a large part in the causation and development of poliomyelitis. The myelitic changes in the anterior horns and in other parts of the spinal cord follow the distribution of the vessels. Destructive changes were found in several of the peripheral nerves as well as in the phrenic nerve. Judging from this case, some poison circulating in the blood, probably a bacillus, seems to be the cause of poliomyelitis."

and toxins,) is not without an analogy, we may mention the poisonous action of other substances, *e.g.*, nicotine, which may produce an incurable paralysis of the optic nerve.

We must, however, not forget that the lessened alkalinity or the abnormally high acidity of the body fluids are not the only factors which we have to take into consideration here; there is also a *defective composition of the nerve substance, which is the natural result of our defective system of feeding.*

It is reasonable to suppose that the brain and spinal cord can act in a normal manner only when normal in composition, and we must further admit that the vitality of the different constituents of the nerve matter is limited (for otherwise, what would be the use of tissue change [metabolism], that contrast to eternity!) We cannot, therefore, agree with Gorup-Besanez, * when he says: "von Bibra's experiments show that in starving animals the weight and chemical composition of the brain undergo no considerable change, and that, accordingly, the tissue changes go on undisturbed in the brain, even when the rest of the body is suffering considerably from the starvation." It would be more correct to say, "that the tissue-changes seem to go on undisturbed in the brain." The fact that the vitality of any part of the living organism is limited, has been overlooked by the above writer.

* Ibid. page 697.

Although the vitality of nerve tissue is perhaps greater than the vitality of any other tissue, yet the brain of a starving person, or at least some of its constituents, must in time be affected.

Now, our brain and nervous system will remain in a healthy condition and normal as regards vitality, if we can supply the elements necessary to the formation of the tissues by regularly consuming the right food; nor will the nervous system suffer, if, *e.g.*, in the morning we consume carbohydrates, at noon albumen and fat, and in the evening mineral substances; but we cannot possibly possess a normally fed and normally efficient nervous system, if during seven or eight months in the year we live on substances which contain hardly any food-salts: meat, bread, potatoes, cereals, and pulses (comp. p. 33), and only during the four or five summer months supply the deficiency of food-salts by living on vegetables and fruits; for the albumen and fat taken in the winter cannot wait to combine with the mineral substances taken in summer to form normal nerve matter. Thus the brain and nerve matter is often inferior in quality, just as in rickets a cartilage-like bone material inferior in quality is formed, owing to a lack of lime salts; and hence the frequency of brain and spinal-cord diseases.

If we push this comparison with bone tissue further, we shall be led to change our present conception of *senile weakness of intellect*, a widely-spread condition, which is now looked upon as due to natural causes, and not as morbid in character. Where else in the whole animal kingdom do we find a creature that becomes weak in intellect or childish, in old age? This sad condition is confined to *homo sapiens*. And where, in the animal kingdom, can we find a creature suffering from osteoporosis (brittleness of the bones) in old age?

The way in which the latter arises, has been described in a former section, and we can easily deduce from that description how dementia senilis arises.

It has been supposed that some diseases of the spinal cord originate in an atheroma of the final branches of the arteries supplying the spinal cord with blood (comp. Gout and Apoplexy). Thrombosis has also been observed to occur in these vessels.

Different conditions may produce the same result, namely a destruction of the functions of some part or other of the brain or spinal cord, just as for example apoplexy of the brain may be produced by embolism in one case and by atheroma in another, causes which have hitherto been considered as quite distinct from each other, but which, according to our theory, are themselves due to a common fundamental cause, dietetic dysæmia (comp. Heart-disease and Gout).

In this section we may conveniently mention a *fourth form of dysæmia*, namely, that *due to indulgence in such stimulants as tea*, *coffee*, *alcohol*, *tobacco*, *etc.* They have enormously assisted in the rapid degeneration of civilized mankind in this latter half of the nineteenth century.

Our ancestors breakfasted on porridge, the most nutritive of cereals, and thus started the day well. We on the other hand have substituted coffee, a worthless, nerve-exciting and in time injurious drink, with which we eat a miserable roll of bread prepared from flour so often sifted, that it has lost most of its nutritive material.

For dinner our ancestors ate chiefly vegetables (green or white cabbage, or "Sauerkraut") with whole-meal bread and only a very small portion of meat; for even amongst the higher classes it was the custom to serve up the same piece of meat prepared in different ways for at least a week. To-day meat forms the principal dish, vegetables are rarely eaten, whilst potatoes, which are of less nutritive value, are used to replace vegetables and whole-meal bread. Those who can afford it, again indulge in coffee after dinner, whilst the men smoke tobacco, the most dangerous of nerve poisons.

Milk and whole-meal bread provided a sufficient supper for our ancestors. We partake of either coffee or tea and modern bread (of less nutritive value), after which the men consume large quantities of beer or wine, not to speak of spirits.

Thus there is no doubt that we are worse fed than our ancestors, and owing to this the composition of our bodies and nerves must also be worse. And further we irritate our organisms day after day with tobacco, alcohol, tea and coffee, stimulants which should only be used on special occasions. In many cases, the effect produced by the constant use of the stimulant is quite evident: nicotine poisoning owing to the use of tobacco, paralysis of the optic nerve owing to tobacco or alcohol, delirium tremens from overdrinking, gout and insomnia due to the tea or coffee habit.

Hence the nervous system of civilized man, which is poor in composition and daily irritated, becomes unequal even to the ordinary routine of life—how much more to exceptional tasks.

A section on "*dysæmia and mental diseases*" has been left out of this volume, on account of the great variety of opinions held as to the nature of mental diseases, to discuss which would have made the section too long.

DYSÆMIA OF THE UNBORN
OR
THE INFLUENCE OF DIET UPON PREGNANCY AND THE FŒTUS

A considerable number of the births amongst civilized nations cause injury, or even become fatal, to the mothers, owing to the relative disproportion between the size of the fœtus and the genital passages. We are, therefore, led to ask *whether the size of the fœtus cannot be reduced?*

Perhaps we should first ask whether it is natural for woman to suffer so much in childbirth, when the higher animals do not suffer in this way. To us, it certainly seems most unnatural. As a rule, there is a great difference between new-born infants and new-born animals; the latter, when born, are little more than skin and bone, whilst the former are usually quite fat, or plump.

Working women in many cases still give birth to comparatively thin children, whilst the fattest and heaviest children are, as a rule, born amongst the delicate anæmic upper classes.

The fat and heavy infants are evidently in a morbid condition. *They suffer, even before birth, from fat anæmia*, more properly speaking *dysæmia* and *hydræmia* (watery condition of the blood). We must naturally look for the cause of this in the mother's diet; for if this diet is wrongly composed, it produces dysæmia in the mother and consequently also in the fœtus. To understand this, let us again refer to the principal points mentioned in our first section.

Meat, cereals and potatoes form the principal food of the civilized nations of Europe. Such green vegetables as are eaten, are deprived of their mineral constituents (food-salts) by a wrong cooking process. Fruits are considered a luxury and are only eaten in small quantities and at certain seasons, or even avoided as injurious.

Now, anæmia, or more properly speaking dysæmia, does not consist in a want of albumen in the blood, but in a want of food-salts. Iron, however, is not the mineral lacking; on the contrary, the amount of iron in dysæmic blood may be too great; it is the excess or deficiency of various other mineral constituents of the blood which renders it unfit to supply the tissues with their proper nourishment. Thus, *e.g.*, a want of soda in the blood is much more serious than a want of iron, the former being connected with the excretion of carbonic acid, and its absence giving rise to an injurious accumulation of carbonic acid in the organism. If there is a deficiency of lime in the blood, decay of the teeth, soft and badly formed teeth (so frequent in anæmic persons), osteo-malachia, osteo-porosis, etc., are the results.

It is impossible to ascertain the exact quantities of the different food constituents which we must consume in order to remain in good health; but we can get some idea of these quantities from milk, which represents a perfect food-mixture.

Every book on physiology shows us how easy it is to choose our food so that we obtain the right quantities of albumen, carbohydrates (sugar), and fat; but the case is different, when we turn to the hitherto neglected mineral constituents of the food. When we compare the percentage composition of the food-salts contained in milk (a normal food-mixture) with the percentage composition of the food-salts contained in our ordinary food, we are at once struck with the result.

The following table shows the amounts of the food-salts contained in 1,000 parts by weight of the dry substance of various foods:

	Total ashes	Potash K_2O	Soda Na_2O	Lime CaO	Magnesia MgO	Oxide of iron $Te\,O_3$	Phosphoric acid P_2O_5	Sulphuric acid SO_3	Silicic acid $Si\,O_2$	Chlorine Cl
Cow's milk	48·4	12·04	4·73	10·66	1·49	·26	13·88	·15	·02	6·67
Meat	40·6	16·76	1·47	1·15	1·30	·28	17·27	·63	·45	1·56
White flour	4·7	1·69	·04	·13	·39	—	2·45	—	—	—
Rye flour .	19·7	7·57	·34	·20	1·57	·50	9·51	—	—	—
Potato	37·7	22·76	·99	·97	1·77	·45	6·53	2·45	·80	1·17
Pea	27·3	11·41	·26	1·36	2·17	·16	9·95	·95	·24	·42
Spinach...	164·8	27·29	58·16	19·58	10·51	5·52	16·89	11·32	7·45	10·22
Apple	14·4	5·14	3·76	·59	1·26	·20	1·96	·88	·62	—
Strawberry	34·0	7·16	9·68	4·83	—	2·00	4·70	1·07	4·10	·48

This table proves that we cannot obtain the amount of mineral substances required by our tissues from meat, bread, potatoes, and pulses, however rich they may be in albumen and carbohydrates. If we use these incomplete foods alone, we shall become dysæmic. We shall especially suffer from a deficiency of soda and lime, although we may be consuming sufficient iron. If on the other hand we will only give the preference to green vegetables, salads, and fruits, our blood will soon contain the right quantities of the various mineral constituents necessary to our organism.

Thus we can easily see that pregnant women, feeding on the ordinary foods, must be dysæmic.

In most dysæmic persons there is a tendency to corpulency. The want of soda in the blood and lymph causes an excessive accumulation of carbonic acid in the tissues; but the lessened alkalinity of the blood is also harmful in other ways, rendering processes of oxidation more difficult and giving rise to the formation of abnormal products of tissue-change. Further, the uric acid present in the body cannot combine with the soda, to form the easily soluble acid urate of soda, but remains uncombined and more or less insoluble in the blood. To wash out these abnormally formed or accumulated substances, the organism instinctively cries for water, and thus the "anæmic" thirst is created, being nearly related to the thirst of feverish and diabetic patients. The majority of anæmic people drink a considerable amount of fluid, while the excretion of fluids by means of the kidneys and skin is retarded or lessened, owing to a deficient activity of the heart and to the poor circulation of the blood in the skin which is always cold and pale. Thus the quantity of fluid in the vessel system is constantly too large, and at the same time the tissues must also contain too much fluid (bloated condition). The blood is diluted and poor in red blood corpuscles, consequently the quantity of oxygen absorbed is smaller than when the blood is normal in condition and undiluted. The red blood corpuscles also degenerate in quality, because their nutrition, which takes place through a process of osmosis, must be deficient, owing to the diluted condition of the plasma. The oxydising power of the blood is thus lessened, and both the tissues of the body and the albumen of the food can only be oxydised to the stage of fat (just as in the case of a dead body lying for a long time in water, the slow and gradual action of oxygen can only convert it into a waxlike mass of fat).

Now, in pregnant women, dysæmia (hydræmia) need not necessarily develop into corpulency, as the necessary predisposition may be absent. For to allow of the development of corpulency, there must be a certain want of tone in the vessel-walls, so that the blood pressure is not sufficiently regulated by them, and the secretion of superfluous water by means of the kidneys and skin is to some extent hindered. If this lax condition of the vessel-walls is not present, they remain lean. Yet, strange to say, a fatty development of the fœtus nearly always occurs even in these cases. For we can see that, firstly, it is impossible for the blood of the fœtus to be normal when, as we know, it is derived from the dysæmic blood of the mother; secondly, owing to the accumulation of carbonic acid in the blood of the mother, there is a still greater accumulation of carbonic acid in the blood of the fœtus; thirdly, the blood of the fœtus must suffer from a considerable lack of oxygen, as the mother (in civilized countries) usually lives in a vitiated atmosphere; finally, the hydræmic condition of the mother's blood is passed on to the blood of the fœtus by the process of osmosis, and thus all the conditions mentioned above, which favour hydræmia, the formation of a bloated organism, and corpulency or fat dysæmia, are present.

Hence many weakly women give birth to children weighing 4,500 grammes (10 lbs.) and more; the walls of the abdomen and the uterus of the mother are overextended, and the strength of the muscles weakened, and this, combined with the disproportion which frequently exists between the overlarge fœtus and the genital passage of the mother, leads to the difficulty in labour.

Having now ascertained the conditions which give rise to difficulty in labour, we are in a position to consider the *measures necessary to prevent the occurrence of difficulty.*

The civilized woman being usually hydræmic, as mentioned above, we must first *restrict the amount of fluid consumed,* and since she is also dysæmic, we must secondly *prescribe a food rich in food-salts.*

To fulfil these requirements, I prescribe the following diet:

For *breakfast,* 1 to 1½ cups of half food-salt cocoa and half food-salt chocolate *, occasionally a cup of coffee made with milk, and some bread and

* In manufacturing these, the mineral alkalies (potash, soda, magnesia generally used are replaced by food-salt alkalies extracted from vegetables. Manufacturers: Hewel and Veithen, Cologne.

butter. (My wife, who has usually an antipathy to other foods, takes fruit alone for breakfast, when pregnant.)

In the *middle of the morning*, some bread and butter with radishes, or fresh milk curds, as well as fruit.

For *dinner*, soup is allowed twice a week only; the principal dishes are green vegetables, occasionally green salads (prepared with very little vinegar, or better with lemon juice or cream), as well as stewed fruits of all kinds: cereals as well as potatoes are looked upon as additional foods, whilst meat is allowed in very small quantities only. (My wife eats hardly any meat.)

For *supper*, we give any vegetable left from dinner, warmed up, or mashed potatoes, macaroni, and the like, with green salads; or simply bread and butter (whole-meal bread) with fresh milk curds or a wholesome soft cheese, always finishing with fruit and nuts and about half a pint of well-beaten-up sour milk. We occasionally allow another glass of sour milk, or a glass of beer or wine, when asked for.

This relatively dry diet (which, by the way, I consider the most suitable diet for everybody), does not give rise to thirst, as might be supposed, for the thirst-producing common salt is avoided as much as possible in the preparation of the food, and the meat, which owing to the kreatin, etc., contained in it, also gives rise to thirst, is scarcely eaten at all, whilst the large amount of absolutely pure (distilled) water contained in the fruits, sufficiently supply the body with water.

In addition to this food we insist upon such hygienic measures as the following: constantly breathing *fresh air*, particularly at night (sleeping with windows sufficiently open at all times of the year, in winter in a heated room), sufficient *exercise*. (My wife takes no particular care of herself, walking, climbing, even jumping ditches and running up to the day on which she expects to be delivered.) Further, suitable porous bed-linen and blankets (no feather-beds), suitable porous clothing. *

The following examples show the result of carrying out the above rules, and to begin with, I will mention my own family, as my observations upon them have been most exact.

When I first became acquainted with my wife, a year before our marriage, she entered my sanatorium suffering from severe chlorosis and to some extent from fat anæmia (really dysæmic corpulency). After about two years' dietetic and hygienic treatment as described above, my first son was born, weighing 3,065 grammes (6 lbs. 13 ozs.); my second son was born about a year later, weighing 2,950 grammes (6 lbs. 9 ozs.). Both children were normal in length (52 cm.) and well

* Comp. "Dr. Lahmann's Reform." A. Zimmer, Stuttgart.

built, but owing to the absence of cutaneous fat, they looked rather thin and ugly in the face.

Thus we see that it is quite possible to reduce the weight of newly born male children to 3,000 grammes and less, most dysæmic women giving birth to boys weighing 4,000 grammes (8 lbs. 12 ozs.), or even 4,500 grammes (10 lbs.).

As regards my third son, I reprint here the following report from the "Frauenarzt" (Heuser, Neuwied, publisher), 1893, No. 7:

The following interesting paper helps to establish the correctness of my views on this subject.

OBSTETRIC HERESIES

By Dr. Eichholz, Kreuznach.

Reprinted from the "Frauenarzt," a monthly journal of gynæcology and obstetrics, 1895.

That terrible curse "In sorrow thou shalt bring forth children," has been received by mankind from time immemorial with a dull resignation, and few scientists have inquired scientifically into the cause of this phenomenon. And yet, does it not seem strange that so natural an act, an act upon which the propagation of mankind depends, should be so difficult and dangerous? Nature, in order to secure the continued existence of her creatures, supplies innumerable germs for their propagation; and why should she make the last act of propagation, the separation of the offspring from the parent so difficult?

How is it that the same trouble does not occur amongst animals? They bring forth their young with the greatest ease, and it is very seldom that there is any disproportion between the size of the pelvis and the fœtus. Over the whole organic world the act of delivery takes place without any difficulty, and there is no reason to suppose that man was intended to be different in this respect. Man must, therefore, have created this trouble for himself by his artificial mode of living. As far as I know, it has always been taken for granted that the normal female pelvis is too small in proportion to the size of an average child's head, to allow of an easy, painless delivery. Schauta, in his paper on "Treatment in normal cases of delivery," tries to explain this disproportion by tracing it to the crossing of races amongst civilized nations. But this explanation is not sufficient. For it is impossible to believe that a crossing between wide and narrow pelves should always result in too-narrow pelves and never in too-wide ones.

The first who sought for an explanation of this anomaly, not in the size of the pelvis, but in the dimensions of the child's head, was Dr. Lahmann, in his "Healthy Blood." This must be looked upon as a great achievement. Lahmann says that it is not the pelvis which is too narrow, but the head which is too large, and that this is due to the mother feeding wrongly during pregnancy. If the mother partakes of a diet consisting chiefly of nitrogenous food, the one usually ordered by physicians during pregnancy, the head of the fœtus becomes too large and hard, so that the average pelvis is too narrow for its easy passage. If, in addition to this, large quantities of fluids of all kinds are given (soups, beer, wine, and water), too large a quantity of amniotic fluid is created, the uterus is distended beyond its natural size, and its muscles weakened during the last few months of pregnancy by this excessive strain; is it not natural that, if the resistance to be overcome be very great, the uterus relaxes and is unable to complete its task! If, on the other hand, pregnant women are fed on a food chiefly vegetable and poor in albumen, and if the ingestion of fluids is restricted to the quantities absolutely necessary, the fœtus remains lean, the head small, the quantity of amniotic fluid small; the efficiency of the uterus is preserved, and the act of delivery is considerably shortened. The average length of the children at birth is 50 centimeters, but as a rule they do not weigh more than 2,500 grammes. Their vitality is just as great as that of fat children.

I must confess, the simplicity of Lahmann's theory is startling. If it is right, obstetrics will have to undergo a complete reformation. Artificial help, especially the use of the forceps, would become almost unnecessary. The deliveries would become less dangerous, as injuries during birth would be less frequent, whilst the danger from infection would also be less, owing to the shorter duration of the delivery. But not only this—our principles of feeding would also be completely changed. If with a certain diet the proportion between the size of the pelvis and the fœtus becomes such that the delivery takes place as easily as with the higher animals (mammals), and without any disturbance of health either in the mother or child, it is evident and indisputable that such a diet is the natural one for man. We should be obliged to recognize a food poor in nitrogen to be the right one, in spite of modern physiology; vegetarianism would become paramount, in spite of the hostility of scientists. We should then judge quite differently of the ætiology of, and predisposition to, diseases, the origin of which is completely unknown to the science of to-day. We should perhaps look with the eye of a vegetarian for the origin of chlorosis, tuberculosis, scrofula, carcinoma, chronic nephritis, diabetes, and various acute diseases, for which "infection" alone is not a sufficient explanation. And we should perhaps arrive at the conviction that most of the diseases from which civilized mankind suffers, are due to wrong feeding, and that bacilli do not play the important part attributed to them by science.

We should then inquire into the causes of disease not only with the microscope, but with our eyes open. It seems to me that with our *special* studies we have lost the faculty of looking at nature as a whole, and we have forgotten that the *species homo* does not differ essentially, as regards his biological behaviour, from the organic nature around him. Our investigators, possessed of wonderful powers, are engaged in solving subtle questions which are of no practical importance to the physician; whilst the food question, a question connected with the very existence of mankind, is no longer considered worthy of study. A physician nowadays prescribing a vegetarian diet, even under special conditions, would be laughed at by his colleagues. However accurate and free from objection the proofs and experiments of our physiologists may be, the results obtained at the so-called natural cure establishments, which are mostly conducted on vegetarian principles, are so striking as to startle every unbiassed observer. We ought no longer to ignore these results: only by a careful investigation can we arrive at the truth.

Such considerations and the fact that the question of prophylaxis in cases of pregnancy has hardly been discussed at our schools of medicine, led me, some years ago, to put Lahmann's ideas into practice, though not without hesitation. For if the albumen theory was right, a diet poor in albumen used in cases of pregnancy would greatly injure the patients. And as to the child, would it not become a miserable product incapable of life?

Only educated women were of course fit for the experiment, women capable of grasping the idea of the treatment, and who were at the same time in a position to observe strictly the prescribed diet. I found that women who had suffered a good deal in previous deliveries and who, therefore, looked forward to another delivery with a certain amount of fear, were most ready to try the experiment. They were naturally able to judge of its success or failure by comparison with their previous deliveries.

I prescribed the following diet: Only a small quantity of meat to be eaten once a day and with very little salt. Principal food to be taken at will: leaf-vegetables, spinach, cabbage, salad, potatoes, whole-meal bread, bread and butter, very few eggs, and pulses only occasionally (being too rich in albumen). Soup very rarely. To quench the thirst milk, cocoa, very little water, plenty of fresh and preserved fruit. Any drinking without a strong feeling of thirst forbidden. No beer or wine.

My patients very soon became accustomed to the prescribed regime, especially when it was adopted gradually. The feeling of thirst, inconvenient at first, soon disappeared.

The patients felt remarkably well after a short time. The disagreeable feeling of fulness and heaviness, which so often torments pregnant women, ceased or did not occur at all. Several women told me that on the day before their delivery they walked for several hours. The bowels, which in the case of pregnant women so often require artificial help for weeks and months, acted as a rule with perfect regularity. In short, the state of health was excellent.

As to the act of delivery itself, it is very difficult to tell objectively, whether it has been difficult or easy. We are thrown back on the subjective statements of the mother, which are the more trustworthy if she is in a position to compare this with previous deliveries. Amongst the 25 women, who lived according to my prescriptions for at least the last three months of pregnancy, artificial help was never required. The quantity of amniotic fluid was surprisingly small; in many cases there was not more than a cupful, in some cases none at all was observ-ed. The weight of the children was mostly below 3 kilos ($6^3/_5$ lbs.). The circumference of the heads was in every case less than 36 centimeters (14 in.), mostly 33—34 cm. (13 in.) The children were all healthy and full of vitality. In nearly every case the mother was able to feed her child herself, whilst several had not been allowed to do so on previous occasions. In my opinion feeding by the mother is much too often forbidden by physicians, its dangers being decidedly exaggerated. I have often seen very weakly women recover visibly during the time of nursing. At any rate it is remarkable that the dry food poor in albumen had not an injurious but rather a favourable influence upon lactation—another proof of the correctness of the theory.

Now you will justly say that the observation of 25 cases only does not prove much. But it proves at any rate that the Lahmann diet has in those particular cases favourably influenced delivery and can therefore do no harm. Further experiments can thus be made without hesitation. It is to be hoped that this method may soon be tried by physicians and in clinics; the question of the right food for man will then perhaps also be given the attention it deserves. A physician may indeed be proud to help with his art in a case in which the natural powers are insufficient, and gain glory and honour by it. But experience teaches us that, in spite of the high development of technical and operative skill, we are not able to render a delivery as free from danger, when we are compelled to give artificial help, as when the delivery takes place naturally. There is, therefore, all the more merit in producing the conditions which render artificial help unnecessary. Unfortunately science effects very little in the way of prophylaxis; its main object is to correct developed conditions of disease, to overcome diseases which already exist. Thus the physician who starts practising knows very little about the real origin of diseases and how to avoid them. He has been taught something about infectious diseases and about public hygiene; but no academical teacher has given him a clear insight into the beneficial or harmful action of the habits of daily life upon the body.

We accept our present civilized mode of living as something unalterable and not to be questioned, and hardly take it into account when inquiring into the fundamental causes of disease. And yet any one who thinks seriously about this matter, must come to the conclusion that only man's unnatural mode of living can have produced in him such an enormous number of diseases, when the higher animals living naturally and following their instinct, suffer from so few. It is this unnatural mode of living which causes the disproportion in size between the fœtus and the mother's pelvis. Finally, it is our unnatural mode of living which gives rise to all disease or at least to our predisposition to disease.

A CONTRIBUTION TO THE QUESTION OF FEEDING DURING PREGNANCY.

A letter from DR. LAHMANN to DR. FREUDENBERG.

My dear Colleague,

I am pleased to be able to inform the readers of the "Frauenarzt" that my theory (comp. "Dysæmia of the Unborn" in my "Healthy Blood", and also the favourable notice by Dr. Eichholz in No. 2 of this year's "Frauenarzt"), when put into practice in my own family, has produced strikingly successful results.

Whilst it is usual in civilized countries for women to give birth to male children weighing over 3,000 grammes, and for the size and weight of the children to increase with a certain regularity at each successive birth, I have obtained in the case of my wife (who, as you know, enjoys the best of health) a completely different result, by means of the dietetic and hygienic system described in my book.

My first son, born January 21st, 1889, after my wife had lived according to my system of diet for about two years, weighed 3,065 grammes at birth; my second son, born January 6th, 1890, weighed 2,950 grammes, whilst the third, born May 18th, 1893, weighed only 2,700 grammes. The first two were wrinkled and thin in appearance when born; but the third, born after the mother had lived according to my system of diet and hygiene for six years, no longer exhibited that appearance, his larger and better developed muscles filling out his skin. The birth was completed in two hours. There was no displacement of the bones of the head, and no hæmatoma etc. could be discovered. The mother, who suffered less than many women during their menstrual periods, left her bed on the fifth day. She was able to feed the child more easily than on the previous occasions (the child was occasionably fed on goat's milk mixed with my vegetable milk).

Whilst it is usual for new-born children to lose weight at first, my sons on the contrary began at once to gain in weight. My second son weighed 2,950 grammes on the 6th of January, 3,000 on the 11th, 3,100 on the 18th, 3,240 on the 23rd, etc. My third son, who up to the present time has thriven best, weighed 2,700 grammes on the 18th of May and 3,075 on the 30th of May, therefore he has increased 375 grammes in 12 days. My eldest son was only weighed at longer intervals.

How much more family happiness, how many more healthy children would there be, if only this dietetic system was generally adopted. Will you not assist me in spreading it?

H. LAHMANN.

My fourth son and my daughter both weighed 3,750 grammes (8 lbs. 5 oz.) at birth, and like their North-German grand-parents were both very long, whilst their heads were comparatively small.

My wife, since her third delivery, has kept to our usual diet, and did not return to the "lowering" diet, as in former pregnancies. Nor had she, owing to increased household duties, as much bodily exercise as I think advisable. But compared with other women she has been living pretty hygienically, so that her muscles were strong, the quantity of amniotic liquor small, and the deliveries short and easy, lasting only $2^3/_4$ and 2 hours.

Others of my patients, who had suffered a good deal during previous labours, have derived the same benefit from my regime. In one case, the birth took place quite successfully without even the assistance of a midwife, who was called too late.

Now the fœtus is not only influenced by a *long* dietetic treatment of the mother, but even by a comparatively *short* treatment, commencing near the end of the pregnancy. The following example illustrates this:

A foreign lady, who had suffered much on three previous occasions, came to me for treatment at the end of the seventh month of pregnancy, November 1890. She was suffering from dysæmia, chronic scrofula (inflammation of the eyes), moderate corpulency, and chronic constipation. On the 4th of November she weighed in her clothes 64.9 kilos.

Besides the above-mentioned dietetic measure, including a total abstinence from meat, the treatment consisted of daily sitz-baths (23° R.) for 10 minutes, alternating hot and cold foot-baths (as she suffered from cold feet), Priessnitz body-compresses applied nightly, careful daily massage of the body and light gymnastic exercises to strengthen the muscles of the abdomen.

Towards the middle of December the patient was surprised to notice that her body was becoming decidedly thinner. She feared that the fœtus had died; particularly as all fœtal movements had ceased. Indeed, the decrease in the circumference of the abdomen and the size of the body generally was very remarkable; in reality she had increased 5 kilos in weight from November 4th to December 15th, when she weighed 69.8 kilos. This increase of weight was only to a small extent due to an increase in weight of the fœtus: it was chiefly to be accounted for by a greater density, a greater specific gravity of the tissues; for even some weeks after delivery the weight of the mother was 66.9 kilos.

On examination, the fœtal heart could be heard beating strongly, and the fœtal limbs, which were evidently very thin, could now be distinctly felt through the abdominal wall. The fact that the fœtal movements had almost disappeared, was due to the improved condition of the blood and to constantly living in the fresh air, which facilitated fœtal respiration. A fœtus which obtains a good supply of oxygen through the placenta, keeps perfectly quiet. My wife notices distinct fœtal movements only in badly ventilated or overcrowded rooms.

On the 30th of December, a girl was born so easily that my presence was not required. The child weighed scarcely 3,000 grammes (6 lbs. 11 ozs.), whilst her other children had weighed from 4,000 grammes (8 lbs. 12 ozs.) to 4,500 grammes (10 lbs.).

I should mention that in the case of this child, as well as of my own children, the heads were comparatively small, and the bones of the head easily moveable.

There was no unnecessary water (serum) in the cerebral ventricles, in the subarachnoid space, etc., whilst most new-born children exhibit a more or less pronounced hydrocephalus internus and externus.

The advantages which result from following out my theory in practice, are easily evident. Women who are normally built, give birth to their children quite easily because

1. the size of the fœtus corresponds to the size of the genital passages (bony and soft) in the mother, and therefore
2. the internal organs and tissues are not injured;
3. owing to the small size of the fœtus, neither the muscles of the abdominal wall nor of the uterus are overstretched, so that both these groups of muscles remain stronger and facilitate the labours of normally built women;
4. surgical operations to assist muscular weakness, or overcome a disproportionate size of the fœtus, are never required in the case of normally built women.

Women who suffer from a narrow pelvis, have also a better chance of being delivered successfully, the factors mentioned above under No. 1 and 3 favouring a spontaneous delivery of the child. The well-known Dr. Mensinga, of Flensburg, the inventor of the occlusive pessary for the protection of women, wrote to me in the autumn of 1894: ..."Another patient entreated me to produce premature labour, as she had always suffered intensely on previous occasions; but I refused and prescribed instead your system of diet with the result that she was delivered easily, quickly, and painlessly."

Finally, as regards the fœtus, the danger of being injured owing to prolonged labour, or owing to operative measures, is greatly lessened. It is also evident that a dry (not hydræmic) constitution, a lean infant, thrives better and is more capable of resisting adverse influences, than a bloated, dysæmic child.

I lately found a partial confirmation of my theory in a treatise by Dr. Prochownik on "an attempt to replace artificially produced labour by other means" (Zentralblatt für Gynäkologie, No. 33, 1889). Dr. Prochownik, it is true, starts with the mistaken idea that the too heavy children are too well fed, and therefore proposes that mothers with a narrow pelvis should be placed upon a very restricted diet.

But unconsciously he has adopted the right method of treatment in the cases which he quotes. For following the general but erroneous belief that vegetables are less nourishing than meat, beer, etc., he orders vegetables alone to be eaten. Thus unintentionally he improved the condition of the mother's blood and kept the fœtus free from hydræmic and fat dysæmia.

DYSÆMIA OF INFANTS

Published before under the title "How can we reduce infant mortality?" in No. 12—15 of the "Internationale Klinische Rundschau" (Vienna 1891).

If we physicians could only succeed in guaranteeing the life and health of children, what a debt of gratitude would mankind owe to us!

It is our duty to listen to any suggestions on this question, offered by others, and at the same time to make known the results of any investigations which we ourselves may have successfully carried through.

I wish in this section to give an account of my experiences based on a theory of my own. As my discovery dates six years back, I have the successful results of six years' practical experience of my theory to corroborate its truth and practical applicability.

The principal point in the rearing of children, is the question of food.

As the suckling of the child by the mother herself, or by a wet nurse is exceptional nowadays, we must ask ourselves if a satisfactory substitute for human milk has been found.

The frequency of pernicious diarrhœas, of rickets, and of general debility in children, as well as the enormous mortality of infants, conclusively answer this question in the negative.

The difficulties connected with feeding with animals' milk, the most natural substitute, have unfortunately given rise to the use of *farinaceous* substitutes of various kinds. They have become a curse to the children; for in consequence of their *deficiency in mineral substances*, they are bound to cause rickets, anæmia, and debility, not to speak of disturbances of digestion due to the difficult assimilation of the starch. The following tables may illustrate this (only the dry substance of the food has been used to obtain the analysis, as the amount of water contained in the foods differs so much):

The dry substance of

human milk contains		3·46% of ashes
cow's milk	„	5·64 „ „ „
goat's milk	„	6·48 „ „ „

The dry substance of

fine wheat flour contains		·54% of ashes
coarse „ „	„	1·09 „ „ „
rye flour	„	1·67 „ „ „
pease meal		2·20 „ „ „ *

The percentage composition of the ashes is: †

In	Potash K_2O	Soda Na_2O	Lime CaO	Magnesia MgO	Oxide of iron Te_2O_3	Phosphoric acid P_2O_5	Sulphuric acid SO_3	Silicic acid SiO_2	Chlorine Cl
Human milk...	38·08	5·69	18·78	·87	·11	19·10	2·64	—	19·06
Cow's milk....	24·67	9·70	22·05	3·05	·53	28·45	·30	·04	14·28
Wheat flour....	36·00	·93	2·80	8·23	—	52·04	—	—	—
Rye flour......	38·44	1·75	1·02	7·99	2·54	48·26	—	—	—
Pease.........	41·79	·96	4·99	7·96	·86	36·43	3·49	·86	1·54

Thus human and cow's milk contain from *five* to *ten* times more ashes than wheat flour, the principal constituent of all children's foods and soups. Further, the percentage composition (that is the amounts of the various mineral food substances) of the above-mentioned milks is much better than that of the cereals, etc.

* Comp. I. König, "Chemie der Nahrungs- und Genussmittel". Berlin, 1882.

† Comp. E. Wolff, "Aschenanalysen". Berlin 1871.

The most important mineral substances for building up the body, are iron, soda, and lime. The iron of the hæmoglobin renders possible the process of oxidation; the soda compounds (not sodium chloride!) bring about the excretion of carbonic acid; whilst the lime is needed for building up the bones and the teeth.

The large quantity of phosphoric acid contained in the "farinaceous foods" is useless to the child's organism, the quantity of phosphoric acid needed being much less, as shown by the composition of milk given in the above table.

But how about the amount of iron, soda, and lime contained in wheat-flour?

To realize the difference, think of how small the quantity of mineral substances (food-salts) contained in 1,000 parts (by weight) of the dry substance of wheat flour is, compared with that contained in 1,000 parts of the dry substance of cow's milk! Cow's milk contains in this quantity of dry substance about 50 grammes of food-salts, wheat flour scarcely 5 grammes.

	Soda	Lime	Oxide of iron
The 50 g. contain	4.73 g.	10.66 g.	.26 g.
" 5 g. "	.04 g.	.13 g.	—

Thus cow's milk contains about 100 times more soda and about 80 times more lime than wheat flour, whilst only the slightest traces of iron can be found in wheat flour (some kinds excepted).

Can we, after these statements, be surprised at the bad results of feeding with farinaceous foods? It is true, children fed on so-called children's foods and soups often look well, or more properly speaking, fat. But it is "dysæmic" fat which gives them this appearance, the formation of which is caused by an insufficient combustion, owing to a want of iron. Rickety bones are hidden under the round form, a bloated body has been built up, which is unable to resist disease and will succumb to the first attack of acute disease.

We have said enough about the farinaceous children's foods: to prescribe these foods without any addition (see later) is to commit a crime against the child, though unconsciously. This fact cannot be upset by any manufacturer declaring that he uses the comparatively better pease-meal; for whether the amount of mineral substances (food-salts) be 10 or 20 times less, it is always less.

As to the use of *animal's (cow's) milk*, the ordinary method of giving it leads to equally bad results, though in a different way. To make animal's (cow's) milk digestible for the child, it is diluted with, on an average, two parts of water. We do this quite innocently, and do not consider how absurdly we act. Whilst a child fed by its mother, whilst a young calf or goat consumes milk of full (100%) nutritive value, and can build up with this full-value food a full-value body, the infant fed on diluted cow's milk is expected to achieve the same result with a $33^1/_3$% food, that is a food which has only one-third of its proper nutritive value. But the quantity of fluid which a child can take, being limited, say to one litre (=$1^3/_4$ pints), it cannot take three litres of the inferior food: it is thus cheated of $66^2/_3$% of food material and must needs build up a body which is of $66^2/_3$% less value.

So, whilst the breast-fed child, or the sucking animal, receives in 1,000 parts of food 870 parts of water and 130 parts of dry substance, the "thin-milk child" receives in 1,000 parts of food *956 parts of water and only 44 parts of dry substance.*

The former finds in a litre of food **23·6**—34·1 grammes of albuminous substances, 36·5—**39·4** grammes of fat, 48·1—**62·3** grammes of sugar, and **4·5**—7·1 grammes of food-salts.* The "thin-milk child", on the contrary, finds in a litre of his diluted food *only 11·5 grammes of albumen, 12·5 grammes of fat; 16·4 grammes of sugar, and* 2·4 *grammes of food-salts.*

Besides this, the "thin-milk child" cannot even make good use of his inferior food, because his blood, inferior in itself (especially in mineral substances), is further diluted by the larger quantity of water, and can, therefore, only create diluted, inferior digestive juices. The invariable result of giving this diluted

* Those figures in heavy type represent the average amounts in human milk, the others those in cow's milk. Comp. König.

milk, in a condition of hydræmia *(watery condition of the blood)*. This is most frequently shown by the bloated look of these "thin-milk children", in their being subject to cold and damp feet, in their tendency to rickets, and thus also to the combination of rickets and hydræmia, the hydrocephalus internus (water on the brain).

To render cow's milk more digestible without diluting it, was the next thing aimed at; and for this purpose a new mixture (Biedert's *cream mixture*) and also *peptonizing* the milk were tried. Biedert's cream mixture, however, suffers from the same want of food-salts as diluted cow's milk, and its digestibility is not assured; whilst the peptonized milk can in many cases not be given on account of its taste, and the practical results of feeding with it fall short of the theoretical suppositions, perhaps on account of the chemical ingredients.

Milk is also very commonly mixed with thin *gruel* or *barley water;* but it can hardly be doubted that the food value of these mixtures is not much greater than that of milk diluted with water, at least as regards the first few months of life. For what is gained by the easier digestibility of the casein, owing to the breaking-up power of the oats or barley particles, is compensated for by the indigestibility of the starch.

Now, in 1883, I hit upon the idea that the injurious influence of the milk dilution might be compensated for by adding to the milk *nuts* and *almonds*, which are rich in albumen and fat, instead of cereals, which had hitherto alone been tried. An emulsion rich in albumen and fat is (supposing that it is digestible) doubtless better than pure water or a thin starch paste. But the want of food-salts is not supplied by this means, the amount contained in nuts and almonds not differing much from the amount contained in cereals. Therefore I tried, by the *addition of food-salts* (extracted from leaf vegetables rich in food-salts) as well as of sugar syrup, to make a preparation which is chemically of full nutritive value and equivalent to human milk. I argued that the interposition of plant albumen (conglutin) particles, which coagulate with difficulty, between the coagulating casein masses would increase their digestibility, by breaking them up; and that the digestion of the plant albumen and oil as well as of the sugar and food-salts would present no difficulty. I was even myself surprised to find later how perfectly these expectations were fulfilled. It appeared that not only physical but also chemical influences became active.

First, Dr. Huth at Iserlohn proved by microscopical experiments the correctness of my deductions.

He used (according to his own report) the following four solutions:

1. Boiled cow's milk, half diluted with water.

2. A solution of the "*vegetable milk*" * in boiled distilled water, in the proportion of 1 : 7.

* The name given to my preparation, which is concentrated into a thick jelly, to keep well. Manufacturers: Hewel and Veithen, Cologne.

3. A mixture of the preceding emulsion (2) with pure boiled cow's milk, in equal parts.

4. Human milk after six months' nursing.

Dr. Huth says in his report: "We have now only to bring the above-mentioned preparations into contact with the chief curdling agent of the stomach, the rennet ferment. This is extracted by means of glycerine according to Wittig's method.

If we mix pure cow's milk with rennet ferment, big lumpy curds in broad cohering layers are seen under the microscope, whilst macroscopically they appear as middle-sized flakes. If we cause rennet ferment mixed with $^1/_{10}$ % sol. hydrochloric acid to be drawn under the cover glass from the side, a sudden curdling results, by which the whole preparation is immediately changed into a compact solid lump, a lump which, by gently pressing the cover glass is only incompletely broken up into smaller pieces. Preparation No. 2 remains almost entirely uninfluenced by the rennet ferment. No. 4, human milk, differs considerably from cow's milk as regards the curdling by rennet ferment + hydrochloric acid. In this case the seemingly fine flaked curd also shows under the microscope larger lumps. They are, however, composed of finely divided flakes, which only loosely cohere to each other.

But the most interesting specimens are the preparations from No. 3. Curdling is also immediately produced by the addition of pure rennet as well as of rennet + hydrochloric acid. If we look at it macroscopically, an apparently cohering flat mass again appears, but after being magnified 80 times, extremely fine little flakes are seen to lie loosely beside each other, and the intervals between them are so wide that the mass looks like a lattice work. The reason for this is probably that the particles of Lahmann's vegetable milk which do not curdle, are, so to speak, scattered as a dispersing element in the midst of the forming curds of the cow's milk."

The total results of the examinations may, therefore, be summed up in the following sentence: "Among the preparations that have been considered and compared, there is none which allows the gastric juice such free admission and such easy power of action as the animal milk mixed with Dr. Lahmann's vegetable milk."

Further, Dr. A. Stutzer (president of the chemical testing laboratory at the university of Bonn) proved the value of the "vegetable milk" from a physiologico-chemical standpoint. In his report he says:

"The vegetable milk is, therefore, advantageously distinguished from "children's foods" and similar substitutes by the absence of starchy substances. In common with Biedert's cream mixture the vegetable milk contains considerable quantities of fat in an emulsified condition. But it differs from the cream mixture both in the way in which it is prepared and in its other qualities.

Chemical analysis gave the following result:

Fat	34·72 %
Plant casein and similar nitrogenous constituents	12·00 „
Sugar and plant dextrin	31·02 „
Salts	1·64 „
Water	20·62 „

I dissolved the vegetable milk in seven times the quantity of water, and examined the behaviour of this fluid as well as cow's milk and mixtures of the two towards gastric juice containing various strengths of acid. The results of my observations were as follow:

1. Vegetable milk, mixed with acid gastric juice and warmed to the temperature of the blood, curdles in very fine flakes. After standing undisturbed for some time, the lower layers of the fluid become perfectly clear. The curd has therefore a lower specific gravity than the surrounding fluid.

2. Cow's milk, treated in the same way, curdles in thick lumps, which remain at the bottom of the vessel.

3. Mixtures of dissolved vegetable milk and cow's milk in the ratio of 1 : 2 and 2 : 1 show fairly fine flaked curds which are distributed through the whole fluid. A curdling in thick lumps does not take place.

This effect of the gastric juice upon a mixture of vegetable milk with cow's milk is surprising. The vegetable casein derived from the almonds and nuts in connection with the oil also contained in them, is able mechanically to split up the forming curds of the cow's milk in a most striking manner. Such fine curds cannot possibly lie heavy on the stomach. The finely separated casein must offer a larger number of attacking points and consequently the digestion of the casein of the milk must be facilitated. It is true that we cannot exclude the possibility that the vegetable casein is somewhat more slowly assimilated than the animal casein, but it is not likely that this will prove any great disadvantage, because the vegetable casein curdles in very fine flakes under the action of gastric juice.

These opinions which I formed after observing the mechanical behaviour of the examined fluids towards gastric juice, cannot, of course, be proved to be correct by statistics based on experiments. I had, therefore, in the following experiments to confine myself to examining generally whether the vegetable milk would produce a favorable or an unfavorable influence upon the digestion of the casein contained in cow's milk.

I carried out my observations under the following conditions: I used gastric juice with cow's milk, with vegetable milk, and with a mixture of the two. The gastric juice was prepared according to my suggestions in the "Zeitschrift für physiologische Chemie," vol. XI, page 208. The fluids were kept at the temperature of the blood; after a certain time, the action of the digestive ferment was suddenly interrupted, and then we had to find out, how much of the casein and of the other nitrogenous substances had been dissolved and digested.

The progress of digestion was measured by the total quantity of dissolved nitrogen contained in the fluid. The nitrogen forms a very characteristic constituent both of the casein of milk and of the so-called plant casein of the almonds and nuts, and the quantity of that substance present can be very accurately determined by chemical analysis.

The cow's milk used for the following experiments contained exactly ·50 grammes of nitrogen, corresponding to ·12 % of casein (+ albumen); the vegetable milk, in an undissolved state, contained 1·92 % of nitrogen = 12 % of vegetable casein.

The milk was diluted with water, as is usual in feeding little children. The water was partly replaced by dissolved vegetable milk. I arranged the dilution so that in all cases exactly 1 gramme of nitrogen (in the form of casein etc.) was contained in 1/2 litre of the total fluid. Before mixing, each fluid was separately warmed to 37—38° C., they were then mixed in certain ratios, mentioned in the following tables, allowed to stand exactly an hour at the temperature of the blood, and then so much of the fluid was at once filtered off, as was acquired to ascertain accurately the amount of dissolved nitrogen. The filtration took very little time, and it was thus possible to interrupt almost suddenly the further action of the digestive ferment upon the casein which had remained undigested. The small quantity of nitrogen contained in the gastric juice, has always been deducted in the calculations.

Quantity of					
Cow's milk used ccm.	Vegetable milk used (dissolved in water in the ratio of about) 1 : 7 ccm.	Amount of nitrogen contained in the fluid: grammes	Amount of nitrogen dissolved: grammes	Amount of dissolved nitrogen which according to calculation ought to have been present in experiment c: (a + b : 2) grammes	Surplus amount of nitrogen dissolved in experiment c: %
Experiment I. Amount of hydrochloric acid contained in total fluid = ·02 %					
a 200	—	1·00	·392	—	—
b —	400	1·00	·332	—	—
c 100	200	1·00	·426	·362	6
Experiment II. Amount of hydrochloric acid contained in fluid = ·05 %					
a 200	—	1·00	·408	—	—
b —	400	1·00	·374	—	—
c 100	200	1·00	·461	·391	7
Experiment III. Amount of hydrochloric acid contained in fluid = ·10 %					
a 200	—	1·00	·453	—	—
b —	400	1·00	·503	—	—
c 100	200	1·00	·537	·477	6
Experiment IV. Amount of hydrochloric acid contained in fluid = ·20 %					
a 200	—	1·00	·838	—	—
b —	400	1·00	·618	—	—
c 100	200	1·00	·732	·728	½

Further experiments were made in the same way, the time, during which the fluids were kept warm, being, however, 1½ hours.

Amount of nitrogen dissolved: grammes	Amount of dissolved nitrogen which according to calculation ought to have been present in experiment c: (9 + 6 : 2) grammes	Surplus amount of nitrogen dissolved in experiment c: %
Experiment V. Amount of hydrochloric acid contained in fluid = ·02 %		
a ·519	—	—
b ·335	—	—
c ·570	·426	14
Experiment VI. Amount of hydrochloric acid contained in fluid = ·05 %		
a ·608	—	—
b ·395	—	—
c ·606	·501	9
Experiment VII. Amount of hydrochloric acid contained in fluid = ·10 %		
a ·702	—	—
b ·494	—	—
c ·638	·501	4
Experiment VIII. Amount of hydrochloric acid contained in fluid = ·20 %		
a ·949	—	—
b ·549	—	—
c ·794	·748	4

The following are the conclusions which, I think, ought to be drawn from these observations:

1. By the addition of Dr. Lahmann's vegetable milk to cow's milk,

a most advantageous mechanical breaking up of the casein of the cow's milk takes place at the commencement of the process of digestion. The casein does not curdle in thick lumps, but in fine flakes, which cannot lie so heavy on the stomach as pure or watered cow's milk.

2. The vegetable milk contains no starchy substances, to weight the juvenile organism with an undigested and injurious mass.

3. The vegetable milk contains fat and plant casein; therefore, by mixing the vegetable milk with the cow's milk, the nourishing value of the latter is not diminished (as in cow's milk diluted with water), but increased.

4. In a mixture of cow's milk with vegetable milk the casein is, on account of its more finely divided particles, more easily digestible. The increased rapidity of the digestion can be observed particularly when the amount of acid contained in the fluid is small—corresponding to the quantity of acid in the stomach of little children. If that amount is larger (·1 and ·2 % of hydrochloric acid—corresponding to the quantity of acid in the stomach of grown-up persons), the specific action of the vegetable milk is less striking, the acid together with pepsin being in this case quite sufficient for a quick digestion.

5. From these experiments alone I should not like to express a positive opinion as to the usefulness of the vegetable milk as a milk substitute. The best proof is, after all, practical success in feeding."

Finally, *practical experience of the vegetable milk as a food* shows that it has more than fulfilled our expectations.

I have many cases at my disposal, but will confine myself to those in which there can be no mistake.

First I must say that I have not yet heard of any case in which the vegetable milk has failed. This means a good deal, as it shows that those who use the vegetable milk do at least not run any risk. Nowadays one or another of the children's foods is often successful in a single case, but as soon as we try it again, it fails.

As our first example let us take the case of the child of W. Wanger, a schoolmaster at Wollishofen (Switzerland), which is very instructive.

The child was born on April the 29th, 1889, and was fed on sterilized cow's milk, but suffered constantly from indigestion. Its weight on June the 2nd was 3,085 grammes, on June the 30th 3,825 grammes.

During the whole month of July it suffered from diarrhœa, which reduced the weight to 3,075 grammes. From July 28th to October 10th Biedert's cream mixture was given. Result:

4th of August	3,200	grammes	16th of	September	3,150	grammes
11 " "	"	3,225	"	22 " "	"	3,200	"
16 " "	"	3,280	"	29 " "	"	3,175	"
20 " "	"	3,300	"	8 " "	October	3,100	"
27 " "	"	3,150	"				

From October the 11th the vegetable milk was used as an addition to cow's milk. The general condition improved even on the second day. The child slept well, left off crying, suffered no longer from stomach, and no more undigested milk appeared in the stools, although this had been a constant symptom previously. Also under these conditions the quantity of milk given could be rapidly increased.

The weight increased as follows:

On the 8th of October it was 3,100 grammes, as mentioned before.

On 13th of October	3,125	grammes
„ 20 „ „ „	3,375	„
„ 27 „ „ „	3,675	„
„ 3rd „ November	3,850	„
„ 10th „ „	4,125	„
„ 17 „ „ „	4,450	„
„ 24 „ „ „	4,700	„

These numbers are sufficient to speak for themselves. My own children's weights were as follow:

I. Albert.

Born 21 January, 1889.
Weight 5 days after birth
3,065 grammes

At the end of	1 month	3,400 g.
„ „ „ „	2 „	4,300 „
„ „ „ „	3 „	4,940 „
„ „ „ „	4 „	6,050 „
„ „ „ „	5 „	7,500 „
„ „ „ „	6 „	8,000 „
„ „ „ „	7 „	8,800 „
„ „ „ „	8 „	9,750 „
„ „ „ „	9 „	10,800 „
„ „ „ „	10 „	11,400 „
„ „ „ „	11 „	11,800 „
„ „ „ „	12 „	12,000 „

II. Henry.

Born 6 January, 1890.
Weight at birth
2,950 grammes

At the end of	1 month	3,800 g.
„ „ „ „	2 „	4,900 „
„ „ „ „	3 „	6,300 „
„ „ „ „	4 „	7,100 „
„ „ „ „	5 „	7,600 „
„ „ „ „	6 „	8,300 „
„ „ „ „	7 „	8,900 „
„ „ „ „	8 „	9,300 „
„ „ „ „	9 „	9,800 „
„ „ „ „	10 „	10,200 „
„ „ „ „	11 „	10,800 „
„ „ „ „	12 „	11,000 „

No. II's rapid and regular increase of weight during the first month is especially interesting:

On the 6th of January	2,950	grammes
„ „ 11 „ „ „	3,000	„
„ „ 18 „ „ „	3,100	„
„ „ 23 „ „ „	3,240	„
„ „ 27 „ „ „	3,350	„
„ „ 3rd „ February	3,500	„

These figures show that the weight did not at first decrease, but at once started to increase. It is true, a boy of 2,950 grammes weight at birth had not much weight to lose.

The most striking fact is the incomparably greater and more uniform rate of increase in weight than, according to the tables of Fleischmann, Meier, Escherich, and others, we usually expect. All children show a uniformity as regards their growth which clearly proves that, by the addition of vegetable milk to animal milk, the latter is fully made use of and that the vegetable milk is itself an important food.

Let us give as an example another case which came under my notice quite recently.

The child of C. Klattenhoff at Hauhof near Aschaffenburg, a boy, was born September 9th, 1890, a month too early and apparently dead; his weight was 2,520 grammes. He was fed on cow's milk mixed with vegetable milk.

On the 9th of December, at the end of 3rd month, the weight was 5600 g.
„ „ 9 „ „ January, „ „ „ „ 4th „ „ „ „ 6250 „
„ „ 9 „ „ February, „ „ „ „ 5 „ „ „ „ „ 7020 „

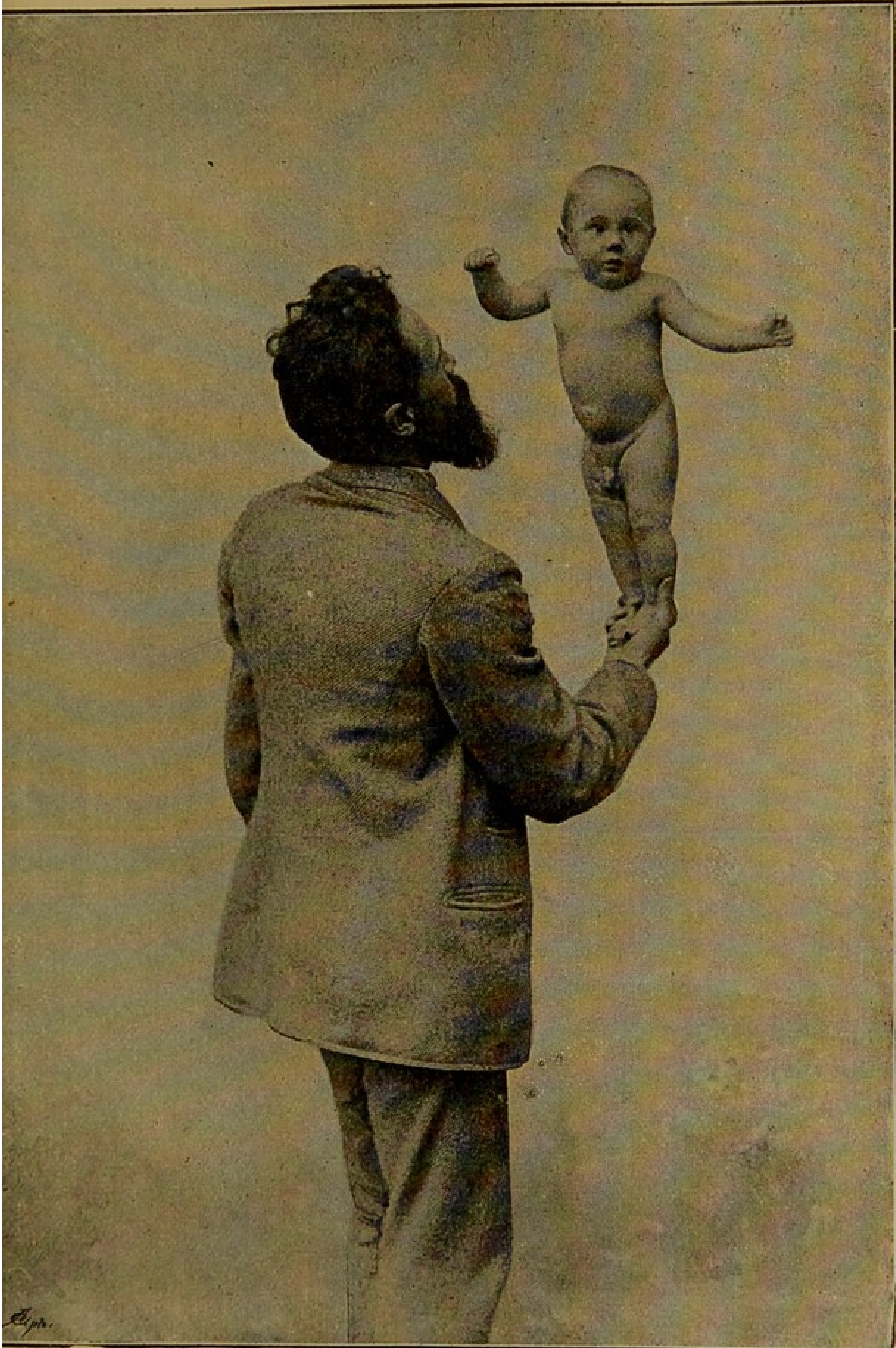
This weight places him among children who are born 1,000 grammes heavier.

No disturbances, worth mentioning, of digestion, much less of assimilation have occurred in my children; nor were they by any means bloated, weak-muscled, etc., as is usual with "heavier" infants. On the contrary, each of them was able, about the eighth month, to support his own weight, hanging free from a walking-stick, the second even at seven months; in the ninth month each of them could hold on to a chair (11 lbs. in weight) so strongly with one hand, that when the child was held up, the chair was also lifted. Both could ride free upon my shoulders in the ninth month. In the thirteenth month the second would swing wildly on a trapeze, sitting or standing, and keep his balance splendidly. If by chance he slipped off, he clung so strongly to the ropes, that he did not fall. The pictures taken at the beginning of March 1891, and representing the elder about 2 years and 2 months, the second 1 year and 2 months old, illustrate this.

The third boy, of whom we have already spoken in the preceding section, even surpasses the first two. If it were not for the two photographs, it would be difficult for people to believe that a child scarcely four months old could perform such muscular feats. The fourth boy went through the same performance first on January 6th, 1895, when he was exactly five months old. These are feats of strength unheard of at that age. Similar feats are performed by the children of my patients, when they are brought up in the same way. I am, however, sure that this is not only due to the feeding with vegetable milk, but also to the *food given in addition to milk*.

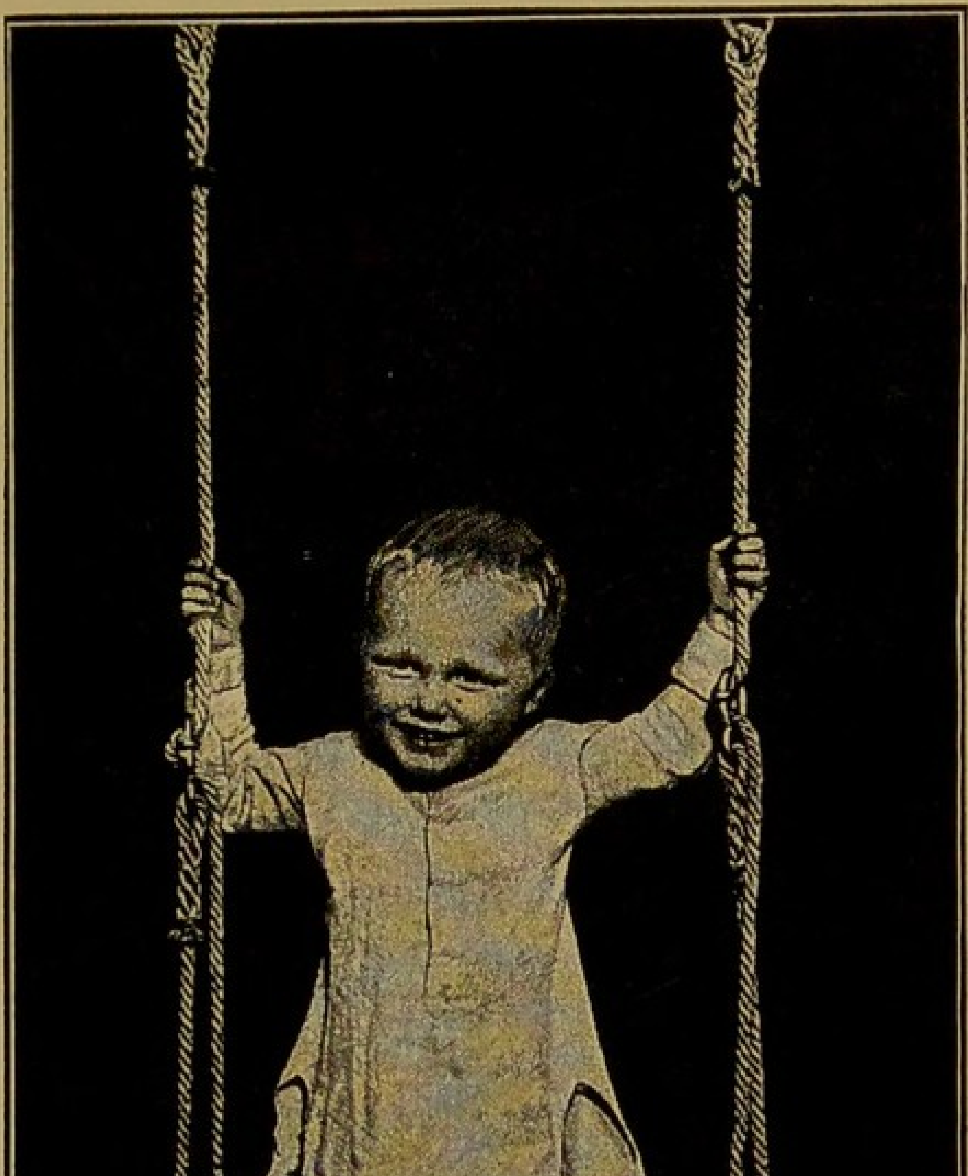
Certainly, children can grow up on milk alone; but

AGE OF THE CHILD: 4 MONTHS.



AGE OF THE CHILD: 4 MONTHS.

AGE OF THE CHILD: 1 YEAR AND 2 MONTHS.



AGE OF THE CHILD: 2 YEARS AND 2 MONTHS.

should they be allowed to do so? I am inclined to answer this question in the negative; for looking at it from only one point of view, the mother may be one-sidedly fed herself, and the child would thus receive milk defective in one or another substance: *e.g.*, the amount of albumen contained in human milk may vary from ·71 to 4·80 %, the amount of fat from 1·46 to 7 %, the amount of milk sugar from 3·88 to 8·45 %, and the amount of food-salts from ·12 to 1·95 %, and as regards cow's milk the same holds true. It is evident that a child which only receives milk containing 1·46 % of fat will suffer from indigestion, and one restricted to ·12 % of food-salts will become rickety or anæmic.

Now, if in addition to the milk we give suitable digestible foods, there is an increased probability that we shall compensate for the lack of certain constituents in the one-sided food.

Young animals soon begin to consume the same food as their parents, and it seems to me that they do so not from mere wantonness, but because they really require it, and it certainly does not harm them; the assertion, therefore, made by so many physicians and non-physicians, that a child should receive nothing but milk for one or even two years, cannot be supported by analogies from animal life.

Most mothers and nurses do indeed (though without knowing why, and only with the idea of strengthening) use additional food. But what do they give? Farinaceous foods of all kinds, meat, and wine! Can these be approved? No: *farinaceous foods* are practically useless and only weight the digestive system. To convert into sugar, a considerable amount of chemical work is required, and this work would be saved by giving sugar directly, and would help in building up the organism. The quantities of albumen and of food-salts contained in the farinaceous foods, are so small that they are not worth considering. Why, therefore, do we offer the children such an insufficient additional food?

Meat broth with its heart-exciting extractive matters is simply a poison to children, for their hearts already work as actively as possible. The bad effect is shown by the feverish bright eyes, flushed faces, and cold extremities of children after partaking of the meat broth. *Wine* is just as harmful. It can only benefit the child by the food-salts contained in it, but these can certainly be supplied in a much better way by giving unfermented fruit juices. *Meat* supplies no fat and very few food-salts; its albumen is more difficult for the gastric juice of a child, which contains little acid, to digest than the albumen of milk; the products of the retrogressive tissue-changes contained in the meat cause an unnecessary amount of work on the part of the tender kidneys; and finally, who will guarantee that the meat does not contain harmful toxins due to chance decomposition, toxins the existence of which cannot be proved, which are not dangerous to the stronger grown-up person, but which may cost the child its life! I am convinced, after having made careful observations, that some cases which are diagnosed as meningitis (inflammation of the cerebral membrane), and which end fatally in one or two days, are simply cases of poisoning from meat. In one case I noticed a smell like phosphuretted hydrogen in some yellowish masses which the child vomited, and this led me to the supposition that the patient had been poisoned by eating sausage, which proved to be correct.

The *additional food which I use* is as follows: I give after the third month (in case of constipation even earlier) *fruit juices* according to the season, cooked or uncooked, once or twice a day enough for a meal, *e.g.*, orange juice, mashed strawberries and raspberries, skinned gooseberries, mashed fresh plums and apples, scraped fresh apples and pears, etc. These foods, given between the meals, agree splendidly with children who are fed on digestible milk food (mixed with vegetable milk); the fresh fruits agree even better than those cooked (supposing that they are pure, *e.g.*, from one's own garden). This fact is difficult for people to realise, as it is in such contradiction to ordinary custom. But why should not infants digest the water, the fruit sugar and the dissolved food-salts of the fruits? Perhaps on account of the acids? We need have no fear of that; for experiments have proved that citric acid may to some extent make up for a want of gastric acid, and thus facilitate digestion. The fermentation acids which are developed from the indigestible starch food so long remaining in the stomach, are dangerous: the fruit acids are not. Try it; the experiment will justify what I have said.

In order to procure as much change as possible, I give after the fifth month at latest *leaf and root vegetables* of all kinds, stirred through a very fine sieve, at noon, in quantities of one to one and a half table-spoonfuls. Why should not a finely divided spinach which contains water 88·47, albuminous substances 3·49, fat ·58, sugar ·10, free extractive substances 4·34, wood fibre ·92, food-salts 2·09 %, be assimilated by the stomach of an infant? The albumen is in solution, fat and sugar offer no difficulty, the other non-nitrogenous, readily soluble substances (dextrin and the like) offer less difficulty than starch, whilst the food-salts are pretty plentiful and very desirable for the blood on account of the high percentage of soda, lime, and iron contained in them. Is the wood fibre harmful? Oh, no, not any more than the acid and wood fibre of fruits. In fact, I have never seen the digestion of my two eldest children, who were six months old when gooseberries came into season, so good (though it was always excellent!) as at the time when the gooseberry stones stimulated the peristaltic action of their bowels. Not that the children had diarrhœa, for after their third or fourth month they go like "big people" once, at most twice, a day to stool, and their excrements are well formed and have at one time the darker colour of the vegetable milk, and at another time receive their colour from the additional food, so that it can be clearly seen when they have had, *e.g.*, cherries or blackberries.

I can only repeat: Try it, and let the experiment convince you.

An additional food that may be approved of, is obtained by adding to the leguminous soups or gruels a small quantity (size of a pea or bean) of the plant food-salt extract * (which is also contained in the vegetable milk and makes it a chemically full-value food). But *only* with this addition can I approve of those gruels etc.

As I have been asked many times for an exact bill of fare for children from one to two years old, I will here mention what my second youngest boy, one and a half years old, is given at present (January 1895).

Between 6 and 7 o'clock (according to the time of awakening) a bottle of milk to which some vegetable milk has been added, after that a date and an oat biscuit (Hohenlohe's manufactory, Gerabronn), or some bread and honey.

* Manufactured by Hewel and Veithen, Cologne. Comp. footnote on page 194.

Between 9 o'clock and 9·30 a bottle of half milk and half food-salt chocolate, after which sometimes some milk curds and a fig or the juice of an orange.*

At 1 o'clock a small plateful of green or root vegetables passed through a sieve and mixed in equal parts with potatoes or rice, or now and then some pulses; after which a small plate of some cooked fruit.

Between 3·30 and 4 o'clock half a bottle of milk.

At 6 o'clock a small plate of mashed apples, or fresh scraped apples,* or the juice of one or two oranges,* two dates or figs; twice a week the yolk of an egg stirred with sugar, and twice a cereal pudding. On such days when he has not eaten enough at noon, on account of tooth troubles and the like, he receives a plate of mixed vegetables as at noon.

Lastly half a bottle of milk.

As soon as the children can chew well, I also give nuts, but only a little bread.

In connection with this I feel obliged to mention another proof for the food-salt theory, taken from the correspondence of a Dutch lady (Mrs. van Marken, Hof van Delft), who is personally unknown to me, but highly esteemed in her country as a philanthropist. The lady writes: "By the advice of a peasant in our workmen's colony, we brew a tea from the common green grass and give it in teaspoonfuls between the milk meals to those infants who are weakly. I have

* The fruits replace each other according to the season.

convinced myself of the efficiency of this remedy. Perhaps this green juice corresponds to the food-salt and fruit juices?"

This is certainly the case. For hay, that is dried grass, infused in hot water, gives according to Wolff's "Analyses of Ashes" the following percentage composition of the food-salts!

Potash	Soda	Lime	Magnesia	Oxide of iron	Phosphoric acid	Sulphuric acid	Silicic acid	Chlorine
2·27	9·93	23·63	2·54	—	6·96	—	51·42	—

If we compare this table with that on page 189, we must at once be struck with the large quantities of the important soda and lime contained in hay.

In addition to the special diet, I owe a good deal of my success in my children's practice to other measures. First of all I insist upon their *sleeping with open windows*. The children, while they are still very young, always have in winter a hot bottle placed at the foot of the bed and are covered with two or three blankets and an extra pillow, which reaches up to the hips; the blankets are fastened to the mattress at the neck with two strong safety pins, to prevent the child from kicking them off. In this way the children, from six months old upwards, sleep right through eleven hours, whilst we know that children always sleep restlessly in unventilated rooms.

Further, I have found that children (of course on a hard under-bed, *e.g.*, horse-hair mattress) *sleep best after meals when lying on their stomachs:* for in this position the eructations can most easily escape, and vomiting due to gases collected in the stomach does not occur, as is usual when the children sleep on their backs. The children, however small, rest their weight upon their fore arms, so that their heads find a comfortable lateral position; at the same time this position causes a strengthening of the back muscles, which is the best protection against the spine becoming crooked.

Finally, I must mention that, to remove chance indigestion, or to prevent such disturbances as occur during the teething period, there is nothing better than a simple *Priessnitz stomach compress.* This consists of a simple linen bandage two hands wide, wrung out of water at the temperature of the room and covered with a flannel bandage; and this is left until it becomes dry (generally four to six hours).*

* Further remarks on the natural rearing of children may be found in my book "Die wichtigsten Kapitel der natürlichen Heilweise" ("The most important chapters of the natural cure system"). A. Zimmer, Stuttgart, publisher.

Beauty is impossible without health. Indeed, real health is equivalent to beauty. In this sense the often quoted Tyrolese dairy-maid was right, when she said, "We are not beautiful, but healthy".

Where is beauty to be found amongst mankind nowadays? For the connoisseur nowhere at all. The most beautiful girl, even if the colour of her skin and lips does not at once allow us to diagnose dysæmia, has relations whose more or less unhealthy, that is "not beautiful", faces speak to her thus: "Your beautiful face will share the fate of ours, you are fed like us, and you suffer from dysæmia like us. You have preserved your youthful freshness until now, but it will not be for long". The beauty of one face will be destroyed at the age of thirty by fat dysæmia; the beauty of another by lean dysæmia; here disagreeable freckles and there defective teeth begin to appear. A perfect "health-beauty" over the age of forty is hardly to be found, so that we are obliged to content ourselves with the story of Ninon de l'Enclos, a beauty even when sixty years old.

And what is the reason of all this? The universal spread of dysæmia. We have already spoken of the disfigurements caused by fat and lean dysæmia, of the imperfect growth of the teeth on account of an insufficient supply of lime and soda, of the early destruction of the teeth arising from the common habit of eating and drinking things much too hot, or from the action of fermentation acids in case of dysæmic catarrh of the stomach. Rickets produces besides bad teeth, ugly (square) skulls, crooked limbs and twisted spines.

The disfiguring "pimples and acne spots" found in the face arise from an imperfect circulation of the blood in the body and feet, owing to dysæmia and wrong clothing. The blood from those parts is naturally drawn to the face, which is kept in a state of irritation by the air, and there readily deposits its worn-out matter. (The face is tanned by the air, and in its skin the blood circulates freely; from the collar downwards the body is generally morbidly pale.)

Freckles arise no doubt from a premature decay, under the influence of light, of red blood corpuscles possessing a poor vitality; really this decay should take place in the liver.

Large staring eyes and shortsight certainly do not enhance beauty, and the same applies to the scrofulously bloated noses, which are so often seen.

All these defects and many that have not been mentioned, can be prevented; for they originate in dietetic dysæmia.

Man can rear beautiful animals, but he is too conceited to apply this knowledge for his own good. Civilized man apparently prefers to be considered the least beautiful creature upon earth.

But does not this constitute a great danger? Ugly men are not influenced by beauty, so they degenerate not only physically, but also morally. In modern society we can gradually trace the downward tendency of mankind from the noble and beautiful type, in which everything is complete harmony, to the morally degenerated, the born criminal, the final result of dysæmia. The middle types are physically branded by their dysæmia, as a glance at any crowd will show. It is impossible that such can form, either as artists or philosophers, an harmonic conception of the world around them, and this is no doubt the reason for the lack of a modern art, a reasonable philosophy, and a purified religion.

So much is said and written about the generation of the modern woman. This is simply ridiculous. Woman, who is so nearly related to the child (the only being deserving the name of man), can be led back to the normal type in two generations: man not in five generations. The pernicious effects upon man of dysæmic influences during a few generations, of tobacco and alcohol, of the vile practices of modern life and of the struggle for life between persons dysæmically degenerated, are beyond description.

If spectacled and bald-headed men are constantly chattering about woman's degeneration, it is worth noting that a woman herself, Emmy Rossi, in her essay on "the degeneration of man's beauty" (T. Harrwitz, Berlin 1894) has answered them well.

That she forgets the principal cause, "dysæmia", is of no consequence. It suffices to state that man and woman are each startled at the other's degeneration and are considering how the further degeneration of mankind can be stopped.

COOKING-REFORM

We have already shown that the commonly used foods are unsuitable in composition for us, and that we must restrict the prevailing or even exclusive use of meat, bread, cereals, pulses, and potatoes, and use in their place leaf and root vegetables, salads, as well as the various fruits in sufficient quantities, in order to be secure against dysæmia.

But against this there is the supposed fact that these vegetables are difficult to digest and to assimilate. That this supposition is erroneous and that the indigestibility is really due to a wrong process of cooking we shall attempt to prove in this section.

It is now a generally accepted fact that green leaf salads and uncooked red and white cabbage prepared as salad, are easily digested, at least if prepared with very little vinegar, or better with fresh lemon juice.

The flatulence which usually occurs after a meal of cooked green vegetables and especially of cabbage, will not trouble us, if we eat uncooked salads. So it *must* be the cooking process that causes this injurious change.

Owing to the splitting-up influence of the heat and the fermentation of the carbohydrates facilitated by cooking, there is a formation of fermentation acids or gases (chiefly carburetted, phosphuretted and sulphuretted hydrogen) in the system; but this will not sufficiently account for the indigestibility of the cooked vegetables. The principal cause can be explained as follows: vegetables are commonly cooked in too much water which, when afterwards poured away, carries with it the larger quantity of the soluble alkaline salts contained in the vegetable. This cooking water also dilutes the vegetables, which themselves contain plenty of water, and therefore also dilutes the alkalies, which alone possess the power of combining with the fermentation acids.

Owing to the want of alkalies, the acidity of the gastric juice (hardly necessary for the digestion of the leaf vegetables, as is shown by the lower acidity of the gastric juice of the herbivora) is more strongly developed, and thus abnormal decomposition processes are set up. The digestion in the bowels will also take place in an acid medium instead of an alkaline, on account of the excess of fermentation acids and the want of neutralisation. This can often be proved by the stools, which smell of fermentation acids.

We have no analyses of the chemical changes produced by cooking the leaf vegetables, especially as regards the amount of food-salts; but we may gather some very interesting particulars from the food-salt extract * prepared from leaf vegetables according to my suggestions.

Whilst, *e.g.*, white cabbage (as a representative of these vegetables) contains in 100 parts of ashes:

Potash,	Soda,	Lime,	Magnesia,	Oxide of iron,	Phosphoric acid,
48·32	4·95	12·64	3·74	·68	16·59

the food-salt extract contains (according to Prof. Birnbaum):

16·53	<u>21·45</u>	<u>18·90</u>	4·89	·40	4·46

The preparation of the latter is practically also a cooking process: the vegetables are thoroughly cooked by steam and subjected to pressure; the fluid squeezed out of them is then condensed to form the extract.

Now, as this extract contains relatively more soda (as well as lime and magnesia) and much less potash and phosphoric acid than the vegetable itself, we must conclude that the former salts are much more easily soluble and are therefore constantly thrown away in the cooking water, when the vegetables are prepared for the table in the ordinary wrongful way.

The correctness of this supposition is also proved

* Used for the improvement of many foods prepared in the common wrongful way; further as an addition to "vegetable milk," our children's food; finally for the preparation of a wholesome cocoa, instead of the injurious potash, soda, and magnesia. Prepared by Hewel and Veithen, Cologne.

by the fact that these green vegetables are easily digested and almost entirely lose their flatulent qualities, if they are so cooked that no food-salts are lost, and if they are not diluted with water, that is, if they are stewed or cooked by steam. The following is the best way of preparing the leaf vegetables in a small household: After the vegetables have been washed, put them, still dripping with water, into the pan, fasten down the lid tightly and place the pan on a moderately hot part of the stove; move it gradually closer to the fire as the vegetables are softened by the steam which is given off, and as they exude the water which is contained in them. After they are well softened, they should be dressed with a butter or milk sauce, or one made by mixing flour with melted butter, or with concentrated meat broth (if we cannot do without the "strengthening (?) beef-tea").

Cauliflower alone may be cooked in a large quantity of water, if we wish to keep it a white colour; and in the case of spinach some of the cooking water may be poured away on account of its strong smell*. We can, therefore, say shortly that the green leaf vegetables must as much as possible be treated like the root vegetables, which are generally stewed.

If vegetables are prepared in this way, we can also dispense with the harmful common salt, by the ad-

* I have lately observed that the best way of preparing spinach is, to chop it up finely before cooking, and stew it in butter.

dition of which the vegetables are more readily deprived of their salts.

It is true that vegetables deprived of their food-salts by cooking in a large quantity of water, have no taste whatever, and they therefore require the addition of common salt to season them; but if we adopt the improved cooking method, as sketched above, the addition of common salt is only necessary in the case of potatoes and farinaceous foods; to other foods it need only be added in very small quantities, and yet the vegetables will have a pleasanter taste than if a large quantity of common salt were added.

In my sanatorium I have restricted the quantity of common salt used to 3·5 grammes * per head per diem (the usual average being 20—25 grammes), and even new-comers seldom object to the taste of the dishes; if necessary, harmless vegetable spices are made use of.

Vegetables prepared in this manner, green salads, and all kinds of fruits, ought then to form the main part of our food, and ought not to be considered merely as an additional food to meat, potatoes and bread. For we have shown that if we feed exclusively or principally on those foods which are poor in food-

* It must be mentioned that this number represents the average amount consumed during the week from the 7th to 13th of June, 1891, when 158 visitors and members of the household, as well as 32 servants were present in the sanatorium. The servants, following their usual habits, consume much more common salt, so that the visitors, etc., consumed rather less than 3·5 grammes.

salts, we must become dysæmic and ill, whilst if we keep to those foods which abound in food-salts, we can remain or become healthy.

The small amount of albumen which we need, is sufficiently contained in all foods; whilst nowadays the very opposite opinion to this is generally though erroneously held, namely, that the quantity of mineral substances which we need, is sufficiently contained in all foods.

Albumen is praised over and over again as the most important food substance; but we have proved above that albumen becomes a poison to us if we do not take a sufficient amount of food-salts in our food. For, are not undissolved uric acid and uncombined sulphuric acid, which originate in the albumen, real poisons, and are not gout and diabetes, etc., due to the poisons produced by wrong feeding?

If we carry out practically this cooking reform, we shall soon find out that vegetable albumen, *e.g.*, that contained in the pulses, is just as easily digestible as that contained in meat, supposing that we take care that a sufficient quantity of vegetable alkalies (not mineral bicarbonate of soda) be present. Whilst a meal of peas or lentils with potatoes is sure to produce indigestion through the formation of fermentation acids (shown by acid eructations and acid stools), no indigestion will occur, if we consume at the same time a sufficient quantity of green salad. The food is then also made the best use of in the bowels. Of course, we must not make such foolish experiments as used to be made: we must not stuff ourselves with peas; for the quantity of albumen that can be assimilated by the body, is limited, and anything beyond this is, of course, excreted undigested.

We shall further find that certain fermentation acids, *e.g.*, vinegar, render the digestion of many foods more difficult, whilst vegetable acids, such as citric acid, or lemon juice, do not cause that harmful effect. This is clearly shown by the following: cucumber salad dressed with vinegar is not only digested with difficulty by a great many people, but sometimes acts simply as a poison, prolonged disturbances being caused by it; whilst cucumber salad dressed with fresh lemon juice is so easily digested that I give it even to those patients suffering from stomach disorders, and it agrees well with them.

We may mention here that it is the greatest therapeutic mistake to dissuade persons who suffer from nervous indigestion (eructations, flatulence, constipation) from taking vegetables and fruit. Certainly these people have fewer troubles when eating meat and soup alone; but in spite of this the slow action of the bowels still allows of the formation of gases, only these latter are mostly absorbed by the blood and are finally excreted through the lungs. (Compare many cases of bad smelling breath found in nervous, dyspeptic, hypochondriacal, hysterical persons.)

If in such cases a few Priessnitz abdominal packings (or if necessary, a hot stomach bottle or alternate douches on the abdomen) are applied, as well as massage of the abdomen, the nervous stomach will digest the properly prepared and properly composed vegetables and fruits just as easily as a healthy one, and really this is the only way to thoroughly cure the ill-fed nervous system.

After these remarks I think it is clear that it ought not to be below the dignity of men of science to study the science of cooking. A matter so eminently practical must also be treated practically. *So important a matter as feeding, the foundation and main spring of bodily and mental, individual and social health, deserves the best work of the highest minds.* Nowadays we theorise too much, and too often forget to treat things practically. European science must become somewhat more modest and perform more practical work; otherwise her practice will remain faulty in spite of her perhaps good theory.

Thus Europeans succeeded in persuading the Japanese to experiment on their armies by feeding them with barley in the place of the rice which had formerly stood the test of experience. Barley was thought *theoretically* better, *because it contains more albumen.* But the *practical* experiment showed that, bulk for bulk, a much larger proportion of the rice was assimilated and utilized in the body than of the barley, and this was undoubtedly due to the composition of the mineral substances in the rice being better; though absolutely poor in mineral substances, it contains relatively more soda and less potash than any other cereal.

The experiment was of course discontinued, and the Japanese army has kept to rice. But what about the reputation of the European wiseacres!

The question of food reform has only lately been practically taken in hand, and this we owe to the *vegetarians*. They were the first to earnestly consider the food question, and were right in beginning with that most important question: Ought man to belong to the carnivorous class, to the herbivorous (frugivorous), or to the omnivorous? One through instinct, another by philosophy, a third from moral reasons, arrived to the conclusion that flesh-eating was not proper for man, and all united in opposing it. But after all there was comparatively little gained by this; for almost all of them held fast to the albumen theory, with which they had been too deeply imbued by long habit, and we have learned that a person who lives principally on pulses, whole meal bread, and cereals, may be just as dysæmic as one who eats everything. This is the reason why the vegetarian regime has failed in so many cases. Thus, mere enthusiasm is not sufficient. Science must try to replace our lack of instinct, in order to obtain a satisfactory result. We can certainly live without meat, and indeed it is more natural for us to do so; but there is a right and a wrong way of using even vegetarian food. Animals living in the woods and in the fields and feeding freely on grass and herbs, and birds feeding on berries, are in good health; but the poor caged bird, fed by silly people on seeds alone and deprived of all green food, lives a miserable life and soon dies. In the same way, a man who lives chiefly on juicy fruits and vegetables, and uses cereals, pulses, and nuts only as an additional food, will be well fed, whilst another who lives exclusively on the cereals and pulses, will become dysæmic as certainly as one who lives exclusively on meat, bread, potatoes, coffee, and beer.

A few hints may here be found useful by all those who *are obliged to feed in hotels, restaurants, etc.*

Let us for the moment watch the ordinary young man or commercial traveller, as he dines at the hotel table.

First of all he swallows a whole plateful of hot, thin meat-broth as well as a quantity of bread, and quenches his thirst with wine, or perhaps soda-water. (How does this thirst arise? Is it due to the soup, or in spite of the soup?) Next he will take some fish, potato, and bread, after which roast beef with perhaps some vegetables. When the game or fowl comes on, in 50 cases out of 100 he will allow the accompanying salad or compot to pass as unnecessary, and will in 80 cases out of 100 finally choose cheese and bread instead of fruits, etc., for dessert.

The piquant dishes, the hot-spiced sauces, the wine or beer taken unnecessarily, unite in producing after the meal in the mouth and throat that staleness and want of taste which he seeks afterwards to dissipate by using tobacco and coffee. The tobacco smoke sets up a thirst for beer and wine towards the evening, and in between the bouts of drinking, a beefsteak, a cutlet, or a sausage is taken for the last meal. On no account will he spend 4d. on a salad or vegetable (besides the latter is very often absent from the bills of fare), for that would be looked upon as a luxury, and would mean a glass of beer less.

And what is the result of all this? That no commercial traveller is in good health, however stout and red-cheeked he may look. Every one of them will suffer from some complaint sooner or later, gout and degeneration of the heart being the most frequent.

But what can a man do to counteract the bad effects of feeding in this manner? He should do as follows:

For breakfast, let him take milk or chocolate, and in the middle of the morning some fruit; at dinner (midday) he should avoid the soups, except good vegetable or fruit soups, and should partake chiefly of green vegetable salads, compots, and fruit dessert, treating the other food such as meat, etc., as additional food; he should drink wine or beer only when thirsty.

In the evening he should try to make up for the wrongly prepared dinner, by a supper chosen by himself. He should drink less beer and wine, and order instead a good green vegetable or a salad (not potato salad) dressed with lemon juice; to this he may, if he likes, add a dish of eggs or meat.

Those who have less money to spend may note that it will be quite sufficient for them to have for dinner and supper a dish of properly cooked green vegetables or salad, with potatoes or pulses, as well as some fresh or dried fruit.

Nervous debility of the digestive organs being so very widely spread, I cannot help mentioning here a conversation which I had the other day with a gentleman whose wife had been a patient of mine. This gentleman told me that he had successfully adopted my diet, but he thought that there must be some mistake, as he still suffered from flatulence; lately he had been obliged to return to restaurant dinners, and his digestion had at once improved. I asked him how much and what he generally ate, and it appeared that he consumed about twice as much as myself. "But," he continued, "you say in your book that we should eat plenty of vegetables." "That is not entirely correct," I replied. "As regards myself, I take equal parts of leaf or root vegetables, green salads, and fruit daily; my second son, who is not fond of vegetables, lives almost exclusively on salad, fruit, nuts, dried dates and figs, some bread, cocoa and milk. For dinner I eat from one and a half to two tablespoonfuls of vegetables, one and a half tablespoonfuls of potatoes or rice, and a small plateful of salad or compot. My digestive powers are perfect, and my working powers are extremely good. You eat a whole dish full of vegetables and naturally suffer from indigestion. My servants can eat that quantity, but you cannot, especially as you are neurasthenic. You tell me that your feet are constantly cold; hence the abdomen becomes overfilled with blood, the functions of the bowels become impeded, the food remains abnormally long in the stomach and bowels, and both flatulence and constipation arise.

"Now, if you again return to a more piquant food, the stomach and bowels will at first work better, owing to the stimulation, but the constant overloading will soon bring back the old troubles. It is certainly good for the neurasthenic and in fact for everybody to deviate from his ordinary diet once a week or fortnight; I even arrange for this in my sanatorium by giving stimulating dishes every now and then. This is not only harmless, but even useful. The great point is, how we feed during six days of the week, whether rightly or wrongly.

"Eat in future as little as I do, keep your feet warm by alternate hot and cold foot-baths, or by walking about in easy shoes with straw soles, leaving off the stockings; take a hot bath (32° R. for 10 minutes), and for some time use abdominal compresses during the night, to improve your poor circulation. You will then have nothing more to complain of, either as regards yourself or my diet."

A table of the amounts of the food-salts contained in the various foods may be introduced here with advantage. Hitherto we have found in books on diet only tables concerning albumen, fat, and carbohydrates, and these we may use here to complete our own table.

This table confirms our assertion (although not so clearly as the table of the dry substances on page 33) that the ordinary foods used, namely, cereals, pulses, potatoes, and meat, are poor in soda and lime, and relatively too rich in potash and phosphoric acid. As regards soda, we must except lentils and the unbled flesh of animals, birds, and fish, although the loss of vitality in the latter reduces their nutritive value.

The presence of the large amount of potash in the fruits is due to the fruit-acids, with which the potash is combined. In this combination the potash has quite a different character from that which it has when present uncombined in other foods.

Percentage Composition of the Foods. *

Percentage Composition of the Food-salts. †

	Water	Albumen	Fat	Carbo-hydrates	Food-salts	Potash	Soda	Lime	Magnesia	Oxide of iron	Phosphoric acid	Sulphuric acid	Silicic acid	Chlorine
a **Cow's milk** } the normal	87·42	3·41	3·65	4·81	·72	24·67	9·70	22·05	3·05	·55	28·45	·30	·04	14·28
Human milk } food-mixt.	87·02	2·36	3·94	6·23	·45	33·79	9·12	16·69	2·16	·22	22·66	·95	·02	18·38
b **Vegetables and Lettuce**														
Savoy	87·09	3·31	·71	6·02	1·64	27·50	10·16	21·38	3·59	1·73	14·75	8·20	4·78	7·91
Cabbage..............	89·97	1·89	·20	4·87	1·23	36·86	9·46	17·63	4·00	·69	8·99	13·91	·87	8·51
Spinach	88·47	2·49	·58	4·44	2·09	16·56	35·23	11·88	6·38	3·35	10·25	6·87	4·52	6·20
Cauliflower............	90·89	2·48	·34	4·55	·83	44·36	5·89	5·58	3·66	1·02	20·22	13·01	3·76	3·44
Stinging-nettle } vegetable and salad	82·44	5·50	·67	7·13	2·30	32·04	2·39	28·24	7·16	4·77	7·84	8 35	4·03	6·66
Dandelion } weeds	85·54	2·81	·69	7·45	1·90	38·86	10·44	19·96	8·38	·86	7·84	2·24	7·01	2·65
Asparagus.............	93·75	1·79	·25	2·63	·54	24.04	17·08	10·85	4·32	3·38	18·57	6·18	10·09	5·93
Cucumber.............	95·60	1·02	·09	2·28	·39	41·16	10·04	7·30	4·15	1·40	20·00	6·92	8·03	6·59
Lettuce	93·41	2·09	·41	2·73	·79	46·01	9·43	6·05	2·17	—	8·52	3·89	20·23	4·75
Cabbage-lettuce	94·33	1·41	·31	2·19	1·03	37·63	7·54	14·68	6·19	5·21	9·19	3·76	8·14	7·65
Summer endive.........	92·50	1·26	·54	3·55	·98	25·30	35·30	11·86	4·33	1·26	10·90	3·87	2·99	4·19
Leek (porret)..........	87·62	2·83	·29	6·53	1·24	30·72	14·15	10·37	2·92	7·61	16·69	7·35	7·36	3·11
Onion................	85·99	1·68	·10	10·82	·71	34·03	2·48	22·87	4·65	2·27	17·35	5·68	8·50	2·41
Mushrooms............	89·12	2·61	·28	6·11	·70	50·89	1·65	1·01	3·37	1·62	33·71	3·94	·98	·88

Radish	93·34	1·23	·15	3·79	·74	32·00	21·15	14·94	3·10	2·84	10·86	6·47	·91	9·15
Horse-radish	86·92	1·92	·11	7·43	1·07	21·98	3·75	8·78	3·53	1·16	41·12	7·71	8·17	4·90
Celery (the stalk)	84·09	1·48	·39	11·80	·84	43·19	—	13·11	5·82	1·41	12·83	5·58	3·85	15·87
Potato	75·48	1·95	·15	20·72	·95	60·06	2·96	2·64	4·93	1·10	16·86	6·52	2·04	3·46
Topinambour	79·59	1·98	·13	15·66	1·17	47·74	10·16	3·28	2·93	3·73	14·00	4·91	10·03	3·87
French turnip	89·90	3·52	·14	11·34	1·28	46·93	5 65	11·33	3·68	·61	14·51	9·62	1·06	6·59
Carrot	87·05	1·04	·21	9·40	·90	36·92	21·17	11·34	4·38	1·01	12·79	6·45	2·38	4·59
Cabbage-turnip	85·89	4·87	·21	8·18	1·17	35·31	6·54	10·97	6·84	3·03	21·90	8·85	2·48	4·95
d **Cereals and Pulses.**														
Winter wheat	13·65	12·35	1·75	67·91	1·81	31·16	2·07	3·25	12·06	1·28	47·22	·39	1·96	·32
" rye	15·06	11·52	1·79	67·81	1·81	32·10	1·47	2·94	11·22	1·24	47.74	1·28	1·37	·48
" barley	13·77	11·14	2·16	64·93	2·69	16·33	4·14	·74	12·53	1·72	32·82	2·98	28·74	—
Oats	12·37	10·41	5·23	57·78	3·02	17·90	1·66	3·60	7·13	1·18	25·64	1·78	39·18	·94
Maize	13·12	9·85	4·62	68·51	1·51	29·78	1·10	2·17	15·52	·76	45·61	·78	2·09	·91
Rice	13·11	7.85	·88	76·52	1·01	25·04	4·21	3·73	11·08	1·43	53·76	·50	2·59	·13
Millet	11·66	9·25	3·50	65·95	1·67	11·39	1·30	·63	9·63	1·08	21·92	·24	52·97	·49
Pea	14·99	22·85	1·79	52·36	2·58	43·10	·98	4·81	7·99	·83	35·90	3·42	·91	1·59
Lentil	12·35	25·70	1·89	53·46	3·04	34·76	13·50	6·34	2·47	2·00	36·30	—	—	4·63
Bean	14·76	24·27	1·61	49·01	2·26	41·48	1·06	4·99	7·15	·46	38·68	3·39	·65	1·78
e **Nuts, etc.**														
Walnut	4·68	16·37	62·86	7·89	2·03	31·11	2·25	8·59	13·03	1·32	43·70	—	—	—
Cocoa-nut (fresh)	46·64	5·49	35·93	8·06	·97	43·88	8·39	4·63	9·44	—	16·99	5·09	·50	13·42
Cocoa-bean	3·63	11·99	49·32	26·43	3·48	55·89	2·26	5·44	11·06	·03	38·61	3·43	1·51	·85

* From J. König, "Chemie der menschlichen Nahrungs- und Genussmittel." Berlin 1882.

† From E. Wolff, "Aschenanalysen von landwirtschaftlichen Produkten." Berlin 1871 and 1880.

Percentage Composition of the Foods. | Percentage Composition of the Food-salts.

	Water	Albumen	Fat	Carbo-hydrates	Food-salts	Potash	Soda	Lime	Magnesia	Oxide of iron	Phosphoric acid	Sulphuric acid	Silicic acid	Chlorine
f **Fruits.**														
Apple	84·79	·36	—	12·04	·49	35·68	26·09	4·08	8·75	1·40	13·69	6·09	4·32	—
Pear	83·02	·36	—	11·80	·31	54·69	8·52	7·98	5·22	1·04	15·20	5·69	1·49	—
Cherry	79·82	·67	—	12·00	·73	51·85	2·19	7·47	5·46	1·98	15·97	5·09	9·04	1·35
Grape	78·17	·59	—	16·32	·53	56·20	1·42	10·77	4·21	·37	15·58	5·62	2·75	1·52
Plum	84·86	·40	—	8·24	·66	59·21	·54	10·04	5·46	3·20	15·10	3·83	2·36	—
Strawberry	87·66	·54	·45	7·29	·81	21·07	28·48	14·21	—	5·89	13·82	3·15	12·05	1·69
Gooseberry	85·74	·47	—	8·43	·42	38·65	9·92	12·20	5·85	4·56	19.68	5·89	2·58	·75
g **Animal products.**														
Flesh of animal	72·00	20·00	5·00	·40	1·10	41·27 *	3 63	2·82	3·21	·70	42·54	1·56	1·11	3·85
						37·04 †	10·14	2·42	3·23	·44	41·20	·98	·69	4·66
" " fowl	76·22	19·72	1·42	1·27	1·37	30·90	18·70	3·25	4·15	—	36·40	—	—	8·05
" " sea fish	80·97	17·07	·34	—	1·64	21·80	14·90	15·20	3·90	—	34·50	—	—	11·40
Ox's blood	80·82	18·12	·18	·03	·85	7·61	44·99	1·08	·60	9·38	5·25	3·05	·84	34·38
Pig's blood	?	?	?	?	?	23·29	29·43	1·30	1·40	8·86	12·15	1·03	—	28·52
Egg	73·67	12·55	12·11	·55	1·12	17·37	22·87	10·91	1·14	·39	37·62	·32	·31	8·98
The white of the egg	85·75	12·67	·25	·74	·59	31·41	31·57	2·78	2·79	·57	4·41	2·12	1·06	28·82
The yolk " " "	50·82	16·24	31·75	·12	1·09	9·29	5·87	13·04	2·13	1·65	65·46	—	·86	1·85
Holstein cheese (without common salt)	?	?	?	?	?	13·26	1·40	35·43	2·38	·80	38·37	·17	—	7·44
Gruyère cheese (with common salt)	33·61	32·42	29·67	—	4·78	2·46	(33·01)	17·82	·81	·17	20·45	—	·08	(33·61)

* Bloodless flesh, as usually eaten.

† Flesh containing blood.

THE SOCIAL SIDE

After what has been said in the previous sections, it would seem to be sufficient for every one to know that he ought to use green and root vegetables, and leaf salads which are rich in food-salts, especially those rich in soda and lime, as his principal food, as well as all kinds of fruits.

But it is not possible nowadays for every one to obtain this special food, as the supply is so small, owing to the small demand. There is a scarcity of green vegetables, salads, and fruits, because our wrong system of feeding has encouraged the almost one-sided production of cattle and corn.

We have already seen that the public health cannot profit much from a system of feeding which is based upon our present system of agriculture, the principal and often exclusive consumption of meat and cereals being the chief cause of the universal dysæmia. Hence we must conclude that something is wrong in the foundation of human society; for ought not the production of food, which is the very life of mankind, to be looked upon as the real foundation of society? Something must be wrong with society itself.

We shall in this section give expression to a few of our own ideas concerning the future of mankind, which in the age of "Bellamys" will perhaps not be out of place.

All those good people who write of the future development of mankind, to whatever party they may belong, always reckon on too much goodness in human nature. But we are all more or less dysæmic; half of us suffer from a distinct ailment of some sort, and as a healthy spirit and a healthy will can exist only in a healthy body, our thoughts and sentiments cannot be healthy, that is, mankind cannot be good; and we are degenerating more and more in each succeeding generation.

A new age cannot be created, as long as mankind continues crippled bodily and mentally.

Anybody who has had daily personal experience with patients of all kinds, knows that only necessity, the necessity of suffering, can induce them to give up harmful habits, and take to healthy ones in their place. It is the same with society. Society will never voluntarily adopt any wholesome reform, until compelled by necessity, or by some calamity; then only will it fall in with a system more favourable to general health.

We hygienic physicians do not consider diseases as being foreign or hostile to the body, but on the contrary regard the symptoms of disease as healing efforts.

In the same way we can also see healing efforts in the symptoms of the diseases of society, which will produce their effects in the future.

The words which in our age are generally used to denote the symptoms of disease, are "over-population" and "industrial over-production." "Over-population" is a wrong expression; we should say "over-production of useless men," an expression which would be equivalent to "over-production of useless goods." Now, we employ the word "useless" here only in a relative sense, as many men, otherwise serviceable, cannot use their powers on account of our present social conditions; but we are the last to deny that the word can also be used here in an absolute sense, so universal is the spread of dysæmia.

Is it not likely that this social uselessness has the same origin as dysæmia? Certainly, and the two are connected with each other in the following manner.

Agriculture is the most natural occupation of man, the foundation of all other occupations. In a nation possessing a healthy organism, about 75% of the population will be found occupied with agricultural labour, and at most 25% with trades, commerce, and the so-called free arts. Whenever a different proportion to this exists, abnormal, morbid conditions prevail, the symptoms of social disease.

Many, it is true, will differ from us, when we express the opinion that the constant growth of large towns, and the erection of so many factory chimneys in small towns and in the country, are a symptom of social disease; but if we find that many of the greatest thinkers of all nations have expressed the desire "to cultivate their own cabbage, and bedew it with their sweat", we have certainly a right to hold that opinion.

The decrease of the country population, owing to their adoption of industrial occupations and to emigration, is an undoubted fact. The causes for this are to be found in the wrongful tendencies of our civilization, the disadvantages of which seem likely to outweigh its benefits.

The gigantic empire of China is almost entirely given up to agriculture. For want of space, the Chinese have passed from field farming to garden farming. The soil, thoroughly broken up by the spade, must evidently be much more productive than that ploughed by machines. The author, when travelling in Mecklenburg, the classical country of great landed proprietors, has often seen in the midst of the fields bare spots, where no grain had been sown, the hired sower having been too lazy to fetch more grain for a spot likely to be unnoticed by the inspector. This cannot occur in the garden farming of China.

The Chinese are poor, it is true, but are they not as happy as we? In their seclusion they have remained untouched by the baneful influences of our morbid western civilization. Commerce is restricted to a small part of the country containing a limited population; trades and industries hardly exist as yet and will (even if in course of time they become equal to those of Europe) have hardly any influence upon the peculiarity of the Chinese civilization and upon the mode of living of the four hundred millions of Chinese labourers. The Chinese, like all other nations, are acquainted with social "problems," but they do not know the "social question," the attempt to solve which will ruin many a European state, when the Chinese empire will continue to exist for another thousand years or more. The strength of the Chinese empire is in its agriculture, in its peasantry; the weakness of the European and American states in their industries and in the decline of their peasantry.

However important the discovery of America may have been for the development of the European nations, yet obvious disadvantages are attached to it. The introduction of potatoes was the first thing to disturb European agriculture; the commerce with America overfilled the European markets with American grain, so that home-grown grain fell in value, and numbers of families were ruined; the emigration to America partly deprived agriculture of its most pushing and cleverest workers, thus rendering impossible an increase of the population sufficient to cause that transition from field farming to garden farming which is the only way to produce a more healthy agriculture.

Every emigrant who settles in America, attracts others; for it is only human nature to send good reports from abroad home. Thus America has become a paradise to the German peasant and agricultural labourer.

But there are yet other influences to be attributed to America. Agricultural machines, which were necessary in America on account of her scanty population, were also introduced into Europe, to enable her to compete with America successfully; and owing to this many agricultural labourers have been thrown out of work.

Under such conditions the industries, which had developed in the commercial centres, in the coal districts, etc., had no difficulty in growing at the cost of agriculture. The higher wages naturally attracted the agricultural labourer, and this attraction became still greater when agricultural machines were introduced. Those who had first moved into the industrial centres, themselves became centres of attraction for others. The smartly dressed operative, who originally came from the country, and who pays a visit to his native village and old companions, who cannot talk enough of the doings of the great city, becomes a magnet of attraction for the city, just as the emigrant on the other side of the ocean has already become a magnet of attraction for America.

Thus there is a constant movement from the country to the towns, especially into the industrial centres, and this will not cease until the industries become as neglected as agriculture is in the present day. I will not speak here of the mortgage and credit system as a further cause of the retrogression of agriculture; this would lead us too far.

The miserable condition of agriculture is, however, not sufficiently explained by the baneful influences of civilization, by our intercourse with America, and by the prosperity of the industries; for if agriculture, the foster-mother of the nation, exhibits so many grave symptoms of disease, that she can no longer support the population, and is deserted by them, other poisonous influences must be at work.

Wrong theories of feeding, which engender a wrong system, press heavily on agriculture.

It is becoming more and more recognized that cattle-rearing and corn-growing are the causes of the decline of German agriculture. This sounds very strange; but we must remember that cattle-rearing is always carried on together with agriculture, though on a small scale; the care which must be given to the cattle, causes a division of the working powers, so that either the agriculture, or the cattle-rearing must constantly suffer, unless the staff of labourers is doubled, and this would render the farm unprofitable. Further, cattle-rearing pays badly. If the work expended on the cattle were employed in the fields, and if the ground given up to the cattle were used for growing corn, etc., and the corn could be sold at a good price, the profit to the farmer would be greater. But a good price for corn is seldom obtained, the cattle on the other hand can always be sold with certainty, and their price supplies to the peasant the ready money so difficult for him to obtain otherwise and so sorely needed for household expenses, taxes, etc. Thus the peasant is compelled to continue his cattle-rearing, which is really a burden to him.

There are people who cannot imagine that agriculture can exist without cattle-rearing; they would be at a loss where to look for their manure. But the Chinese show us how to overcome this difficulty. In China there is no cattle-rearing either for the slaughter-house, or for work: there is neither space nor food for them. As a rule men plough and men draw the carts. At most they rear a pig on the leavings from their own tables, and this, in addition to fish, forms their only meat food. They use human manure and all sorts of refuse, even hair from the barber's shop.

Germany does not produce sufficient cattle and corn for home consumption; *enormous quantities of both have to be imported.* Vegetables and fruit *might* be supplied in abundance, if there were a demand for them. In this sense, therefore, *agriculture suffers from wrong feeding theories.*

Carey has formed the inexorable sociological law, that vegetable food must gradually replace animal food as the population increases. Alexander von Humboldt says that a piece of land sufficient to support one huntsman, can support ten agriculturists, or a hundred fruit-eaters.

The civilized inhabitants of the west of Europe and America demand bread and meat as their principal food, consequently agriculture supplies this demand; European agriculture can supply it only by the sweat of her brow, owing to the American competition. For in America there are yet rich harvests to be obtained, there are still vast pasture grounds for the cattle.

But if the population of America continues to increase, if the produce of the soil is diminished by careless cultivation, if fewer cattle can be reared for want of space, America will no longer be able to export, but will produce only sufficient for her own needs. The same will be the case with Siberia, which is now being opened up, and there are no other countries worth considering as exporters of food.

In those countries and parts of the world which are at present scantily populated, industries will grow as their populations increase, and in times not far distant, these countries will be independent as regards manufactured goods; in other words: To-day we can still exchange our industrial products for the meat and corn of foreign countries; but the time will come when this will be no longer possible. On what shall we feed then?

The transition will take place gradually, but it is inevitable. The industries will gradually shrink, until each country produces just enough for her own needs. Many operatives, forced by hunger, will then take up the spade. Meanwhile it will have become generally recognized that the cultivation of grain is most unprofitable. Apart from damage due to the weather, the produce of a cornfield, as regards its food value, is exceedingly small. (The food value of an agricultural product is very different from its money value!) In garden farming, on the contrary, the same piece of land may produce instead of the one harvest of grain (followed perhaps by an additional crop of late turnips), first, *e.g.*, a crop of radishes and salads, then a crop of spinach, and finally a crop of pulses (peas, beans, etc.), or winter cabbage, whilst at the same time the fruit trees yield their fruit. Grain will only be cultivated to a small extent and in specially favourable places.

Whilst to-day not fifty millions of Germans can live on the produce of their own country, in the future depicted by us, a family will be able to live healthily and happily, though perhaps not luxuriously, upon a piece of ground measuring 3—4 hektars (about $6^1/_2$ to 10 acres) in extent, and this will make room for even further millions of population.

We seem to have forgotten the question of cattle-rearing, but it is not necessary to say much about it. Man, and the garden farming system * will leave no room for the cattle, and our descendants will be forced to become vegetarians. The proof of this is to be found in China, and China would not be a bad place to live in, without its pigtails and provided with modern conveniences

Thus in a few lines we have depicted the future of the world, a future inconceivable to many, but which has the forces of nature and necessity on its side. Much social misery, many convulsions of the social body, revolutions, etc., may bring great changes before that arrives; but it is as impossible to stop the onward movement towards this great future, as to stop nature in her work.

In that happy(?) future it will no longer be difficult to feed every one rationally. But what about all

* Around the towns land is even now divided into small plots which are used for garden farming (cultivation of vegetables and fruit); these plots are too small to support a farmer's family who want to grow corn and rear cattle, but are sufficient for a garden farmer to live comfortably. The question at present is how to make the best use of the products of garden farming; but the introduction of establishments for drying vegetables and fruits, shows us how to solve the question in the future. A rational system of winter feeding will only be possible when green vegetables and fresh fruit can be perfectly preserved by means of a drying process. Many families even now use dried preserved vegetables during the winter, thus obtaining a great variety in their food. As soon as people have learned the way to prepare them, they will prefer the dried vegetables, *e.g.*, cabbage, to the half-rotten cellar vegetables; besides, the dried vegetables are cheaper, and are becoming cheaper still every year.

those now living who do not own any land, what about the millions who *must* live on bread and potatoes, because at present there is no other supply of food for them? Well, if they can be brought to recognize how wrongly they live, they can even under present conditions obtain sufficient of the right kind of food, they need no longer be troubled by the dreadful conviction that they cannot feed their children as they ought to be fed.

Nature, though ill-treated everywhere by human folly, will not forsake those who live according to her laws.

We have shown above that our food should consist principally of green vegetables and salads rich in food-salts, as well as of fruits. Can the man who has only sufficient money to buy bread and potatoes, procure such food? Yes, and indeed for nothing.

The weeds which grow in every meadow and on every roadside, can furnish innumerable poor people with those substances so necessary for the blood. Thus the young shoots of the stinging-nettle can be made into a sort of spinach which has a better taste than the real spinach; and so, in the early spring, when the poor cannot possibly afford to buy green vegetables, they can obtain their spinach as well as the rich. Salads also grow wild in the fields (comp. "Salatbüchlein" by Theodor Lange, Berlin 1890, Bodo Grundmann, publisher). First there are the pale spring shoots of chicory and those of dandelion (Leontodon Taraxacum), which make an excellent salad, and which our neighbours, the French, fully appreciate. Scurvy-grass (Cochleria officinalis), brook-lime, plantain, common sorrel (Rumex), borage (Borago officinalis), wood-sorrel (Oxalis), may be added to the list, and even the shoots of the cuckoo-flower or lady's-smock (Cardamine pratensis) can be used. In England and France hedge mustard (Sisymbrium officinale) is commonly eaten.

Good Henry (Chenopodium bonus Henricus), which is very common and grows on all roadsides and waste grounds, also makes a good spinach or salad. In Italy, where salads are so commonly eaten, the stichwort (Stellario media) is used. And to give one more example, there is the common orache, which grows everywhere. All these weeds and many others can be gathered on Sundays or on holidays by the poor and not cost them a penny.

It is not so easy for the poor to get fruit; they can no longer obtain a winter store of bilberries from the woods and forests, which are rapidly being cut down. We can only repeat over and over again: Use the money generally spent on sausages, tobacco, and spirits, for cheap dried fruits (dried apples, prunes, figs, and dates), and both yourself and your children will be better fed.

Every parish might do a good deal to supply this want of fruit; they should plant every road with fruit-trees, and should not allow a fruit-tree to be cut down until another has been planted; they should compel every landowner to plant at least one fruit-tree per year, etc.

Such unusual reports as the following would then become quite common; "This summer, the cherry crop, especially that of sweet cherries, is in spite of the heavy rain so enormous that in the neighbourhood of Berlin the growers have given up picking even the finest cherries, the price offered for them by the dealers being so low. The cherries are actually left on the trees for the birds to peck at."

Let all of us who have been brought to recognize the truth of the principles laid down in this book, remember that the greater the demand for these foods, the sooner shall we see an adequate supply.

The truth of what he have said about the defects in our system of agriculture, is clearly demonstrated this year (August 1891).

Nearly the whole of the work spent on the corn- and potato-fields in Germany, has been rendered useless owing to the heavy rains. On the other hand, a good fruit year may be expected, nor can we complain of the supply of cabbage, root vegetables, salads, tomatoes, etc.

In other words: If our agriculturists did not restrict themselves to single crops of corn, potatoes, etc., but cultivated, as in garden farming, all kinds of fruits and vegetables, an all-round bad harvest would be impossible; for to have weather unfavourable to every kind of vegetable and fruit and lasting through the whole year, is an absurdity.

Here, then, we have suggested the natural means by which the position of agriculture may be improved in the future. And following on this, the health of the people must also be improved.

As to the question whether from a national standpoint our system of agriculture should be modified at present, and in what respects, opinions differ. If it is right that industries should in the future be restricted, and that each country should manufacture goods for herself alone, then each nation has an interest in encouraging agriculture, or else both industries and agriculture will some day fail together, and state bankruptcy will be imminent. I myself, although according to my hygienic views I teach that it is better to eat less bread, agree with the following article:

Our Daily Bread.

From "Der Reichsbote." November 1893.

Dr. Ruhland, professor of national economy, has published a book on the fundamental principles of agrarian politics, after visiting England, America, Australia, India, Russia, and the countries on the Danube, to study the question.

He begins by enquiring into the part which land plays in the life of nations. When the ancient Germans migrated from their old homes westward, they were driven by hunger and by the necessity of obtaining new lands, to grow food for the people. And the nations which have afterwards developed in the course of history, have also retained the principle that they grow sufficient corn to supply the whole nation with bread. If the harvest happened to fail, it was universally considered a great national disaster; the revolutions of past history have always been preceded by bad harvests. Since 1860 the wonderful development of the means of transit has connected the various parts of the earth so closely together that the whole world may now be looked upon as one huge commercial market. National economy is being replaced by world economy. We buy our corn where it is cheapest, not caring whether it has been grown on the banks of the Elbe, the Missouri, or the Ganges. And if the interests of the agriculturists are not served by this, it is their business to reorganise their system of agriculture.

The author has come to the conclusion, that the present ideas of politicians concerning free trade and "world economy" are perhaps among the most dangerous errors which the human mind has ever given birth to. He calls it a simply fatal mistake to aim at industrial riches, in the belief that the interests of the corn-growing agriculturists can be disregarded, because to-day foreign competition supplies corn for bread in sufficient quantities; for this foreign competition in corn-growing is a transitory phenomenon. The so-called "enormous quantities of corn in the world's market" are in reality none too great. Scarcely 6 % of rye and 14 % of wheat of the yearly harvests of the earth are internationally exchanged. In the year 1876 only 4 % of the rye produced, and 8 % of the wheat produced was found in the markets of the world. In another 15 years we may have returned to the same point. And it will not be very long before each state will have to grow all the corn required for its own consumption.

Rapid progress has produced great changes in these matters. Germany has been a corn-exporting country, and even in the year 1872 her wheat export exceeded the import by 100,000 tons. To-day the quantity of wheat and rye together, imported into Germany, amounts to 1½ million tons. Hungary was between 1860 and 1865 the most important wheat-exporting country. According to the statistics drawn up by Dr. Polya, the Austrio-Hungarian exportation of wheat will not outlive the present century. The wheat export of India reached its highest point about 1880.

Dr. Ruhland sets forth at some length the reasons why in the future this system of corn exportation from one country to another must gradually dwindle and finally cease altogether. As regards North

America, even Sering comes to the same conclusion. Of all the other countries of the world Russia alone will find it possible to increase her exports. But if some day Russia is actually the only country possessing a considerable surplus of grain, at what price will she sell it to the central European industrial states? Or if Russia were to stop exporting, whence would England obtain $^4/_5$ of the corn which she needs for bread, if her own agriculture only produced $^1/_5$? And if she could not obtain these $^4/_5$, what power upon earth would then prevent the ruin of England, so much envied to-day?

These are most interesting facts, the more so as negotiations on the duty question are at present being carried on in Berlin between Russia and Germany. The $15^1/_2$ millions of tons of grain, grown by ourselves every year, could easily be increased by 50% by a more rational management such as is practised for example in Anhalt, Brunswick, and the province of Saxony. We have it, therefore, in our power to free ourselves from external competition by suitable agrarian reforms. The independence of a state ought not to be a merely legal conception; it should rest on a solid foundation, and that foundation should be agriculture. Any disproportional overgrowth of industries and commerce, especially when accompanied by a decrease of agriculture, will threaten the very existence of a state.

The happiness of nations does not depend upon riches derived from industries, but upon the independent and harmonious development of the whole state. It should be the aim of politicians to prevent a one-sided overgrowth of industries and commerce, and to secure the uniform progress of agriculture, industries, and commerce together. Whether this harmony be maintained, or not, depends upon the relation between the production and the demand for grain food. Every country ought to produce sufficient grain to feed its own population: this old, but ever new principle must always serve as a guide in practical politics; it teaches us to encourage agriculture so as to become in case of need independent of foreign countries.

CONCLUDING REMARKS

DIETETIC dysæmia is not the only cause of disease, it is true; but, as we have seen, it must be considered as the principal and fundamental cause, compared with which the others are only accidental causes. Most of the latter have been mentioned in the first section and occasionally in other parts of the book, and have often been described by others.

The object of this book is to fill up the gap left open by other writers on hygiene and diet, a gap to which we may attribute the various disagreements amongst hygienists; for the fundamental cause of disease being unknown, one attached too much importance to water alone, another to air, a third to clothing, etc.

As has already been said in the introduction, we may be wrong in some of our details, but our theory is certainly right; for its correctness has been proved in practice many times.

Let us take an example: A patient perhaps tells me that on account of obesity he has, acting on the advice of his medical man, lived almost exclusively on meat for many years, and has visited Marienbad, to drink the water, every season; symptoms of gout then appeared, and the same doctor immediately changed his diet to an almost purely vegetable one: is not this a nice illustration of the excellence of our present dietetic system?

If, however, treated according to our system of diet, a fat man gets rid of his fat, and a lean man again recovers the flesh which he has lost; if a patient with the first symptoms of gout is preserved from further gouty degenerations; if children thrive and old people feel well; if the strong men and the healthy women are really capable of work and remain free from degenerative diseases—this I consider a sufficient proof of the correctness and efficiency of our system.

We have only to grasp the real significance of "dietetic dysæmia" and its consequences as described in this book, to be freed from the fear of disease and even from disease itself, and this is the first condition of human happiness. Viewing the world from this standpoint, we are even required to modify our religious ideas; for it is not *necessary* that the earth should be a vale of tears, either for the individual, or for society. If it is so at present, *the reason is more material than we think.*

But we cannot expect to see any great improvement in this respect, until the subjects of health and hygiene, the very foundation of life and wisdom, are taught to the rising generation in our schools. Only thus can we render possible a real prevention of disease and a perfect development of the body and its functions.

As bodily misery and disease grow less, physicians will find less employment as physicians—they will have to become teachers of hygiene and protectors of health. Only then will the physician be able to develop the highest ideal of his art, the desire to help others to obtain perfect health. To-day the ordinary work of a doctor is "mending work", his patients merely use him to help them to sin again against nature.

We have innumerable physicians, and yet more disease and sickness than ever. Things cannot change until we physicians become teachers of hygiene, until the public have learnt at school that fear of air, wrong feeding, etc., cannot but make us ill. Even if the poor hardworked country doctor had the best intentions, he could find no time for teaching, nor would he probably have the courage, considering the hygienic ignorance of his patients; whilst the "drawing-room doctor" has in many cases been so infected by his patients watch-word "live and let live", that he has almost sunk to the same level as his patients and has become unfit to teach them hygiene.

The day that hygiene is introduced as a new subject into schools, the day on which physicians are appointed by the state as teachers of hygiene—that day will see the commencement of a new era, a time of progress unrivalled as yet in the history of civilized nations.

FINIS.