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OBSERVATIONS

ON

NAVAL HYGIENE AND SCURVY.

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AND

SCURVY,

MORE PARTICULARLY AS THE LATTER APPEARED DURING A

POLAR VOYAGE.

BY

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ETC. ETC.
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A PERSONAL NARRATIVE OF THE DISCOVERY OF THE NORTH-WEST PASSAGE.

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TO

SIR JAMES CLARK, Bart., F.R.S.,

PHYSICIAN TO HER MAJESTY

THE QUEEN,

AND TO HIS ROYAL HIGHNESS

THE PRINCE CONSORT.

My dear Sir James,

It is with feelings of great truth and sincerity that I dedicate this little book to you.

The exalted position you occupy in our Profession would in itself fully entitle you to any compliment I could offer; but I wish to place on record my humble estimate of your excellence and worth, and to express the grateful sense I entertain of the uniform kindness I have ever received from you during an uninterrupted friendship of many years,—a friendship that has afforded me an opportunity of admiring the many virtues which adorn your character; and which are best known and appreciated by those who enjoy the privilege of your acquaintance.

With every sentiment of esteem and regard,
Ever believe me,
Dear Sir James,
Very truly and gratefully yours,

Alex. Armstrong.

PREFACE.

THE Observations contained in the following pages are not presented as a systematic Treatise on either Hygiene or Scurvy; but as they are of a practical nature, it has occurred to me that they might not prove an unacceptable addition to the knowledge which we at present possess on these subjects.

Those on Scurvy have been compiled from the Journal of my Practice, kept during a prolonged period of service in H.M.S. "Investigator," in the Arctic Regions, for which Sir Gilbert Blane's gold medal has been recently awarded to me. With the permission of the present Director-General of the Navy (Sir John Liddell, C.B.), that Journal has been temporarily placed at my disposal.

As Scurvy is a disease now happily seldom met with in the British Navy, I have considered it a duty no less to the Service to which I have the honour to belong, than to the Profession generally, to make known the results of my experience in prevention and treatment.

As the prophylactic means adopted were attended with a degree of success hitherto unprecedented, I am desirous of directing to this circumstance, the attention of those Authorities who have their power of enforcing their adoption in the Commercial Marine of this country, where Scorbutic disease still unfortunately occurs, and I believe to a greater extent than is generally supposed.

I am not without hope, that the few remarks I have made on Naval Hygiene may prove useful to the junior Medical Officers of the Navy, on first entering the Service, and may guide them to the adoption of those means which are essential to the preservation of the health of the brave seamen and marines committed to their charge on board ships of war. Anything that can contribute to the attainment of this noble object is a matter of vital importance, and one, the full and zealous carrying

out of which, should ensure the hearty co-operation of all classes of officers. No absurd feeling of jealous interference ought ever to arise, on the part of one class of officers, to induce them to thwart or render abortive the representations made by another; but on a subject where all should feel the same deep and mutual interest, they should work together with the zeal and earnestness essential to success, so as to render our seamen healthy, and our ships efficient.

London, April, 1858.

ERRATA.

Preface, page vi., line 6.—In prevention and treatment, *read* in its prevention and treatment.

,, idem, line 11.—Their power, *read* the power.

Page 39, line 13.—Observations, *read* observation.

,, 49, line 12.—Honolalu, *read* Honolulu.

,, 74, line 5.—Corpuscles, *read* red corpuscles.

" 96, line 8.—Recurrence, *read* occurrence.

ON

NAVAL HYGIENE AND SCURVY.

CHAPTER I.

THE History of the wars in which this and other countries have at former times been engaged, tells us of the direful effects produced in Fleets and Armies by Scurvy, a disease which is now comparatively rare; and when it does unhappily break out in the present day in the Army or Navy, its appearance can always be traced to the neglect of proper preventive measures. Those hygienic means, which are not only preventive of the disease, but are likewise curative when it occurs, afford, I think, some of the most striking proofs of the inestimable blessings which science has conferred on mankind, and furnish the most direct evidence of the great extent to which the progress of scientific discovery has contributed to the greatness of our country. Unimportant as at first sight it may appear, it is indisputable, that the application of Lemon-juice for the prevention and cure of Scurvy, so far back as 1564, has been attended with the greatest and most beneficial results, not only to our own country, but to the world in general.

I shall now very briefly, and without entering into the history of the disease, adduce a few instances in support of what I have advanced.*

The early settlers in our northern colonies suffered dreadfully from the ravages of Scurvy. In England, in the sixteenth and seventeenth centuries, and even later, it was a disease of very frequent occurrence, in consequence of the small amount of vegetable food which entered into the diet of the people. Smollett tells us in his History of England, that after the capture and occupation of Quebec by our troops, 6,000 in number, 1,000 died from the effects of Scurvy in the space of a few months, and double that number were made unfit for duty. In more recent years, it has appeared in our armies in India, and also at the Cape of Good Hope, where the troops, otherwise well provided, were deprived of vegetable food. More recently still, our army in the Crimea suffered from the effects of this dreadful malady. The writings of Foderé, Larrey, and many other distinguished men, tell us of its fearful ravages among the continental armies, numerous instances of which might be adduced. But, it is in Britain's best bulwark,—our navy, that this direful scourge has been most severely felt, and where it is still, I regret to say, to be occasionally met

* In the "Library of Medicine," there is a very able and excellent article on Scurvy, by Dr. Budd, with a good epitome of the history of the disease, to which I am indebted for several facts in connexion with this subject.

with. In the Commercial Marine of this country, it is, I believe, becoming a disease of frequent occurrence, from causes to which I shall again have occasion to allude.

Who can read the narratives of the earlier enterprising navigators of this country, in their voyages of discovery to the Polar Sea, and elsewhere, without feeling the deepest sorrow for their sufferings, and admiration for their fortitude; and who can reflect without regret that their noble efforts were so cruelly baffled, and their mortality so materially increased, from the occurrence of this disease, as often to frustrate all efforts to prosecute their enterprise?

The voyage of Lord Anson, in more recent times (1740-44), gives us a harrowing account of the sufferings of his crew from scorbutic disease, that navigator having lost in the space of two years four out of five of his ship's company. The voyage of that great commander, Captain Cook, however, affords a pleasing contrast to that of Lord Anson. In Cook's voyage round the world, occupying upwards of three years (1772 to 1775), the crew enjoyed a high standard of health, and were free from scorbutic disease, one man only having died during the whole of that period. This happy result was, no doubt, attributable to the judicious use of lime-juice, and the allowance of fresh vegetable food whenever it could be procured. It is therefore not too much to say, that

by the agency of this valuable antiscorbutic, have British sailors been enabled to circumnavigate the globe.

The early history of our Navy, and the writings of men so distinguished in the service as Lind, Trotter, and Blane, inform us of the fearful ravages of scurvy, and prove how much the efficiency of the fleet became impaired by this disease in various parts of the world. Towards the close of the last century, the Channel Fleet was unable to keep the sea, and the squadron under the command of Admiral Geary, in 1780, returned to England with 2,400 men affected with scurvy. The fleet of Lord Rodney in the West Indies at the same period, suffered severely from the disease, which also raged among the crews of many of our ships in various other parts of the world.

The disease continued to prevail in the fleet for several years subsequently, to a greater or less extent, and it was not until fifteen years after the return of Admiral Geary, namely, in 1795, that any means were adopted for improving the health of the Navy, and for preventing the occurrence of this terrible scourge, which had for so long a period caused such devastation among our brave seamen. It was owing to the urgent representations of that distinguished physician, the late Sir Gilbert Blane, Bart., who had already conferred such inestimable benefits on the fleet, and who may be justly termed the Father of Naval Medical

Science, that the Admiralty were prevailed on to give the necessary orders, that lemon-juice should be issued to the navy for the prevention and cure of Scurvy. Although the remedy had long been known, yet it was not until this period that it was officially ordered to be supplied to the Navy.

This fortunate circumstance was brought about in consequence of the alarm created by the prevalence of the disease in the fleet under the command of Lord Howe, in the spring of 1795, the outbreak being traceable to causes entirely analogous to those which induced the epidemic on former occasions—namely, the deprivation of fresh vegetables. So prevalent was Scurvy in this fleet, and so much enfeebled were the crews by its visitation, that the ships were rendered quite inefficient, and the safety of the Empire became in consequence absolutely imperilled.

From this period, a new era dawned on our navy. The health of our seamen became wonderfully improved, and the efficiency of our fleets was greatly increased, when it was found that ships could keep the sea for any length of time, although deprived of that kind of diet, the want of which had been hitherto attended with such disastrous results. This happy state of things, which has contributed so much to the efficiency of our Navy, and to the greatness and prosperity of our country, became established by the introduc-

tion of lemon-juice and its judicious employment as a means for the prevention and cure of a disease that had previously been the dread of sailors, and the scourge of the sea.

From this period, therefore, Scurvy gradually disappeared from the navy of Great Britain, and is now seldom or never seen in the ordinary course of service; indeed, it should never appear, if proper precautionary means were adopted, and if due discretion and judgment were exercised in using an agent of such undoubted power and efficacy, as long experience has proved lemon-juice to be in the prevention and cure of scorbutic disease.

Since the disease has, therefore, I may say, almost disappeared from the Navy, it is only to the history of the Polar voyages that we must look for the record of its occurrence. If, by preventing or curing a most destructive malady, a simple but powerful antiscorbutic has enabled us to circumnavigate the World with safety, it has likewise, by the same beneficial agency, enabled us to establish the greatest maritime discovery of the age, the long sought-for "North-West Passage," and thus to enlarge the limits of our empire, by the discovery of vast territories in the hitherto unknown regions of the Pole.

Practically useless, in a commercial point of view, as these discoveries may be pronounced to

be, we must yet remember that it was an imperative duty imposed on the first Maritime Power in the world to become the pioneer of maritime discovery in hitherto unexplored seas; and one might well feel jealous of our supremacy at sea, had we allowed any other power to win in the Polar Sea those laurels, the acquisition of which for centuries baffled our energy and enterprise, but which Great Britain can now at last indisputably call her own.

In the absence, therefore, of all merely practical and commercial results, we should feel pride in the reflection, that by such great maritime discoveries we have occupied the position which became us, as an adventurous and enlightened people, and that we have thereby added much to our greatness as a nation, and contributed largely to the Geographical Science of the world.

In the various Polar expeditions that have left this country, Scurvy has always occurred to a greater or less extent, and in every instance, as far as I can ascertain, the disease, with one exception, appeared during the first winter in the ice. Now, as all her Majesty's ships which have been employed in Polar discovery since the time of Parry, differed but little in tonnage, internal arrangements, general equipment and victualling, and I may also add in the *matériel* of which their crews were composed, it becomes a subject for inquiry, to what circumstance it was owing, that

one ship, in no respect better equipped or victualled than the others, but in some respects placed under comparatively disadvantageous circumstances, enjoyed an immunity from the disease for a longer period than has been hitherto known, and was visited with less comparative mortality than has ever occurred on board any ship wintering in the Polar Sea. There is no instance on record of any ship having spent one winter in the ice, with the exception before mentioned, without losing one or more men by death; the mortality for the most part resulting from, or associated with, the existence of scorbutic disease. Even the expeditions of the great and good Sir Edward Parry do not furnish us with an exception, although no man connected with Polar discovery ever exercised half so much wisdom and judgment as did that distinguished Arctic navigator, in adopting means for the prevention of the disease, and in promoting hilarity and cheerfulness, which are the great moral antagonists to its occurrence. It is to be regretted that so few of his successors have ever followed his good example in this respect.

The exemption from scurvy for the unprecedentedly long period to which I have alluded, occurred on board H.M.S. Investigator, during the late expedition to the Polar Regions; and in the following pages I shall attempt to account for the immunity from this disease, which was enjoyed by no other ship.

I feel that I shall best convey my views to the reader by very briefly narrating a few circumstances in connexion with the voyage of the Investigator which may have exercised some influence, evil, or otherwise, on the health of her crew: and I shall describe the means adopted for the prevention of the disease, before I speak of the disease itself as it occurred on board that ship.

CHAPTER II.

The Investigator left this country for service in the Polar Sea at the coldest period of an English winter (January 1850), with a complement of sixty-six officers and men, all carefully selected with a due regard to their physical ability, and their powers of enduring the hardships and privations to which they could not fail to be exposed. A finer body of men for their numbers I never met with in her Majesty's service.

As it was resolved to enter the Polar Sea, *viâ* Behring Strait, the voyage was long and monotonous, the ship having had, I may say, no communication with the land until the Sandwich Islands were reached, six months after leaving England, with the single exception of having been one day at anchor in the Straits of Magellan. During this time we experienced twice the cold of winter, and twice the intensity of equatorial heat, and we encountered much bad weather, with a succession of gales, occasionally lasting for weeks without intermission. As the men

were necessarily much exposed to the united influence of cold and wet during such long and trying periods of boisterous weather, and as the entire strength of the crew was at times required for working the ship, the consequences may be readily conceived. The ship became leaky, and from the decks being extremely crowded with stores and provisions, the ventilation was very imperfect; and indeed at times it was nearly cut off altogether, from the necessity which existed of frequently battening down the hatches. The consequence was, that the ship became wet and damp throughout, the men's garments were seldom or never dry, the air between decks was very impure, and the admissions to the sick list were numerous, owing to the causes just mentioned; the diseases consisting for the most part of catarrhal, pulmonic, and rheumatic affections.

In the Straits of Magellan we received fresh meat sufficient for a few days' consumption, but we obtained no vegetable food whatever. It was not until we reached the Sandwich Island of Oahu, that we procured the first supply of fresh vegetables since leaving England. Our stay at this island was necessarily short, and the ship was only one clear day in harbour, thus affording us but little time for recruiting our men after a long and trying sea voyage. We were enabled, however, to procure fresh meat sufficient for

fourteen days' consumption, but the supply of fruit and vegetables was considerably less, owing to the great and increasing demand for these articles in the island; the fruits consisted chiefly of a few bananas and limes, together with some pumpkins.

From the period of our departure from these islands we had no further communication with the civilized world; and the fresh supplies which were subsequently obtained, being the result of chance, I shall again have occasion to allude to them, when I describe the salutary influence which they exercised on the health of our crew.

From the time when we entered the ice (2nd August) until the ship became finally frozen in winter quarters, towards the middle of October, in the ice pack, the crew were constantly employed at the most laborious and harassing work, and were necessarily much exposed to cold, wet, and fatigue.

It was not the physical powers alone that were so severely taxed throughout this period; the minds of the men were in a constant state of agitation, either elated by hope, or depressed by despair, as the perilous position in which we were placed, alternately excited either one or other emotion. Notwithstanding the numerous causes, arising from the nature of the service, which contributed to the production of disease, we went into winter quarters in a state of good health and

efficiency, the diseases which had occurred having been in their character somewhat similar to those already mentioned.

The victualling of the ship is the next subject to which I wish to direct attention. The provisions consisted of salt beef and pork, and preserved meat, all of which were of a most excellent quality. The two former had been salted only a few days previous to our departure from England, so that we received them under the most favourable circumstances that it was possible for us to possess salt meat. The fresh meat had been but recently prepared by Messrs. Gamble, of Cork, and, from the excellence of its quality, reflected great credit upon that firm. The vegetable food supplied consisted of Edwards' preserved potatoes, pearl barley, peas, rice, and carrots, together with cranberries and pickles, the latter consisting of cabbage, onions, mixed pickles, and walnuts.

Subjoined is the scale of victualling adopted from the period of the ship's commission until her abandonment, three years and a half subsequently. From this table it will be seen that we continued on what was termed full allowance for a period of twenty-one months, until October 1851. After this period we were placed on two-thirds allowance, the quantity of the vegetables remaining the same, except that the potatoes were issued less frequently, rice or pearl barley being substituted; the quantity of lemon-juice remained unaltered,

Scale of Victualling adopted on board H.M.S. Investigator during 1st, 2nd, and 3rd years spent in the Arctic Regions.

DAYS.	From August, 1850, until October, 1851.														From October, 1851, until September, 1852.												From September, 1852, until June, 1853.												REMARKS.
	Bread.	Preserved Meat.	Salt Meat.	Vegetables.	Flour.	Tea.	Chocolate.	Sugar.	Peas.	Rum.	Pickles.	Cranberries.	Oxcheek Soup.	Suet.	Bread.	Preserved Meat.	Salt Meat.	Flour.	Vegetables.	Tea.	Chocolate.	Sugar.	Peas.	Rum.	Pickles.	Suet.	Bread.	Preserved Meat.	Salt Meat.	Flour.	Vegetables.	Tea.	Chocolate.	Sugar.	Peas.	Rum.	Pickles.	Suet.	
Monday	1 lb. of Fresh Bread daily.	lb.	lb.	oz.	lb.				pt.				lb.			lb.	lb.	lb.	oz.				pt.					lb.							pt.				
Tuesday ..	"	"	"	4	"				"				"			"	"	"	4				"					"							"				
Wednesday .	"	"	"	4	"				"				"			"	"	"	"				"					"							"				
Thursday ..	"	"	"	4	"				"				"			"	"	"	4				"					"							"				
Friday	"	"	"	4	"				"				"			"	"	"	"				"					"							"				
Saturday ..	"	"	"	4	"				"				"			"	"	"	4				"					"							"				
Sunday	"	"	"	"	"				"				"			"	"	"	"				"					"							"				
Monday	"	"	"	4	"				"				"			"	"	"	4				"					"							"				
Tuesday ..	"	"	"	4	"				"				"			"	"	"	"				"					"							"				
Wednesday .	"	"	"	4	"				"				"			"	"	"	4				"					"							"				
Thursday ..	"	"	"	4	"				"				"			"	"	"	"				"					"							"				
Friday	"	"	"	4	"				"				"			"	"	"	4				"					"							"				
Saturday ..	"	"	"	4	"				"				"			"	"	"	"				"					"							"				
Sunday	"	"	"	"	"				"				"			"	"	"	"				"					"							"				
	Vegetables during this period were Potatoes and Carrots. Lime-juice and Sugar of each 1 oz. issued daily.														Vegetables at this period were Potatoes, Carrots, Barley, and Rice alternately. Lemon-juice and Sugar as in previous year.												Vegetables at this period were Potatoes, Carrots, Rice, and Oatmeal alternately. Lemon-juice and Sugar of each ½ oz. daily.												½ lb. of Preserved Meat averaged about 6 oz. The Salt Meat consisted of Beef & Pork with bone, ½ lb. averaged about 6 oz. 4 oz. of Carrots averaged about 1 oz. Suet issued in lieu of Flour, ¼ oz. of the former equal to 1 oz. of the latter. No Cranberries or Soup after first year. Deficiency in Preserved Meat from jelly, and in Salt Meat from bone.

but no soup or cranberries were issued. From September, 1852, a further reduction took place. Vegetables were reduced to two and a-half ounces daily, and lemon juice to half the quantity formerly issued, and the rum was given only on alternate days.

On referring to the remarks appended to the scale, it will be seen that the weight of the meat was only nominal, owing to the presence of bone in the salt meat and jelly in the fresh meat.

In the autumn of 1850 we were fortunate in procuring some musk oxen, the flesh of which was issued in lieu of salt beef, at the rate of 1 lb. per man each week, and occasionally three times in a fortnight for a few months. In the following summer we were equally fortunate in procuring game, consisting of wild ducks, geese, and ptarmigan, which for about three weeks afforded us a pound of fresh meat weekly. Throughout the winter of 1851-52, owing to the circumstance of meeting with reindeer, we were enabled to issue a pound of fresh meat three times in a fortnight, the allowance being subject to occasional interruption, and birds were procured in the summer as before. For several months of the third winter we were also enabled to continue the supply of reindeer, and occasionally the supply was continued in the spring.

In the summer of 1852, for a period of nearly three weeks, we were able to procure limited

supplies of sorrel (*rumex acetosella*), and scurvy grass (*cochlearia officinalis*), which were daily issued in variable quantities of a few ounces. This was the only fresh vegetable food that we ever obtained.

Towards the beginning of the third year the salt beef and pork were very generally eaten in the raw state, or only partially cooked, as the meat was found to allay hunger better in the raw state; and this plan was adopted from the additional reason that the meat shrunk very considerably in boiling.

Having now fully stated the nature and quality of our diet, I may here remark that I consider the full allowance inadequate to maintain health in a polar climate, from the necessity there exists for a larger supply of carbonized food in such a region. If the supply of food is not equal to the demand, and is deficient in the proportion of carbon necessary for the wants of the system, that supply must be furnished from some other source, otherwise the vital process of respiration cannot be fully maintained. The tissues of the body, therefore, which are rich in carbon, must furnish that element, and hence the body gradually wastes, and debility and disease ultimately ensue. Men are less capable of resisting cold in the second year in a polar climate than they are in the first, and so on for every subsequent year of their sojourn. Their state of body is either at or above par, on first entering the ice, from the

recent effects of wholesome diet and fresh vegetable food, which enable them to generate sufficient heat to meet the exigencies of the climate; and what the allowance of food fails to supply is taken from other sources within the system. Now, in the second year these resources are obviously not so abundant, and a larger instead of a smaller quantity of food is necessary to generate heat, and to make up the deficiency. If this additional supply be not forthcoming, the results which I have before mentioned must necessarily take place.

The Lemon-juice with which we were supplied was of the most excellent quality, and consisted of two kinds, one of which was prepared by adding a tenth part of brandy, and the other was the acid simply boiled, and containing no spirit. The juice was kept in bottles, each containing 6¼oz., with a stratum of olive oil, about half an inch in thickness, on its surface, and the bottles were carefully corked and sealed.

Previous to my departure, I received instructions from the then Director-General of the Navy to adopt whatever means might seem to me most judicious, whereby I might be able to report on the relative merits of the two kinds of acids, and their efficacy as antiscorbutic agents. I therefore recommended the following plan for adoption, that I might be enabled to arrive at results as accurate as it was in my power to obtain, viz., that each half of the crew should partake of the different

kinds of acid. In pursuance of this plan it was mixed in separate tubs, from which each man daily drank his allowance in presence of an officer. The adoption of this practice was attended with the happiest results. I had thus the positive evidence afforded me that every man in the ship drank his allowance (1 oz.) daily, and was thus fortified with a regular daily quantity of a powerful antiscorbutic. To this circumstance, therefore, I unhesitatingly attribute not only the immunity we enjoyed from Scurvy for a longer time than has ever been known before in the Polar Sea, but also our good fortune in maintaining an unprecedentedly high standard of health among our crew during the same period.

The custom which has been hitherto observed in Polar ships, and which is still followed in the Navy, is to issue the Lemon-juice, with the necessary quantity of sugar,* to the different messes into which the ship's company may be divided, in quantity proportionate to the number of men contained in each mess.

But, although the Lemon-juice is regularly issued, it does not necessarily follow that it is consumed; and this plan affords no guarantee whatever that each man drinks his allowance.

This I know from experience, not alone from

* The Navy allowance is half an ounce daily, with the same quantity of sugar, after the men have been fourteen days on salt provisions, but in Polar service double the allowance is daily given.

observing the practice adopted in Polar ships, but likewise from my observations made in the general service of the Navy. When the lime-juice is taken into the different messes, many of the men are careless about it, and seldom or never take it; others will give it away, or, what is a common occurrence, will barter it with the few who are wise enough to prefer it to spirits, so that one-half of the crew may not in all probability take it. Thus there is no certainty whatever that it is taken by all with any degree of regularity, but there is positive evidence to the contrary. In order that each man should drink his proper allowance, I proposed for adoption the plan I have already mentioned, which was very strictly carried out. I could wish that this plan was enforced in the Navy, not only as regards lime-juice but likewise spirits; for I am quite satisfied that by making the men drink their allowance of either at the tub where it is mixed in presence of the officer who always superintends the "grog tub," the most beneficial results would accrue, not only in a sanitary point of view, but in preventing the occurrence of drunkenness and its attendant evils on board ships of war. Cases of drunkenness are by no means of unfrequent occurrence, even at sea, despite the vigilance of the most able commanding officers, or of the best regulated police, and this vice results from a custom which exists among sailors, of frequently bartering their

grog, or accumulating it until they have collected a sufficient quantity to make them intoxicated.

The necessity of enforcing some very stringent measures in the merchant ships of this country with regard to Lemon-juice, is, I think, an imperative duty on those who have the power to do so, from the fact that Scurvy has recently become a disease of much more frequent occurrence amongst merchant seamen.* The disease is caused, in merchant ships, I have no doubt, by the generally bad quality of the provisions, the want of vegetable food, and the absence of the adoption of proper means for the exhibition of Lemon-juice. The latter is generally found to contain other acids and is of very inferior quality; and as the provisions are generally supplied by contract, the cheapest and worst are for the most part taken; and it not unfrequently happens that the meat itself is diseased. Indeed, we know that measly pork is but too often met with, which is in itself a source of disease. Little regard is ever paid to the evil influence which bad provisions will exercise on the health of seamen who do not live under the exercise of the salutary discipline, regularity, and order of their more fortunate brethren in Her Majesty's Navy. The merchant seamen, too, do not live under a system in which cleanliness is

* The testimony of Dr. Budd sufficiently establishes the fact of its frequent occurrence, from his experience on board the Dreadnought. Article "Scurvy" in Library of Medicine.

the order of the day, and in which every measure is taken to promote health, and to prevent the occurrence of disease. Our poor merchant sailors, therefore, are surely worthy of more protection than they receive, not only in respect of enforcing the adoption of adequate means for preserving health, but of preventing the occurrence of such acts of barbarity and cruelty as so frequently disgrace our Police reports. Many such, I regret to state, have come within my own personal knowledge.

As an opinion appears to be entertained by many that the antiscorbutic properties of lime-juice are deteriorated by keeping (an opinion which I hold to be entirely erroneous), I shall take occasion to speak more fully on the subject, and also to state the results of my experience in connexion with its curative agency.

It only remains for me to notice a few other circumstances, which exercised an influence on our sanitary state. In the first place, I shall mention that the ventilation of the ship was rendered as perfect as the means at our disposal could make it; but, notwithstanding all our efforts, the air between decks in the winter months was cold, moist, and impure. This was caused by the want of sufficient fuel to maintain at a comfortable temperature the lower deck on which the crew lived, and also to assist in dispelling the vapour generated by a number of men

congregated together. The consequence was that the vapour was rapidly condensed by the coldness of the deck above, which was coated with ice, while the deck below was rendered wet. The air * thus became moist and vitiated, and the temperature generally stood only a few degrees above the freezing point during the day, and was always below it during the night.

The daily routine adopted during the winter months ensured to each man five hours' daily exercise, which was continued during the summer months, when the men were not otherwise employed at work in connexion with the ship, or when they were engaged in the pursuits of the chase.

I have now mentioned the principal causes that may have exercised an influence on the sanitary condition of our crew, whether in maintaining health or producing disease; and in the next chapter I shall speak of the manner in which such causes appeared to me to operate in the production of Scurvy as it appeared among us.

* I may here mention that a few cases of ague occurred in each winter. One of the subjects of it had previously had the disease, but the circumstance of its occurrence may be considered in proof of the insalubrity of the atmosphere between decks.

CHAPTER III.

That Scurvy is essentially a disease of debility, occurring in connexion with an altered and vitiated state of the blood, is universally admitted; and that the deterioration of the vital fluid is caused by a deficiency or entire deprivation of vegetable food, is a truth which has been, I think, clearly established. It is evident that this vitiated state of the blood is more readily induced by the operation of those causes which tend to impair the physical powers and energies, and by the want of those agents which afford to the body a proper degree of sustenance. This want is experienced when the food is either small in quantity, or defective in those elements of nutrition which are essential for maintaining the body in a state of health. The same principle also holds good, when the food is neither small in quantity nor defective in nutritious properties, but when there exists at the same time a deficiency or deprivation of vegetable food. The evil effects produced by the latter deficiency, however, are much more

slowly manifested than in the former case, where the food in general is deficient in nutritious properties.

We thus see that, although we may have food sufficient, under ordinary circumstances, for maintaining the body in a state of health and vigour, yet that, from the long-continued absence of the vegetable element, an alteration takes place, both in the physical and chemical character of the blood. The deficiency in question converts the blood from a healthy into a morbid state, renders it unfit for the maintenance of normal nutrition and secretion, and causes a general impairment of the vital powers and energies, ultimately inducing a state of disease, known as Scurvy.

I shall now state the result of my experience of the operation of those agents and circumstances which appear to me to have exercised an influence in producing this disease, as it occurred within the sphere of my observation.

Much importance was attached, by the earlier writers on this disease, to the effects which salt meat, or other provisions deteriorated in quality, exercised in inducing a scorbutic diathesis. Although the cause of its doing so was unknown to them, yet experience guided their judgment in the conclusions at which they arrived. With their views my own opinion fully coincides, as I consider that salt or unwholesome provisions exercise a strong predisposing influence in the pro-

duction of this disease. A contrary opinion, however, has been advanced by some Authors who have arrived at the conclusion, that salt has no share whatever in producing scurvy; but I think that the facts adduced by them do not by any means justify such a course of reasoning. The circumstance that scurvy may occur among those whose diet consists entirely of fresh meat, and that it may be prevented or cured by the use of antiscorbutics when it occurs in those persons who live on salt provisions, by no means invalidates the fact that salt meat is a predisposing cause of the production of the disease. Nor can I possibly understand by what process of reasoning such a conclusion could be arrived at. I admit the facts, but I deny the inference that excludes a salt meat dietary from favouring the establishment of a scorbutic diathesis. It is true that persons living on salt provisions may be cured of the disease, and indeed its occurrence may be prevented when antiscorbutic agents are placed liberally at our command; but both the cure and prevention are much more difficult, than when the diet consists of fresh meat. Still, although we may prevent or cure the disease, we shall fail to prevent or remove the debility induced by a salt meat diet; and the occurrence of that debility, I maintain, exercises a predisposing influence in the production of Scurvy. Indeed I believe that even worse effects than mere debility may result

from a long continuance on a salt meat diet, even where fresh vegetables are at the same time consumed, and that the blood may become more or less vitiated under such a diet, although it may not induce that exact condition which developes scorbutic disease. For I have frequently observed in this country, but more particularly in Scotland and Ireland, that persons who in the country live chiefly on salt meat, but with an abundance of vegetable food, both succulent and farinaceous, are very liable to cutaneous eruptions of a squamous, pustular, and vesicular character, and chiefly of a chronic form. But on the other hand, those whose diet was more varied with fresh meat were entirely free from them.

This fact, I think, may be considered to support the opinion I have advanced, and that debility may not be the only result of a salt meat dietary, but that the blood may also become more or less deteriorated from its effects. In the Navy we have not an opportunity of observing the effects of a salt meat diet in combination with fresh vegetable food, for the former is but little used where the latter can be procured, as fresh meat is then substituted. But what Naval Medical Officer has not noticed the visible effects of a long cruise and the continued use of salt meat on the general health of a ship's company, although the allowance of Lemon-juice may have been pretty generally consumed? Seamen will frequently say

themselves, that they have plenty to eat, but that they feel the necessity of a change of diet, and the state of the sick list invariably proves that their complaint is well founded.

Sir Gilbert Blane and other distinguished writers of his day considered that salt meat, from its innutritious character, aided very materially the development of scurvy. He says: "Salt beef and biscuit that have been long kept do not contain much more nourishment than sawdust or the bark of a tree, and the disease induced by this diet is the Scurvy."*

I might cite numerous other authorities in support of the opinion which I entertain and which I have expressed, but I feel it would be quite unnecessary to do so. I shall content myself by noticing the change which takes place in meat that has been salted, and show how far its nutritious properties become thereby impaired. I can quote no higher authority than that of Baron Liebig on the subject, who informs us † "that in the salting of meat, the flesh is rubbed and sprinkled with dry salt, and that where the salt and meat are in contact a brine is formed amounting in bulk to one-third of the fluid contained in the raw flesh, and that this brine contains the chief constituents of a concentrated soup or infusion of meat, and that, therefore, in the process of salting, the com-

* On the Diseases of Seamen, p. 472.

† Chemistry of Food, p. 134.

position of the flesh is changed. In salting, the albumen is separated from the flesh; for, when the brine from salted meat is heated to boiling, a large quantity of albumen separates as a coagulum."

We thus see that by the process of salting, the meat loses its most nutritious constituents, and we can readily understand why debility should result from a salt meat diet, unless those elements of nutrition, of which fresh meat is deprived in the process of salting, are supplied from other sources.

Now with regard to the action of salt upon the animal economy, Dr. T. K. Chambers gives us some information in a very interesting paper on the action of various articles of food on the system.* Dr. Chambers tells us, chiefly on the authority of a German physician, Dr. Böcker, who appears to have investigated the subject with great care, that salt in proper quantity, (such I presume as we are in the habit of taking with fresh meat,) is an important element in the process of digestion, for it is a solvent of the albumen of the food: but that if taken in excess it favours the solution of the tissues of the body, and necessitates an increase in the amount of food in proportion to the waste entailed. Hence, if that increase be not forthcoming, waste of body must ensue and debility must in consequence result.

* British and Foreign Med. Chir. Review, vol. xiv. p. 390, October 1854, and Ranking's Abstract of the Medical Sciences, vol. xxi. p. 350.

We must therefore arrive at the conclusion that the nutritive properties of meat are materially impaired by the process of salting; that debility must ensue from the continued use of salt provisions; and that the action of salt in excess, on the animal economy, entails a waste of tissue: thus causing a doubly pernicious influence to result from a salt meat diet.

From these facts, therefore, supported as they are by the results of experience, we can have no difficulty in concluding that salt meat is a strong predisposing cause in the production of Scurvy, and that it will induce the disease at a much earlier period than when the diet has consisted of fresh meat.

With the knowledge of these facts before us, it becomes a subject of interesting inquiry how far the standard of health enjoyed by our Fleets and Armies might be increased, and how much the diet of our soldiers and sailors might be improved so as to conduce to that result, by preserving meat with a less quantity of salt than has hitherto been used. In former days, the salt provisions of the Navy fully established the truth of Sir Gilbert Blane's observation, already quoted, "that they did not contain much more nutrition than sawdust or the bark of a tree."

Although the salt provisions at present issued in the Navy are much better than they were in former days, and the diet of seamen is in every

respect improved, yet I can well remember on several occasions seeing salt beef issued, which had become so hard that sailors were able to fashion various little ornaments out of it, and it resisted the knife like a piece of wood. The amount of nutrition, therefore, contained in such an article of food, would fully confirm the observation recorded by Blane.

With the knowledge, therefore, which we now possess of the extent to which the nutritious properties of meat become impaired by salting, and of the action of salt in excess on the animal tissues, it becomes a question, what means we can adopt to render the diet of our soldiers and sailors more nutritious and wholesome, and thereby diminish its tendency to the production of disease. I think much might be done towards this object, as I am of opinion that there is much more salt used in the preservation of meat for the public service than is necessary, and that the quantity, therefore, might and ought to be very considerably diminished.

I am also of opinion that spices might be very advantageously used, in lieu of a portion of the salt considered necessary for the preservation of meat, assuming that the latter had been reduced to the lowest necessary quantity.

The use of spices would not only exercise a preservative power on the meat itself, but would compensate also for the diminution of the quantity

of salt. In addition to this argument, Böcker tells us as the result of his experiments with various accessory articles of diet in which spices are included, that these condiments tend to prevent the metamorphosis of tissue, and that they consequently aid in counteracting the waste of body entailed by other causes.

I make these suggestions with a sincere desire to see the diet of our sailors and soldiers improved in the highest possible degree; and when we know how admirably meat can be preserved in the present day without any salt, or with a small quantity only, by those conversant with the art, their aid might be advantageously invoked to improve the diet of our Fleets and Armies.

I feel confident that the results would prove most satisfactory, that the amount of disease would become materially diminished, that the general state of health of the men would be improved, and their efficiency would be proportionally increased.

With regard to the influence of cold and moisture in producing Scurvy, some difference of opinion exists. Still, I cannot concur in the doctrine that "cold has not much influence in producing it,"* and I think that this inference is not warranted merely by the facts that the disease sometimes occurs in sailors who come from warm climates, or who have been in no higher latitudes than the Cape of Good Hope, and that when it

* Library of Medicine, vol. v. p. 67.

does occur in cold climates, it is readily cured by the adoption of proper means.

I am of opinion that cold and moisture do aid very materially in the production of this disease, in proportion to the intensity of these agents, and consequently to the rapidity with which they favour the abstraction of animal heat. This is more particularly the case where the quantity of food is insufficient to supply material for the production of that caloric, which cold and moisture have abstracted. Hence, where Scurvy prevails on board ships, the decks should be kept dry, and the air rendered warm and comfortable. A cold, moist atmosphere between decks is at all times pernicious to the health of a ship's company. I feel satisfied that the fact of the quarters of the officers on board the ships employed on Polar service being kept drier and warmer than those of the men is one of the causes why the officers have invariably enjoyed a greater immunity from scurvy and have been longer able to resist its approach. To this immunity, the better and more varied character of the officer's diet, purchased from their own private resources, must also largely contribute.

It is impossible to deny some degree of influence to the effects of impure air in this disease. I have found, where the ventilation was occasionally rendered less perfect than usual for a few days (from unavoidable causes), and the escape of

impure air was thereby interfered with, that those who were labouring under the disease always experienced more or less aggravation of their symptoms. I think that the existence of a vitiated atmosphere always tends to impart a more aggravated character to Scurvy. Hence, attention to ventilation in this disease, as in every other, should always be an object of our greatest care.

The system of enforcing daily exercise which was adopted, tended generally, to the maintenance of health, as long as the effects of the abstraction of caloric could be counteracted by an adequate allowance of food. But when that allowance failed, the men became less capable of taking the same amount of exercise with an equal degree of benefit.

Any cause that tends to the expenditure of physical power, while at the same time there exists no adequate means to supply the waste, must tend to exhaustion and consequent debility. Under such circumstances it should always be our object to husband the strength of men.

The advantage, therefore, of enforcing a regular amount of daily exercise upon the crew of the Investigator, instead of employing them at laborious and unproductive labour, as had been done generally in former Polar expeditions, must be taken into account, when considering the causes of our longer enjoying an immunity from Scurvy. I have always observed at those periods,

when our crew were engaged at necessary but laborious work, either in connexion with the duties of the ship, or with the still more harassing pursuits of the chase, that the increased number of admissions to the sick-list, afforded ample confirmation of the fact, how much the extra amount of labour had favoured the development of scorbutic symptoms. Indeed, it was not an uncommon circumstance to find that men, who were previously more or less debilitated, presented themselves after one day's very laborious exertion, with symptoms of Scurvy well and fully developed. Moderate exercise tends also to keep the mind in a more healthy and contented state, and, where it can be combined with hilarity and cheerfulness, it tends to retard the occurrence of the disease and to counteract the influence of that mental depression, which generally precedes, and is almost invariably present in Scurvy.

With regard to the influence of *sex and age*, I shall only observe, that I have had no opportunity of judging of the former; but in respect to the latter, I have found that in proportion as the men were advanced in life, and their constitutions were debilitated from the effects of previous Scurvy or from other causes, so much the earlier did they manifest symptoms of the disease. I also observed that those men who were light, active, and of middle stature, enjoyed a higher degree of health and a longer immunity from the disease

than the heavy large men who required a greater amount of food for their support. The former could also endure much more labour and exertion, and they are therefore the class of men I should recommend for Polar service. I cannot confirm the opinion, which has been expressed upon high authority, that the marines were more affected with the disease than the seamen.*

I cannot by any means agree with those who consider that Scurvy is in any degree contagious. There is no evidence whatever to support such an opinion, but as the presence of causes for the production of this disease is for the most part general over a given number of persons, so, where it does occur, all who are within the influence of this causation will naturally become more or less affected, and hence the universality of the morbific agents may have erroneously given rise to the idea of contagion.

* Blane on Diseases of Seamen, pp. 322, 465.

CHAPTER IV.

Scurvy did not make its appearance among the crew of H.M.S. "Investigator" until the spring of 1852, or upwards of two years and three months from the date of the ship's commission. This is the longest period of immunity from the disease, which is hitherto recorded in the annals of Polar service, or which has ever been enjoyed by any ship's company under similar circumstances. But the causes in existence for producing Scurvy were by no means few, as the preceding pages testify. Notwithstanding a sea voyage of six months' duration, and a sojourn of two winters on the ice, during the first of which we were on an allowance of food insufficient for maintaining the body in a state of health and vigour, and during the second of which our allowance was reduced to two-thirds of the original quantity, yet it was not until we had been nearly seven months on this reduced allowance that the disease made its appearance among us. To what causes this unprecedented immunity was attributable, I shall endeavour to

show when speaking of the preventive treatment of the disease.

In order that I may be enabled to convey a somewhat clearer and more accurate idea of the disease as it came within my observation, I purpose to consider it under three heads, viz., 1. Scorbutic Debility or Mild Scurvy; 2. Scurvy Proper; and 3. Acute Scurvy. Although this divisional arrangement may perhaps appear unnecessary, as the three varieties are merely forms of the same disease, differing only in the degree of intensity and development, yet I consider the arrangement to be not inapplicable to a more accurate consideration of the subject, than I could otherwise propose to myself and to my readers.

The symptoms of Scorbutic Debility are of an insidious and masked character, and this form of the disease may be readily mistaken, as I believe it often is and has been, for Rheumatism. But when the circumstances under which it occurs are well and fully investigated, the diagnostic signs will become more and more manifest, and they will fully establish the true character of the disease. Indeed, I believe that a scorbutic taint may very often be met with among the poorer classes in our own country, resulting from the effects of bad and insufficient food, with a deficiency of the vegetable element. This scorbutic cachexy may probably be overlooked in the investigation of the more urgent symptoms of other diseases which have supervened on the primary malady.

The early symptoms complained of are feelings of languor and lassitude, with a disinclination to exertion; headache and giddiness are experienced on assuming the erect posture; the respiration becomes hurried on making slight exertion, or in ascending hills, or going up ladders. The aspect of the countenance becomes somewhat depressed and haggard; and in the circumstances of our position, a loss of flesh and strength was in every case present; pains in the back and loins and weakness of the lower extremities are complained of, but in this stage of the disease they are generally of a transitory character. The skin is dry and harsh, and if the legs are minutely examined, small dark spots or points will be observed here and there at the roots of the hair, and in other spots also unconnected with the hair, but less numerous. This is a symptom which will readily escape observation, if not very minutely investigated by careful inspection. The gums at this early stage of the disease are generally paler than usual, with a slightly tumid or everted line on their free margin, but their colour is not livid; and they are slightly tender when pressed upon. There is likewise a bad taste in the mouth, and the breath is somewhat offensive; the tongue is clean and pale, and looks large and flabby; the pulse is small and weak, the bowels are disposed to be constipated, and there is occasional sense of weight in the hepatic region. There are frequent,

sharp, lancinating pains in the thoracic muscles, and pleurodynia is of frequent occurrence. These muscular pains may be considered more perhaps as the effects of cold, than as being really pathognomonic of Scurvy, yet they deserve attention, as they are of very general occurrence. Hunger is always present, the appetite is greedy and voracious, but there is no marked degree of thirst. The sounds of the heart are normal, and the urine is generally high coloured, becoming readily ammoniacal.

In this early stage of the disease, remedial measures, according to my observations, never failed to afford speedy relief, and after a short period of treatment, men were able to return to their duty. The same causes, however, were still in operation for producing the disease, and as a second attack was always more severe than the first, true Scurvy became fully developed; or, when men labouring under the symptoms of scorbutic debility failed to present themselves for relief, this second and more aggravated form of the disease never failed to supervene, presenting the following characters :—

The patients are always much reduced in flesh and strength. The aspect of the countenance is careworn and haggard, the features appearing to have lost all their former animation. The face is pale and sallow, sometimes presenting a leaden hue. The sense of weariness, languor, and lassitude is

much complained of, with great aversion to exercise, however trifling. The pains in the back, loins, and legs are constant, and much more aggravated than in the previous stage of the disease, but this aggravation is more particularly observed at night. There is a tendency to fainting or giddiness in suddenly assuming the erect, or semi-erect posture, much dejection of spirits, occasional anxiety about the præcordia, palpitation and shortness of breath, at times amounting to dyspnœa. The thoracic pains are much more frequent and severe, and in a few cases which I attended symptoms of Angina Pectoris were present. The skin is always dry, colder than natural, and contracted, presenting the appearance of cutis anserina, with a peculiar scurfy or scaly roughness on the legs,* and as the disease advances, on other parts of the body also. On briskly rubbing with the hand, these scurfy projections fall off in the form of small scales. Petechiæ are now seen scattered over the body, more numerous on the legs and arms than elsewhere; but I have failed to observe them on the face or neck. The small discoloured points of the roots of the hair are considerably larger than usual. The legs from the knees downwards were, in a few cases, entirely of a dark purple colour; in others, of a greenish hue, resembling bruises, and the legs, together with the feet, were generally swollen and œdematous. The character of the œdema is harder

* This appearance has also been observed by Blane, "Diseases of Seamen."

and more unyielding than is observed in other diseases, more particularly as the symptoms of Scurvy increase; and the swelling is aggravated by walking, or by keeping the legs in a depending position. Slight abrasions readily took on an unhealthy, ulcerative action, and effusion rapidly took place from the slightest contusion. Pains and stiffness in the joints are present, more particularly in the knee, ankle, and elbow-joints, and there are rigidity and spasm of the muscles, with much hardness and thickening of the tendons, chiefly of the hamstrings, the tendo-Achilles, and the tendon of the biceps of the arm. The hamstrings are frequently so rigid and contracted as to cause lameness, and in some cases complete inability to straighten or move the limb, which, in some of my cases, was often bent at right angles, causing the greatest pain when any attempt was made to extend it. Nodes on the tibia, the result of effusion, are occasionally observed, and these elevations are somewhat painful when slightly pressed. The gums now present an appearance quite different from that mentioned as characterizing the previous stage or form of the disease; they are swollen, livid, spongy, and painful; they bleed on the slightest touch, or at times even spontaneously, it being no uncommon occurrence for a patient, on awaking from his sleep, to find his mouth filled with blood. In many cases the gums become ulcerated, and pus is freely secreted

at the roots of the teeth, and fungoid growths are occasionally present, which increase with great rapidity. The teeth become partially exposed at their roots, and lie loose in their sockets, so as to render the patient incapable of masticating. The breath is always very offensive, and there is a dark, clammy secretion about the mouth, particularly in the mornings. The tongue is generally clean, moist, and pale. Hæmorrhage from the nose is frequent, and passive discharges of blood from the bowels and stomach take place in a few instances; hæmaturia was present in two of my cases. The pulse is invariably small, weak, and compressible, and occasionally irregular. No abnormal sound accompanies the action of the heart, but its impulse is feeble, and its sounds more diffuse. The chest is unusually clear on percussion, and respiration is generally louder and harsher than is ordinarily observed. The bowels are for the most part constipated, and at the onset of the disease are seldom evacuated more than two or three times weekly, and sometimes less. The alvine discharges are dark, scanty, and offensive, and diarrhœa becomes readily established on the slightest cause. The urine is scanty and high-coloured, but is not materially affected in density; in two of my cases it was albuminous. The mental faculties are for the most part unimpaired, but I observed that the faculty of memory in the more severe cases

became confused and defective, and that there were always strong feelings of depression present. The sleep is disturbed, and the nights are restless, with a considerable aggravation in the muscular pains. The appetite, according to my experience, was always good, and food was eaten with avidity. Thirst in this stage of the disease is certainly increased, and the strongest desire is manifested for acid drinks. The presence of hemeralopia has been observed by some writers* as an early and very constant symptom of the disease: but I am unable to verify the accuracy of this observation, from the fact of defect of vision being at all times temporarily experienced by men coming on board the ship from the ice. The eye previously resting on nothing but a snow-white surface, which always exercised an exhausting influence on the power of the retina, often produced a species of blindness; so that I am unable to describe the occurrence of hemeralopia as a special symptom of scorbutic disease.

This form of Scurvy gradually gives way to appropriate treatment, but recovery is less rapid than in the milder form. When a fatal termination ensues, all the foregoing symptoms increase in intensity; syncope occurs on making the least attempt to rise from the horizontal posture, and the slightest exertion is always attended with extreme danger. Indeed, in the first case that proved fatal (a

* Bryson in "Medical Times," June 15, 1850.

case to which I shall have occasion again to allude) the subject of it spoke to me cheerfully about ten minutes before death, when lying in his hammock, but on turning round he suddenly expired.

The symptoms of the third and last form of the disease, which I designate "Acute Scurvy," appear to be somewhat similar to those which characterize what the older writers called *Hot Scurvy*, from the fact of its being attended with a hot skin and an accelerated pulse; but this form has otherwise received very little notice.

The subjects of this form of the disease were all previously more or less affected with scorbutic debility, but were able to do their ordinary duty. The attack was always sudden, having come on only a few hours before they presented themselves to me; and it was attributable to the effects of cold acting on debilitated bodies, that debility being of a scorbutic character. The same causes in operation on persons not so debilitated would, I think, produce a violent catarrh or a fever.

The subjects of this affection always presented themselves in a state of great distress, anxiety, and prostration, with a skin intensely hot and dry, with an anxious yet haggard expression of countenance, with eyes suffused, respiration hurried, headache, and wandering pains in all parts of the body, but chiefly in the loins and lower extremities. The tongue was furred, and the thirst was intense, the pulse ranged from 120 to 130, and was some-

times higher. The state of the mouth and gums afforded a marked contrast to what is observed in the two preceding forms of the disease. The gums were much swollen, hot, and painful, and of a bright red colour; the mucous membrane of the mouth was in a similar state, and the flow of saliva was much increased. The slightest attempt at mastication was attended with great pain, and nothing but liquid food could be exhibited; indeed the state of the mouth and gums appeared to be the source of the greatest distress to the patient. The secretions were disordered, the bowels were either obstinately constipated, or the attack was ushered in with diarrhœa, in which case the state of prostration and weakness was extreme. The biliary secretion was always deficient, the urine was very scanty, high-coloured, and acid, becoming rapidly ammoniacal, as in the preceding forms of the disease. There was almost an entire absence of sleep, with great restlessness, and occasionally incoherence, and all the symptoms underwent aggravation at night. The appetite was not impaired to the extent that might have been expected under such circumstances, but liquid food was taken in considerable quantity, and apparently relished, although the greatest desire was manifested for acid or cooling drinks. Under the treatment which will be subsequently mentioned, these symptoms generally subsided in the course of a week or ten days, and were always

succeeded by those of the second form of this disease, or True Scurvy. I remarked, however, that the subsequent debility was always greater, the recovery slower, and the gums more extensively diseased than in True Scurvy. Fungosities and ulcerations invariably appeared, with frequent hæmorrhage from the mouth.

Little need be said in regard to the Diagnosis of Scurvy, if due investigation be made of the diet of those labouring under the disease. When this inquiry is made, there will be no difficulty in establishing or ignoring its existence from the presence or absence of those causes which influence its production. The state of the gums, however, will always furnish an early and infallible diagnostic sign, as I have never met with a case in which those parts were not affected; and, indeed, the state of the gums is generally the first symptom to show itself. Attention to the state of the gums, therefore, will always enable an accurate observer to detect the existence of the disease, even before the other symptoms become fully developed; and this is a marked diagnostic symptom to distinguish Scurvy from Purpura or other diseases attended with petechial eruption.

Scurvy is one of those diseases, in the treatment of which the effects of remedies assist us materially in the diagnosis, from the rapidity with which improvement takes place and a cure is effected under proper remedial treatment, which consists

in supplying those articles of food in which the diet has been found defective, viz., fresh vegetables, or in their absence, lemon-juice.

With regard to the complications which occurred in connexion with this disease, as it came within my observation, the most frequent were Diarrhœa, Dysentery, effusion into the Serous Cavities, Rheumatism, and Bronchitis. In a disease where debility and prostration of vital power were the prominent symptoms, it may be easily conceived how critical became the state of a patient, when any of the foregoing diseases supervened.

The attacks of Dysentery and Diarrhœa were generally sudden, and appeared to result from exposure to cold, and inability to maintain in the system a due degree of warmth. In the majority of cases, constipation of some days' duration had preceded, and the retained fæces may have acted as a source of irritation on the intestinal mucous membrane.

The most alarming state of prostration followed the alvine evacuations, which in the dysenteric attacks were of a muco-sanguineous character, and in the rest were mucofæculent, and frequently of a pure rice-water character. It was by no means an infrequent occurrence that one evacuation prostrated a man so much as to render him unable to stand without support, and the tendency to syncope was so great that strict confinement to bed became necessary. Even the calls of nature

were necessarily obeyed in the horizontal posture, as life was absolutely placed in peril by the patients being allowed to get out of bed or sit up, and thus to incur the danger of fatal syncope. Thus a disease otherwise simple in its nature, and occurring in a mild form, becomes one of a most formidable and dangerous character when associated with a scorbutic habit, and it then demands the most prompt treatment for its removal.

I remarked in these diseases that in addition to their usual symptoms, which it is unnecessary to narrate, the secretion of the liver was generally deranged, and the flow of bile was scanty. A sense of weight occasionally amounting to pain in both hypochondriac regions was almost universally present.

The occurrence of diarrhœa or dysentery where the patients were in the first stage of Scurvy, generally developed the second stage, or where they supervened on the latter, they never failed to aggravate the scorbutic state.

As an instance of the rapidity with which an attack of Diarrhœa may prove fatal, when occurring under the circumstances I have mentioned, in confirmation of what has been stated by other writers on this disease,* I shall very succinctly narrate the particulars of the first case of death that occurred.

John Boyle, aged 29, A.B., of rather slight

* *Vide* Lord Anson's Voyage, &c.

frame of body, states that he had been at sea from his boyhood in the merchant service, where he had endured considerable hardship and privation. In 1849, in a voyage from the East Indies in a ship badly provided in everything, he, with nearly all the rest of the crew, became affected with Scurvy in an aggravated form, for which, on his arrival in England, he was successfully treated on board the "Dreadnought" hospital ship. Soon after his discharge from hospital, he entered on board a merchant vessel bound to the Pacific, and at Honolalu, in the Sandwich Island of Oahu, in July, 1850, he was entered on board the "Investigator," to complete our complement before entering the ice.

At that time he afforded no evidence of the presence of scurvy or other disease, and although not a strong man, yet he was light and active, and until the third winter of our sojourn in the ice, he had enjoyed good health. At this time (October 1852,) he, in common with the rest of the crew, expressed a strong sense of growing debility, and in the course of the winter was treated for mild scurvy, with which he was then affected, and was in due course discharged to duty.

On the evening of the 4th April, 1853, without any other cause than those generally existing, namely, cold, hunger and want, he was seized with a brisk attack of diarrhœa, with rice water

evacuations, followed by much prostration. Towards bed-time, however, about two hours after its occurrence, he felt better, and thinking it would pass off, made no application for relief until the following morning at eight o'clock, when he presented himself before me. He was then pale, haggard and dejected in aspect, he felt weak and faint, but had been purged only slightly during the night, and again in the morning: the surface was rather cold, he had some shivering; the power of utterance was somewhat impaired, and there was slight incoherence in his replies. The pulse was weak and small, and the heart's action feeble, the tongue was clean and moist, the gums livid and spongy, and there were petechial spots on the extremities.

His state was such as to call for the most prompt measures. He was immediately placed in bed, and under the treatment adopted, the warmth of body was re-established; he became generally more comfortable, and at noon, (four hours after his admission) the diarrhœa was arrested; no further purging took place during the day, and he continued, as I thought, and as he expressed himself, much better and steadily improving, but still weak. At 3 p.m. he partook at intervals of food and wine, which he appeared to relish, the food consisting of preserved fresh meat and potatoes. The pulse had become fuller and stronger, the aspect of the countenance was improved, the

expression was more animated, and he was quite collected in mind.

As the diarrhœa had ceased, the medicine (carminative draughts with chalk and opium) was given less frequently, but the wine was continued steadily at intervals, occasionally in combination with lemon juice. At 5 p.m. he was still going on favourably, dozing a little from time to time. At 7 p.m. he expressed himself to me as feeling still better, and his general state afforded every corroboration of this statement. I was not then under any apprehension of an unfavourable termination of the disease. At 10 p.m., however, I again saw him; he was then sleeping tranquilly, having a short time before taken his wine with a dose of Dover's powder, which had been previously prescribed. Before I left the sick bay he awoke, and spoke to me, and afterwards cheerfully conversed with the man lying next to him, and called to the night-watch for a little drink, which was given to him in the horizontal posture. He then slumbered for a few minutes, awoke, and again made some casual remark to the man next him. A few minutes afterwards he was heard to breathe somewhat heavily, when I was called; and although the space of five minutes had not elapsed from the time his breathing became oppressed until I was in the sick bay, and not more than ten minutes from the time he had last spoken to me, yet he had ceased to exist before I reached him, and he

must have expired in the most easy and tranquil manner.

This case ought to be a warning to all those who may be called upon to treat diarrhœa supervening on a scorbutic habit. There can be no more insidious or dangerous complication of Scurvy than diarrhœa, or one more likely to be attended with fatal results. There is nothing novel in a fatal termination occurring under such circumstances as I have before stated; but the fact is fully illustrative of what has been previously advanced as to the mode in which death removes its victims in this disease, from the directly exhausting influence of diarrhœa on a scorbutic habit; thus inducing fatal syncope. The vital power is not sufficiently strong to withstand the exhausting effects of an attack of such suddenness and of such comparative severity.

No *post-mortem* examination took place in the above case, for reasons unnecessary here to allude to.

Such were the general characters of the cases of Dysentery and Diarrhœa, associated with a scorbutic diathesis, as they came within my observation; all of them, with the exception of the case just mentioned, had a favourable termination.

Ascites, one case of which proved fatal, and which I shall briefly relate, was the next most frequent complication. The case in question may

be taken as a fair type of this disease, when supervening on a scorbutic habit, and it fully exemplifies the character and extent of the effusion in Ascites, and the rapidity with which it takes place. In all my cases the effusion occurred in the most insidious manner, and was not preceded by any symptom of functional or organic visceral disease; the attention of the patient being first directed to its presence by the inconvenience experienced from the progressive enlargement of the abdomen.

The following is the fatal case referred to:— John Kerr, æt. 34, gunner's mate, was placed on the sick list on the 8th of February, 1853. He was naturally a man of a spare habit of body, who, up to this period, had enjoyed good health, but had been for some time losing flesh and strength, and had become extremely attenuated. He had been at sea from his youth.

He was seized with dysentery when doing duty as quartermaster of the watch on the previous night, about six hours before admission, the temperature of the air being at the time 46 degrees below the zero of Fahrenheit.

On presenting himself to me, he was in a state of extreme prostration and weakness, and so faint and helpless that he was quite incapable of walking or even standing without support. His power of articulation was impaired, and he replied to questions in a confused and incoherent manner.

His aspect was pale and haggard, the expression anxious, the features collapsed, the eyes appeared sunk in the sockets, the nostrils were dilated, and the respiration was hurried. The surface of the body was cold, rigors were present, and there were occasional cramps in the muscles of the chest, abdomen, and legs. Pulse 108, weak and small. Tongue clean and moist anteriorly, but furred towards its base. Gums tender and spongy, with a line of lividity on their free margin. Minute petechiæ on legs. A slight feeling of soreness was experienced on making firm pressure on the abdomen, but there was no pain on respiring. The purging had set in suddenly, not being preceded by any previous symptom, but the bowels had been torpid and irregular throughout the winter. The evacuations were frequent and copious, and but little subject to the control of the will (a circumstance of almost universal occurrence in all dysenteric and diarrhœal cases at this period): they were of a muco-sanguineous character, and accompanied with severe tenesmus and occasional griping. The urine was scanty, high coloured, and not coagulable.

The most prompt means were taken to establish the natural warmth of the body by all the artificial means at my disposal. The man was placed in bed, hot applications were used in various forms, warm drinks and carminatives with wine were exhibited, and a sinapism was applied to the

region of the abdomen. The early administration of chalk, in combination with ipecacuan and opium, was likewise resorted to, and suppositories of opium were introduced into the rectum. Under this treatment an improvement took place in the course of the day; he felt much more comfortable, the purging had considerably abated, the evacuations were more scanty and less sanguineous, the tenesmus was less urgent, the heat of the body had been restored, the pulse became fuller and stronger, he partook of some food, wine was given at intervals, and a full dose of Dover's powder was administered at bed-time.

On the following day I found him still further improved, and the purging was much less frequent; but he remained in a state of extreme debility. For the next few days he continued improving. The acetate of lead with opium was now administered with excellent effect, the purging ceased, and the appetite gradually improved.

At this time, which was about six days after his admission, I detected, in the lower part of the abdomen, an obscure sense of fluctuation, which rapidly became more distinct, until Ascites was fully established. His debilitated state entirely contra-indicated the use of active remedies for the removal of the effusion; and I therefore thought it more judicious to effect it, if possible, through the medium of the skin; and, as the liver

had manifested signs of torpidity, it became necessary to arouse it to a state of greater activity. For this purpose small doses of Hydr. c. Creta, with Dover's powder, were given, accompanied by diaphoretic draughts of Sp. Æth. Nitr., alternated with nitrate of potass. in mist. camphoræ, and sinapisms were applied to the hepatic region. This treatment arrested the progress of the effusion, and, indeed, slightly diminished it; but the diaphoretic effect could not be fully established, and the results were, therefore, not so beneficial as I had hoped. His enfeebled state and want of due vascularity may fully account for this comparative failure in the effects of the treatment. The bowels were maintained in a state of regularity, the secretion of the liver had become more active, and his general state was otherwise improved. He was able to sit up in bed and take his meals without feeling faint. I now determined, however, to act as I had done in former cases with much success, and to transfer the action to the kidneys, and with this view I had recourse to Sup. Tart. Potass. in combination with Pulv. Zingib. in doses varying from 1 to 2 drs., thrice daily, with a diuretic draught nightly, composed of Sp. Æth. Nitr. in Mist. Camph. Wine and lemon-juice were likewise exhibited daily, with marked mitigation of the scorbutic symptoms. Under this treatment the effusion sensibly diminished, the urine became much increased in

quantity, the breathing, which had been at times greatly oppressed, was now performed with ease and comfort, and in all respects the patient was better; yet he remained in a most enfeebled condition, and beyond a certain point further improvement appeared to be arrested, although he had all the support that it was in my power to bestow. The greatest extent to which the effusion could be reduced was about one inch below the umbilicus; but beyond this, no remedial power that I possessed could reduce it; and the medicine which promised to be the most likely agent to effect the reduction (cream of tartar) had become entirely exhausted from its constant use. I had already tried the effect of all the diuretics in my possession, with the amount of benefit I have already related, and the only one left untried was the pil. digitalis et scillæ, and this medicine, from its activity and power, I had hitherto considered inadmissible for use in a subject so enfeebled, but necessity now compelled me to have recourse to it.

It was therefore given accordingly, in small doses three times daily, with a marked good effect in reducing the effusion, and increasing the quantity of urine; but, owing to its cumulative power, its physiological action became suddenly manifest on the third day after its exhibition, together with a train of the most alarming symptoms, and I was consequently obliged to discontinue its use.

The patient was suddenly seized with dimness of vision, dilated pupils, intolerance of light, nervous tremors, and general trepidation. The pulse became small, weak, and irregular, and the power of distinct articulation was entirely gone; great efforts were made to speak, but only discordant, muttering sounds could be uttered, and even the power of uttering these was impaired from partial paralysis or loss of nervous power in the organ of voice itself. He gazed about in a wild, confused manner, and made great efforts to speak in reply to questions. A semi-lethargic state supervened, and the evacuations ceased to be under the control of the will. He was seized with the above symptoms very suddenly, as there had been no previous evidence indicative of their approach; indeed, he had been talking quite rationally only a few minutes before, and I had seen him about an hour previous to the attack, as I was carefully watching the slightest manifestation of the physiological action of the digitalis, which had thus so suddenly exerted its power.

Stimulants were at once administered, in the forms of wine, brandy, and ammonia, with good effect. The pulse soon became fuller and more regular in its action, and, in the course of a few hours, the power of utterance had become partially restored, and he continued to improve in other respects until the symptoms disappeared; but he could give no account of the state of his

feelings previously to or during the attack. The further use of digitalis had thus become inadmissible, and I was again obliged to resort to the method of treatment which I had in the first instance adopted, varying it according to circumstances. The Sp. Terebinth. was exhibited in diuretic doses, and for a time with considerable benefit, but it soon ceased to exercise its good effects; and the same may be said of the other remedies which I have previously mentioned. Thus he continued for some days, the extent of the effusion varying from time to time, as proved by measurement, by the degree of flaccidity or distension of the abdomen, and by the state of the respiration. At length the effusion had increased so much, as seriously to impede the respiratory function, and to render the occurrence of thoracic effusion highly probable. His distress and suffering at this period, and his enfeebled condition, were most painful to witness.

With the view, therefore, of at least removing urgent symptoms, and preventing for a time what otherwise appeared to be inevitable—viz., thoracic effusion and death, I determined on removing the fluid from the abdomen by operation, although only a temporary amount of good might be expected. There was, it is true, on the one hand, a great chance of fatal syncope ensuing on the removal of the fluid; but, on the other, a remote hope existed that the fluid might not re-accumu-

late in the same proportionate degree as before, and that a better state of things might therefore perhaps be established.

The operation of "Paracentesis Abdominis" was therefore performed on the 4th of April, and nine pints of bloody serum were drawn off, of a dark, port-wine colour, and of rather muddy character. The operation afforded him great and early relief, although he became faint during its performance, and afterwards occasionally required the administration of stimulants.

For a few days he appeared to improve, but the hopes of recovery were fallacious, for the fluid began to re-accumulate in the abdomen, his strength became still more impaired, and all the means at my disposal failed to restore him, or even to support him against the progressive debility and utter want of power which supervened. He became dull and stupid, and at times was incoherent and wandering. Convulsions followed, several attacks of which occurred daily, each in succession more severe than the preceding, and threatening a fatal termination. He was sustained in this state by means of minute quantities of food, and by stimulants and antispasmodics. The effusion still went on slowly increasing, with almost entire loss of the power of utterance and deglutition, and he gradually fell into a state of coma, only interrupted by occasional convulsions, until he was released from his

sufferings by death, on the morning of the 12th of April.

Sectio Cadaveris. 10 *hor. post mortem.*

The body was the most attenuated I had ever seen. On opening the thorax about 2 oz. of bloody serum were found in the pericardium. The heart was small, pale, and flabby, but was otherwise free from disease. The lungs were healthy, but appeared small, were partially collapsed, and slightly congested posteriorly. About 1½ pints of bloody serum were taken from the cavity of the left pleura, and about 8 oz. from that of the right side. On opening the abdomen about three pints of bloody serum were found in its cavity. The peritoneal surface of the stomach and bowels was of a dark colour, and presented a solid deposition like dark fibrine, which was with facility scraped off with the knife, leaving the serous covering partially discoloured. The liver was of natural size, but of dense structure, dark-coloured, and congested. The spleen appeared smaller, harder, and firmer than natural; the kidneys were small and much congested. The head was not examined.

The result of this case afforded a truthful indication of the state of debility which existed, and it was evident that very little cause was required for the occurrence of secondary disease such as Ascites, or of others usually attended with a fatal termination. There was an entire absence

of any organic disease, and there only existed that degree of congestion in the liver and other organs which evidently had existed for some time, and which retarded the circulation through their substance. A great alteration had evidently taken place in the composition, and vitiation in the quality of the blood, judging from the character of the effused serum and the rapidity with which that effusion had taken place. I shall again refer to this point in connexion with the pathology of the disease.

The third and last death which occurred on board the Investigator, previously to her abandonment, was the result of Pericarditis, attended with effusion, and was no less remarkable for the insidious nature of the disease than for the rapidity with which effusion took place.

The disease as it occurred appears identical with that described by Dr. Kyber as Pericarditis Scorbutica,* and also by Dr. Seidlitz, of St. Petersburg, under the name of Hæmorrhagic Pericarditis.† The case is as follows :—

John Ames, A.B., sick-berth attendant. Had been at sea from his youth; had served principally in warm climates; and in China suffered severely from intermittent fever and dysentery. Of the former disease he had had a few slight

* Pericarditis Scorbutica, and its Treatment, by Paracentesis, by Dr. Kyber in Œst. Med. Wochenschr, and Monthly Journal, and Ranking's Abstract, Vol. 7, p. 65.

† Vide British and Foreign Medical Review, Vol. 1, p. 262.

attacks in the ship. He was strong, and of a robust habit of body, and, with the exception I have mentioned, enjoyed general good health up to the period of his attack; but, like all the rest of our crew, he had felt his strength declining for some time, and his health becoming gradually impaired from the supervention of the scorbutic taint.

On presenting himself to me on the 2nd April, 1853, his countenance was haggard and dejected. He complained of a sense of weight and oppression in the cardiac region, where he had felt, two days previously, a little transient uneasiness, not amounting to pain; but he made no complaint, thinking it would pass off. His breathing, on admission, was somewhat hurried and oppressed, but more so on assuming the horizontal posture. He felt weak and faint on moving the body, with a tendency to syncope. There was sickness, with loathing of food, and great irritability of stomach; he was unable to retain the mildest food, either solid or fluid; and he appeared dull and stupid in his replies to questions.

On examination of the chest, there was found extensive dulness on percussion in the cardiac region, the left side appearing fuller than natural when compared with the opposite side, and the costal cartilages protruding a little. The heart's impulse was scarcely perceptible, its action was weak and irregular, occasionally intermitting, but

no abnormal sound accompanied its pulsations, and there was, therefore, no evidence of the existence of valvular disease. The respiration was audible in the upper two-thirds of both lungs, but it was faint, and almost inaudible in the lower lobes. The pulse was 96, small, weak, and irregular. The tongue was pale, flabby-looking, and moist; gums livid, tender, and spongy; and the other symptoms of scurvy were present. The skin was cold, and disposed to shivering; the eyes heavy and inexpressive. The bowels were irregular; there was also thirst; but the patient was unable to retain any drink.

As it was evident that extensive effusion had already taken place into the pericardium, and also into the pleura, the removal of the fluid from the former became the first object of treatment. A large blister was at once applied to the cardiac region, the surface having been previously stimulated to induce early vesication; the bowels were acted on by enemata; and calomel, in combination with opium and ipecacuan, was administered with a view of inducing early ptyalism, and promoting diaphoresis. The blister rose well and rapidly, affording him considerable relief, as he subsequently breathed more freely, felt less sense of oppression, and expressed himself as feeling more generally comfortable. The blistered surface was dressed with weak mercurial ointment; and when ptyalism supervened, as it

did on the third day after his admission, he appeared easier, but a sense of great oppression and weakness was still present, and the state of the heart and pulse gave but little indication of the effusion having become very materially diminished. A distressing and afterwards almost incessant irritative cough gradually came on, induced by the pressure of the distended pericardium on the diaphragm and stomach. The latter organ had become so irritable that nothing whatever could be retained, and it appeared quite beyond the power of medicine to allay this irritability (arising as it did from the causes I have mentioned) until the pericardiac effusion should become diminished.

Various means were adopted with a view of tranquillizing the stomach; opium in various forms and proportions, hydrocyanic acid, turpentine, creosote and effervescing draughts were successively administered, with no permanent good result. The saline draughts, with one or two drops of creosote, appeared to produce the most tranquillizing effect for a time, but all were ultimately rejected. The bowels were kept free by emollient and stimulating enemata, which always afforded a little temporary relief; and as I could not depend on any medicine being retained, even in the form of a pill, I was obliged to have recourse to mercurial inunction, with a view of maintaining the ptyalism, the presence of which appeared to keep

the effusion in check. Blisters were reapplied to the regions of the heart and stomach, but with no very marked effect; and from the low, weak, and irregular action of the heart, and the almost constant tendency to faintness present, it became necessary to have recourse to stimuli in the form of wine, brandy, and ammonia, which were seldom retained for more than a few minutes. The breathing was performed with still greater difficulty, the sense of oppression increased, syncope became more frequent, with signs of increasing effusion into the pleuræ, the face and lips becoming livid and puffy. These symptoms gradually increased, and remedial means at length afforded very little relief; everything was ejected almost as soon as it was swallowed. A state of coma gradually supervened, from which stimulants, either in the form of injection, or applied externally, failed to arouse the patient to a proper sense of consciousness. The extent of the effusion produced a feeling of suffocation, from which, and the consequent imperfect oxygenization of the blood, he died in a comatose state, on the morning of the 9th of April, at 1 A.M., less than seven days from the period of his admission.

Sectio Cadaveris. 10 *hor. post mortem.*

The surface of the body was generally livid and discoloured. On opening the thorax, the pericardium was quite distended, with dark bloody serum,

barely distinguishable from blood itself. A patch of soft, fibrinous effusion, about the size of half-a-crown, was found towards the apex of the heart, very slightly attaching it to the pericardium, by a few slender threads, the connexion being easily broken, by the slightest touch. The heart itself was of good size, and there was no valvular disease present. Both the pleural cavities were quite full of fluid, similar in character to that found in the pericardium, with some old adhesions on the right side. The lungs were much congested, partially compressed, but otherwise free from disease. The abdomen contained about a pint of dark bloody serum. The liver was considerably enlarged, congested, and somewhat indurated, and the spleen was found in a similar state; the other organs were free from disease; the head was not examined.

The unfortunate termination of this case fully revealed the great constitutional change which had taken place in us all, as this was one of our strongest seamen, and on this account he had been one of those selected to remain in the ship, when necessity compelled us to detach one half of our crew, in the hope of their reaching a place of safety. Yet so low had the vital power become, that here we found a disease, originally of an inflammatory character, (and one which, under other circumstances, would have attracted the patient's attention from the acuteness of the symptoms,)

advancing so insidiously, that he became aware of its presence only when extensive effusion had taken place as its result. The extent and character of the effusion are likewise corroborative of the remarks made in connexion with the case of Carr, as the blood in both cases appears to have undergone the same degree of change and vitiation.

It may therefore be inferred that, in all the other cases where effusion had taken place, the effused fluid was of a similar character.

CHAPTER V.

As Scurvy evidently depends upon, and is caused by, an alteration in the physical and chemical properties of the blood, as I have previously stated, we are necessarily led to inquire what is the exact pathological state of the vital fluid which induces the disease. I had no opportunity of making any experiments on the morbid state of the blood; for the circumstances of our position rendered the loss of a single drop a matter of consequence. From deficiency of food we were without the means of supplying it, so that it was always our object to make blood rather than to lose it. The abstraction of the smallest quantity, indeed, would have been quite unjustifiable.

Although few analyses have yet been made, much difference of opinion exists as to the relative quantity of the various constituents found in scorbutic blood. Some authors maintain that the amount of fibrine is increased, others that it is diminished. Among the former may be mentioned the names of Busk and Andral, and amongst the latter those of Becquerel and Rodier, Chatin

and Bouvier, and some others. MM. Becquerel and Rodier state,* that in acute scurvy the quantity of fibrine is often increased, or it remains unchanged; whereas, in what they term chronic scurvy (analogous, I assume, to the second form of the disease as I have described it), the quantity of fibrine is diminished. But it is worthy of remark, as regards the amount of fibrine, that it is always associated with the colourless corpuscles of the blood, as these corpuscles and the fibrine cannot be separated from each other. These authors also assume the existence of an increased quantity of soda in the blood, though without being able to establish the existence of the fact. But on this supposition they infer that its presence induces a more ready solubility of the fibrine, and its consequent transudation. This view is advanced in connexion with the etiology of the disease (salt meat diet), and with the efficacy of the vegetable acids in its treatment. These acids, by combining with the soda, are supposed to eliminate the alkali from the system by the kidneys in the form of carbonate of soda.

However plausible and ingenious the views here advanced may appear, they cannot be supported in those cases where the etiological agency is absent, and in other cases of Scurvy where fresh meat has been the principal article of diet. Nor does the hypothesis appear tenable in those cases

* Pathological Chemistry, translated by Speer, pages 134 *et seq.*

where the salts of the blood are at or below the natural standard, and where the fibrine coagulates readily; results that have been stated by some writers on the subject.

Could the fact of the existence of an excess of soda be clearly established, by a series of accurate experiments,* the pathology of the disease would become wonderfully simplified, from the known physiological effect of alkalies on the fibrine of the blood, and a clear indication would be afforded for treatment, in eliminating them from the system. Be the fact as it may, however, we know that in this disease the plasticity or coherent power of the fibrine is diminished, from the facility with which it is effused, and the difficulty experienced in some cases of separating it from the red globules. This circumstance tends to support the views advanced by Becquerel and Rodier, which are further strengthened by the fact that lemon-juice is undoubtedly the most efficacious agent in the cure of the disease, from its combining with the soda, as previously mentioned.

In those cases where the quantity of fibrine is diminished, it becomes a question whether the decrease is proportional to the extent of the fibrine which is effused, or if the diminution has been chiefly found in those cases only, where considerable effusion of fibrine had taken place,

* In Mr. Busk's experiments, the quantity of the salts in scorbutic blood were found increased in each case.

and which effusion might account for the deficiency of fibrine in the circulating blood.

Becquerel and Rodier found it increased in Acute Scurvy and diminished in the Chronic form, and there is no question that effusion is much more generally observed in the latter than in the former. In future experiments on scorbutic blood, it would be an interesting fact to ascertain, how far an excess or deficiency of the fibrine can be associated with the presence or absence of its effusion.

I incline to the opinion that, in all cases where Scurvy has become fully developed, the amount of fibrine will be found diminished and its plasticity impaired; and I cannot but consider, that in those cases, where analysis has yielded a contrary result, the disease has been either too imperfectly developed or insufficiently prolonged for the blood to have acquired those qualities which are characteristic of Scurvy.

The experiments of Becquerel and Rodier, four in number,* are corroborative of this opinion; for in proportion to the duration of the disease, there was a decrease in the amount of fibrine. In support of this view, I may also mention, that bloodletting, an operation which enabled those gentlemen† to experiment on its properties, could not be practised with any degree of safety, except in

* Pathological Chemistry, pages 135 *et seq.*

† Andral, Busk, and others.

cases in which the disease was not fully developed, and in which the physical powers were not impaired to the extent that I have seen them reduced when the disease was completely established.

I incline also to the opinion, that the salts of the blood are in excess in this disease, and, from their well-known action on fibrine, that their presence in abnormal quantity will enable us to account for the great alteration which takes place in the physical characters of the blood.

In a very ingenious essay lately published,* Dr. Garrod relies on the result of one analytical experiment (only one, be it remarked) on the serum of the blood, in which he found a deficiency of potash, and on this case he bases a theory for the treatment of the disease. The circumstance of having performed one solitary experiment on the serum of scorbutic blood, however accurately it may have been conducted, does not necessarily establish a theory, and still less does it justify us in founding a plan of treatment consisting in the exhibition of such an amount of potash, as that in which the blood is supposed to be deficient. The majority of the analyses that have been made of scorbutic blood prove that the salts are increased in quantity, and that upon the excess of its alkaline constituents its vitiation may depend. Hence the alkaline treatment of the disease is not tenable, and I believe that

* Monthly Journal of Medical Science, January, 1848.

such treatment would be not only inefficacious, but positively detrimental in any form of Scurvy.

In all the analyses that have been made of scorbutic blood, as far as I am aware, the proportion of corpuscles was found considerably diminished, a fact which explains some well-marked symptoms of the disease, such as the peculiar aspect of countenance, and other signs, which are referable to a deficiency in the vivifying power of the blood. It now becomes a question of interest to ascertain, whether the red globules undergo any change in their physical properties in this disease. On this subject I regret to say that our knowledge is very defective. MM. Chatin and Bouvier could observe no alteration in the form of the red or white corpuscles, when placed under the microscope; but Dr. Ritchie, in his observations, thought that he found them more irregular in outline and more flattened than usual.* An opinion very generally prevails among physicians, that in this disease the globules are dissolved in the serum, and, in the absence of facts to refute this opinion, I think we are fully justified in maintaining it, not alone from what is observed in this disease during life, but from the appearances after death. The fact that blood in a few cases separates into clot and serum, as in healthy blood, does not in the least invalidate the opinion entertained on this subject. Although Dr. Budd states to the

* Monthly Journal of Medical Science, July and Aug. 1847.

contrary,* yet, I believe, this separation, as in healthy blood, will only be found to take place where the disease has not been of long continuance, and is not perhaps fully developed. I am persuaded, however, that such a result would not have taken place in the cases that came within my observation, had I been sufficiently injudicious as to have practised bloodletting in their treatment. The testimony of the older writers, especially of Lind, Blane, and Foderé, and that of the surgeon in Lord Anson's ship, goes in support of the opinion, that the blood does not separate "into clot and serum, as in healthy blood," but presents every appearance of disorganization.

Now, as the weight of opinion and the majority of experiments incline us to believe, that the fibrine and albumen are physically changed, and that the other constituents of the blood are more or less altered, how can we possibly suppose that the red globules alone will escape the change which still affects the other constituents of the fluid? That these globules are unaffected appears to me a conclusion impossible to be arrived at, in the face of what we observe in the disease, when, for instance, we observe the readiness with which blood becomes effused in the tissues not only in the form of Petechiæ and vibices, but as a consequence of the slightest bruise or injury. But facts still more conclusive are furnished by the

* Library of Medicine, vol. v. p. 91 (note).

character of the effusion as observed at the *post-mortem* examinations in the cases narrated, and also by the appearance of the fluid effused during life, as in the case in which I performed the operation of Paracentesis Abdominis. In the cases alluded to, the serum was so charged with the colouring matter of the blood, that I could liken it to nothing more truthfully than to thick and muddy port wine. It appears to me, therefore, impossible to deny, that the blood globules undergo a great physical alteration in this disease, and that the colouring matter becomes more readily soluble in the serum.

With regard to the state of the albumen in this disease, it would appear from the analyses, that in quantity it undergoes but little change; but the majority of experiments show a slight decrease in its amount from the normal state. MM. Chatin and Bouvier have, however, recorded a remarkable fact in connexion with its physical character,* viz. that in a case of Scurvy in which they examined the albumen, it did not coagulate at the usual temperature, about 158° F., but required a temperature 7° higher for that purpose. As the coagulability of albumen is found to be lessened by alkalies, the necessity of a higher temperature for its coagulation in this disease is an indirect proof of an excess of alkalies, and is

* Journal de Chimie Médicale, Mars 1848, p. 144.

corroborative of what has been previously stated as the result of analysis.

This appears to me a very important point to establish in connexion with the pathology of the disease, and it is to be hoped that further investigation will tend to increase our knowledge on the subject, not alone in relation to this, but likewise to the other constituents of the blood. By such investigations it is probable that the morbid change which they undergo will be fully ascertained, and that the action of those remedies, which are now so efficacious in the cure of the disease, will be better understood than they are at present.

The quantity of water in scorbutic blood has been found in all the analyses which have been made, to be increased, a fact which may readily be conceived, from the great tenuity of the blood in this disease.

With regard to the opinions that have been advanced by some writers, that Scurvy is caused by a deficiency of one or more of the mineral constituents of the blood, such as sulphur, phosphorus, lime, &c., it is unnecessary here to notice such a theory, further than to state that it is entirely unsupported by any trustworthy evidence to warrant such a conclusion. No refutation of this opinion is necessary, except in stating, that by supplying those substances (phosphorus or sulphur) in proportions corre-

sponding to the deficiency existing in the blood, we shall utterly fail in curing the disease.

I think the same doubts may be entertained of the theory which has assigned the want of milk or other nitrogenous products as a cause of the disease, and of the induction of that state of the blood which produces it. Those who have advanced these views will find occasion, I am fully persuaded, to alter their opinion, if they rely on milk or nitrogenized food only in the treatment of Scurvy.

In bringing these imperfect observations on the state of the blood to a conclusion, it must be admitted that our knowledge of its pathological condition is still defective; and, as much remains yet to be accomplished in this department of medical science, it is to be hoped that the researches of those distinguished men who have already contributed much to our knowledge of this subject, will by future investigation add still further to its elucidation.

CHAPTER VI.

As there is no disease, the occurrence of which it is so much in our power to prevent as Scurvy, the consideration of the treatment necessarily resolves itself into that which is *preventive* and *curative*.

The same observation does not so fully apply to any other of the many evils to which our flesh is heir, many of which depend very much on causes more or less accidental, or rather are such as we cannot with accuracy always foresee. But in Scurvy the case is different, for we know exactly the circumstances under which the disease will occur, the causes which produce it, and the means which will either prevent or cure it. With this knowledge, therefore, and with the proper means at our disposal, and the exercise of judgment and vigilance in using them, this disease should in the present day be unknown in our Army and Navy, and indeed among all communities of persons.

A consideration of those causes which appear to me to exercise an influence in producing the disease, will, in a great degree, guide us in its preventive treatment; but, before speaking more

in detail on this subject, I wish to offer a few observations on those Hygienic measures, the full and complete adoption of which exercises so much influence in maintaining the health of our seamen at a high standard. But that the success of this Hygienic agency may be rendered more complete, it is necessary that those on whom its influence is to act should at least be, in regard to general health, at a fair average standard. This subject, therefore, brings us to the consideration of that important part of the duty of the medical officers in the public service—viz. the entry of men.

I know of no duty to which a greater degree of responsibility is attached than the entry of men, or one, the due performance of which demands so much care and attention, or the neglect of which is so highly reprehensible. When we consider that the efficiency of the Public Service absolutely depends upon the judgment and care which are exercised in the selection of the men, means should be taken to ensure that this duty should never be performed in a light or careless manner. But, on the score of national expense, it is a matter of grave import that the Public Service should not be burdened with men who can render no adequate service for the pay which they receive, who too frequently become the occupants of the sick-list from the day they enter the service, and who ultimately present themselves before an Invaliding Board.

I have frequently seen, during my course of service in the Navy, when acting on Invaliding Boards, men brought forward for survey a few months after their entry, labouring under diseases which were never contracted in the Service, and which the exercise of greater care and attention might possibly have detected. I believe that the number of men in the Navy invalided annually from Foreign Stations might be considerably reduced by the observance of greater care than that which is sometimes bestowed on the examination of men previously to their entry.

As I am fully impressed with the great importance of this examination, it is a duty that I have seldom deputed to my assistants when I am present myself; and when I do depute this duty to others, their report of men's efficiency always receives my personal confirmation. I cannot but consider that the care bestowed in the selection of the Investigator's crew exercised a very important influence on the standard of health enjoyed; and had the men been less efficient than they proved themselves, Scurvy of a more inveterate character might have appeared at an earlier period, and I have no doubt that our mortality would have been considerably greater.

This is a duty, therefore, which demands our best care and judgment in its performance. I would wish particularly to direct attention to the necessity of observing whether there exists

such a degree of constitutional debility from strumous or syphilitic taint as to predispose to the production of other diseases from exposure or hard service. Although men may be free from any organic disease, yet the existence of either of the foregoing constitutional taints, in an intense degree, should form a disqualification against admission into the Service. A simple strumous habit is not of itself sufficient to disqualify a man, for a sea life generally improves this habit; but, when combined with secondary eruption, it becomes a very doubtful question how far a person so affected is fit for Her Majesty's Service.

The state of the chest should always form a subject of our especial attention. I have never entered a man or boy in the Navy without making such a stethoscopic examination of the heart and lungs as to satisfy myself that these organs were free from disease. Where this practice is neglected, there is no guarantee that a man is fit for service, and a medical officer who fails to adopt the practice, does not properly do his duty, and should be gravely censured for such palpable neglect. My experience leads me to fear that this duty is often neglected where the healthy aspect of men appears to render unnecessary a physical examination of the heart and lungs; but I would appeal to every one, who has, as a rule, adopted the practice, to state what an amount of existing and latent disease it has enabled him to

discover, even in cases where appearances might scarcely have seemed to call for the necessity of an examination. I would, therefore, strongly urge on all my Professional brethren in the Navy to adopt this practice as a universal rule, not only for the good of the Service as the first great object, but for the sake of their own character and reputation; for what can be more mortifying to any man of spirit or of a well-regulated mind, when he presents himself before an Invaliding Board with men to be surveyed as unfit for service, a short time after their entry into it, and labouring under diseases, the existence of which might have been readily detected before their admission, had a proper examination been made. Nevertheless I have seen instances where such a circumstance has occurred. No man can entertain a higher estimate than I do of the zeal and ability with which Naval Medical Officers perform their duties. I am proud to belong to such a class of men, as I do not think there is a body of officers under the Crown who discharge their duties with more honesty and fidelity to their Queen and country, or with more beneficial results to those under their care; yet I feel bound to state, that the important duty of the entry of seamen is, in my opinion, occasionally performed in a somewhat careless manner in cases where an apparently healthy aspect sometimes conceals a large amount of secret evil.

It is not my intention to speak further in detail of the mode of examination to be adopted, nor of those causes which should disqualify men for the Service, as I feel assured that equal, if not better, judgment than mine will always be brought to bear on that subject. But, I feel it incumbent on me to take this opportunity of directing attention to a subject, on which so much of the efficiency of the Public Service depends.

Before dismissing the subject, however, I would beg to remark, that the hepatic and splenic regions should always be carefully examined. The presence of marks of leech-bites and cupping will often prove a guide to the existence of organic disease in these and other organs. In the examination of the spleen and liver, the practice of percussion will greatly aid in the diagnosis. The state of the eyes should also be carefully examined, for some diseases of these organs might otherwise very readily escape observation.

Assuming that we have got together a good ship's company, our next duty is to take care of them, and preserve them in as high a state of health and efficiency as can be maintained under the varied and ever varying nature of the service on which they may be employed.

There is nothing therefore in the whole range of Naval Hygiene, that appears to me to exercise a greater influence on the health of men, than the state of the air between decks, and of the decks

themselves. The former should be pure and dry, and the latter always dry. Free ventilation to all parts of a ship, by means to which it is unnecessary here to allude, is always attainable, and should always be promoted. The air, however, may be rendered impure from causes existing within a ship, from the want of proper precautionary measures. The most frequent of these causes is the presence of stagnant water in the bilges, than which, nothing can exercise a more baneful influence on health, and certainly nothing can be more offensive to our sense of smell than the presence of bilge-water, a fluid well known in the Navy, and of the effects of which we have all had more or less practical experience. I think that the records of those ships, on board which epidemic fevers and other diseases have prevailed, if carefully inquired into, would tell us that the odour of bilge-water, or something akin to it, had previously existed.

The state of the bilges, therefore, is a matter of great importance, and, with attention, they may always be kept sweet and pure. I think there is no better means of doing so than by daily pumping out and washing them with *salt* water, which prevents the accumulation of anything that would render them foul. The occasional use of solution of chloride of lime, in washing out the bilges, will be found very useful.

As cleanliness on board all well-regulated men-

of-war is not only considered a virtue, but is practised as such, it is quite unnecessary for me to speak of the evil influence on health and comfort which a want of it always entails. I may remark, however, that it is surprising how soon small accumulations of dirt in dark corners, where the purifying influence of light and air may not have free access, become not only offensive, but injurious, while their existence is quite incompatible with the observance of a good system of Hygiene.

There can be no more fertile source of disease amongst seamen, or indeed other persons, than the constant inhalation of a moist atmosphere, whether sleeping or waking; but particularly is this influence injurious, when the moisture exists between a ship's decks, where it may be at the same time more or less impure, and hot or cold, according to circumstances.

I have already stated the influence which, I believe, it exercises in favouring the production of Scurvy. The maintenance of a dry atmosphere must therefore be considered a more or less powerful preventive of the disease. But where the evil influence of a moist atmosphere is exercised in a marked degree, is in the vast number of Rheumatic, Catarrhal, Bronchial, Pulmonic, Intestinal, and other diseases which it never fails to engender; and these are often of a very severe and obstinate character, in many cases ultimately

entailing the necessity of invaliding the subjects of them. This evil has its origin, for the most part, in a practice formerly universal in the Navy, (and which, I regret to say, still exists, but to a less extent) of daily washing and holystoning the decks and all parts of the ship that could be reached. They consequently become saturated with wet, and the slow process of evaporation does not properly dry them at the end of twenty-four hours, when they become subject to the same process again, and thus the air between decks is kept constantly moist. It was therefore, in my experience, no unfrequent circumstance to find a sick-list almost entirely made up of diseases resulting from this cause. The representations of the Medical Officers, who were aware of the injurious influence of the practice, often failed to arrest it; and the health of a ship's company was and is but too frequently sacrificed to the caprice or self-will of commanding officers who persist in a practice, which to minds the least intelligent must appear to be fraught with much evil. Yet it is still followed to a great and unnecessary extent in the Navy, merely because it is the custom of the service; and I have generally observed that some officers are most wedded to the practice in a degree proportionate to their unfitness for other and more important duties; and they glory in their ability, at least, to practise the cold water cure on the ship's decks, in spite of all representation

and remonstrance, and with a total disregard of consequences.

An improved system of Hygiene will, I hope, in due time, remove a source of so much evil; for it has been found, that decks can be kept quite as clean, and will look equally well, and a ship will be rendered much more healthy where other means are adopted to keep them always dry, instead of the everlasting washing and holystoning, at present practised. With its decrease or cessation I am persuaded there will be a proportionate improvement in the general health of the Navy.

The proper clothing of men is an object that should always meet with due attention, and in the Navy the faults committed in this respect do not always rest with the men themselves. When men enter the Navy, as they frequently do, with very inadequate clothing, particularly landsmen, or those joining for the first time, they are not generally allowed any clothing from the ship, until they have been sufficiently long in the service to have earned it, unless under special circumstances. Hence these men are put on board hulks or receiving-ships, which are generally cold and damp, and they consequently become extremely subject to Pulmonic and Rheumatic affections; and ships fitting out at our home ports have large sick-lists, the men for the most part suffering from those diseases, the occurrence of which might be obviated, if they were in the first instance pro-

perly clad, and if the hulks or other places prepared for their reception, were rendered warmer, drier, and more generally comfortable than they are at present. I would strongly recommend that flannel should always be worn next the skin, as nothing tends so much to maintain uniformity of temperature, and protect us against the occurrence of those evils which result from sudden atmospheric vicissitudes. In warm or cold climates it is equally serviceable, for it protects us from the effect of the temperature of both one and the other, and I have seen many instances where men who paid attention to this point have escaped disease, while those who neglected it have suffered; in all cases the salutary agency of flannel was incontrovertible.

In Scurvy, where the temperature of the skin is generally low, the necessity of paying attention to the clothing is sufficiently obvious.

Nothing can be more injurious than to allow men who have been exposed to bad weather, in boat or other service, where they have become wet, to keep their clothes on, when there is an opportunity of changing them. The evils which result from doing so are many and great, and in all well-regulated men-of-war due precautions are always taken to obviate them.

Sea-bathing is a practice which should be encouraged among seamen, when it can be indulged in with safety; it keeps men clean, and it invigorates

and refreshes them, but it never should be allowed more than once daily.

The promotion of hilarity and cheerfulness has always appeared to me to exercise a most salutary influence amongst seamen ; and it has, I think, a strong preventive influence over the disease under consideration. I have always remarked what an exhilarating effect music exercises on the mind and feelings of those within its influence, and so sensible am I of its good effects on board ships of war, in promoting hilarity, in tranquillizing the mind, and in antagonizing many of the evils resulting from long and monotonous sea voyages, that I am satisfied much good could not fail to accrue, if all ships were provided with Bands, with the number of musicians in proportion to their crew, and if the expense were borne by the State instead of being, as at present, dependent on the spirit and liberality of Officers.

There is no other agency so great in the prevention of scorbutic disease, as that which is exercised by the quantity and quality of the food, both animal and vegetable. When speaking of the causes of the disease, I fully stated my opinion of the power of the provisions to produce it, whenever they were deficient in quantity or quality. In proportion therefore as the food, both animal and vegetable, is sufficient or otherwise for maintaining the vigour of body which is essential to the maintenance of health, so will its preventive agency

be felt. A sufficiency of animal food (if there be at the same time a deficiency or deprivation of vegetable food) will not alone prevent the occurrence of the disease, the presence of which in point of time and character, will much depend on the supply of vegetables. A due supply of fresh succulent vegetables is therefore essential to prevent this disease, and none are so powerful in their prophylactic influence as the plants yielded by the order *Cruciferæ*, and the fruits of the *Aurantiaceæ*. When these can be procured in sufficient quantity, there need be no apprehension entertained of the occurrence of scorbutic disease. Unfortunately, however, these cannot be procured at sea, nor can a sufficient supply be taken on board for the wants of a ship's company. But their want is well supplied by the admirable manner in which fruits and vegetables can now be preserved, by which means an excellent substitute for the fresh articles is obtained. We also possess, in preserved Lemon-juice, an agent of great efficacy and undoubted power in the prevention of the disease, and the application of this juice was one of the greatest blessings that Science has ever bestowed on mankind.

I have already alluded to the mode in which Lemon-juice should be given, and I have mentioned the good results which attended the mode adopted in the "Investigator." I would again strongly urge that the same practice should be

strictly carried out on board all ships, whenever the exhibition of Lime-juice becomes necessary during a voyage.

The quantity allowed in the Navy, is half an ounce daily, with the same quantity of sugar; and this combination, I have no doubt, contributes to the efficacy of the juice. But Trotter,* and some others appear to think that unripe fruit, which contains less sugar than ripe, possesses also greater antiscorbutic power. The present Service allowance of Lime-juice, I should like to see increased; and I should recommend double the quantity to be given, in all cases where the regulations of the Navy call for its exhibition, which is after having been fourteen days on salt provisions, or at other times when the Principal Medical Officer may deem it necessary. Now, although the present allowance may answer all the purposes intended, during short voyages, yet it does not appear to me quite sufficient to antagonize the evils of a long one. Be that as it may, however, there can be no doubt that the exhibition of the larger quantity could not fail to be attended with such good results, in improving in a greater degree the health of seamen, and affording a more certain guarantee against the supervention of a scorbutic taint, as to justify the adoption of a practice which has so much to recommend it.

* Medical and Chemical Essays, with Observations on Scurvy. London. 8vo, 1795.

The opinion entertained by many, that Lemon-juice becomes deteriorated by keeping, is quite fallacious, as it will retain its virtues unimpaired for any length of time, provided that due care be observed in the mode of preserving it. That with which we were supplied, was kept in glass bottles, each capable of containing sixty-four fluid ounces, and on the surface of the acid a little pure olive oil, about half an inch in depth, was poured; the bottles were then carefully corked and sealed, and in this way the acid may always be kept for an indefinite period quite unimpaired. The Lemon-juice on board the "Investigator" was subject to every possible vicissitude of temperature from the highest degree of Equatorial heat, to the lowest of Polar cold, being under the influence of the latter for upwards of three years; and when I examined it at the end of this period, I found it as good and pure as on the day we left England, and its power of neutralizing alkalies was not in the slightest degree impaired.

I have previously mentioned that we were supplied with two kinds of Lemon-juice; one of which was prepared by adding a tenth part of brandy, the other was simply boiled, without the addition of any acid. Now, with regard to the relative merits of the juices thus differently prepared, I could detect no difference in the excellence of either from their therapeutical influence over the disease, as both appeared to me equally efficacious

in their action. I remarked, however, that that which was prepared with spirit remained clear and free from deposit in the bottle, while that which was simply boiled, deposited a portion of its mucilaginous constituents in the form of a heavy, dense, cloudy-looking mass at the bottom of the bottle, apparently indicating that some change had taken place, but neither its power of neutralizing alkalies, nor its therapeutic efficacy was in the least degree affected. But from the fact of this mucilaginous deposit taking place, I am disposed to give a preference to the juice which is prepared with spirit, and I consider it the best for use in Her Majesty's Navy.

The quality of Lemon-juice which is used in the Mercantile Marine of this country is very much inferior to that which is in use in the Navy,—which is the best that can be procured. In the former service it is but too often mixed with acids which have little or no antiscorbutic properties. From all I can learn, it is never given to merchant sailors, with any degree of regularity; and this juice of inferior quality is taken on board merely to comply with the law, but not to be used as the law directs. Now it has been recently stated,* that Scurvy is becoming very prevalent in the Merchant Service, a result which can only be owing to the neglect of adopting proper means for preventing the disease. I think, that if the cir-

* *Vide* Lancet and Medical Times, January 8, 1858.

cumstances of its occurrence were accurately investigated, it would be found that the master and owners were in every case to blame, and that, while the latter furnished both provisions and Lemon-juice of inferior quality, the former did not adopt the means necessary for exposing the fraud, and preventing the disease.

Our Merchant Seamen, therefore, would in such a case have great cause for complaint. As matters such as these come within the cognizance, I believe, of the Board of Trade, it is the imperative duty of that Board to exercise the utmost vigilance and care in seeing that all merchant-ships are supplied with sound provisions and good Lemon-juice, and to enforce the most stringent regulations for the regular issue of the latter to the ship's company.

Scurvy should be unknown at sea, if only the proper preventive means were employed. Ships are seldom more than two or three months at sea, at the very utmost, without touching at a port, and having thus an opportunity of procuring fresh supplies; but the "Investigator" was six months continuously at sea, without procuring any fresh vegetable supplies, and was two winters subsequently in the ice, as I have previously mentioned, before Scurvy made its appearance. The assertion, therefore, cannot be controverted, that this disease can always be prevented, and that it should never occur, when we possess the

proper preventive means, and know how to use them. Those means are always at our command in every region of the world wherever a ship can sail, except in the icy regions of the Poles; and no ship should ever be allowed to put to sea until it is placed beyond a doubt, that she is amply supplied with the means necessary to prevent the recurrence of the disease, in times when it is impossible to procure fresh vegetable supplies.

CHAPTER VII.

THERE is no disease in the treatment of which more early, decided, and certain manifestations of the effects of remedies are observed than in Scurvy. In proportion as we can supply those who are attacked with it, with fresh animal food, fruits and vegetables, so will the rapidity of the cure be effected. In the absence of those remedial agents which act as specifics in the treatment of this disease, the same effects will be produced, but less rapidly, by the exhibition of lemon-juice alone, in quantity proportionate to the severity of the attack; the therapeutic action of this powerful remedy being always much aided, and being more quickly seen, if the diet can at the same time be improved, by the substitution wholly, or in part, of fresh meat for salt, where the latter has been in use. Indeed, the good effects of fresh articles of diet of any kind, however small in quantity, or however feeble their antiscorbutic properties may be, never fail to display themselves in the course of treatment.

Fresh meat and succulent vegetables and fruits, as they are preserved in the present day, and of good quality, will, if given in sufficient quantity, cure the disease, although less rapidly, than when given in the purely fresh state, and the rapidity of their effects will be greatly aided when lemon-juice can at the same time be exhibited; but even without it, they will cure the disease.

Lemon-juice, therefore, is, in my opinion, the sovereign remedy in the treatment of this disease, where fresh fruits and vegetables are not available. I have never seen it fail in any form of the disease, when I could command an unlimited supply of it; but where debility has resulted from insufficiency of food, a larger supply of provisions will of course be necessary to restore the enfeebled physical powers. The promptings of nature alone would appear to indicate the treatment to be pursued, for there is great desire always manifested by those labouring under the disease for acids, or anything of an acid character. I can add the weight of my own personal testimony to the existence of this feeling, from having myself been attacked by the milder form of the disease. Although not at any former period fond of acids, yet so strong was my desire for them at this time that I could drink undiluted lemon-juice with a wonderful degree of relish, and in quantity much greater than that with which I could afford to supply myself. I observed that

the same feeling generally existed among our crew whenever the scorbutic taint made its appearance, and indeed before its perfect development.

The early exhibition of lemon-juice, therefore, becomes our first duty in the treatment; and the quantity should be proportionate to the severity of the disease. In the milder form, when the resources of the ship admitted it, I always gave two or three ounces in the course of the day, mixed with half or two-thirds its weight of sugar, and about twice its weight of water. Sugar is not a necessary adjunct to the juice; but from its being a nutritious vegetable product, it cannot fail to exercise a certain amount of good, in addition to which it renders the acid drink more agreeable. In the more severe forms of the disease the quantity of the acid must be increased, and in some cases I have given as much as eight ounces daily.

It is more easy to prove the efficacy of lemon-juice in this disease than to ascertain its mode of action; but that its power as an antiscorbutic depends upon those vegetable acids which it contains, and which are usually found in fresh vegetables, is, I think, a fact as clearly established as its efficacy is proved. How they act is another question, and one on which nothing positive has yet been ascertained. The weight of opinion however goes in favour of the hypothesis, that it is by virtue of some decomposition which

these acids undergo, but whether it is by supplying material to the altered constituents of the blood, or by exercising some power on the assimilation of the nutritive part of the food,* it is yet impossible to determine; but it is to be hoped that future investigation will enlighten us on the subject.

With regard to the relative antiscorbutic power of Lemon-juice and the pure Citric acid, I have had ample opportunity of forming an opinion; and I have no hesitation whatever in giving it in favour of the former, as being more certain and rapid in its action, and producing more durable results in its curative agency. As Lemon-juice, in addition to the Citric acid which it contains, is composed of malic and tartaric acids, extractive matter and mucilage, it may probably be upon the combination of these constituents that its greater efficacy depends.

I have treated and cured the disease with the pure Citric acid, exhibiting it in the same manner as the Lemon-juice, and in proportionate quantity (estimated from the relative power of the two in neutralizing alkalies), but in no instance was the remedial power of the acid equal to that of the Lemon-juice. But as a preventive or curative agent in this disease, I know none so well adapted to occupy a second place as Citric acid.

* In the British and Foreign Med. Chir. Review for October, 1848, a somewhat similar opinion is advanced, in an excellent Review on this disease.

These two powerful antiscorbutic remedies have been considered by some as inferior to the nitrate of potass in the treatment of this disease, but on what grounds I am quite at a loss to conceive. Although the advocates of the potash system of treatment have reported cases in support of its antiscorbutic power, no such good results followed its use in the hands of others, who found it not only inefficacious as an antiscorbutic, but positively detrimental to health. I have had no personal experience of its use, but I consider its exhibition as a preventive or curative agent in this disease, as being at variance with all sound principles of medicine, and I trust that I may never be placed in circumstances where this or any other preparation of potash, is the only means at my disposal in the treatment of Scurvy.

Dr. Bryson, Inspector of Hospitals and Fleets, has written a very excellent paper* on the relative merits of the acids and potash in this disease. His opinion, based on the results of experiment and observation carefully made, is decidedly in favour of the acids; I beg to refer the reader to the interesting paper itself, for full information on the subject.

With the exhibition of the acid, it should be our duty to improve the diet by every possible means, for I always remarked that when I could substi-

* Vide Med. Times for March 23rd, and June 15th, 1850. I take this opportunity of expressing my thanks to Dr. Bryson for the facilities he afforded me in consulting some official documents in connexion with this subject, in the Archives of the Medical Department at Somerset House.

tute fresh for salt meat, whether the former was the ordinary preserved meat, or the recent product of the chase, such as reindeer or wild fowl, or the addition of preserved vegetables, the good effects of such a diet were sensibly observed. The recently killed fresh meat, however, was immeasurably superior to that which was preserved, and it appears to me impossible to deny the good effects of fresh meat, in conjunction with acids, in the treatment of Scurvy, as the improvement was always more rapidly manifest under this combination, than when the diet consisted only of salt meat, or even when it was alternated with the fresh preserved meat. In proof of this view, I may state, that success in the chase or otherwise never failed to exercise a most manifest influence on the general health of our crew, not only in increasing their strength, but in alleviating the scorbutic symptoms. It was my custom to make a personal examination of our crew once a month,* and I always observed at those periods, when the greatest supply of fresh meat could be procured, that the scorbutic symptoms and appearances became sensibly improved, and men always expressed themselves as feeling better and stronger; indeed, on this as on most other matters in connexion with

* This is a practice which I wish strongly to recommend to Medical Officers employed on similar service, for reasons too obvious to call for explanation; and in the general service of the Navy, when occasionally had recourse to, it will be found of advantage, independent of the usual Sunday inspection at Divisions.

this subject, I can support my statement with the evidence of my own personal experience.

When pickles, preserved vegetables, fresh bread, vinegar, or other of the milder antiscorbutics can be obtained, they will form valuable additions to an antiscorbutic dietary, particularly the three former, to the relative merits of which I shall shortly allude more in detail. Little in general requires to be done in the way of medical treatment in Scurvy, when it occurs simply, unassociated with the complications I have previously mentioned; but, as it came within my observation, I found the use of medicine not only necessary, but attended with the utmost good. The secretions were for the most part more or less deranged, and were characterized by much functional torpor. When there existed signs of hepatic congestion with constipation of the bowels, I found the exhibition of small doses of Hydr. c. Creta, combined with ipecacuan and opium, very serviceable in removing the obstruction. When the effect of these remedies, either alone or when associated with others of a diaphoretic character, was manifested on the skin, this circumstance always contributed much to the alleviation of those pains in the loins and limbs, which were so much complained of, and to the general comfort of the patient. Diaphoresis is not always readily produced in this disease, but I was so well satisfied of the good results which attended its manifestation, that it

was one of the principles of my treatment, to do all in my power to promote it. I found that Dover's powder in fifteen grain doses at night was the most certain in its diaphoretic action, and when this action was once established, small repeated doses generally seemed to maintain it. When my supply of this medicine failed, opium and ipecacuan by themselves were substituted, but with a larger proportional quantity of the latter, than in the officinal preparation. This compound did not produce sickness, and it appeared to me that the sudorific action was rendered more certain. Warm drinks were useful adjuncts, and the administration of sp. æth. nitr., and other diaphoretics was occasionally resorted to, but their action on the skin was much less certain than that of the above mentioned medicines.

The use of Mercury in Scurvy is decidedly objectionable, unless when given in the mildest alterative form, and in small doses, such as I have mentioned, and with a view to increase or promote the hepatic secretion. This medicine has a tendency to produce very troublesome ptyalism, and to aggravate the state of the gums, and otherwise to produce a depressing effect. If, however, we are willing to submit to the presence of the evils entailed by the establishment of its physiological action, for the sake of its therapeutic agency in some of the more dangerous complications incidental to Scurvy, the use of mercury may be-

come justifiable, but it should be proved that the amount of expected good is of more vital consequence than the presence of certain evils. It becomes therefore a question for the exercise of our individual judgment in such cases; I exercised mine in giving it in the third case I have narrated, and with temporary good results. From the time that ptyalism became established, there was marked relief of this patient's symptoms, but the case being one which no remedial measures could cure, its fatal termination does not in my opinion invalidate an inference, at which we may, I think, fairly arrive—namely, that there are complications associated with Scurvy, where the exhibition of mercury is admissible, and where no other agency is likely to be so certain and rapid in its action. The use of aperient medicine became generally necessary in the early stage of the disease for the removal of that torpid state of the bowels which was so frequently present, and which appeared to me to proceed from the small amount of food daily taken; the diminished quantity failing to produce a sufficient degree of distension of the bowel as a mechanical stimulant to its action. This torpidity was moreover due, no doubt, to the deficiency of the biliary secretion and the impaired power of the intestinal muscles.

Those medicines which I found most useful in removing this state, were Ol. Ricini and mild carminative purgatives, the latter consisting chiefly of

pulv. rhei., with magnesia, pulv. zingib. and conf. aromat. in combination, or the milder forms of aperient pills. When these failed in their action, I found that emollient enemata generally succeeded. Saline purgatives appeared to me highly objectionable from the great tendency they had to produce exhausting and troublesome diarrhœa. Even the tart. potass. et sodæ, was not entirely free from this objection, and I consequently seldom had recourse to these medicines. The use of opium appeared to me particularly serviceable in all forms of scorbutic disease, whether used in combination with other medicines to produce diaphoresis, or given singly in the form of hydrochlorate of morphia, as a sedative at bed time. A draught of the latter in solution generally tended to promote sleep and allay the severity of the pains and restlessness so much complained of at night. Its diaphoretic action was promoted by the addition of sp. æth. nitr. and mist. camphor.

In every case I gave wine to as large an extent as my resources would admit, and I believe that it assisted very materially in the treatment; but I should certainly give a preference to ale or porter over wine had they been available, as I believe they are valuable auxiliaries in this disease, no less aiding in its prevention than assisting in its cure. I had subsequently an opportunity of observing the power of ale and porter in contributing to the maintenance of health, as

likewise in the treatment of scorbutic disease. Beer was always relished much more than any other beverage, and in Polar Service it ought to be given as frequently as the resources of a ship will admit. Spruce beer is likewise useful, but I consider it secondary to either ale or porter. No ship going on service, where Scurvy is to be apprehended, should be unprovided with the means for making these valuable beverages. The good effects of wine and fresh bread when given to men, instead of rum and biscuit, as part of seamen's rations, are fully established from what has been reported in regard to the relative state of health enjoyed by the British and French squadrons in the River Plate. The circumstances in which they were respectively placed were identical, the diet was the same, with the exception above mentioned. The consequence was, that the French squadron, which had the wine and fresh bread, almost entirely escaped from Scurvy, and the few cases that appeared were of a mild character, while the British squadron suffered severely from the disease.*

The state of the gums will frequently require the use of astringent gargles, particularly in those cases where fungi are present, and hemorrhage from them is frequent. The decoction of oak bark with alum will be found very useful, and the

* Vide Bryson in "Medical Times," June 15th, 1850.

same may be said of cinchona and kino, and other vegetable astringents.

When ulcers appear, as they frequently do, from slight abrasions or mere scratches, they assume a weak and often irritable character, with fungoid granulations. I have healed them by the application of lemon-juice, slightly diluted, and when they were of an irritable character, I found a weak solution of acetate of lead with opium very efficacious.

As convalescence from Scurvy became established, I invariably adopted a tonic course of treatment, which appeared to me to be attended with very good effects, from the general support which it afforded, and the increased improvement which the patients experienced from its use. Quinine, in combination with the tonic vegetable infusions, I found very valuable, as it exercised a good effect not only in promoting convalescence, but likewise in rendering recovery more durable.

In all cases of Scurvy, I should strongly advise that patients should be confined to bed, and should make as little exertion of body as possible. There is always a great tendency to syncope, which even in slight cases often proves fatal; but when the disease is associated with Dysentery, Diarrhœa, or any of the complications formerly mentioned, confinement to bed becomes absolutely imperative.

This restriction should be enforced until convalescence is fairly established, when fresh air,

moderate exercise, hilarity and cheerfulness, with light occupation, will be found materially to aid the recovery.

As improvement takes place, and the scorbutic symptoms subside, it is wonderful to observe the change that occurs in the appearance and conduct of the patient, as indicated by his more cheerful tone of conversation, and his disposition to hilarity and amusement; the face gradually loses the characteristic dull, sallow hue, the aspect becomes animated, and contrasts forcibly with its previous haggardness and depression. The gums become firm and natural in colour, hemorrhage ceases, petechiæ and vibices fade and disappear, pains and stiffness cease in the joints and limbs, and, in addition to other signs, the patient appears to think himself much stronger than he really is, and equal to any amount of exertion. But in persons recovering from this disease where the physical powers have been previously much enfeebled, care should be observed that they be not employed for some time at any work which severely taxes their strength, otherwise symptoms of a relapse may soon again be induced.

When Scurvy presents itself in an Acute form, then in addition to the early exhibition of Lemon-juice, the febrile symptoms must be subdued. It was in this form of the disease principally that bleeding has been recommended and practised by some, but on what principle I am at a loss to

understand. There is, in my opinion, no circumstance in connexion with this disease, that can in any manner justify such a proceeding, and I consider the use of the lancet in any form of Scurvy to be highly reprehensible. More I need not express, less I could not say in condemnation of a practice so much at variance with all sound principles of medicine in the treatment of Scurvy.

In the acute form nothing affords such early relief as promoting diaphoresis, but it requires much larger doses of diaphoretic medicine than is usually given, to produce an effect in this disease. Dover's powder I found the most certain and efficacious medicine, aided occasionally by others; this drug, together with confinement to bed and warm diluent drinks, will generally establish perspiration, and its establishment is always accompanied by more or less mitigation of the febrile symptoms, and that restlessness and anxiety which is always present. The exhibition of a full dose of an anodyne at night has a very tranquillizing effect, although it may not induce sleep; and it is in this form of the disease that opiates appeared to me to be particularly serviceable. When the acute symptoms subside, the treatment may be conducted as in the other forms of the disease. The state of the gums in acute Scurvy is a source of great pain and uneasiness; they become hot, red, and exquisitely painful, and their condition contributes much to produce that general feeling of restless-

ness which is always present. In this state I found that lotions composed of nitr. potassæ with tinct. opii, afforded much relief, and exercised a cooling influence on the mouth and gums. As the acute symptoms subside, astringent lotions should be used, as fungoid excrescences generally appear, and the gums are left in a more tumid and spongy state than in other forms of the disease.

Patients are generally left in a more enfeebled state after an attack of acute Scurvy than after one of an ordinary type, and they then require every form of support which it is in our power to bestow.

With regard to the articles of food which are possessed of antiscorbutic properties, I may here simply state my opinion of their relative merits.

All those vegetables which are of a succulent nature, such as the cabbage and others of that class, should I think occupy the first place, when they can be procured in the fresh state. When preserved in the dry state or pickled, although less powerfully antiscorbutic, yet they exercise very considerable power in the prevention and treatment of the disease. The various forms of pickles usually supplied, especially the pickled cabbage, will be found most serviceable; our expedition was not supplied with "Sour Kraut," yet the experience of others has, I think, justly pronounced it efficacious and useful.

The potatoe both in the fresh and preserved state

has been recently much lauded for its antiscorbutic properties, and I fully believe that it is deserving of much that has been said in its favour. I have had no personal experience of its efficacy in this disease in the fresh state, but in the form of Edwards' Preserved Potatoe, as supplied to us, I can bear the most ample testimony to its excellence. It was most agreeable as an article of food, possessing all the taste and flavour of the fresh tuber, and I believe it exercised a most beneficial influence on the health of our crew, and I can also affirm that it was universally better liked than any other vegetable with which we were supplied.

Now it appears to me that patients labouring under Scurvy generally manifest a strong instinctive feeling for those articles of diet which are most highly antiscorbutic, and judging from the expression of this feeling in favour of the potatoe, among our crew, that vegetable should certainly occupy a place second to none in the list of antiscorbutic articles of diet. I may also remark, without attributing the result entirely to this cause, but in connexion with other powerful causes in existence for the production of the disease, that it was not until after the quantity of potatoes was reduced that Scurvy appeared among us. I know no article of vegetable food that has more to recommend it than the potatoe, to form part of the dietary of our soldiers and sailors: it is portable, very readily prepared for use, and is a powerful

agent in the preservation of health. No ship in my opinion should go to sea without it.

The use of onions carrots, beet-root, and parsnips produces an agreeable variety in diet, in the preserved state, and these vegetables possess considerable antiscorbutic power. The preserved fruits, such as apples, cranberries, gooseberries, plums, &c., will be found of great service in the prevention and treatment of this disease.

Fresh bread should be substituted for biscuit, as the former can always be made on board ships and is generally much relished by scorbutic patients. Although no antiscorbutic virtue is attributed to the use of flour, oatmeal, and other articles of farinaceous diet, yet I think we should never exclude them from use when they are available, as I believe all vegetable products are more or less useful in this disease.

With regard to the use of vinegar, I believe its power as an antiscorbutic is feeble ; but it is a very useful adjunct with articles of vegetable food, in their preparation, as in the form of salads.

The only fresh vegetable products that the barren regions of the Pole furnished, during its short-lived summer, were sorrel and scurvy-grass. Our own ingenuity enabled us to procure scanty supplies of mustard and cress. The sorrel, although much less succulent than that which grows in this country, is nevertheless a very valuable antiscorbutic, and much superior to scurvy-grass : its

good effects were well marked among our crew during the short period that it could be procured. On my recommendation, a number of our men were daily employed in gathering it, as soon as the land became denuded of its snowy covering, and it was issued in proportionate quantity to our crew, its use being attended with very beneficial results. In some instances it was cooked and eaten as a boiled vegetable, and was very palatable; but prepared in the form of salad in the raw state with mustard and vinegar, it was also very agreeable, and was, no doubt, more highly antiscorbutic, as I believe all vegetable matter is more efficacious in the raw than in the cooked state.

Scurvy-grass and mustard and cress are pleasant and agreeable, and, no doubt, are very beneficial in the scorbutic state, but they are much less so than sorrel.

CHAPTER VIII.

The complications which I have previously mentioned as occurring in connexion with this disease, were of a very insidious character, and generally threatened dangerous results, accompanied as they generally were by a state of the most alarming prostration. In the dysenteric cases, the copious muco-sangineous discharge from the bowels, early produced extreme debility, so that fainting was a prominent symptom, and readily ensued on the slightest deviation from the horizontal posture. The treatment pursued, consisted chiefly of counter-irritation in the form of sinapism or epitheme to the abdomen, and the exhibition of diaphoretics combined with antacids or astringents. Chalk in combination with the vegetable astringents, kino and catechu, or with opium and ipecacuan, was very serviceable. The acetate of lead combined with the two latter was of great service in arresting the discharge. The tinct. nitr. ferri proved an excellent astringent, and one I can recommend with confidence in chronic mucous discharges; opiate suppo-

sitories seldom failed to allay the troublesome tenesmus which was always present. Every support in the form of wine and light food was urgently called for from the onset of the disease. Tonics with Lemon-juice, were given with good results as convalescence advanced. The foregoing remarks are equally applicable to the cases of Diarrhœa, the great object being to arrest the exhausting alvine discharge at the earliest period.

The treatment pursued in the cases of Ascites and other effusions will be seen on reference to the cases I have narrated. I may remark that while the doses of Diaphoretic Medicine required to be unusually large for the manifestation of their action, those of a sedative or narcotic, and diuretic character, such as digitalis, &c., required to be proportionately small, from the very early and often alarming evidence they afforded of their effects on debilitated bodies. The Cream of Tartar was found a safe and efficacious Diuretic in every form of this disease, as long as I could command a supply of it.

The Rheumatic cases were generally obstinate in their course and treatment, as may be readily supposed, from the circumstances under which they occurred, and the intense degree of cold present. The treatment found most successful, was to promote and maintain warmth, and establish Diaphoresis. The Tr. Guaiaci. co. was used with benefit, but the preparations of Colchicum were

quite inadmissible from the great prostration attending their use.

In concluding these observations, I may remark that nothing calls for the exercise of greater care, judgment, and promptitude than the treatment of the complications which occur in connexion with Scorbutic disease.

FINIS.

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