Catarrhal fevers, commonly called colds, their causes, consequences, control and cure / by R. Prosser White.

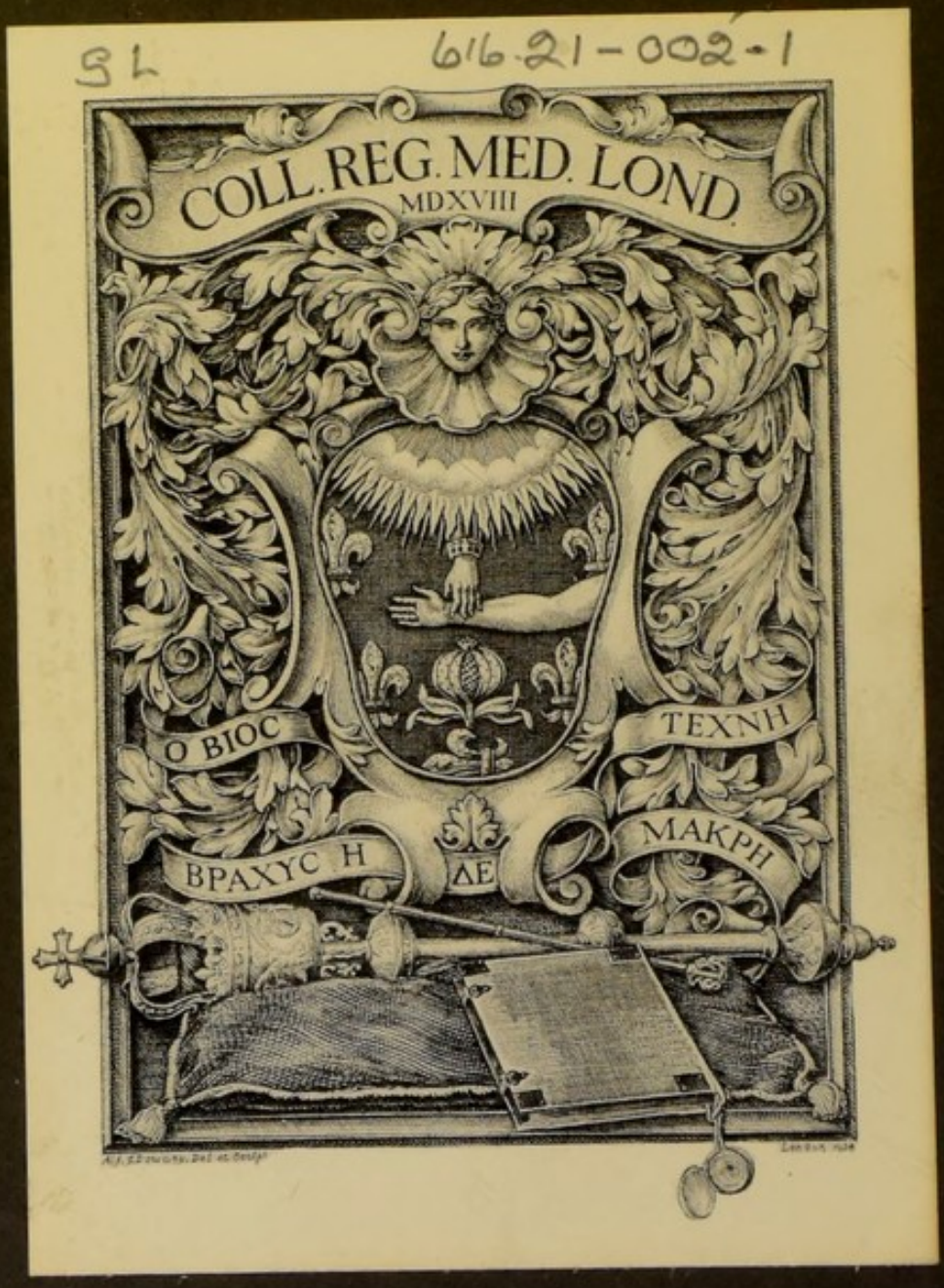
CATARRHAL FEVERS

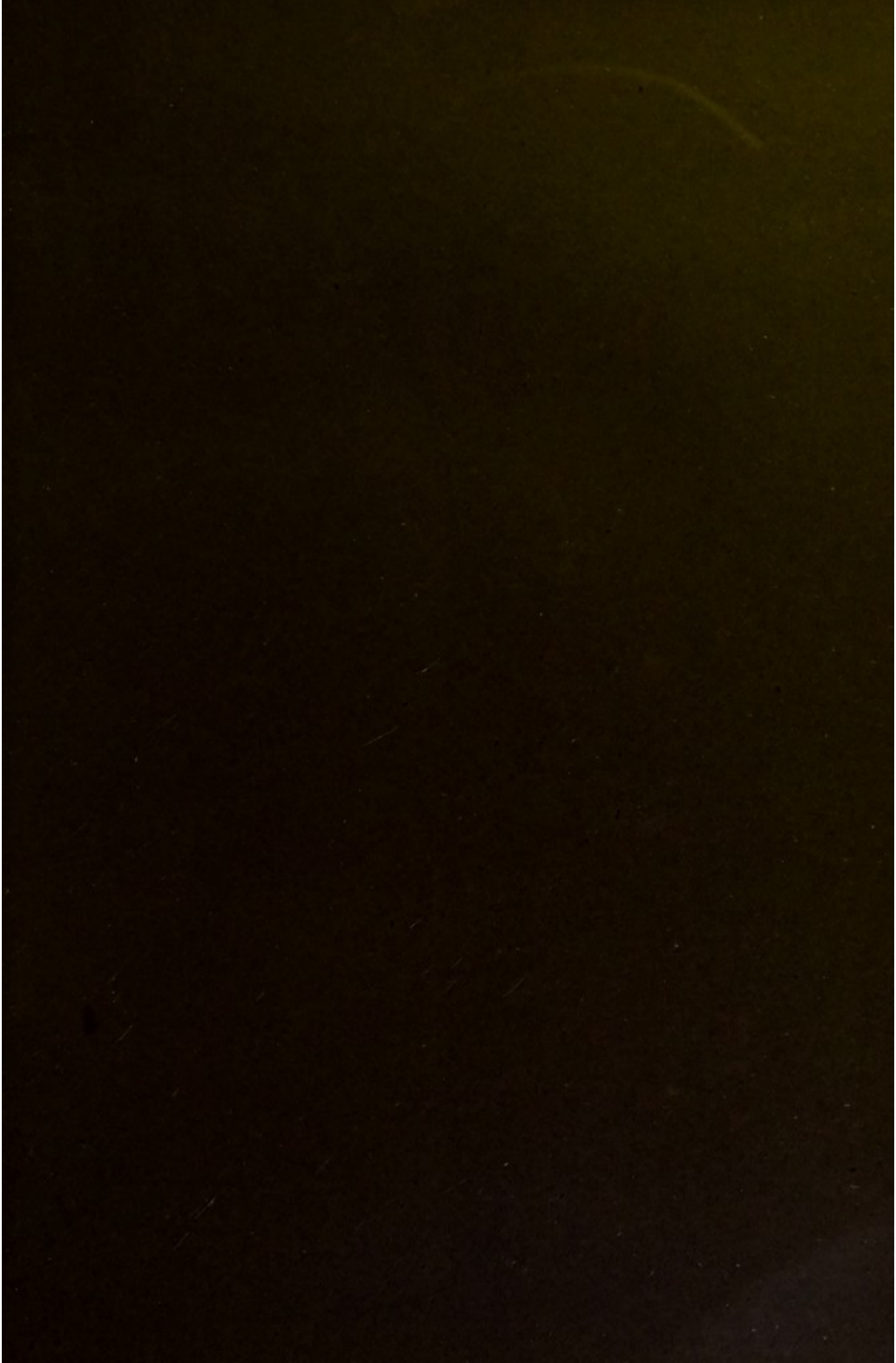
COMMONLY CALLED

COLDS

Their Causes, Consequences, Control, and Cure

R. PROSSER WHITE





CNATAN-NA-GALL

CATARRHAL FEVERS

COMMONLY CALLED COLDS

Their Causes, Consequences, Control, and Cure

BY

R. PROSSER WHITE, M.D. ED., M.R.C.S. ENG.

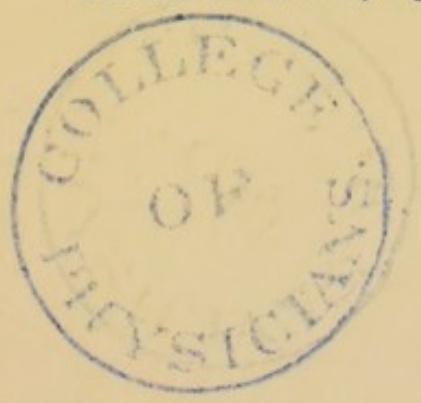
LIFE VICE-PRESIDENT AND HONORARY MEDICAL OFFICER, ROYAL ALBERT EDWARD INFIRMARY, WIGAN; HONORARY LIFE MEMBER, ST. JOHN'S AMBULANCE ASSOCIATION; VICE-PRESIDENT OF THE FACTORY SURGEONS' ASSOCIATION.

AUTHOR OF "ACUTE SYMMETRICAL ERYTHEMATOUS KERATODERMIA CAUSED BY THE ADMINISTRATION OF ARSENIC," "BRIT. JOURN. OF DERM.," NO. 171, VOL. XV. "THE EFFECTS OF DINITROBENZENE AND OTHER NITRO-SUBSTITUTION PRODUCTS OF THE AROMATIC SERIES ON THE WORKMEN EMPLOYED IN THE MANUFACTURE OF HIGH EXPLOSIVES," CHAP. XXXII., "DANGEROUS TRADES" (OLIVER). "A CRITICAL RÉSUMÉ OF OUR CLINICAL KNOWLEDGE OF COMMON COLDS," "TRANSACTIONS OF THE WIGAN MEDICAL SOCIETY." EDITOR OF "THE CHURCH LADS' BRIGADE MEDICAL MANUAL," ETC.

LONDON

H. K. LEWIS, 136, GOWER STREET, W.C.

1906



PREFACE

Some of the matter contained in the following pages has appeared in the *Lancet*, *Treatment*, and other medical periodicals.

The greater part, however, is published for the first time, and is launched upon the sea of public opinion to incur the favourable, or adverse *aura seminalis* of professional criticism.

The writer is only too conscious that he has attempted much, and accomplished little, but at the same time, with all its failings, he believes this booklet will fill a hiatus in medical literature, and may be the means of inaugurating more correct views upon a most vital subject.

Wigan,
May, 1906.

CONTENTS

PART III

PREVENTION AND TREATMENT

CATARRHAL FEVERS

COMMONLY CALLED COLDS

INTRODUCTION.

To some it may appear superfluous, or even impertinent, to *brochure* a subject so apparently trifling and ordinary as "common colds." I venture to submit that our zeal and interest in a disease should be proportionate not to its rarity, but to its frequency; and to call trifling, a disease which incapacitates members of every class of society oftener, and more commonly than any other, and has the reputation of initiating so diverse, and numerous ailments, is a travesty of facts. Pathological problems of far less import are eagerly studied by the erudite workers, and thoughtful investigators of our profession. This condition, the bane of the household, and the scourge of the community, is allowed to run riot, practically ignored by our leaders, our medical schools, and our text-books.

Hotspur exclaims:*

"'Tis dangerous to take a cold."

---

* Henry IV., Part I., Act I., Scene 3.

Is it not worth while endeavouring to prevent so potent a disease, if preventable?

Careful consideration, and practical experience compel me to believe, that an inquiry into its cause, and sequence is of the highest practical importance to the public, and of the utmost interest to the inquirer in the apparently limitless intricacies of medical science.

The *Lancet** pertinently remarks in "A Plea for the Study of Minor Ailments": "Minor ailments are common ailments, common ailments provide the bulk of general practice, common ailments furnish as much food for reflection as the most elaborate medical problem. The cause of 'common cold' is not more easily explained than is the etiology of pernicious anæmia, and Friedreich's hereditary ataxia is almost as amenable to treatment as is a simple headache in certain persons. The disease which affects the largest number ought to be grappled with first." I was also encouraged by a letter I received from Professor Carter of Liverpool, in response to a communication I sent to him bearing on this subject. He says: "I consider it so important that I read your, and other communications of a like nature to my class at University College, and should like to be able to do so session after session."

I am hopeful that, however deficient in facts, diffuse in statement, or extravagant in theory these pages may appear to some readers: they will eventually lead to a correct elucidation of the subject, and bring into closer harmony the conflicting opinions, both lay and professional, that now prevail.

* *Lancet*, March 15, 1902.

The subject bristles with difficulties, and the questions requiring solution will be found both intricate, and absorbing. Is it a morbid entity *sui generis*, or a modified expression of many pathological conditions, such as rheumatism, influenza, febricula, etc., altered by soil and surroundings, or the attenuation of virus? What are the limits and extent of the common cold? Does it confine its ravages to the nose, pharynx, and fauces, or can they pass on to the bronchi, the vesicles of the lungs, or even invade the mucous membrane of the stomach, and intestines? Is it the immediate exciting agent of the "thousand and one ills to which flesh is heir," from toothache to peritonitis, as is popularly imagined? Does it initiate a sty in the eye or pneumonia, a crick in the neck or bronchitis, superficial conjunctivitis or gastritis; or can it lessen, or increase the activity of other pathological conditions, such as nephritis, phthisis, and laryngitis? What are its causes and consequences, its modes of propagation, its treatment, and prophylaxis?

It is endeavoured, in the following pages, to show that common colds are of a highly infective, and contagious nature, that they are readily disseminated from one individual to another, are a source of inconvenience if not danger to the strong, and are often followed by the severest consequences in the old, and young, the feeble, and debilitated. Again, we find in those who suffer from some chronic affection, the onset of true catarrhal fever may be the active factor, in overburdening an already embarrassed heart, setting up the final catarrh in the later stages of

phthisis, or multiplying the difficulties, and distresses of the chronic invalid suffering from bronchitis, and emphysema.

If these consequences are due to what is commonly called "catching cold," and that catching cold is due to an infective germ, generally passing directly from one person to another, and that modern pathology, and universal clinical experience can prove that this is practically the only way in which cold can be "caught"; it opens up important questions affecting the attitude of the profession, and the conduct of the public towards this disease. What, for example, is the correct duty of the doctor, nurse, attendant, or friend affected with a cold, towards the sick person with whom they come into personal contact? Has the patient not a right to look for, and expect sympathy and comfort, rather than to be the possible recipient of a dangerous and malignant disease from those who minister to him? To the lay individual this point becomes particularly pressing when we remember, that at all our social functions and gatherings, where men and women congregate in close proximity, an affected person may unwittingly be the centre and focus, dealing out a hazardous infection to those around.

PART I

CLINICAL AND SPECIFIC CHARACTERS

SYMPTOMS.

The classical signs found in the household, common, infective, influenzal, or coryzal cold, or, as I prefer to call it, "catarrhal fever," are associated with a distinct train of subjective symptoms.

An irritation, itching and smarting in the posterior nares, or back of the throat. This itching and dryness is of a very troublesome nature, and primarily may affect any part of the upper respiratory tract. To relieve this discomfort frequent attempts at swallowing are performed, the saliva is forced by the tongue against the soft palate, and the friction and moisture so produced give a transitory feeling of relief. The area of fulness and distress in a few hours increases. The nose feels stuffy and blocked, breathing becomes difficult, and has to be carried on through the mouth. Pain, varying in intensity, follows on deglutition, or on pressing under the angles of the jaw. Frontal headache, slight or severe, which may be relieved by lachrymation or rhinorrhœa; this rhinorrhœa is sometimes profuse and abundant, and excoriates the parts, rendering the

mucous membrane of the nose, and the skin of the upper lip tender, and painful to touch. As the naso-pharyngeal catarrh spreads to the contiguous parts, congestion and œdema result, causing deafness, usually in one, sometimes in both ears. The voice becomes harsh, phonation difficult and painful. The tongue is dry or coated, a feeling of thirst is produced, loss of taste ensues, and the sense of smell is perverted or impaired. Then follows a constant desire to hawk up the increasing secretions from the back of the throat, and the mucous membrane of the bronchial tubes. The usual relish for food is absent or capricious, depending upon the severity of the attack. The skin is dry and hot, later on moist. Malaise, listlessness, and great nervous prostration are invariably concomitants in severe cases, and even in slight cases, in susceptible individuals, are some of the most prominent, and difficult sequelæ to combat. Aches, pains, and nausea are usually transient experiences, and depend upon the severity and extent of the affection, and probably the idiosyncrasies, and constitution of the individual. Idiosyncrasy here represents immunity, or predisposition, acquired or hereditary. As the catarrh passes on to the bronchi, cough and expectoration become more pronounced. In the early stages the secretion is sticky and small in quantity; later on, or in the subjects of previous attacks, it becomes profuse, purulent, or watery. In uncomplicated cases of catarrhal fever the bronchial affection is but slight, the faucal and throat irritation causing the greater trouble. The stomach, I believe, can be affected in a similar manner as the bronchial tubes,

although we have at present only clinical proof. In some persons the stomach affection seems to take the place of the bronchial catarrh. If one carefully sifts out particulars of the ailments of a family in which catarrhal fever is running through a house, their sites of attack are so various that one is apt to look upon them as different diseases. In some instances it appears chiefly to affect the nose, or throat, or middle ear; in others it rapidly passes on to the bronchial tubes; occasionally subacute attacks of indigestion, probably from the direct passage of the germ to the lining membrane of the stomach, cause inability to take certain foods without pain or discomfort. Particularly is this the case in subjects liable to acute or chronic gastritis; in them it may light up and maintain an inflammatory condition for some time, and to my mind explains this frequent enigma: Why a sufferer from chronic stomach troubles visits you, who is quite unable to offer any explanation as to the wherefore of her being worse, being unable to attribute it to any indiscretion in diet. Under these circumstances, I invariably ask the patient whether there have been any catarrhal colds in the house, and if she has been affected, however slightly. Diarrhœa, as a direct consequence of this condition, may, of course, be possible, and is frequently popularly attributed to it; but here again, satisfactory proof is wanting.

Shivering, chills, or rigors are probably constant symptoms in catarrhal fever, although the sensation of chill may be so slight in mild cases, and in healthy individuals, as hardly to be noticed. It is from this

feeling of general or local coldness the disease begets its name. The possibility of localizing, or connecting this sensation with the special organ, or parts affected is probably closer, and more important than is usually believed; because, besides the general regulating heat-centre in the medulla, there are numerous others, at different levels, in the spinal cord, and these are intimately associated with the various organs, and their associated skin areas. Byrom Bramwell says: "The diseased part will throw out its toxins into the adjacent lymphatics and capillaries, these circulate to the nearest heat-centre in the cord, and thence the sensation will be referred to the corresponding skin areas." The rigor is usually the first indication of ill-health, and the chilliness is felt in the shoulders, back, or legs, and is usually looked upon as the cause, whereas it is solely one of the initial symptoms of the developing disease, and no more a cause than the headache, sneezing, sore throat, etc. The localized rigors and chills may remain restricted to definite areas, or in severe cases become generalized.

PATHOLOGY.

The portals through which micro-organisms enter the body are the skin, and the mucous membranes. The most delicate and easily penetrated parts of these structures are the glands. That these vulnerable sites are especially selected for attack is well shown in diseases of the skin, where pathological processes are readily observed. In the skin it is remarkable how

constantly the initial lesion is found clustered round the coil, or hair glands. Upon mucous surfaces a similar selective tendency is evident. The gland ducts form suitable resting, and culture points for the growth of germs, and the elaboration of their toxins. Many pathogenic organisms show a purely local irritative action, and produce only circumscribed lesions—*e.g.*, the *Staphylococcus epidermidis albus*. Others seem to spread rapidly along the contiguous surfaces; and others again cause little apparent local inflammation, but pass immediately into the blood-stream, and thereby distribute themselves and their toxins. Catarrhal fever apparently belongs to the second of these categories, and displays its chief virulence as an immediate locally spreading infective inflammation. We have no evidence that it can metastatically invade an internal organ. One of its distinctive peculiarities is this rapid superficial peripheral extension. In this respect it is like measles, but here the toxins appear rapidly in the blood-stream, and thus we get the symptomatic rash, and the more severe constitutional complications. The bronchitis of measles is probably a primary direct condition, similar to that caused by catarrhal fever. In this particular, measles and catarrhal fever differ from another microbic disease, typhoid, where the bronchitis, which is almost always present, is due to a secondary infection from the blood-stream, just as we can get a typhoid cystitis, or a typhoid synovitis.

The onset of catarrhal fever is so generally signalized by some irritation of the nasal mucous membrane, that we have come to regard this as the incipient site of the initial lesion. In this respect it

is closely allied to measles, whooping-cough, and glanders, and the virus of all these diseases enters the system through the upper respiratory tract. Dr. de Havilland Hall,* speaking of catarrhal fever, says: "At its onset the disease is quite localized in the nose or naso-pharynx, and the secondary symptoms are due to the absorption of toxic materials secreted by the bacillary growth."

The anatomical peculiarities of the upper respiratory tract lend themselves specially liable to the spread of many infective conditions. R. S. Lauder† says: "This tract is covered with a thick mucous membrane, causing a narrowing of the openings of the different sinuses and the nasal duct. This membrane is thickest over the middle and inferior turbinates. The following sinuses communicate, more or less directly with the nose: The antrum, the frontal sinus, the anterior, middle and posterior ethmoidal and sphenoidal cells, the nasal duct, and the Eustachian tubes. The patency of all these communications depends upon the healthy condition of the mucous membrane. With the exception of the frontal sinus, the drainage of these cavities, owing to their openings being placed near the bottom, depends upon the healthy, and efficient ciliary action of their epithelia. The mucous membrane of the naso- and oro-pharynx, including the tonsils, is rich in lymphoid tissue. We have here an extensive surface of glandular tissue, richly supplied with vascular and lymphatic vessels. It is not difficult

* *British Medical Journal*, August 22, 1903.

† *Lancet*, December, 1904.

to appreciate the possibilities offered by the upper respiratory tract for the reception, cultivation, and dissemination of specific micro-organisms." The follicles of the tonsils form ideal culture tubes for infective germs.

Mr. Marsh,* in speaking of this disease affecting the hypertrophic pharyngeal lymphoid tissue in this region, says: "The symptoms may be arranged in three groups: obstructive, catarrhal, and reflex. The obstructive, cause deafness, and altered voice: the catarrhal, cause rhinitis, adenitis, myringitis, or may travel downwards to the bowels, larynx, trachea, bronchi, or gastro-intestinal tract, according to the degree of tissue resistance and predisposition of the individual"; the reflex, cause twitching of the eyelids, possibly convulsions in children. (*Vide* also Mr. B. Harman's case.) Eichorst, speaking of catarrh of the lungs, says: "Rough vesicular breathing, and prolonged expiration are dependent on catarrhal conditions of the smaller bronchi at the apex, and upon them are engrafted the first manifestations of tuberculosis." In this connection it is but right to mention that Dr. Norman Bridge, in his book on "Tuberculosis," repudiates the idea that ordinary common cold can affect the tubercular process: and goes so far as to say, that the catarrh so set up may be of benefit.† This opinion is certainly exceptional, to say the least of it.

Headache, if not toxæmic, is a symptom of ethmoiditis; the headache in this condition is often of an

* *Lancet*, June 21, 1902.

† *Medical Chronicle*, p. 430, March, 1904.

obstinate type. The catarrhal ethmoiditis will itself often produce great nervous disturbance, and accounts for asthmatic and sneezing attacks, rhinorrhœa, occasionally amaurosis, asthenopia, and loss of smell. Continued acute attacks predispose to suppuration in any of these accessory cavities, as the results of secondary infection. Whilst the toxins are being absorbed, reactive inflammation, with enlargement and tenderness of the associated cervical glands, is produced. The extraordinary mental and nervous depression, noticed by all careful observers, which follows catarrhal fever, especially in persistent cases, and debilitated persons, must be put down to the effects of the poison upon the higher nervous centres. The sweating which occurs at the crisis, and persists for some time after, and is easily excited by emotional disturbances, is due to the profoundly modified, and unstable condition of the vaso-motor nerve apparatus, by the fever poison.

DIAGNOSIS.

To appreciate correctly the differential diagnosis of "catarrhal" fever from the numerous conditions which simulate it, and are generally classed as colds, is not always a simple matter. In the first place, it must be remembered that every subjective feeling of chill is caused by some pathological entity, and that the toxæmia of cold is only one of a large number of causes. Take a common instance, as follows: A man is suffering from chronic bronchitis, and experiences a chill; this is not necessarily due to a fresh infection of catarrhal fever: it may represent the

expression of a blocked bronchial tube, or the absorption of an extra dose of some other already present pathogenic toxin, a sapræmia. Again, in certain persons the chill may indicate the entrance of the products of a totally distinct, and different infection through one of its usual channels, rheumatism, etc.; and the only symptoms observed may be some vague pains or slight fever; these are often mistaken for, and wrongly called, "catching fresh cold."

All practitioners are familiar with the fact, that during the prevalence of a scarlet-fever epidemic, there are seen, at the same time, a large number of what is usually called a septic sore throat, a condition lasting only a few days. These sore throats are generally attributed to colds affecting the household, and are considered cases of catarrhal fever. Although we cannot at present say that such is not the case, it certainly seems more in harmony with modern thought, to look upon such sore throats as the results of the inoculation of an attenuated virus of the poison of scarlet-fever at the time epidemic, or its inoculation into a subject who is largely immune.

Since the invasion of this country some ten years ago by true influenza, it is customary to label the symptoms found in common colds as influenza. I do not know by what authority this is done, and there is no investigation which confirms the suggestion. Personally, from over twenty years' experience in general practice, and from careful observation of the epidemics of true influenza which I have seen, and from bacteriological study, I believe catarrhal fever to be a distinct entity, though possessing many

characteristics in common; and the distinctions between it, and true influenza are probably not more subtle, than those between typhoid and typhus fever, bronchitis and broncho-pneumonia, or some of the numerous forms of chronic pyrexia.

In most cases a differential diagnosis between catarrhal fever, and influenza is possible, and in every case should be attempted. In influenza, the unique suddenness of the onset is a marked symptom, it is associated with great prostration, greater frequency and intensity of pains, especially in the back, the quicker rise in temperature, often its greater height (rarely under 102° or 103° F.), the profuse sweating, the presence of an epidemic at the time, the absence of catarrhal symptoms, and the finding of Pfeiffer's organisms will, of course, clinch the diagnosis. In more doubtful cases, we expect to find in influenza always a multiplicity of symptoms, showing a systemic rather than a focal invasion, and their great variety of combinations and complications assists at arriving at a conclusion. In the descriptions of the characters of this disease, written previously to 1889, the catarrhal, and respiratory symptoms were found to be most prominent. In the epidemics which have passed over this country in later years, the nervous symptoms have been chiefly in evidence, gastro-intestinal and respiratory affections occurring in a very much smaller number, and the catarrhal symptoms almost a negligible quantity, so with ordinary care the diagnosis should be, and is, quite easy.

Many of the symptoms of common colds, and especially the initial ones, such as rhinorrhœa, lachry-

mation, sneezing, and chills, can be, and are, produced by numerous local irritants. The insufflation of certain powders, pollen of certain graminaceæ, the in-breathing of air differing appreciably in temperature, and humidity may occasion them. These circumstances may explain the popular belief in the occurrence of colds during the prevalence of east winds, and also the sneezing, and coryza frequent in some persons on retiring to rest. Sudden immersion in cold or salt water, as occurs in bathing, sometimes produces these results. Idiosyncrasy is a powerful factor in these cases, as is observed in the numerous martyrs to that distressful neurosis, hay-fever; and hay-fever certainly increases the liability to catarrhal infection. In many cases the presence of a sensitive spongy area on the septum, opposite the lower edge of the middle turbinal bone, will cause puzzling symptoms, which the application of the actual cautery will remove.

I am acquainted with a gentleman who, at certain seasons of the year, has violent attacks of sneezing, lachrymation, and subsequent prostration immediately on wakening in the morning, so that dressing becomes a difficulty. These symptoms he attributes to the effects of the sun's rays, as he finds he is always worse on a sunny morning. The attacks also occur in the night after the first sleep, and in this regard closely resemble asthma.

Dr. Sidney H. Carr, M.D. (of the China Inland Mission, Kalleng-Fu, China) writes:* "For the last year or more I have on several occasions been suddenly seized with a very severe coryza, accompanied by con-

* *British Medical Journal*, February 17, 1906.

siderable œdema of the uvula, and causing in one or two instances extreme discomfort. I knew of no reason for these attacks, until I found that they supervened on the days on which I had taken a small dose of quinine. To confirm this I took the other day: Quinine sulphate 3 grains dissolved in water, with acid. sulph. aromat. 5 minims, at about noon. An hour later, during dinner, the symptoms came on, sneezing, running at the nose, injection of conjunctiva, and œdema of uvula."

I believe that what is termed a "thorough chill" is often in reality more correctly designated a "reflex" or "vasomotor" cold, and is well illustrated in the following class of case of Mr. B. Harman:

Mr. Bishop Harman* said: "It was not often that cases of hay-fever came the way of the ophthalmic surgeon; they were almost wholly the monopoly of the surgeon who specialized upon the respiratory tract, and not a few were gold-mines to the quack. He did not propose any new, and infallible panacea for the hardy annual of hay-fever, the title of his paper clearly told that. He had observed several cases which had been diagnosed and treated as hay-fever, and which he had been able to relieve by a very simple procedure, just the relief of the exaggeration of an ordinary physiological reflex. Notes of one case would suffice. A woman, thirty years of age, born and bred in the Midlands, of high intelligence and engaged in responsible work, removed to a southern seaside resort, well known for its pine woods. Until this time she had enjoyed excellent health, and

* *Lancet*, July 5, 1905.

suffered none other than simple 'colds.' The spring following her removal she had violent, and recurrent attacks of coryza, lasting ten days. Next spring the attacks lasted a month, and by the third year they increased in severity and lasted two months. Her physician diagnosed 'hay' or 'pine' fever, but treatment, even the use of adrenalin, did no more than temporarily allay the severity of the attacks. The patient allowed that nearness to hay or pines did not annoy her, but that bright sunlight was distressing, especially to the right eye; relief was best obtained by shutting herself in a room with the windows closed, and darkened. Mr. Bishop Harman had the advantage of having seen most of the members of her family; all had astigmatic eyes. The suggestion that her eyes might be at fault was flouted. Later, Mr. Bishop Harman examined her. The nose and throat were healthy, but the vision was defective. R.V. $= \frac{6}{18}$, with +3 D. sphere and − 2 D. cyl. ax. 15 $\phi = \frac{6}{8}$. L.V. $= \frac{6}{6}$ nearly, with +0·75 D. sphere and 1 D. cyl. ax. $\phi = \frac{6}{5}$. It is now three years since these glasses were ordered, and there had been no renewal of the attacks during this period, yet no other treatment than the wearing of the glasses had been attempted. The *rationale* of these cases of 'false hay-fever' was perfectly easy of comprehension. Reflex irritation of the fifth cranial nerve area from irregular stimulation of the optic nerve formed one of the stock illustrations of 'reflexes' in every text-book of physiology. Sneezing was readily excited by sudden exposure to bright sunlight. In these cases the irritating effects of brilliant light were exaggerated

by an error of refraction, particularly by an anisometropia. Experimentally, Mr. Bishop Harman was able to produce attacks not unlike those described by the wearing of incorrect spectacle lenses."

Wet feet will reflexly cause a similar sequence of symptoms. These "pseudo-colds" are quite different, and distinct from the infective cold, or catarrhal fever, which, like influenza, typhoid, pneumonia, and all other specific fevers breed true. A more serious error is to overlook a graver disease; Dr. Latham* draws attention to the fact that some persons are especially liable to feverish colds, and catarrh of the bronchi, and that these symptoms may strongly point a tendency to, and the early onset of, tuberculosis in susceptible persons. Bronner† defines a cold as "acute rhinitis." Acute rhinitis may have other causes, as we have shown above, but in all probability catarrhal fever cannot exist without this symptom.

A condition which, in its earlier state, has to be differentiated is the catarrh of glanders. This is due to the glanders-nodules, or the glanders-infiltrates, which with such special frequency form upon the mucous membrane of the nose. The presence of purulent, or bloody discharges should at all times arouse suspicion, and the finding of some ulceration will at once put the examiner on his guard. In subacute cases of this disease, the greater intensity, and length of the symptoms will allow a further inquiry into the circumstances of the origin of the affection, and permit of a bacteriological examination.

* *Lancet*, December 28, 1901.

† *Ibid.*, December 7, 1901.

Another catarrhal condition that might give rise to difficulty is that which occurs in measles. In such cases, the age-incidence, the presence of Koplik's spots, and the greater congestion of the conjunctivæ will assist the diagnosis.

Lastly, the presence of true nasal diphtheria may occasion difficulty. Dr. E. Foord Caiger,* in an address on the diagnosis and management of doubtful cases of diphtheria, says: "With respect to cases of diphtheria in which no abnormality can be detected, beyond the presence of a mucous rhinorrhœa, it is usually quite impossible to differentiate diphtheritic rhinitis from a simple nasal catarrh. Careful inspection of the anterior nasal fossæ, through the external nares, may reveal the presence of membrane either on the septum, or on the floor of the inferior turbinate. In the majority of cases no exudation whatever is visible, though the discharges may be teeming with diphtheritic bacilli. Some degree of redness, and occasionally an impetiginous excoriation of the skin, immediately inside the nostrils, can often be detected. This, when present, is strongly suggestive of diphtheria."

VARIETIES.

The kinds of catarrhal fever are popularly assumed to be as numerous and as diverse as are its individual symptoms. We are thus familiar with the cold in the nose, the cold in the head, the throat, or the chest. These varieties are simply synonyms of the four cardinal signs of the disease: rhinitis, post-nasal

* British Medical Association, November 6, 1905.

catarrh, pharyngitis, and bronchial catarrh. The first of these symptoms has been amply discussed in the preceding pages; the second and third are mutually interdependent, and are so invariably associated as to be indistinguishable clinically from one another. Both are constant accompaniments of catarrhal fever. Bronchial catarrh is further discussed under the heading of Prevention.

To discriminate a pharyngitis of catarrhal origin clinically, from the numerous conditions which simulate it appears at present impossible, such, for instance, as the various kinds of septic and pseudo-diphtheritic throat, or from the more acute forms of rheumatic and gouty anginas. That there is a specific catarrhal sore throat is certain, although its differentiation by naked-eye appearances only may be difficult. As aids to its diagnosis, we must largely depend upon its associated symptoms, and any suggestive surroundings that may assist in unravelling its cause. All these supposed forms of catarrhal fever do not disprove its single entity, they simply exemplify in the individual case the more prominent or specializing symptom.

Experience and research will, I believe, eventually prove there to be only one variety of common cold, and that dependent upon some specific organism. In all, rhinorrhœa is present; in some, the effects may be restricted to this symptom. The catarrh may spread to the superficial membrane of the eye; in others, the nose and its adnexæ, the throat, the Eustachian tubes, and bronchi, are chiefly affected, or the mucous membrane of the stomach; or, again, the main expression of the disease may

show itself in the lymphatic glands, or the nervous system.

The early symptoms of catarrhal fever may be so slight as almost to pass unrecognised; but an erythema of the fauces, an enlargement of one or both tonsils, a slight bronchitis or laryngitis, or some submaxillary tenderness will often betoken a recent invasion.

EPIDEMIC NATURE.

Catarrhal fever, although probably sporadic cases are always with us, is essentially a zymotic disease, and it is our common knowledge and experience, that it runs an epidemic course. In my small practice I have been called in one day into four different houses, to find in each house one or more persons suffering from catarrhal fever. I obtained culturally from the nose the *Bacillus coryzæ segmentosus* as the most numerous organism from two of these cases living in different houses. The particular type of disease affected in this epidemic was the anginal condition of the throat, but we often find the special type differing with each epidemic.

CAUSES.

One of the most important questions affecting this subject is that of its causation. The origin of symptoms simulating catarrhal fever, such as sneezing, lachrymation, etc., have been incidentally alluded to under the heading of Differential Diagnosis. How true catarrhal fever originates is to-day a most controversial theme. When initiating a correspon-

dence some time ago in the *Lancet*, one was struck by the diversity of opinion upon this question. Thus, Dr. O. Clayton Jones* states "that the almost universal opinion, both lay and medical, is against the acceptance of the infectivity of common colds"; and again, Dr. Latham,† under the heading of "Modern Treatment of Pulmonary Consumption," seems to imply that immunity to catching cold is due to avoidance of contrasts of temperature rather than to the absence of an infective germ. Dr. William Sykes,‡ quoting Liebermeister, remarks, "A chill may in one person give rise to a 'common cold,' in another to a 'bronchial catarrh,' in a third to 'diarrhœa,' in a fourth to 'toothache,' and in yet other persons to a variety of 'rheumatic complaints.'" Hutchinson, in his "Pedigree of Disease," says: "Whatever is the result of catching cold is catarrhal. The catarrhal diathesis is one of the fundamental ones. It is not due to any specific specialized cause, catarrh is a reflex nervous inflammation." Such are Hutchinson's statements in the year 1884, but I doubt whether he would subscribe to these statements to-day. Even the *Lancet*§ maintains this fallacy, as in a leaderette they state: "However doubtful the influence of changes of temperature may be in the production of other ailments, there can be no question as to the important part it plays in the

* *Lancet*, January 13, 1902.

† *Ibid.*, July 6, 1902.

‡ "A Plea for the Investigation of Catarrh" (*British Medical Journal*, December 16, 1905).

§ *Lancet*, November 28, 1903.

causation of many colds." Almost every modern text-book reiterates with the same monotony this very dubious point, that variations in temperature, fatigue, and other debilitating causes are constant producers of catarrhal conditions. This seems strange, as no one would suggest in good faith that measles, scarlet fever, pneumonia, typhoid, etc., could be produced by such circumstances.

The point which seems to be most emphatically and prominently brought out by the arguments used in the recent discussion in the *Lancet* is, that those diseases, the bacteriology of which has been worked out and defined, are now permitted to be exempt from that universally accepted potent cause of mischief (cold), whereas the causation of many of the rest are still shrouded in the mists of popular superstition. Even so great an authority as Mansell Moullin* says, in a discussion on appendicitis, "he agreed that first attacks of appendicitis were caused by cold"; and Mr. Edmund Owen, in the same discussion, says, "A sudden exposure to cold is often the precursor of acute symptoms." Dr. F. T. Roberts† remarks: "We should not ignore or forget the ordinary causes which long experience has taught us are capable of inciting infectious diseases, such as chills produced in various ways." Dr. J. L. Stephen‡ supports this view as follows: "Among the exciting causes of primary acute broncho-pneumonitis in children, chill from exposure to cold is certainly one of the most powerful. It can

* *Lancet*, December 20, 1902.

† Address on "Medicine" at Swansea in 1903.

‡ *Lancet*, September 20, 1902.

cause the disease in quite healthy infants, but is perhaps more likely to do so in those who are weakly, or suffering from bronchial or gastro-intestinal catarrh."

When we find the leaders of our profession putting forth such statements, it requires some temerity to differ from them; but, fortunately, there is a wealth of opinion and of fact which appear to discredit them. In a leading article in the *Lancet* upon peritonitis the following appears: "Formerly it was the custom to speak of peritonitis as brought on by exposure to cold; now it is acknowledged that bacterial invasion is the essential cause." Again, Dr. G. R. Murray,* in an address upon pleurisy, says: "Formerly attacks of acute pleurisy were attributed to the action of cold, but the more our knowledge of the subject increases, the more evident it becomes that cold can only be considered as a predisposing cause."

Dr. Rose Bradford† says: "Cold has long been credited with the production of acute congestion and even inflammation of the kidney, just as inflammation and congestion of other organs were also associated with this agent. There is no experimental evidence showing that the application of even intense cold is capable of producing any marked effect on the renal vessels. Although there are instances in which disease has seemed to follow exposure to cold, it is more than probable that this is erroneous, and that some other agent has been effective in pro-

* *Lancet*, November 27, 1901.

† Address on "Bright's Disease," before the Northumberland and Durham Medical Society.

ducing the disease. The progress of knowledge has shown that disease of many organs, such as the peritoneum, pericardia, lungs, and pleura, which were imputed directly to cold, are really dependent upon the action of toxic agents." With the tenor of these remarks most will, I think, agree.

A great mistake in the past has been the using of a term which has two distinct meanings. The word "cold" or "chill" is, first, a peripheral reflex sensation which can be produced by direct cold, insufficient clothing, low temperature, etc., and is in all such cases a purely peripheral subjective feeling; the second, the chill caused by some toxin circulating through the heat-centres, and due, amongst other diseases, to the distinct pathological entity, "catarrhal fever." The former has not been proved to have any direct action upon the onset of a disease, unless severe enough to produce trauma, or so prolonged as to interfere with physiological function. Furthermore, it implies the acceptance of the very improbable theory: that simple exposure to cold can inaugurate a specific poison. The latter is the expression of a toxin circulating in the blood, which may be pregnant with far-reaching consequences, both immediate and remote. "Catarrhal fever," besides its own special and particular course which it pursues, probably prepares the way for many illnesses, the full extent of which we do not at present know. It certainly appears to facilitate and predispose the mucous membranes, which it affects for the luxuriant growth of many pyogenic organisms. Dr. Thomas G. Harris,* Assistant Pro-

* *Lancet*, April 4, 1902.

fessor of Laryngology, New York, says: "There has been made no more important addition to our knowledge of catarrh of the middle ears of recent years than the demonstration beyond question of its relation to diseases of the nose and naso-pharynx."

"Catarrhal fever" is frequently followed by bronchitis and broncho-pneumonia; whether it is primary or secondary is difficult to state. Dr. F. T. Roberts,* in speaking of tuberculosis, says: "There is a very definite class of case in which tuberculosis obviously commences in the main air-passages, especially the larynx"; and also, when speaking of thoracic phthisis, "Nor is it safe to make light of even a slight cold, which, if neglected, may undoubtedly lay the foundation of this complaint. It cannot be too strongly insisted upon that thoracic phthisis is by no means always a 'primary and independent disease, but is in a fair proportion of cases added to or grafted upon, so to speak, some preceding definite morbid condition.' This fact does not in any way invalidate the tuberculosis theory, or call in question the influence of the tubercle bacillus. Indeed, it is usually considered that these organisms cannot do harm unless there has been some lesion which enables them to gain a footing, be it only a slight erosion of the mucous surface, or removal of the ciliated epithelium from any cause. Among the more obvious conditions from this point of view are persistent or repeated catarrhs of the throat, main air-passages, or larger bronchi." That catarrhal fever can directly affect the stomach appears to be highly probable, but whether it can be

* *Lancet*, March 29, 1902.

produced, or is produced by the same organism which causes catarrh of the upper respiratory tract, has not been demonstrated. That the toxins of catarrhal fever pass through the lymphatics to the blood is amply proved by clinical experience.

EVIDENCE OF TRAVELLERS.

The refutation of the popular belief, that exposure to cold, dampness, change of temperature, etc., *per se*, act as direct causes of catarrhal fever, is abundantly proved by the accumulated experience of travellers in all parts of the world. Dr. Willoughby Gardner* mentions the dwellers in the Ben Nevis Observatory, who live in what is almost a constant atmosphere of clouds, fog, and rain. Sir Martin Conway and his four comrades exploring the Spitzbergen, exposed to considerable privations, constantly wet through, and frequently sleeping in their damp things. Nansen and Joansen narrate, in their marvellous expedition over the Polar ice, the following extraordinary facts concerning themselves and their comrades: They described their clothes, saturated with perspiration, becoming frozen into one mass of solid ice during the day. At night, having tucked themselves up in their sleeping-bags, the first hour was spent in thawing. Shivering with cold they all lay, their frozen socks laid across their breasts, until their clothes became gradually soft, then wet, and eventually warm; yet, during none of these experiences did the men suffer from common colds. Again, Dr. Reginald Koettlitz writes: "During

* *Birmingham Medical Review*, May, 1897, and March, 1898.

his stay of three years in Franz Josef Land, neither he, nor any of his ship's company, developed a cold."

The universal experience and unanimous testimony of all explorers is, that whatever the vicissitude of temperature and climate, given absence from an infecting source, common colds are impossible. The immunity of persons during a long sea voyage is proverbial. Describing the tent treatment of the tuberculous insane in America, and comparing this with other methods, Dr. E. McDonald says: "Common colds were frequent in the wards of the built hospital and the attendant's home, but were unknown amongst the tent-dwellers." Dr. H. W. R. Mackenzie* states, "Colds are practically unknown among patients leading an open-air life." A like experience was observed by the medical officers to our "Tommies," when on the veldt during the South African War. Colonel Frere informed me "that so long as the troops were on the open veldt, notwithstanding the changes of temperature were startling, being at night many degrees below zero, causing the water in cups and tins to be frozen into solids blocks of ice, and the men required all the available clothing, blankets, top-coats, etc., to protect themselves from the intensity of the cold, and the rawness of the damp atmosphere. Upon awakening, limbs would be quite stiff and painful, necessitating movement and exercise to restore circulation. During the daytime, as the sun arose, the heat became excessive, and all clothing that could possibly be discarded was removed, and the barest covering only worn,

* An address upon the "Treatment of Phthisis."

such as trousers and shirt. Despite all these sudden changes, and the depression incidental to an army on trek, common colds never occurred."

Mr. Watson,* a gold prospector, detailed to me a similar experience. Whilst his journeying took him to the broad prairies and backwoods of America, the heights of the Himalayas, the hot, sun-parched districts of Australia, the pampas of South America, he never suffered from colds until he came into contact with the centres of humanity. From such testimony we gather: that no vicissitude of temperature, heat or cold, severity of weather, exposure or privation, without infective cause, will result in catarrhal fever.

DEFINITION.

Catarrhal fever, then, may be defined as † a specific infective febrile rhinitis, associated with a putative bacillus (Cautley's), and later by subsequent infection by pyogenic bacteria and cocci. Our want of success in demonstrating, beyond doubt, its causative organism depends upon our methods of manipulation and details of workmanship, rather than upon incorrect principles and false deductions from analogy. As clinical differentiation becomes accurate, so will bacteriological investigation prove precise and definite.

* Under the title of "Health in the Wilds, Sickness in the City."

† Biss, "Borderlands of Diphtheria and Scarlet Fever," *Lancet*, November 7, 1903.

ORIGIN.

The question of the origin of "common colds" appears to have a perennial interest. Dr. Willoughby Gardner, in the year 1898, and in 1899,* was, so far as I know, the first to emphasize the infective nature of this complaint. In 1900, not knowing of the writings by Dr. Gardner relating to this subject, I initiated a somewhat lengthy correspondence in the *Lancet*. This year again the question has claimed attention in the pages of the *British Medical Journal*, and the inexactness of our present knowledge is abundantly shown. The answer is suggested in one of the titles of this book—"Cnatan-na-gall."†

The only plausible cause we can reasonably accept is the presence of one or more specific infective germs, in a condition of sufficient virulence. These germs must be transferred to the suitable tissue of an individual who is neither insusceptible nor immune.

Its source, in the case of explorers returned from regions where catarrhal fever is absent, must be the immediate contact with sufferers in the civilized parts of the world, where catarrhs are frequently epidemic and constantly endemic. Nansen says‡: "We had none during our journey, and we all got it the very moment we reached Norway." The Jackson-Harmsworth explorers were affected with severe colds immediately they touched civilization. Sir Martin Conway's expedition suffered from severe colds when

* *Spectator*, January 7, 1899.

† "Stranger's Cold" (*British Medical Journal*, July 24, 1886).

‡ Gardner.

in contact with Andrée's settlement, which was in direct communication with the mainland; the same thing happened when they came down from the Himalayas and visited a small European settlement, for in a couple of days all Conway's men became affected. "St. Kilda's cold"* is a well-known instance of the rapid extension of catarrh under favourable conditions, as all the islanders become seized with colds when a ship reaches the island, bringing affected individuals from the mainland. Surgeon-Captain Maynard, with the Baluch Afghan Boundary Commission, tells the same tale, how, on giving up the open-air life, and living in a civilized manner, all the mission caught cold. Colonel Frere reiterates the same conclusions. Dr. Nicholas Senn † says: "In the ordinary course of their lives the Eskimos are not subject to coughs and colds, but catarrhal attacks follow visits to ships." The cause of colds is thus shown to be due to a pre-existing source, and its clinical history proves it to be closely allied, in its infective character, to other specific fevers, being produced by specific *materiæ morbi*, which are its constant and essential factors.

CLINICAL EVIDENCE.

As to the general infectiveness of colds, the clinical evidence is only too apparent, and any medical man can satisfy himself on this point if he will make careful and sufficient inquiries amongst his patients

* *British Medical Journal*, July 24, 1886.

† *Journal of the American Medical Association.*

in whom colds have occurred. Personally, for many months I have kept a record of the sicknesses occurring in households where colds have been prevalent. So frequently have a majority of the family been affected, more or less severely, in the different households, as to prove conclusively with what ease and rapidity the infection is spread.

Amongst many instances, I should like to mention the following: In a household of five adults, on December 19, the servant was taken ill: rhinitis, pharyngitis, slight bronchial catarrh, temperature never rising to 100° F. On the 22nd, the lady of the house developed the same symptoms, temperature never rising above 99° F. On the 23rd, four visitors arrived at the house, viz., father, mother, and two children. On the 26th, one of the children was taken ill with the same symptoms, temperature rising to 102° F. The other child succumbed on the 29th. On January 2, the mother was taken ill, temperature not rising above 100° F. On the 4th and 9th, the head of the household and the second servant became infected. The patients were practically convalescent in a week's time from the commencement of their illness.

Similar examples occurred in a district some distance from the above. A mother and her elder daughter, a teacher in a school some miles from her home, came to see me. The mother was suffering from a subacute attack of bronchitis. She stated that her elder daughter had a cold, the mother caught it from the daughter, and it brought on an attack of bronchitis, to which the mother was subject. Her

younger daughter, who is the headmistress at the same school, developed a cold. Here, out of a household consisting of only four persons, three suffered from cold. Upon further inquiry, it appears that, including the above two teachers, seven are engaged at the same school, and, without exception, every one of them has suffered from colds within a period of four weeks. None found it necessary to consult a medical man, and only one was for a day or so prevented from her school duties. The symptoms generally complained of were slight nasal catarrh, headache, sore throat, hoarseness, slight cough, etc.

A few other instances culled from my notebook are subjoined :

Visiting a baby suffering from broncho-pneumonia in a household consisting of nine individuals (though not asked to see the rest of the family), I put the question, Has anyone in the house had or got a cold ? The following information was elicited : About two weeks previous to my visit one of the children developed symptoms of a cold, which was not considered of any special moment by the mother. At intervals of a few days three others contracted colds ; these children were all sleeping in the same room. The general servant, who also acted as nurse, in a few days subsequently developed catarrh, and a slight cough. Shortly afterwards the father complained of a stiffness in the back of his head and neuralgia, which confined him to the house for one day. Eventually a young man who was lodging with the family took the fever. The mother, who nursed all the sufferers, did not develop any coryzal symptoms,

but suffered from a troublesome attack of indigestion, to which she is occasionally liable.

In another household of six individuals, the mother began first, in a week's time the baby, and a few days later, two other young children and the servant were affected with colds. The father, who had a stuffy nose and other coryzal symptoms, stoutly denied that these were due to colds, or were infective. Instances of a like description are numerous, and come under one's notice quite indirectly, and except for careful inquiry would be passed unnoticed. No treatment is asked for or given, the condition being considered trifling.

Here is another example: In a family consisting of six, five suffered from colds, exhibiting sneezing, tenderness, and enlargement of the glands at the angles of the jawbones, headache, catarrh of the nose and throat, and bronchitis.

The following cases were carefully watched and noted, giving the order and day each individual became affected: In a household of eight inmates five became ill. First case, a boy; the third day, the mother; the tenth day, the first girl; the eleventh day, the second girl; the fourteenth day, the second boy. Symptoms were similar in all, viz., sore throat, slight cough, etc. None were confined to bed.

Again, in a family of fourteen six became ill. First case, the father: he suffered from sneezing, running at the eyes, cough, and slight temperature, and was in bed three days.

Two days later, a boy: cold in the head, cough; in bed one day.

Fourth day, second boy: cold in the head, felt sickly; in bed half a day.

Eighth day, a girl: pains in the head, slight sore throat, slight cough, and tightness of the chest, with aching in the limbs; did not go to bed.

Tenth day, a boy: cold in the head, which lighted up an old cough, lasting a couple of weeks; was in bed half a day.

Seventeenth day, a boy: sore throat, sneezing; remained in bed half a day.

Again, in a household of six five became ill.

First day, a boy: cold in the head, running at the nose and eyes, sore throat, slight fever.

Third day, a boy: slight feverish symptoms, cough and headache; kept from school.

Fourth day, the mother: running at the nose, shooting pains about the face, which she called neuralgia.

Sixth day, a girl: running at the nose and eyes, shivering, sore throat, and cough.

Eighth day, the father: headache, diarrhœa; in bed one day.

All these cases became practically well in a day or two.

A series of cases illustrating some significant complications is as follows: The number of persons in the house was nine. The first to develop a cold was the grown-up son, who showed the ordinary symptoms and course. A week later the father suffered in a similar manner; two days after an old lady (the grandmother) and the servant were taken ill. Again, two days later, a grand-aunt complained, and in the

course of a day or two more the mother and daughter showed similar symptoms. Thus, out of a household consisting of nine persons, within a period of twelve days seven of the occupants fell ill more or less severely of apparently a common disease. The interesting point in this series of cases now follows : In the majority the illnesses were slight, and required little treatment. The mother's symptoms were, however, unusual. She suffered from vomiting, sickness, loss of appetite, malaise, prostration, and general weakness. The daughter, again, was different, as besides the ordinary symptoms of cold, she developed syncopal seizures. Both mother and daughter required confinement to bed. In the grandmother, a lady of eighty, an acute attack of pneumonia developed, and only after a long and protracted illness did she recover. It must be granted, I think, that in all these cases there was apparently one casual factor, one common *fons et origo*—viz., the "common cold." The initial symptoms in all were similar, and the primary disease was of a highly infective nature, the ultimate virulence of the attack depending upon some special susceptibility in the individual. Thus, in the grandmother the lungs, in the mother the stomach, and in the daughter the heart or nervous system. The toxins of all infective diseases have selective points of attack.

It is unnecessary to mention further examples; such cases belong to the common experience of all general practitioners, if carefully investigated, and numerically form a large proportion of the ailments they have to combat.

The supreme point for medical men to remember is the close and constant association, in members of the same family, and about the same time, of attacks of epidemic catarrh. Then appears *post*, if not *propter hoc* in another member of the household a severe attack of either bronchitis, pneumonia, pneumonitis, broncho-pneumonia, otitis, relapses in phthisis, bronchiectasis, probably gastritis, etc., depending upon the proneness of the individual to these diseases. Hence arises the seriousness and danger of these catarrhs. If infective colds are not direct causes of these complications, they are certainly not mere coincidences.

Catarrhal fevers do not show an equal epidemic virulence, they vary in their pathogenic potency as do other germ-caused diseases.

CATARRHS IN ANIMALS.

Catarrhal conditions, similar in many respects to those found in man, have been observed in animals. Whether they are of the same nature, or arise from the same source, has not yet been scientifically proved. Diphtheria is said to occur in cats, and to be communicable to man. In Gloucestershire and other districts the popular fear of contagion is so great, that if the domestic cat sneezes and shows other symptoms of a cold, it is at once ostracized from the family circle. Popular beliefs are not necessarily scientific fallacies. In horses, glanders or farcy is highly infective during the catarrhal stage. It is also the accepted opinion amongst horsekeepers that if one horse develops a cold, other horses in the same stable

in all likelihood will follow suit. It is even asserted* that if a horse is put into an empty stable which has lately been occupied by an infected animal, unless strict disinfection of the stalls, manger, etc., be carried out, the new occupant will develop a cold.

The following are the details of an endeavour to determine, the possibility of directly conveying an apparently infective form of disease, from one animal to another by the inoculation of the cultivated bacillus taken from the nose of a sickly animal into that of a healthy one. A cat, aged about twelve months, was suffering from a very severe form of nasal catarrh, accompanied with frequent attacks of sneezing, and an abundant discharge of mucus from the nose. The cat was obviously very ill; it could hardly stand, was listless, apathetic, and refused food. Another cat and dog in the house were apparently recovering from a similar illness. The disease was evidently infectious. A sterile platinum loop was carefully introduced into the nose of the cat, and the mucus so taken inoculated upon Löffler serum. The tube having been incubated twenty-four hours, a prolific number of colonies grew, consisting of one bacillary form, and a variety of cocci. On three occasions I tried to re-cultivate the bacillus upon agar-peptone bouillon, but failed; it thus differs in this respect culturally from the diphtheria bacillus. Upon Löffler's serum it grew luxuriantly. The colonies were round, opaquely white, with irregular edges, and dipped into the medium, which made them somewhat difficult to transfer to other tubes. Upon naked-eye

* Gardner.

inspection they were almost indistinguishable from the Klebs-Löffler colonies. Under the microscope with a $\frac{1}{12}$-inch lens, the bacilli, though resembling in some respects the Klebs-Löffler, Cautley's, and Hoffmann's bacilli, were not identical ; they were thinner, more variable in length ; the metachromatism was more beaded in appearance, less clubbed, and less often curved than the two former bacilli, and were thinner, more irregular both in form and length, more clubbed forms were seen, and the staining less bipolar than is usual in Hoffmann's bacillus.

Dr. Sellers, of the Manchester Public Health Laboratory, after irritating the mucous membrane of the nose of a guinea-pig by a glass rod dipped in hot water, freely rubbed a large loopful of a twenty-four hours' growth of a pure culture on serum of the cat's bacillus into the left nostril of a guinea-pig.

Twenty-four hours' later I took some mucus, made, and examined a smear from the nose of the guinea-pig with a negative result. From tubes of Löffler serum which had been directly inoculated from the left nostril of the guinea-pig the previous day I recovered almost a pure growth of a bacillus, morphologically identical with the bacillus found in the nose of the cat.

With this bacillus Dr. Sellers inoculated the left nostril of a rabbit and a monkey. A cover-glass smear, made from a loopful of secretion from the left nostril of the rabbit twenty-four hours later, showed numerous bacilli morphologically like those found in the cat. From the right nostril only a few were found.

Neither in the smears nor cultures obtained from the nose of the monkey were any bacilli resembling those of the cat's seen.

On another occasion 1 c.c. of a twenty-four hours' growth in peptone bouillon of the bacillus, obtained from the nasal secretion of the sick cat, was injected into the left thigh of a healthy guinea-pig. No local glandular enlargement or abscess resulted.

None of the animals appeared in any way to be affected by these experiments, and though in certain instances the bacilli thrived on the mucous membrane of its new host, they appear to be non-pathogenic when subcutaneously administered.

TRANSMISSION OF COLD IN MAN.

The starting-point of this disease appears to be the nasal passages, and it speads by direct infection to the contiguous mucous membranes. Many other microbic infections follow the same course, or are spread by mechanical dissemination. Septic pneumonia is sometimes caused by the inspiration of germs during operations inside the buccal cavity. True influenza spreads rapidly, the progress of its specific inflammation being determined by the parts it is brought into direct contact with, though ultimately it may become a blood-borne disease. The pneumococcus and diphtheria bacillus in their early stage are purely local growths, progressively infecting peripherically the parts they come into contact with. Their distribution is assisted by such agents as in-

spiration, swallowing, passage of the food, etc., later only being carried by the blood and lymphatics possibly as infective emboli. The typhoid bacillus in certain conditions of the stomach must run the gauntlet of antagonistic secretions to obtain access to the intestines, or may become enclosed in some undissolved bolus of food. Dr. Edmund W. Horton* quotes a case of primary actinomycotic infection of the lungs caused by the inspiration of a small fragment of dentine containing numerous threads of the ray fungus.

The transference of catarrhal fever from one person to another is occasioned by the same methods as other zymotic diseases, and, as Pugh † states, generally the following conditions are necessary :

"The contagia must be conveyable, either directly or indirectly.

"It must be inoculated on to the mucous membrane.

"It must alight in a required state of virulence.

"The dose must be large enough, and the receiver susceptible."

These requisites appear to be exceptionally fortuitous in the case of catarrhal fever. Catarrh of the nose, throat, and bronchi, acute or chronic, seems to be a constant accompaniment of modern civilization. Then follows the expulsion of highly infective droplets of mucous secretion by sneezing and blowing the nose ; or these may be conveyed by the common and indiscriminate use of handkerchiefs recently infected

* Lecturing at the Medical Graduates' College in 1902.

† *Lancet,* February 4, 1905.

by friends and relatives. This practice is as usual now as when Othello demanded:*

> "I have a salt and sorry rheum offends me;
> Lend me thy handkerchief."

Amongst children and not over-particularly clean and careful persons, where spoons, cups, sweets, and various articles of food, are promiscuously applied, the methods of spreading infection appear to be innumerable. Kissing is frequently a dangerous source. Whether expectoration is a usual or general method of conveying infection is doubtful, as I have known even the time taken to send a swab by post has occasionally interfered with the growth of the germ when cultivated.

Dried sputa is probably innocuous. Swabs taken from the throat contain the germs in much fewer numbers than from the nose. The virulence depends largely upon the recentness of the illness of the infecting person. Dr. Lewis and Dr. Turner † strongly emphasize this point in their paper on "Suppuration of the Accessory Sinuses of the Nose." In colds, the first to the third day are usually those of the maximum virility; in a week's time infection has probably subsided, and in uncomplicated cases the germs have possibly lost their pathogenic power. Most people, and at all times, are susceptible to the poison. A closer contact of persons in cold weather in small rooms and stuffy houses are powerful aids in producing the prevalence of catarrhal fever during the inclement seasons of the year.

* Act III., Scene 4.

† *Edinburgh Medical Journal*, November, 1905.

IMMUNITY AND PREDISPOSITION.

Whether anyone can boast of absolute immunity to this disease, can, I think, be answered in the negative. Sternberg* says: "Probably all diseases due to bacteriological origin afford a certain immunity to another attack." Certainly in this fever immunity is very short-lived, and I have known in less than three weeks' time a second attack run through a house, and affect many of the same persons as on the previous occasion. That some persons are peculiarly liable to recurring attacks is common knowledge; others, again, are for varying periods free. Gardner sums up his conclusions as follows:

"That a cold does give a certain immunity to many people for a short time; now many of the islanders (of St. Kilda) do not catch colds, except from the arrival of the first steamer each year.

"That the period of immunity after a cold is very short; the three months at the top of Ben Nevis, and the four months on the Boundary Commission, and even the two months in the centre of Spitzbergen, were sufficient to make all the men highly susceptible again.

"That all are highly susceptible to colds, for all the islanders, all Conway's men, and all the Boundary Commission fell victims thereto.

"That we all in ordinary life have acquired a certain immunity is shown by the fact that the colds these non-protected people take from us are far more severe than our ordinary colds.

* "Text-book of Bacteriology," second edition, p. 241.

"Again, that the virulence of colds varies in different places is suggested by the fixed belief of the St. Kilda islanders, that the colds which come from Glasgow or Liverpool are worse than those which simply come from the Hebrides.

"Again, that vigorous health does not in any way prevent a man from catching cold. Practically all the people we have been speaking about were in vigorous health. Of course, it enables a man to go through the illness better. We do not find that they were rendered weak for long, as delicate persons often are."

MODIFYING INFLUENCES.

Whilst accepting, from clinical experience, the microbic origin as the direct, immediate, and essential factor in the propagation of catarrhal fever, the existence of modifying, exciting, or retarding agencies cannot be wholly ignored. In the artificial cultivation of all parasitical organisms the exact favourable condition of the nidus or medium is strictly confined within very circumscribed limits. To estimate satisfactorily, and to have a correct knowledge of the respected values played by the soil and the seed in determining biological results, must long remain a fertile disputation-ground for the production of opposing opinions, and leaves ample scope for experiment and research in the future. Accepting, then, the uncertain factor of environment and the adaptability of parasitic organisms to it, it would be undesirable to ignore it altogether.

Prominent among the retarding circumstances must be mentioned the antibactericidal or antitoxic action of the blood, or, as Professor Wright would say, the *opsonic phase* of the individual. Again, the degree of the functional activity, and vital resistance of the ciliated epithelium and local mucous membrane; also the suitability of the reaction and composition of the secretions upon which an invading microbe alights.

To artificially grow organisms upon mucous membranes it appears necessary to initiate the adaptability of the soil by some counter-irritation. In all of my experiments, with the exception of this first instance, this precaution was adopted.

Through the courtesy of Professor Delépine, Dr. Sellers, at my request, inoculated the nostrils of a monkey by a swab taken from the nose of a child suffering from an apparently virulent and highly infective cold. I was not able twenty-four hours later to recover the organisms from the nose of the monkey, which I obtained freely in cultures taken from the child's nose. The monkey developed no illness.

Presuming that the organisms which caused cold were present in the child (there were four in the house ill out of a family of five, and the child was in the forty-eighth hour of the sickness, suffering with all the clinical symptoms of a severe cold when the swab was taken), it would seem that the mucous membranes of animals, even as nearly allied to us as monkeys, are invulnerable to artificial inoculation.

Again, in another instance, from the nose of a rabbit which had been inoculated the day before with a loopful of a pure culture of the *Bacillus coryzæ*

segmentosus, I secured a fairly luxuriant growth when some of the nasal secretion was transferred to a suitable culture medium. The rabbit, however, showed no symptoms of catarrh.

The precise circumstances and conditions which permit the growth of a germ and yet cause this insusceptibility to its specific pathogenicity are at present unknown, unless we can attribute it to some technical fault on the part of the operator, or practical immunity on the part of the animal.

PART II

BACTERIOLOGY

STERILITY OF THE HEALTHY NASAL MUCOSÆ.

The evidence of the preceding pages is conclusive in showing the essential infectiveness of catarrhal fever. All infective fevers are known to be microbic in their origin, and it is most unlikely that this disease is an exception to the rest. What is so extraordinary about this disease is that this, the most common and general of all complaints, should have for so long a time baffled the inquirer as to its precise cause, and have evaded all the efforts of so many expert bacteriologists to discover its specific origin.

In the following pages is an endeavour to re-examine the correctness of Cautley's findings, and to narrate and describe some other experiments which may help to form a basis for further work upon this difficult subject.

In reviewing the bacteriology of catarrhal fever, one is naturally led to consult the literature bearing upon the presence or absence of parasites in the healthy nasal mucous membrane. An enormous mass of work, both technical and literary, will be

found, with comparatively very insignificant and occasionally contradictory results. The cause of this may be due partly to faulty technique, but chiefly because of the difficulty of determining accurately whether a nose is in a healthy condition or not, at the time the examination is made. These two points may have brought about some of the conflicting opinions and statements which make up the bulk of its literature.

Does the healthy mucous membrane of the nose support and grow micro-organisms? The answer to this can, I think, be given generally in the negative. Thomson St. Clair* has calculated that 14,000 organisms pass into the nasal cavities every hour during respiration; none are expired, as he proved by breathing into open culture tubes; these tubes on being incubated remaining sterile. Hildebracdt† shows that "all these germs are gone before they reach the trachea. Most nasal cavities are sterile, but the vestibule of the nares and vibrissæ swarm with organisms."

These vibrissæ act as filters. Organisms which do enter are ejected by the ciliated epithelium, if in a normal healthy condition.

F. Fraenkel‡ and Lowenberg§ "found no organisms in the normal nose."

Park and Wright have re-investigated this question.

* *Lancet*, 1896.

† "Beiträge zur Pathologisch Anat. und Physiolog.," Zeigler und Nauwerch, Bd. ii., 1888, p. 42.

‡ *Virchow's Arch.*, Bd. 90.

§ *Deutsch. Med. Wochensch.*, 1885, No. 105.

In thirty-six normal individuals the results were six sterile and thirty non-sterile, but in most of the latter the colonies were not numerous. These observers consider this paucity of microbes is partly due: to the action of gravity, which causes a downflow of mucus; to the action of the cilia; to the fact that mucus is not a good culture medium; to the filtering properties of the vibrissæ; and that inspired air contains few pathogenic organisms.

Thompson and Hewlett remark: "Healthy nasal mucous membranes only exceptionally show any micro-organisms whatever. The interior of the great majority of normal nasal cavities is perfectly aseptic. On the other hand, the vestibules of the nares, the vibrissæ lining them, and all crusts formed there, are generally swarming with bacteria."

Sermoyez,* in 1895, stated "that, in spite of the abundance of dust in inspired air, normal mucus under the microscope shows hardly any micro-organisms, and these rarely develop. From the interior of the nose we made seventy-six cultures, and of these sixty-four remained absolutely sterile; in the other twelve there was a scanty growth. Therefore 84 per cent. of normal healthy nasal cavities are quite aseptic. We do not assert that the Schneiderian membrane is free from organisms, but they are never abundant. The occurrence of pathogenic organisms must be so infrequent that their presence in the pituitary membrane can only be regarded as quite exceptional."

Dr. Clive Reviere, in a letter written to me on "The Bibliography of Nasal Organisms," comes to

* "Annales de Maladies du l'Oreille."

the conclusion from the results of numerous observations that the normal cavities are practically sterile in health once the vibrissæ are passed.

Dr. C. J. Lewis and Dr. A. Logan Turner made many very elaborate and exhaustive experiments described in a paper* entitled "Suppuration in the Accessory Sinuses of the Nose: a Bacteriological and Chemical Research." They state among their conclusions "that the healthy accessory sinuses are probably sterile," and sum up their opinion of the sterility of the nasal cavities as follows: "It appears that the organisms of the healthy nose belong to the same varieties as those found in abnormal conditions, but that they differ from the flora of pathological nasal membranes in actual numbers, in purity of culture, vigour of growth, and pathogenicity."

I am very well aware that numerous competent authorities, such as Neumann, Wright, Von Peters, Von Besser, and others, have found a large variety of organisms, bacilli, cocci, and diplococci, etc., but unless every precaution is taken, the vibrissæ carefully guarded, the nose free from acute or chronic disease, or the remains of old disease—not always easily excluded conditions—the cultures from loops and swabs, and the examination of films, must show a very varied mycology.

* *Edinburgh Medical Journal*, November, 1905.

NASAL ORGANISMS IN ACUTE CATARRH.

The literature relating to the organisms found in catarrhal fever is not only extensive, but here also the results are most conflicting. Many organisms are found in the secretions due to common cold, but what is more strange is that each observer appears to find amongst these numerous organisms, one or more which he thinks predominates, and which he feels justified in assuming to be the causal germ of this disease. At the present time I am doubtful if any one micro-organism can be considered as constituting the sole factor of this fever. Possibly it is a composite infection. My investigations show that, at any rate, experiments performed with a mixed growth of organisms taken from catarrhal rhinitis upon animals produce no more reaction than a similar experiment, with a pure growth of a bacillus, recently found frequently present in catarrh, and which has been regarded as having an intimate relationship with it.

A good historical review of this aspect of the subject is given by Drs. St. Clair Thomson and R. S. Hewlett in the *Medical Chirurgical Transactions*, vol. lxxviii. From this paper it appears that in 1873 Hüter was the first to have suggested a micrococcus as the cause of coryza. In 1887 the pseudo-diphtheritic bacillus was described by Hoffmann and Wellenhof.

The comparative virulence and relationship of diphtheroid bacilli to one another is still a question *sub judice*. Muir and Ritchie summarize a historical sketch of their discovery and their varying patho-

genicity thus:* "Löffler, in 1887, was the first to describe a bacillus, having closely the characteristics of the diphtheria bacillus, but differing from it in its want of virulence. He looked upon Hoffmann's bacillus as a distinct species, and gave it the name of the pseudo-diphtheria. Hoffmann, in 1888, published an account of his investigation on this subject. He agreed with Löffler. Roux and Yersin concluded that it was only an attenuated form of the diphtheria bacillus, and was of the same nature, but failed to make it virulent, and they failed also to make virulent artificially attenuated true diphtheria bacilli. Biggs found two varieties of pseudo-bacilli: one produces an acid reaction in glucose broth, the other does not. Cobbett and Phillips confirmed these results. Hewlett and Knight found evidence that a true diphtheria bacillus may be modified so as to show the microscopic and cultural characters of the pseudo type by successive examinations of the throat following diphtheria, and also by modifying cultures."

The occasional occurrence of bacilli morphologically and culturally allied to the diphtheria bacilli in supposed healthy noses, and their constant presence at some stage or other in the course of nasal catarrh, has led to a large amount of investigation, and a corresponding mass of literature bearing upon the question of the relation of these organisms to common colds.

R. O. Neumann† says: "Pseudo-diphtheritic bacilli were found in all cases of nasal catarrh whether slight

* "Bacteriology," third edition, p. 352.

† *Zeitschrift für Hygiene und Infectionskrankheiten*, Bd. xi., Heft 1, p. 33.

or marked," but rejects the existence of any connection between this organism and catarrh.

Paulsen, next year, in twenty-four instances of catarrh found three kinds of bacilli and five kinds of cocci, but the staphylococci in the larger number of cases. He therefore concludes that the *Staphylococcus pyogenes aureus* might be the cause.

Heyle at the beginning of a cold finds only one kind of organism present, a diplococcus *c.* capsule.

Hajek found a diplococcus, which he termed the *Diplococcus coryzæ* present at the commencement of an attack, but has not proved this organism to be infective to animals.

Dr. Thorne Thorne believed that these infective colds were really modified true "influenzal attacks," and that they were caused probably by the Pfeiffer's bacillus in what he called its "resting stage."

For Pfeiffer's views *vide* Beck's article in Kolle and Wassermann's "Pathogenen Mikro-organismen," Bd. iii., 1903, p. 359.

Many others support this view, and I have had much correspondence with Dr. Murray, now so intimately associated with Dr. Bashford in the investigation of cancer, whose experimental, and clinical experience leads him to consider that common cold, and influenza are closely allied bacteriologically.

Benham* remarks: "Up to the present the organism most frequently found has been a xerosis-like bacillus showing segmentation which has been isolated in most of the cases examined. . . . A bacillus resembling Hoffmann's has been seen in small numbers."

* *British Medical Journal*, December 3, 1905.

Dr. Benham of the Stephen Ralli Memorial Sussex Hospital, who is working at the bacteriology of colds, in a preliminary note in the *British Medical Journal*, December 30, 1905, says he failed to isolate the *Micrococcus catarrhalis* and Pfeiffer's bacillus in only a few cases. Other organisms noted are streptococci, staphylococci, diplococci (gram +), diplobacilli, streptothrix, some groups of very minute cocci which do not take Gram stain.

He read a paper* before the Brighton and Sussex Medico-Chirurgical Society, reported in the *Lancet*, March 17, 1906.

Dr. Benham has kindly permitted me to append his abstract of this valuable paper prior to its publication. He examined—

"1. Twenty-seven cases of mild 'common cold.' The symptoms were sore throat, malaise, muscular pains, headache, with more or less nasal discharge and sneezing.

"2. Six of the above cases were persons connected with isolation hospitals, and have therefore been excluded from statistical consideration.

"3. Of the remaining twenty-one cases, twenty had diphtheroid organisms in the throat or nose = 95 per cent., ten had the *Micrococcus catarrhalis* = 48 per cent. Other organisms were present in much the same proportion as in the recent observations of Lewis and Logan Turner on normal nasal cavities.

"4. The diphtheroid organisms were isolated in six cases, and appeared to be identical with Cautley's bacillus.

* Published in *British Medical Journal*, May 5, 1905.

"5. They gave the following reactions: Positive to Gram's stain; negative to Neisser's stain; *feeble* acid reaction in broth containing 1 per cent. of the following carbohydrates: glucose, lactose, saccharose, and maltose. These reactions serve to differentiate the organism from *Bacillus diphtheriæ* on the one hand, and *Bacillus xerosis* and bacillus of Hoffmann on the other.

"6. Dr. Gordon inoculated a pure culture from one of my cases into a guinea-pig, with negative result.

"7. *Micrococcus catarrhalis* was present in 48 per cent. of the cases, and in considerable numbers. It may therefore have been a cause of some of the symptoms.

"8. Some of my cases did not have profuse nasal discharge, but were rather sore throats, with malaise, headache, and pains in the back, like cases of very mild influenza.

"9. Therefore I feel that it is not yet certain what is the exact pathological significance of Cautley's bacillus, though I feel certain it is one of the ætiological factors in a common cold.

"10. In view of the present uncertainty, I should suggest a name for Cautley's bacillus, which does not commit us to a theory of its pathological effects. The name I suggest is the *Bacillus septus* (Latin, *sepio*). This name is, for the reasons above stated, more suitable than the name *Bacillus coryzæ segmentosus* suggested by Cautley.

"11. Pfeiffer's bacillus, though carefully looked for, was only seen in small numbers in three of the cases. I used Nasgar plates in making subcultures for the

purpose of encouraging the growth of the *Micrococcus catarrhalis*, which does not always grow on the ordinary media."

Inquiring into the bacteriology of influenzal colds in the Twenty-fourth Annual Report of the Local Government Board, 1894-1895, Dr. Edmund Cautley first described his diphtheria-like bacillus, which he named *Bacillus coryzæ segmentosus*. The following is a brief excerpt from this work:

Case 1.—With the history of eighteen hours' symptoms of colds, he found this bacillus formed on agar-agar small, round, grayish-white colonies, which never grew to a larger size than that of a small pin's head. On a gelatine streak at 20° C. no growth became visible until after five days' incubation; they then formed very transparent colonies. On gelatine stab in four days a delicate grayish-white line with no surface expansion. On agar-agar at 37° C. a delicate streak of minute, almost transparent colonies in twenty-four hours grew, with a scanty deposit in the condensation fluid; after a longer growth the colonies became a glazy white. In broth at 37° C. at the end of two days the fluid was quite clear, but yielded a scanty string of white deposit.

Such were the cultural characters of this bacillus which he described. On the fourth day of the illness of this same case this bacillus was also found.

Case 2.—With a history of two days' cold he found this bacillus and other organisms.

Case 3.—With twenty-four hours' cold this bacillus was present, and one other organism.

Case 4.—Of three days' cold the *Bacillus coryzæ*

segmentosus was not found, but a few other organisms were present.

Case 5.—With a cold of eight days' duration, he found this bacillus and a few other organisms.

Case 7.—With a cold of two days' duration, he found this bacillus and a few other organisms.

Case 8.—With a cold of four days' duration, he found this bacillus and a few other organisms.

He concludes from the above that in seven out of the eight cases of colds which he examined, the *Bacillus coryzæ segmentosus* was present. In three it was the most abundant organism found; in other three it was present in very considerable numbers. One case showed a few colonies only.

Dr. M. H. Gordon in the supplement to the Medical Officer's Report to the Local Government Board for 1901-1902, in an investigation upon the *Bacillus diphtheriæ* and organisms to be confounded therewith, divides them into three groups. The first group consisting of the genuine diphtheria bacillus, with its well-known morphology, staining, acid production, and pathogenicity. Group 2, similar morphology, staining, and acid production, but not pathogenic to guinea-pigs. Group 3, bacilli differing in morphology and staining, with alkaline production in diastase broth, and not pathogenic to guinea-pigs. To this latter group belong the *Bacillus coryzæ segmentosus* and Hoffmann's bacillus.

Differential Diagnosis by Dr. M. H. Gordon.

	Bacillus Coryzæ Segmentosus.	Hoffmann's Bacillus.
Size	1 to 2 μ long by 5 μ broad. Much longer than Hoffmann's. Sometimes even 3·5 μ in length. Shorter on agar than on serum.	—
Speed of growth on serum	Quickly.	More slowly.
Reaction	Slightly acid at end of week.	More alkaline at the end of week in diastase broth.
Staining	—	Shows no clear unstained portion.
Size of colonies	On serum after eighteen hours' growth; colonies very minute, hardly seen without a magnifying-glass.	—
Growth on agar	A faint, misty growth in twenty-four hours under low power, showing slightly granular, flat, well-defined colonies.	Copious and opaque growth after twenty-four hours.
Tint	—	Shows a brownish tint to transmitted light.
Growth on gelatine ...	Very scanty growth after several days, at 20° C. and 22° C.	A good growth.
Segmentation	On serum very well marked; greater than any other diphtheroid organisms, including diphtheria itself.	—
Growth in broth	—	Clear the first day. In two days turbidity, followed by flocculent precipitate.
Neisser's stain	Negative. No granules with Löffler's methylene blue.	Negative.

DR. REYNOLDS' REPORT.

To further test the cultural characteristics on Löffler's serum and the morphological appearances, I submitted to Dr. Reynolds for comparison samples of cultures of diphtheria, Hoffmann's, and Cautley's bacilli. The two latter were obtained from cases of catarrhal fever by myself. The culture of the diphtheria bacillus was kindly given me by Dr. Carver, of the Manchester Public Health Laboratory. The following is Dr. Reynolds' report:

"On Löffler's serum the *Bacillus diphtheriæ* grows luxuriantly, and appears in the form of rounded colonies of a pale yellowish-gray colour. The colonies are all more or less confluent, especially in the centre. Through transmitted light they show an opaque centre with a transparent periphery. The periphery is sharply lined out into an irregular serrated margin.

"Hoffmann's bacillus presented the same appearance, only the colonies were more confluent at the lower part of the tube, and the growth is thicker as a whole."

Personally, I have always found the colonies by transmitted light of a distinct amber tint, a useful differential guide. Reynolds continues:

"The individual colonies are more spherical, and not so flat as those of *Bacillus diphtheriæ*.

"The *Bacillus coryzæ segmentosus* grows luxuriantly on Löffler's serum, but is not so thick as either of the above varieties, and presents more the appearance of a thin pellicle where confluent. The colonies are

round, but flat. The opaque centre is marked, and the periphery is also translucent and sharply defined by a stellar outline. They are more discrete than in the other two cultures, and tend towards confluency only in the lower part of the tube. The colonies are smaller than either of the others, and more translucent. None of the edges are marked off in a zig-zag way, but the processes are larger when magnified, and give a stellate appearance thus:

BACILLUS CORYZÆ SEGMENTOSUS.

HOFFMANN'S BACILLUS AND BACILLUS DIPHTHERIÆ.

Reynolds continues:

"I made a subculture on Löffler's serum of the *Bacillus coryzæ segmentosus*, and at the end of twenty-two hours I tried Neisser stain and got a negative result. I then made an ordinary film, and stained with methylene blue.

"1. The bacillus presents most of the forms of the *Bacillus diphtheriæ* and most of its characters; palisade and **V**-shaped arrangements were common in the microscopic field.

"2. I found none of the oval forms which are so usual in *Bacillus diphtheriæ*.

"3. The majority of the bacilli were like those forms of diphtheria which are attenuated, but thinner, and presenting irregular staining, the stained granules numbering five or six in each organism. In some

the granules are very much larger than the rest, but this occurred only in a minority of forms seen in the field.

"4. Involution forms are more common, more readily obtained, than in diphtheria.

"5. The bacillus as a whole stains well with basic dyes, is longer, thinner than that of diphtheria, has rounded ends, does not form spores, is non-motile, and, as you say, stains with Gram's and Neisser's when the culture is from seven to twenty hours old."

PERSONAL OBSERVATIONS.

My own observations, consisting of thirty-three examinations in the various stages of acute coryzæ, strongly support the observations of Drs. Cautley and M. H. Gordon. The method of examination in all cases but one was that suggested by, and carried out by, Dr. Cautley. The only difference, so far as I can gather from Dr. Cautley's reports, is that before applying my sterilized platinum loop, I introduced into the nasal orifice a modified Thudichum's nasal speculum, the blades of which I had made both longer, and broader than is usual. The speculum, being of aluminium, was easily sterilized by heat before being used. This assisted in preventing contamination by the vibrissæ and crusts at the nasal orifices. The loop of mucus was then transferred with all care to a couple of tubes of Löffler's serum. The colonies were examined in the ordinary manner. The results of this examination are as follows:

	B. C. S.	Other Bacilli.	Staphylococci.			Diplococci.	Yeast.	Other Organisms.
			Aureus.	Albus.	Cereus.			
1. Two days' cold. Swab and speculum	+							+
2. Twenty-four hours' cold. Loop and speculum	−							+
3. Three days' cold. Four persons in house had similar symptoms of cold	+	+						
4. Three days' cold. Four in house affected with running nose and sore throat	+							
5. Three days' cold. Three persons ill out of five in house	−							
6. Seven days' cold	−	+						
7. Four days' illness	−							
8. Three days ill. Sore throat ...	−							+
9. Three days' cold. Slight running at nose	+	+				+		+
10. Two days' cold. Sneezing, slight cough	+	+						
11. Two days' cold. Herpetic eruption on chin, headache, and coryza	+							
12. Four days' cold	−				+			
13. Five days' cold	+	+	+			+		
14. Three days' cold	+	+			+			
15. Five days' cold	−							
16. Two days' cold. Pure culture of	+							
17. Two days' cold	+	+						
18. Chronic rhinorrhœa of one month	−			+				
19. Twenty-two hours' cold	+	+		+				+
20. Three days' cold. Quinsy ...	+	+		+				
21. Two days' cold. Four out of five affected	−		+					
22. Ten days' cold	−							+
23. Two days' cold	+			+	+			
24. Twelve hours' cold. Pure culture of	+							
Second day	+							
Third day	+					+		
Fourth day	−						+	+
Fifth day	−							+
Sixth day	−			+		+		
Seventh day	−						+	+
25. Two days' cold. Practically pure growth of	+						+	
After seventy-two hours' culture	−			+				
Culture from five days' illness	−					+	+	+

FIG. 1.—KLEBS-LÖFFLER BACILLUS GROWN UPON AGAR-PEPTONE BOUILLON. 48 HOURS AT 37° C. (× 1000.)

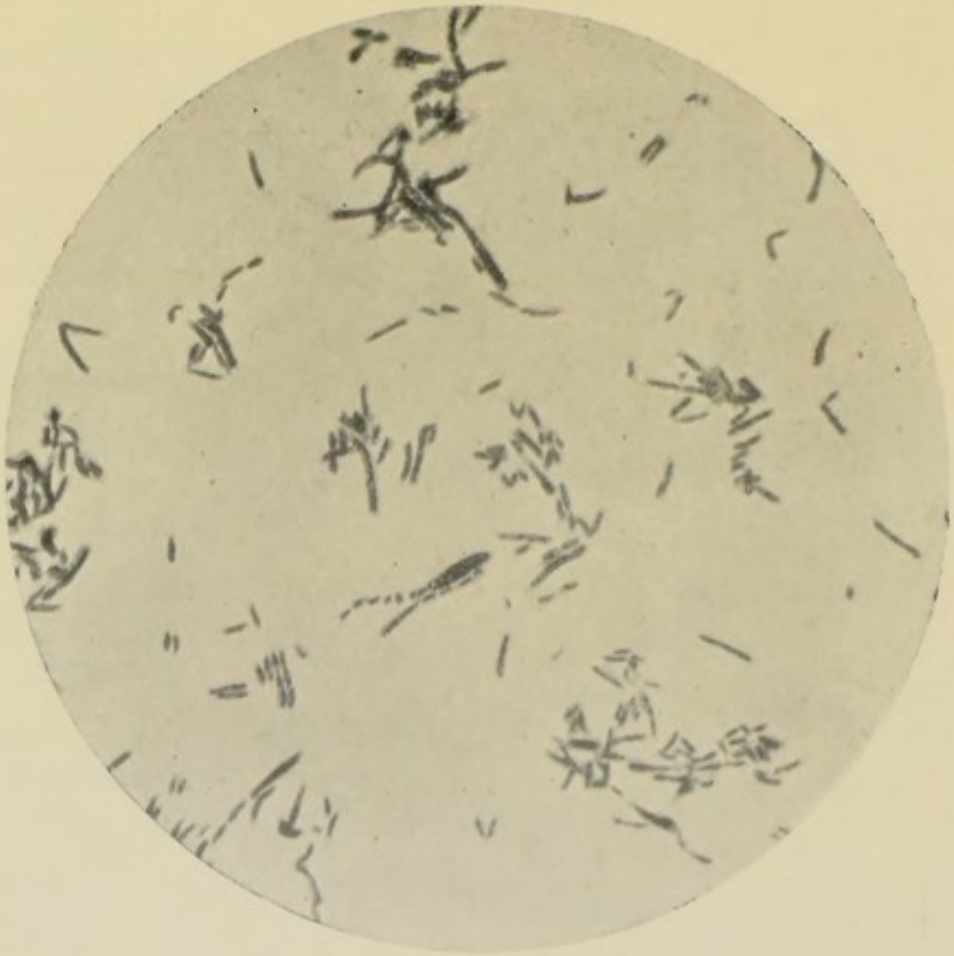


FIG. 2.—KLEBS-LÖFFLER BACILLUS GROWN UPON AGAR-PEPTONE BOUILLON. 4 DAYS AT 37° C. (× 1000.)

[*To face page* 63.

It is most important, when comparing these results with others, to bear in mind the basis upon which the diagnosis was made, and its possibilities of doubt. With few exceptions, for the differential diagnosis of a bacillus from that of diphtheria, I have been quite satisfied to exclude diphtheria by the clinical history, and the morphological appearances. The cases from which the cultures were taken were all personally under my sole care and observation, and presented no symptoms of diphtheria. In all the experiments described in a later part of this paper the bacilli used were proved not to be diphtheria, by the inertness of their inoculation into guinea-pigs. Between Hoffmann's and Cautley's bacillus the differences are very marked, and under the microscope the length, thinness, number of clubbed forms seen in a couple of days' growth, and the remarkable metachromatism displayed are sufficient to distinguish them. It is on these characteristics that the chief diagnostic reliance has been placed. Frequently there was a mixed growth of these two organisms found when, of course, many subcultures were required, but the peculiar amber tint of the colonies of Hoffmann's bacillus rendered it easily detected.

The analysis of the above results works out as follows:

Three cases examined of under twenty-four hours' duration of illness showed 2 positive and 1 negative result.

Nine cases examined, two days' cold, showed 8 positive and 1 negative result.

Nine cases examined, three days' cold, showed 7 positive and 2 negative results.

Three cases examined, four days' cold, showed 3 negative results.

Four cases examined, five days' cold, showed 1 positive and 3 negative results.

Five cases were examined at later days, and all gave negative results.

Out of this number of cases, three only showed a pure culture.

These investigations point to the practically constant presence of this bacillus during the first, second, and third days of acute nasal coryza; after this they appear to be frequently absent.

Professor Delépine kindly inoculated cultures of the *Bacillus coryzæ segmentosus* taken from two of these cases into guinea-pigs to test their pathogenicity. He injected 1 c.c. of an emulsion (about half the total quantity) of a forty-eight hours' growth in sterile bouillon into the left leg of guinea-pigs. No local reaction ever appeared, they suffered no inconvenience, and remained perfectly well at the end of a week.

Dr. Gordon's observations show six cases of ordinary cold in the head. In his growths, either upon serum or agar, the *Bacillus coryzæ segmentosus* was, as a rule, the most abundant organism, but in all his cases Hoffmann's bacilli were also recovered. Owing to the more rapid growth of the latter, these organisms are apt to cloak the presence of the smaller and slower-growing colonies of the *Bacillus coryzæ segmentosus.*

The grand total of results in cases of acute cold where this bacillus has been specifically looked for works out as follows:

PLATE II.

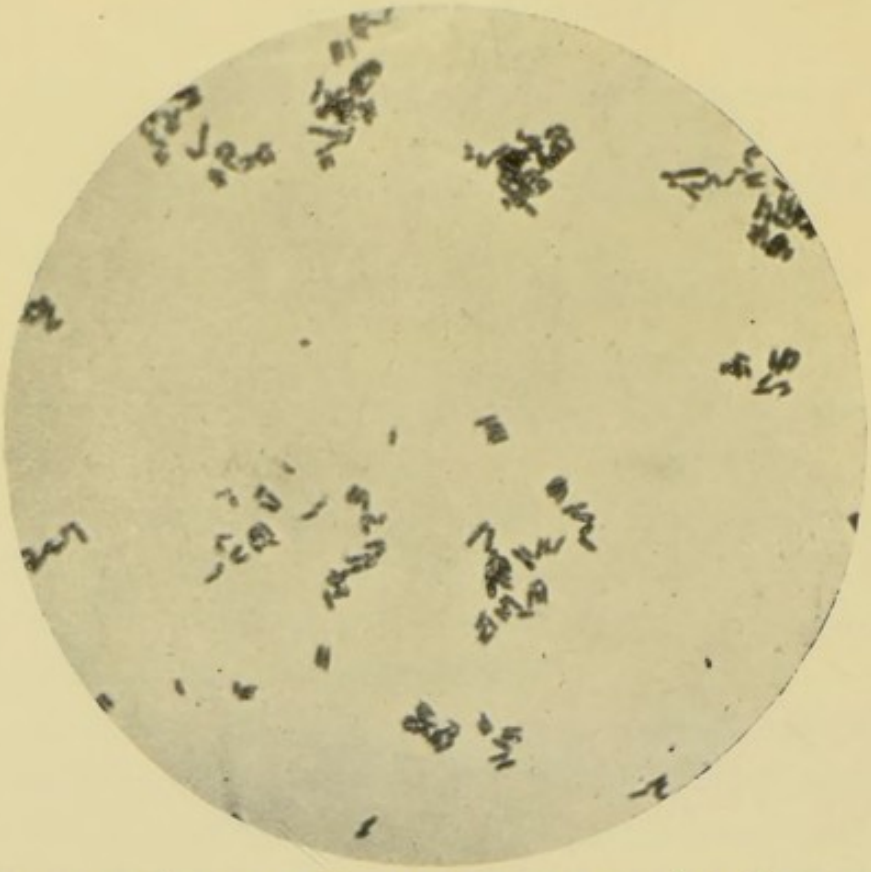


FIG. 1.—HOFFMANN'S BACILLUS GROWN UPON AGAR-PEPTONE BOUILLON. 48 HOURS AT 37° C. (× 1000.)

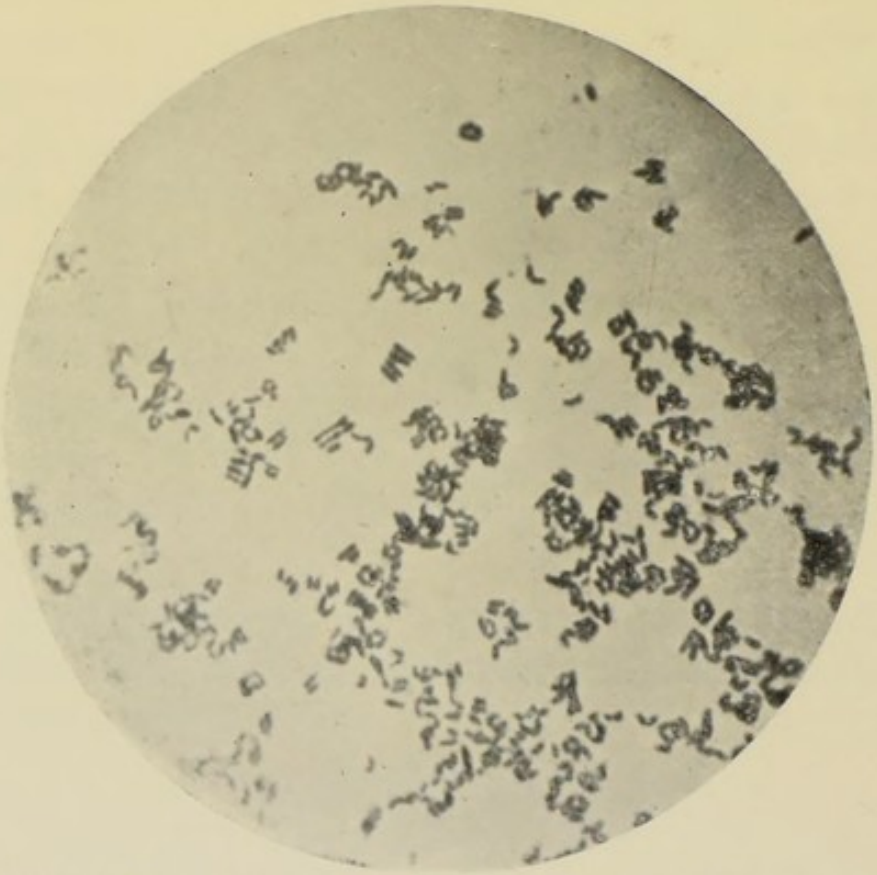


FIG. 2.—HOFFMANN'S BACILLUS GROWN UPON AGAR-PEPTONE BOUILLON. 4 DAYS AT 37° C. (× 1000.)

[*To face page* 65.

Cautley examined 8 cases—7 positive, 1 negative.
Gordon examined 6 cases—6 positive.
White examined 21 cases—17 positive, 4 negative.
Benham examined 21 cases—20 positive, 1 negative.

CHRONIC CATARRH.

In my table of results only cases of acute coryzæ were examined. The figures represent the examination of the first, second, and third day's illness, as beyond that period, in acute cases, the results were often negative, so far as this special bacillus was concerned.

If I may judge from one example of chronic coryza, my investigations lead me to believe that sometimes the *Bacillus coryzæ segmentosus* becomes more or less permanent. The case in point was one associated with chronic post-nasal catarrh of a severe and inveterate type. This catarrhal condition of the back of the nose was hereditary in the individual, as his father had apparently suffered from a similar trouble all his life. The symptoms shown by this case were: Constant hawking and spitting, especially in the morning, and a slight rhinorrhœa occasioning a frequent use of the handkerchief during the day; he was practically never free from these symptoms, and had never been free since a lad from some nose and throat irritation, with constant liability to catching cold. I examined the nasal secretion from this case whilst suffering with, and during recovery from, an attack of cold, and at intervals during a month following, with these results:

Thirty-six hours cold, nearly a pure culture.
Two and a half days, *Bacillus coryzæ segmentosus* chiefly, also a few cocci, and occasional diplococci.

Three and a half days, *Bacillus coryzæ segmentosus* in large numbers, many cocci singly and in pairs.

Four and a half days, *Bacillus coryzæ segmentosus* present, occasional diplococci and cocci.

Six and a half days, *Bacillus coryzæ segmentosus* present, with staphylococci and diplococci.

Seven and a half days, *Bacillus coryzæ segmentosus* present, with some large cocci.

Ten days, *Bacillus coryzæ segmentosus* present, with doubtful streptococci and other cocci.

Seventeen days, *Bacillus coryzæ segmentosus* present, and cocci.

Twenty-eight days, *Bacillus coryzæ segmentosus* present in smaller quantities, and many cocci.

As some of my inoculation experiments were made with the bacillus obtained from this case, it may be interesting to quote the following correspondence. I sent a tube of a pure growth of it upon Löffler serum to Dr. Clive Riviere for his opinion, and he kindly replied as under :

"I have examined the tube you sent, and have no doubt that the inhabitant thereof is the diphtheria bacillus (small form). It is morphologically similar, shows metachromatic granules, and stains well with Neisser ; moreover, it acidifies glucose broth in twenty-four hours. The onus that it is not rests with you." Dr. Riviere continues : "I would gladly have experimented further upon guinea-pigs, but am going away for a holiday."

Professor Delépine, previously to my sending this sample, had inoculated 2 c.c. of a forty-eight hours' growth in bouillon, without result, into a healthy guinea-pig, and from this circumstance I felt justified

PLATE III.

FIG. 1.—CAUTLEY'S BACILLUS GROWN UPON AGAR-PEPTONE BOUILLON. 48 HOURS AT 27° C. (× 1000.)

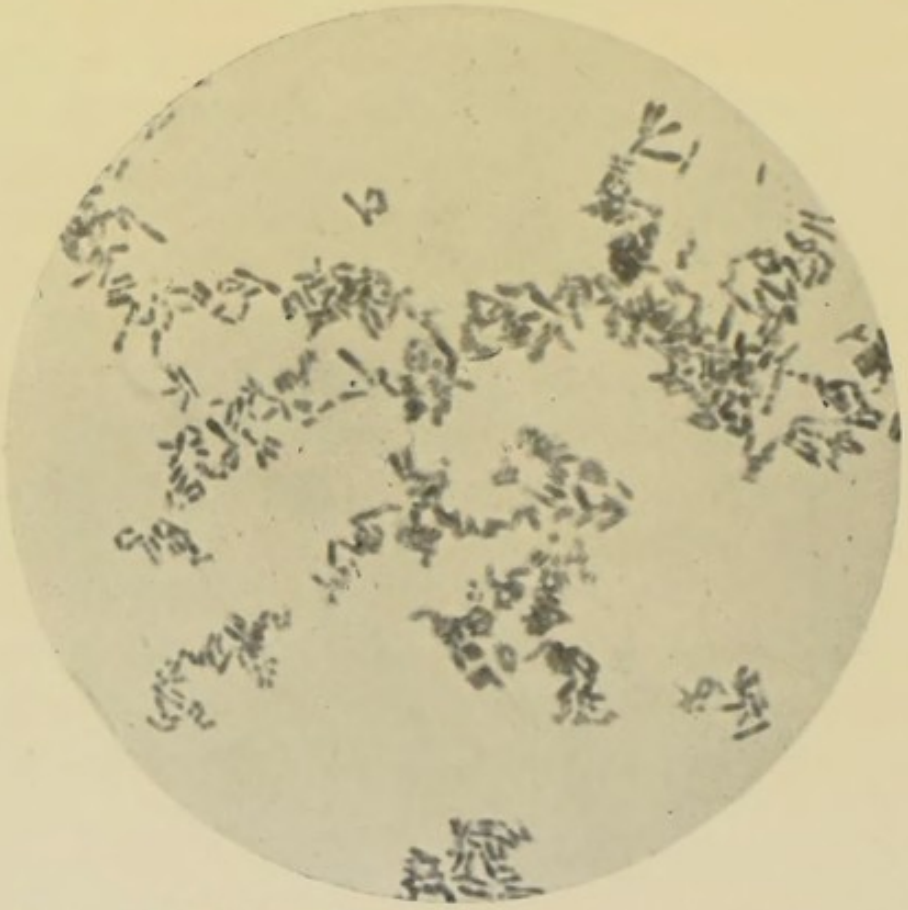


FIG. 2.—CAUTLEY'S BACILLUS GROWN UPON AGAR-PEPTONE BOUILLON. 4 DAYS AT 27° C. (× 1000.)

[*To face page* 67.

in accepting it as Cautley's bacillus; this bacillus is one of those shown in the photographs, and was obtained from the patient two and a half days after he contracted the cold.

The microphotographs explain themselves, and contrast accurately the morphological appearances of the organisms they represent.

STERILITY OF SOME MUCOUS SURFACES OF ANIMALS TO DIPHTHEROID ORGANISMS.

The next obvious requirement was the artificial inoculation of cultures of the *Bacillus coryzæ segmentosus*, or the composite growth of organisms found in catarrhal fever, by the channels through which nature is supposed to convey the infection. The restrictions to carrying out such an investigation by one who is not duly licensed are too well known to the medical public. I approached one licensed authority upon the subject without even so much as a reply to my letter. I therefore feel greatly my indebtedness to Professor Delépine for permission to work in his laboratory, and to Dr. Sidebotham, and the rest of the staff for their unfailing courtesy and consideration.

I append the following summary of the work:

With the assistance of Dr. Sellers, I examined the uterus and vagina of three guinea-pigs, with the object of discovering whether, and to what extent, the normal genital tract was sterile, or otherwise. The dead animals were pinned to the board, the skin and peritoneum of the belly reflected, and the intestines gently moved aside, exposing the whole of the uterus and vagina, except the part covered by the bladder, and

the symphysis pubis. The rami were cut through and reflected on both sides, and a slight dissection exposed the whole genital tract. One of the cornua was then lifted, and its peritoneal surface sterilized by a heated platinum spatula. At Professor Delépine's suggestion the cornua were cut through obliquely with a pair of sterilized scissors. The opening thus made was held by sterilized forceps, and a small sterilized platinum loop introduced. The platinum loop, when withdrawn, was then streaked upon a tube of Löffler's serum. Similar cultures were taken from the vagina just below the cervix, and a third from the vagina a few millimetres inside the vulval opening, and inoculated upon serum. A fourth culture was also taken externally through the vulva, after drying the orifice with a sterilized piece of blotting-paper. With these loops five tubes were inoculated. These tubes were incubated two days at about blood-heat. None of them showed any growth with the exception of those inoculated from the loop introduced through the vulva.

The culture taken from the vagina of a healthy guinea-pig through the vulval orifice, and inoculated upon five tubes of Löffler serum with the secretion gave :

Tube D.	Tube E.
Cocci only.	Two growths : (*a*) A copious growth of well-defined yellowish colonies, which consisted of a regular short bacillus, with rounded ends. (*b*) A few well-raised, well-defined colonies. These consisted of a thin, longish bacillus, which exhibited very characteristically the metachromatic staining, and other characters of the *Bacillus coryzæ segmentosus*.

Tube F.	Tube G.	Tube H.
The colonies could not be distinctly isolated, as the serum was quite liquid on its upper part. Dr. Sellers informs me that he has observed this peculiarity in previous inoculations from the vulva of healthy guinea-pigs upon this medium.	Abundant growth of semi-opaque colonies of cocci.	A few colonies similar to those of F, but chiefly colonies of yeast (?).

The importance of knowing whether diphtheroid-like bacilli are constant normal habitants of the vulval orifice in guinea-pigs, before carrying out further experiments upon the vaginæ of guinea-pigs, become at once apparent. I therefore, for further confirmation on this point, asked Dr. Sellers to take loops from three other guinea-pigs. This he did, and inoculated the secretions from each pig directly upon tubes of Löffler serum, with the following results:

A.	B.	C.
Tubes inoculated from first pig gave a few long, thin filamentous bacilli and a large number of cocci.	Tubes from second pig gave almost a pure culture of diphtheria-like bacilli, which did not stain with Neisser's stain for granules.	Tube from third pig gave many cocci, and a few diphtheria-like bacilli, morphologically indistinguishable from those found in the other tubes, except that, perhaps, they were a little thicker. These bacilli showed the metachromatic staining.

The vulval orifices of rabbits were then examined to see if this bacillus was present. Two examinations were made with the following results:

A.	B.
Tube from first rabbit gave cocci only.	Tube from second rabbit gave a long, slender, granular bacillus, quite distinct in appearance from any diphtheroid organism.

In a similar manner cultures were taken from the nostrils of three healthy guinea-pigs and two rabbits, and grown upon serum. Cocci and yeast were frequently found, but no bacillus that was in any way like a diphtheroid bacillus, or likely to be mistaken for one.

It thus appears that there is usually present a bacillus in the lower part of the vagina of guinea-pigs. This bacillus (probably the *Bacillus xerosis*) is similar in appearance to a diphtheroid bacillus, but it does not occur (so far as these examinations prove) in the interior of the vagina, except from contamination of the vulva in guinea-pigs, nor in the nostrils of either guinea-pigs or rabbits, and is probably not present in the vulva, and certainly not in the vagina, of rabbits.

INOCULATION EXPERIMENTS ON ANIMALS.

Dr. Sellers first caused a slight congestion of the mucosæ by dipping a glass rod into very hot water, and introducing it well into the vagina, through the vulva, of three guinea-pigs and two rabbits. He then applied a loopful of a twenty-four hours' growth of a pure culture of the *Bacillus coryzæ segmentosus*. Twenty-four hours later I took samples of the secretions from the vagina of these animals, made cover-glass smears, and inoculated serum tubes.

In two of the cover-glass preparations from the guinea-pigs, I found a bacillus very similar to those which grew upon the serum tubes A and B.

The third showed cocci only. The cover-glass

smears from the vagina of the rabbits gave cocci only. The serum tubes from the guinea-pigs gave when examined :

A.	B.	C.
Tube from first guinea-pig gave a small, short bacillus, regular in shape, showing very few involution forms, staining bipolar, very like Hoffmann's bacillus. This bacillus was almost in a pure culture (xerosis bacillus?).	Tube from second guinea-pig, a similar bacillary growth as A, with many cocci.	Tube from third guinea-pig, almost pure culture of a like bacillus to A and B.

The tubes inoculated from the vaginæ of the rabbits into which the *Bacillus coryzæ segmentosus* had been introduced gave growths of cocci only.

One of the guinea-pigs and one of the rabbits was killed by chloroform, and each was dissected with sterile precautions through the abdomen. Cultures taken from the uterus and vagina, and inoculated upon serum tubes, gave the following results :

Guinea-pig.	Rabbit.
From cornua of uterus, no growth. From vagina below cervix, no growth. From vagina inside the vulva, no growth.	From uterus, no growth. From vagina below cervix, no growth. From vagina internal to the vulval opening, no growth.

None of the vulval orifices of these animals, except in one case of a pig, where there was a slight mucous discharge, showed any distinctive inflammatory action after the inoculations of the *Bacillus coryzæ segmentosus*. The animals were practically unaffected by it.

These experiments also show that the bacillus found commonly in this situation in guinea-pigs (*Bacillus*

xerosis) does not penetrate any distance up the passage. They prove that the healthy mucous membranes of the vagina and uterus of guinea-pigs and rabbits do not permit of the growth of the coryzal bacillus when artificially implanted upon it in the manner above described. One of the guinea-pigs died a few days later, and the bacteriological cause of death, uncertain before, became evident upon dissection. No *Bacilli coryzæ segmentosus* were obtained. The post-mortem appearances were as follows: The peritoneal surface was dull with a slight excess of fluid. There was a fibrinous exudate about the stomach and liver. The spleen was small, the kidney and liver pale. In the uterus and vagina a considerable quantity of muco-pus was seen, many adhesions round the ovaries and tubes. The lungs were deeply congested, and there was excess of fluid in both the pleura and pericardium. Cultures taken from the pus of the vagina gave several different colonies with many forms of bacilli of varying size and length. These were in all probability ordinary putrefactive bacilli.

My second series of experiments with the *Bacillus coryzæ segmentosus* were upon the nostrils of one guinea-pig and two rabbits. The latter were selected because Pfeiffer found this animal susceptible to influenza. Pfeiffer experimented with mice, rats, guinea-pigs, rabbits, swine, dogs, and monkeys, and only in monkeys was he able to produce a disease simulating influenza by inoculating them through the chest wall into the lung, and in one instance by introducing a culture of the bacillus influenza in the nose.

Dr. Sellers inoculated the nostrils of the guinea-pig

and rabbits in a similar manner as upon the other animals. I took cultures the following day from the nose. In each case Dr. Sellers inoculated the left nostril only.

Cultures from both nostrils of the guinea-pig, grown upon Löffler's serum, gave cocci only.

Rabbit No. 1.—The secretion of the left nostril gave many colonies of cocci, and a luxuriant growth of a bacillus with square ends not well segmented, thinner than the *Bacillus coryzæ segmentosus*, and showing no clubbed forms. From the right nostril cocci only were found.

Rabbit No. 2.—The cultures from both nostrils were negative, showing in one case yeast, and in the other a few cocci.

My third investigation was upon a young female monkey (*Macacis rhesis*). Dr. Sellers inoculated her vagina with a pure growth of *Bacillus coryzæ segmentosus*. Twenty-four hours later he examined the vulva, and found no evidence of irritation. He also took a loop from the secretions. The cultures from these gave a heavy growth of streptococci. A few organisms were seen in appearance like the *Bacillus coryzæ segmentosus*.

The *Bacillus coryzæ segmentosus* not growing, and having practically no observable effect when inoculated upon so many different mucous surfaces, I thought it desirable to try a composite culture from a case of common cold. My experiments were two. My first was taken from a child, with a cold of forty-eight hours' duration, suffering with the ordinary symptoms, acute rhinitis, etc.

I took a sterile swab and carefully introduced it into the nose, and well saturated it with the secretions. This I sent to Dr. Sellers, and with it he freely rubbed the left nostril of the monkey. No symptoms of ill-health were observed at any time in the monkey, and no bacilli were recovered from the nasal secretion of the monkey, when examined twenty-four hours later.

The second experiment was made from the nasal secretions of a child suffering from a very severe attack of illness which ran through a house. Four were ill out of a family of five persons, and the temperature in two ran up to 104°. It was apparently a typical case of influenza. A bacteriological examination of the secretions from the noses of two of the individuals gave, besides a variety of cocci, a great number of very large diplococci, also a very small bacillus. This small bacillus, as well as the large diplococcus, were found as the only organisms in the secretions from the nose of the mother and an infant nine months old. The bacilli were fairly numerous in the first culture upon Löffler's serum, but were lost in both instances in the first subculture. Dr. Sellers and Dr. Carver agreed that it was most likely Pfeiffer's bacillus. I took a swab direct from the child's nose, and sent it by first post to Dr. Sellers, who rubbed it well into the nostril of the monkey. Next day he took a loopful from the nasal secretion of the monkey, and inoculated it upon serum. The monkey showed no symptoms, and the tube Dr. Sellers inoculated gave only one growth of cocci in chains.

RÔLE OF BACTERIA IN CATARRH.

The rôle, accidental, contributory, or causal, played by the *Bacillus coryzæ segmentosus* in catarrhal fever these investigations do not elucidate. The practically negative results of animal inoculation cannot be considered as definite proofs of its inertness. Take, for example, the experiment of the inoculation with *all* the secretions from the nose of the cat to the rabbit, and from the child to the monkey. In both instances, besides the specific organisms that apparently must have been present in these secretions, there were certainly the ordinary septic cocci, which we know under proper conditions are powerful agents of disease, yet under our adopted measures they proved to be perfectly harmless.

Cautley's bacillus may be symbiotic, or metasymbiotic, and require the enhancing influence of other particular organisms. These may have been absent in our experiments. Klein remarks*: "The interdependence of different organisms is frequent, as is shown by the action of the *Streptococcus pyogenes* upon the virulence of the *Bacillus diphtheriæ*, or the *streptococcus*, the *Proteus vulgaris*, and other putrefactive microbes on the *Bacillus tuberculosis* within the animal body."

Another factor of which we are at present ignorant is, how far is the *Bacillus coryzæ segmentosus* dependent upon, and were the experiments we performed agree-

* "Life-history of Saprophytic and Parasitic Bacteria," *Lancet*, November 26, 1904.

able to, the general law, common to the animal and vegetable kingdom, that perfect growth, fructification, and functionalization are impossible without suitability of the soil, and the environment? It is quite likely that the mucous membrane of healthy animals are resistant to the growth of the *Bacillus coryzæ segmentosus*. Maybe this organism requires a more prolonged contact to enable it to obtain a suitable hold, or that the protective activities of the cilia and secretions of the mucous membranes, despite the slight excoriation caused by the hot glass rod, and the pressure of a platinum wire, were sufficient to prevent its attachment and increase.

That the organism of catarrhal fever is not Pfeiffer's bacillus is amply shown by the negative findings of Drs. Cautley, Gordon, Benham, and numerous other investigators.

An organism to be causal must be constant. Other organisms are of frequent occurrence, and are reputed to be causal to this disease, such as the *Micrococcus catarrhalis*. Carriere (*Revue de Médecine*, vol. xxii., p. 508) describes seven cases of primary sore throat due to the *Micrococcus tetragenus*. He says this coccus is found frequently in the nasal mucus, the tonsils, and pharynx, but they are not always present. The finding of other diplococci and other bacilli are too infrequent to require more than a passing reference. Hoffmann's bacillus is very generally found in disorders of the nose, in fact, it very usually, by the greater luxuriousness of its growth, masks the *Bacillus coryzæ segmentosus*. Gordon found it in all his cases, and in most of mine

it was present. Hoffmann's bacillus is so well known, its characteristics have been so well investigated, and it is found in so many conditions not associated with catarrh, as to render it improbable that this bacillus is the active factor in producing catarrh.

What are almost ever present in catarrhal secretions are the pyogenic cocci. However doubtful may be the proofs of what constitute the initiating organism or organisms in catarrhal fever, the important part played by the pyogenic cocci is generally admitted. At present, it appears to be almost impossible to differentiate, even clinically, the specific manifestations from the septic.

The occurrence of Cautley's bacillus sometimes as the only organism found occasionally in pure culture, at an early stage of nasal catarrh, warrants a much closer study of its relationship to the disease, and a more intimate acquaintance with its morphological and cultural peculiarities.

The similarity of the *Bacillus coryzæ segmentosus* to the Klebs-Löffler bacillus in so many respects, and the fact of its being found in the situations usually selected by it, and the diphtheria bacillus, must lead to a reconsideration of the oft-repeated statement that the latter bacillus is frequently isolated from the healthy nose, and throat. It is quite conceivable that in the past the hardships of quarantine for diphtheria have been unnecessarily inflicted, by the mistaking and confounding of these two organisms.

An error is more liable to be made between the *Bacillus coryzæ segmentosus* and the *Bacillus diphtheriæ* than between the *Bacillus diphtheriæ* and Hoffmann's;

but this latter I have known to occur. Drs. Carver and Sidebotham kindly passed on to me some pure cultures which had condemned the cases from which they were taken as diphtheria. I examined each specimen, and morphologically and culturally they gave the characteristics of Hoffmann's bacillus, and when injected into guinea-pigs caused no injurious result. This would appear to intimate that there is greater need to verify an opinion we may express upon a doubtful case of diphtheria, based upon the morphological appearances alone, much oftener than we do, by inoculation experiments.

PART III

PREVENTION AND TREATMENT

PREVENTION.

When considering the question of prevention, or the risks to an individual, and the liability of the community contracting and spreading colds, there are some very obvious lessons from the clinical *résumé* in the early part of this book which the negative results of inoculation experiments cannot dissipate. We find, bacteriologically, in acute cases of cold, infective, and probably specific organisms in all. Certain are found in the early stages of the attack, and very shortly disappear. In chronic cases, on the other hand, the apparently putative, if not specific *materiæ morbi* may last an indefinite time, and are readily supplemented by numerous other organisms which can be classed as septic. It would thus appear that if we can avoid infection from the acute cases, and are able to cure the chronic condition, despite the strong disposition of man to the disease, catarrhal fever might be considerably lessened, or even stamped out.

To deal with infection first, Dr. Macdonald,*

* British Medical Association, August, 1904.

speaking as a rhinologist, said: "This generalization might be formulated: "Any treatment that allayed the irritability of the mucous membrane of the nose, whether by operation, and the ventilating of abnormally protected areas, or by hardening the hyperæsthetic parts with the electric cautery, or by the exhibition of local remedies, might modify or arrest the onset of catarrhal attacks, whether they manifested themselves by sneezing, laryngitis, bronchitis, or asthmatic attacks. Thus, whenever a person complained of frequent and severe cold-taking, and any abnormalities whatever were found in the nose, they could almost cure the cold-taking by curing the nasal abnormality."

The importance of relieving wherever possible all forms of nasal obstruction, such as hypertrophy of the interior turbinals, septal spurs and deviations, adenoids and polypi is evident.

The first principle of prevention, so far as we are in a position to judge from clinical experience, is to remove as far as possible the local conditions which appear to assist the formation of suitable culture grounds for the catarrhal organisms, and which we are justified in believing are the main cause of their long-continued presence.

In the chronic cases of catarrhal fever, unless we eradicate all the tortuosities of their culture, and breeding-grounds, we are practically neglecting the only method of stopping recurrent attacks.

It may be accepted as a fact, until further positive proof or disproof is forthcoming, that the only method of transmitting or receiving infection is the passing

from patient, to the recipient some of the affected secretions. Primarily, we may place those of the nose as the most usual source; the secretions of the mouth, throat, and bronchi take a secondary place.

Again, in all probability the microbes of catarrhal fever, like those of influenza, are affected by drying and desiccation, and thus, if the contagia be carried by fomites, the contagia must be of recent origin.

I find by investigation that a prolonged drying is necessary to destroy the vitality of the *Bacillus coryzæ segmentosus*. Small pieces of blotting-paper saturated with this organism were first thoroughly dried. Every day a piece of this dried paper was put upon agar or serum, and incubated at a temperature of 37° C. for forty-eight hours. The first experiment conducted on these lines killed the bacillus after eighteen days of drying, and the second after twenty-four days. Although alive for so long a time, it is probable that their virulence is interfered with.

The whole question of prevention, therefore, depends upon the careful avoidance of virulent secretion being conveyed from one individual to another.

It is thus we can account for the direct extension of the germs through a household, by the intimate relationship which exists in the family circle, especially when aggravated by close, stuffy rooms; want of ventilation, and kissing, which is practically a direct inoculation. Coughing and sneezing may disseminate a shower of virulent micro-organisms. Sneezing is a special and peculiarly reliable method for the general distribution of nasal organisms.

Dr. Gordon* sums up his experiments on the transmissibility of droplets of saliva during the act of loud speaking in a room. He was able to cultivate the speaker's saliva *streptococcus* at a distance of no less than 40 feet in front, and 12 feet behind him. During silence and quiet conversation no saliva droplets came from the mouth into the air.

Again, fomites may convey the contagion. Even in particular people it is occasionally forgotten how dangerous a source of infection an ordinary handkerchief promiscuously used may be (paper ones are advisable), and in humble life they are applied to many purposes, and many noses. How frequently one sees spoons, forks, cups, saucers, jugs, teeth-soothers, even food, and sweets of many descriptions, pass from mouth to mouth, innocent of any pretensions to cleanliness from secretions which may be reeking with many undesirable organisms.

Another important point bearing upon the question of prophylaxis is the question of the relationship of a nurse or visitor suffering from catarrhal fever, and the person whom she is nursing or attending. What is the duty of the nurse who suffers from an infectious cold whilst nursing a delicate patient, one perhaps to whom an increase of the catarrhal condition of the throat and chest is likely to aggravate the illness gravely? This question, as the question of infection generally, also applies to medical men, but in a minor degree, as the association of the medical man, and his

* Thirty-second Annual Report of the Local Government Board, 1902-1903.

patient is not necessarily so close, intimate, or prolonged, as between the nurse and her charge.

This aspect of the subject, which unfortunately some consider only of polemical interest, has been brought home to me in a practical manner in two instances, in separate families. It was found necessary to change the nurses more than once during the illnesses, owing to the danger that was supposed to extend to delicate patients of catching colds from the nurses who themselves were suffering from ordinary colds. Such incidents are more likely to arise when nursing chronic cases. Readers will at once grasp the anxiety and awkwardness of a timid patient who fears and dreads the dangers of "catching a cold," and also the distress of a nurse who feels it possible that she may directly infect her charge with what in a healthy individual may be a trifling ailment, but to an invalid is a matter of serious moment.

We may take it for granted that any trained nurse would isolate her convalescing patient without the slightest hesitation from, and not allow him to come into contact with, say, a case of influenza, whooping-cough, etc. The question now arises, Would she and could she take the same precautions, if she herself, or any of those who came into immediate contact with her patient were suffering from catarrhal fever? My unhesitating answer to this question is that she would be remiss in her duty if she did not report the fact to the medical man in attendance. Let him decide upon the requirements of the situation, and adopt such methods of prevention and treatment, as

will render the nurse or visitor innocuous to the delicate invalid.

A nurse frequently wrongfully gets blamed for relapses, catching cold, etc., during the course of an illness. These consequences are supposed to be due to, and are attributed to, want of care on her part, such as improper food, insufficient or damp clothing, careless washing and changing. In reality these accidents are oftener due to the neglectful admission of some person suffering from a slight catarrh or sore throat, who, whilst assisting with the nursing, conveyed the infection. A nurse should thus consider it a part of her duty to avoid the catching of colds, and to abstain from the company of those so suffering. At the least appearance of any symptoms of this condition in herself, she should refrain as much as possible from close contact with her patient, and render the mucous membrane of her mouth, nose, and throat as aseptic as possible by the use of antiseptic applications, gargles, mouth-washes, douches, and sprays.

BEDROOMS.

During sleep catarrhal fever is obviously extended. One third of life is spent in bed, and amongst the poor under terribly insanitary conditions. The air of our factories and workshops is less polluted with organic matter than is the poison-laden air of many of the bedrooms of the lower and upper middle class houses during the night. The prevalent, but for many reasons objectionable practice of two, three, or more children or adults occupying the one bed should be avoided.

No doubt this is, in many instances, difficult. The

custom economizes space, clothing, and warmth, and a number of single beds is, in itself, an expensive item. In crowded beds and bedrooms the rebreathing of expired air is necessarily continuous, and is of itself a depressing and injurious poison. To this danger is added the germs of catarrh. The close contact of the mouths and noses of the sleepers in the same bed, which is bound to take place during a lengthy period of unconsciousness, cannot but act as a prolonged inoculation, if any are affected with colds.

It is asserted* that "cold is a disease in which a person reinfects himself again and again, if shut up in the confined space of an ordinary living-room." Whether this statement be true or not, stuffy and close rooms, theatres, and churches are considered fertile causes of catarrhal fever. This accounts for the greater prevalence of this zymotic during the winter. Our rigorous climate necessitates the shut door, the closed windows, and general herding together of the people for purposes of warmth and artificial light, so pleasure and work are largely confined to indoor pursuits. It is usually supposed that the special risks in attending such places and pursuits in winter is due to the exposure of the heated body to draughts of cold air. This produces a sudden closure of the sweat pores, contraction of the skin capillaries, and congestion of the internal organs. An irritative and injurious action is presumed to be set up by the colder air upon the nose, throat, bronchi, or lungs, when passing from the overheated parts of the buildings into the starvingly cold passages, or the

* *British Medical Journal*, December 16, 1905.

open air. That there is much truth in this suggestion is open to great doubt. That it may be injurious for any part of the body to undergo sudden and frequent changes of temperature is not denied ; but to attribute our proneness to " catching cold " at public places of assembly to this cause is probably quite incorrect, and certainly difficult to explain scientifically.

The explanation, by the infective theory, is at once quite easy and simple. In gatherings of any size there must always be persons suffering from catarrhal fever ; the germs are continually being distributed broadcast. The high temperature of the room, and the excitement of the individual render the mucous membrane more or less congested, and add to his vulnerability. This vulnerability is doubtless an important factor, as in laboratory work we know that certain media suit particular pathogenic organisms —*e.g.*, Pfeiffer's, which thrive much better when a little blood is added to the medium upon which it is implanted. Again, the supposed value of adrenalin in the treatment of nasal catarrh is due to its power of evascularizing the nasal mucosæ. Still, the predominating cause in catarrhal fever is the infective source, and so long as people think they are under no obligation to refrain from attending meetings and gatherings whilst reeking with infective organisms the complaint must remain " common."

The necessity and value of enforcing and reiterating the " gospel of fresh air " finds one of its staunchest advocates in the believer in the infective nature of this fever. Williamson* says : " It is those persons

* *Medical Chronicle*, January, 1904.

who live habitually in close rooms, and stop up every crack and crevice in window and door that 'catch cold.'" Stagnant air must allow the lodgment of germs on all the surfaces immediately surrounding, and susceptible persons in close proximity will thus form a ready recipient, especially during the act of inspiration. Open windows and efficient ventilation are thus prime necessities if ever colds are to be stamped out.

The old and the young at all times require warmth, and sudden changes of temperature are to everybody disagreeable, and should be avoided. Indeed, it is possible that sudden variations in temperature and draughts, if continued for any length of time, may in themselves induce morbid conditions as disastrous as a common cold, and its consequences. Man has the power of accommodating himself, with due precautions, to great extremes of heat and cold without ill-effects; but to actually depreciate the general temperature of his body, even by a few degrees, decreases the functional activities of the individual, and lessens his resistance to bacterial invasions. This has been shown in the case of animals. Pasteur and Wagner, in the case of fowls, proved that lowering their temperature with cold water made them readily liable to cholera. Monti showed that dogs die at once after a cold bath when inoculated with pneumococci; whilst, speaking generally, they are resistant to this organism (Mackenzie, *Lancet*, May 31, 1902). It is also a noted fact that by keeping a frog at a temperature of 30° C. it is rendered susceptible to anthrax.

Surely, in the matter of fresh air, it is possible to steer between the Scylla of "stagnation" and the Charybdis of being "blown into eternity"!

CLOTHING.

To avoid draughts, and the unpleasant sensation of chill, great contrasts in temperature are to be deprecated. To secure efficient and sufficient ventilation—that is, the maintaining the inside air as pure as the outside air—the changes of air in an ordinary room in this climate, without special apparatus for heating the incoming air, must be very abundant and free. The advocates of clean air as the great preventative of catarrhal fever, therefore, insist upon that important adjunct to comfort and health, enough and suitable clothing.

It is quite impossible to lay down the precise amount of clothing required by each individual beyond that prescribed by conventional custom, which rests upon a firm basis of valuable experience; so much depends upon the personal constitution, circulation, obesity, habits, and employment of the individual.

The best guide and sentinel ever alert to dangers of too little or too much clothing is perhaps the condition of the skin. Speaking generally, deficiency of covering is shown by any feeling of chill, excluding the chill of toxemia; and excess by perspiration, either general or local, excluding that caused by extra exertion. Both chill and perspiration under ordinary conditions of work and pleasure are to be avoided.

Given freer and ampler changes of air in our houses,

it may follow that our usual habit of "wrapping up" upon going out may be reversed. The heat engendered by exercise and more active employment in the open will prove equal to our requirements; whereas inside occupation, being mostly of a sedentary character, the maintenance of warmth will have to be augmented, and kept up by extra clothing.

LOCAL PREDISPOSITION.

A mucous membrane, perhaps hypertrophied, easily œdematous, with deficient feeble mucous secretions, is easily attacked by catarrhal fever. The part played by mucin as a bactericidal agent would well repay a very careful future investigation. There is a marked liability to "catching cold" in subjects who have had previous attacks, and those who suffer or have suffered from chronic inflammation of the upper air-passages. A beneficial result is well seen after the removal of adenoids, the uvula, or tonsils; these operations are generally followed by a marked lessened tendency to catarrhal attacks. Bronchitis is usually a much more persistent disease in a person who has suffered previously. Weakened lymphoid tissue, thickened and congested mucous membrane, can less readily resist effectually an onslaught of morbid germs.

In this sense the liability to "catching cold" is better expressed as a local vulnerability than a general susceptibility. Hay fever shows a resemblance on similar lines. The direct agent producing hay fever is present both among the affected and the unaffected,

but in the former there exists the special local vulnerability or susceptibility, and without this vulnerability of the particular mucosæ the agent is quite harmless.

COMPLICATIONS.

The mere enumeration of the many special diseases occasioned by catarrhal fever constitutes a very long list, for which the reader is referred to an earlier chapter of this work under the heading of Symptoms. There are, however, a few remote conditions which claim a few words of emphasis, and which, if not entirely preventable, would be much lessened if people will only appreciate the seriousness of the supervention of an infection of catarrh.

Take deafness; what is its most common cause? Catarrhal inflammation of the Eustachian tube leading to middle-ear disease. In children it often ends in suppuration, perforation, and eventually diseased bone, and in adults to recurrent middle-ear catarrh and deafness. It will be admitted that if we could eliminate catarrhal colds from the posterior nares and pharynx, we should have gone a very long way towards stamping out these dreadfully serious conditions.

Again, pneumonitis, or acute capillary bronchitis, or lobular pneumonia; cold winds, wet clothes, damp sheets and beds, etc., are popularly accepted to be direct causes. All our best writers permit us to believe that these are intimately associated in some mysterious unknown way with their production. Their infective origin is the only one probable, being at once

simple and efficient, whereas the older one (cold causation) is illogical, and incompatible with clinical experience. The infective theory supports the well-known experience that an infective cold is often the precursor of these secondary diseases. It is oftentimes the only infection known to be present in the house or neighbourhood at the beginning of the disease, and it prepares the tissues for the transplantation of secondary organisms. Further, this theory suggests that we possess a valuable method of preventing, at any rate, a number of these secondary diseases, by studiously and rigorously avoiding the infection of the initial one.

BRONCHIAL CATARRH.

That a close and intimate connection exists between catarrhal fever and bronchitis is very evident, but whether there is a specific catarrhal bronchitis capable of being differentiated from other specific forms of bronchitis, except by a process of exclusion, is doubtful. The bronchial tubes in health probably contain no microbes, and the bacteriology of bronchitis is at the present time as indefinite and as complicated a subject as the bacteriology of catarrhal fever.

That there is a community of origin in diseases of the upper and lower passages of the respiratory tracts is strongly suggested by the similarity of the organisms found in diseased conditions of these passages. It is impossible to distinguish, clinically or bacteriologically, between the many specific forms of bronchitis, such as those due to typhoid, measles, whooping-cough, and

influenza, except by an examination of the other symptoms of the illness of which the bronchitis is only a secondary addition. In the same way, catarrhal bronchitis, which probably occurs more frequently than all the other varieties of bronchitis added together, can only be differentiated by its association with the other accompanying signs of catarrhal fever of which it is a sequence, until bacteriology shall be more authoritative.

All sufferers from bronchitis and emphysema—theoretically, at any rate—might receive an indefinite prolongation of comfort, and even of life, if the avoidance of catarrh were possible. The dread of another attack is ever impending, and to prevent its return the vitiated air and stove-house treatment so generally advised is adopted. The small and close room is heated to an enervating temperature, and every chink and crevice blocked up. The pure fresh air outside is looked upon with suspicion and dread, increasing with every lessening degree in temperature reached. Night air is rigorously excluded. The night-chamber reeks with carbonic acid and organic impurities. The bright morning sun glancing through the frost-painted windows is regarded as a "siren" luring to destruction.

That a brilliant atmosphere and dry air, *per se*, outside our houses cannot prevent bronchitis is obvious. In the hotels and *pensions* at Davos and St. Moritz, and those built in the ideal climate of the higher Alps, bronchitis is as common as in the humid atmosphere of England and Scotland. There must be something else required besides climatic

perfection to avoid bronchitis, and that something is: The infection of catarrhal fever.

Do not our methods of treatment and prevention of bronchitis seem founded upon an incorrect knowledge of etiology? This ailment is best combated by such things as fresh air, the finest tonic, in plenitude; heat in the atmosphere in strict moderation. The only certain preventive is the absolute exclusion of an infecting source. It is by such means that the elderly and the delicate can be promised immunity from recurring attacks. Had an epidemic of true influenza been prevalent, its dangers would have been at once recognised, its seriousness respected, and any chance of catching it prevented; but the ordinary cold is too trivial to be heeded, and quite unworthy of more than a passing consideration.

PHTHISIS.

Then, again, take phthisis, ordinary consumption.

Dr. Howslip Dicconson says: "The vulgar notion of a cold which settles on the lungs and ends in consumption has a profound truth at the bottom of it."

Dr. Sims Woodhead declares: "A perfectly healthy lung is seldom if ever primarily affected by the tubercle bacillus; the beginning is always a catarrhal affection."

Whence does this affection come? Not even the smoke-begrimed atmosphere, or the thick yellow fogs in the open balconies of London hospitals, or the snow

falling in drifts through the wide-open windows of our sanatoriums can produce it.

Again, what do we find is the usual first evidence of consumption of the lungs? The unilateral jerky breathing over the apices, a rough vesicular respiration in the same situations, with prolonged expiration. All are signs showing a catarrhal condition of the smaller bronchi at the apices. We have all seen these symptoms begin from a cold and disappear under careful treatment, but seem to take it for granted that they will return, and from what cause? Not the unaided growth of the tubercular organism, but solely from the contraction of a fresh infection of catarrhal cold which lights up the old, nearly cured, slumbering tubercles, and allows the introduction of secondary infection; consequences preventable, could we but interpret aright "experience"—the *experimentum crucis*.

We know that a catarrhal condition of the bronchial tubes and lungs forms a ready nidus for tubercle and septic germs; but whether these two latter can begin in the lungs and thrive without the former is unknown.

SANATORIUM TREATMENT.

The value of the sanatorium treatment depends mainly upon the minimum risk and infrequent occurrence of catarrhal fever. It cannot be claimed that excessive alimentation and the deposition of fat in the tissues are any hindrance to the growth of the *Bacillus tuberculosis*, or that rest and the avoidance of fatigue can inhibit its growth. The great worth of

this treatment is the constant living in an atmosphere rich in oxygen, and free from mechanical agents which may wound the tissues; but, above all, its chief value lies in the absence of morbific organisms capable of setting up a fresh irritation, and fostering the growth of the tubercle bacillus. The unsatisfactory results which attend the return of a patient to ordinary home life after sanatorium treatment are differently accounted for by every writer. The chief cause is rarely if ever mentioned, namely, the practical impossibility of avoiding catarrhal attacks from the ever-present sources of infection around him, which, besides their own injurious action, renew the old tubercular mischief. No visitor suffering from a cold should be allowed on any account admission to a sanatorium, or other public assemblage of chronic invalids. All visitors should be particularly warned of the great danger of introducing so serious an infection.

PRO TANTO.

With certain reservations the prevalence of catarrhal fever may be taken as an index of the state of health of the individual or community. A constant liability to catching colds in either one or the other points to a lowered state of personal physique, vitiated surroundings, or insanitary environment. Among the two latter are density of population, inefficient ventilation in the workroom, the playroom or the sleeping-room. The removal of air excreta is as vital to the health of a people as is the removal of other body excreta.

Another incidental advantage in the avoidance of catarrhal cold is the possibility of disseminating other germs present in the respiratory tract by sneezing and coughing. Dr. W. T. Gordon Pugh, in an address delivered before the Medical Officers of Schools Association, December 8, 1904, mentions the casual connection of common colds with diphtheria, and the great likelihood of coughing and sneezing spreading diphtheria bacteria to healthy persons. He states: "From many observations it seems likely that in both scarlet fever and diphtheria convalescents may be released from isolation still carrying the contagion on their mucous membranes, and yet prove harmless, unless catarrh is set up, and the resulting discharges act as carriers of the infection."

MORTALITY.

The mortality indirectly induced by this fever must be simply enormous, and the reason is not far to seek. Compare the death-rate of two familiar infectious diseases, small-pox and influenza. In this country the latter is responsible for a much larger death-rate than the former. Comparing these two diseases we know small-pox to be quite as infectious, and is more dangerous and fatal to life. The reason why the one slays its tens and the other its hundreds is due to the fact that the public dread the infectivity of the one and practically ignore that of the other. They enforce the artificial protection of the community against small-pox by vaccination, and the case is at once removed from the possibility of being a centre

from which infection can spread. The sufferer from a mild attack of influenza thinks nothing of going down to business, his work, the concert, and mingling with his fellow-men in social pleasures. So it is with common colds; no restraint except that of personal discomfort ever once enters the mind of the sufferer, and thus they become scattered through the family and the community. Can we wonder if the mortality caused by it is probably far in excess of any other single ailment? Perhaps an infective cold is not a very serious matter to him or her who can strictly be said to be in perfect health. Far otherwise is it with the weakly, the delicate, or the chronic invalid. Can we expect the sufferer with gradually increasing heart incompetence, œdematous and congested lungs, to withstand the added strain; or the senile heart with degenerating tissues and feeble nerve-tone to battle against an extra dose of toxin? Or the chronic bronchitic with thickened and dilated tubes, and lung tissue partly sclerosed, or emphysematous, and functionless; or the phthisical subject struggling for months with all his available power and artificially-given help against the inroads of his consuming enemy; can we possibly expect such cases as these but to sink under the extra strain of a newly-added poison, be it only that of catarrhal fever, which finally closes the scene.

EFFECT OF SPRAYING ANTISEPTICS UPON GERMS.

Up to the present time the immediate exciting and responsible organism or organisms producing common colds have not been finally settled. This negative knowledge does not prevent our accepting, upon the overwhelming clinical evidence of the preceding pages, the fact that catarrhal fever can only take origin from, or be conveyed by, a pre-existing attack in another individual; in other words, that it spreads by direct infection, and is a microbic disease. Until this view is universally accepted and acted upon, it is utterly impossible to expect any lessening of its frequency or mitigation of its consequences. To my mind, it is the ignorance of the public and the indifference of the profession to these views that account for so much preventable catarrh amongst us. When once this correct aspect of the subject is realized generally, reasonable measures of precaution and isolation will do much to mitigate, if not to eradicate, the disease.

Accumulating evidence tends to confirm the belief that the secretions of the nose contain the infective germs chiefly. Acting upon the belief, many have endeavoured to render the nasal cavities more or less sterile. The insufflation of antiseptic and sterilizing powders, vapours, and sprays, is frequently recommended with this object.

Although this theory is probably correct, practically the results obtained are highly doubtful, as is suggested

by the following series of experiments I made upon the subject. It must be at once admitted that all laboratory work is a very imperfect imitation of nature. Certainly the negative results I obtained surprised me, and may perhaps lead others to think that our belief in the possibility of destroying infective germs in the nasal cavities, by the direct action of disinfectants, is less than we surmised.

In all the subjoined experiments, with one exception (where a "mixed" culture from the nose of an apparently virulent case of nasal catarrh was used), I employed a pure culture of Cautley's *Bacillus coryzæ segmentosus*. This organism is so constantly found associated with acute examples of the disease.

The following method was adopted: A sterilized loopful of this culture was inoculated into a small quantity of sterile peptone bouillon. A sterile spatula was then immersed into this medium, and tubes containing Löffler's serum were thoroughly inoculated by the spatula. (Löffler's serum is a most excellent medium for the growth of most organisms found in the nose.) An antiseptic solution was then immediately and directly sprayed into the tubes, the jet of the spray being held just inside the mouth of the tube. The antiseptic solutions were prepared by Messrs. Midgley, of Manchester, in a vehicle of either water or liquid petroleum. The sprays employed were Midgley's vaseline atomizer, and their miniature glass spray. After the spraying the serum appeared almost coated over with the antiseptic in many instances, and the water of condensation was very perceptibly permeated with the solutions. The

tubes were then incubated about blood-heat for thirty-six hours, and their contents noted. The quantity of antiseptic injected by the vaseline atomizer into each tube is indicated by the number of times the bag was compressed, care being taken that each compression of the bellows caused a large volume of perceptible spray; that of the miniature spray is shown by the number of minims used.

℞ Biniodide of mercury, 1; glycerine and water, 200.

After 10 sprays a small growth appeared upon the serum.
" 20 " " " " " "
" 30 " a luxuriant growth appeared upon the serum.
" 35 " " " " " "
" 40 " a feeble growth appeared upon the serum.
" 45 " " " " " "

℞ Solution of sulphurous acid; B.P. strength, 1 in 8.

ɱx. gave a profuse growth.
ɱxvi. " "
ɱxx. " "
ɱxxv. " "

This solution when sprayed into the nose was disagreeable.

℞ Liq. argyrol, a 6 per cent. solution.

ɱx. permitted a copious growth.
ɱxv. " " "
ɱxx. gave no growth.

This solution, although not irritating, is objectionable in colour.

℞ Ext. hamam. dist., ʒii.; alumnol, grs. iii.; β-eucaine, grs. iii.; aq. ad ʒi.

ɱx. The colonies covered the serum.
ɱxv. " " "
ɱxx. Only a few colonies grew.

This solution is not irritating.

℞ Menthol, grs. xxx.; vaseline, ʒi.

After 10 sprays gave a profuse growth.
„ 15 „ no growth.
„ 20 „ „

This solution is irritating, but bearable. Adrenalin has no influence upon the growth of this organism upon serum. Other combinations of antiseptics in the form of spray were useless, unless in such strength as to be quite unsuitable to the nose.

This investigation tends to show that the popular belief in the efficacy of nasal spraying as a preventative of the growth of organisms in the nose is a mistaken one, or, at any rate, requires further consideration, or an improvement in technique, or in antiseptic agents, to be effective.

TREATMENT.

The treatment of catarrhal fever, important though it be, takes a very secondary place to its prophylaxis. None of our present means of offence against infective microbic diseases appear capable of dealing directly with the agents which cause them. This may account for the remarkable *laisser faire* attitude the profession adopts upon the subject of the treatment of this complaint. For its immediate distresses and baneful experiences no official line of action is recognised. Monumental works upon general medicine and treatment are written, but it is unusual to find mention of any specific line of treatment, even if, which is rare, catarrhal fever is dealt with at all. Occasionally,

some more perspicuous author in special articles upon the naso-pharynx may deem it worth his while to give in outline a few remedial measures, so far as his particular speciality is concerned.

It must be admitted that our methods of treatment, with rare exceptions, are based upon a mere empiricism, and until pathological chemistry and hæmatology have made further progress they must so remain. Scientific treatment can only be adopted when the principles of bodily resistance and immunity become thoroughly understood. In the meanwhile much information is being gained, and the natural protective influences at work in our tissues are becoming more and more evident.

It is our duty to apply our remedies so as to aid nature in the path she pursues, and to assist her by those means which she apparently points out to us and which she herself practises.

The procedure selected by the body to promote its "natural resistance" and to defend itself against microbic invasion appears to be the multiplication of leucocytes at the point of entry of the invading virus, and the elaboration of a sufficiency of alexines to deal effectually with it.

The action of alexines is probably a proteolytic one to bacteria, as it is hæmolytic to foreign red blood cells — that is to say, it lessens or paralyzes the vitality of the invading micro-organisms or other alien intruder. This action is followed by chemiotaxis, the attraction of the phagocytic elements to the injured bacteria, and finally to their destruction.

Our efforts must be to promote this "natural

resistance" of the body by increasing, by general methods of hygiene, the healthy and numerical sufficiency of the leucocytes, and by special local measures to encourage hyperleucocytosis to the part affected. It is interesting to note that many of the applications commonly sanctioned and adopted by long usage have unwittingly been assisting this physiological desideratum.

All measures for improving the general health are as valuable in this as in other morbid conditions, to enable us to deal satisfactorily with the disease when it overtakes us. The vigorous and sound state of the blood serum and its elements must be our prime care.

The importance of fresh air has been so strongly insisted upon under the heading of Prevention, that its reiteration here is hardly required. Exercise and general hygiene, and a previously well-regulated life, enable the sick the more easily to draw upon their reserve stock of strength. Simple, suitable, though ample nourishment are valuable aids in promoting leucocytosis. Tesser and Müller have proved that a deficient dietary lowers the "natural resistance" of rats to microbic infection. Charron and Roger have noted the same disastrous results from over-fatigue. Pasteur, Wagner, and Lode, by lowering the temperature of the bodies of pigeons, and thus decreasing their leucocytic count artificially, interfered with their protective ability to throw off bacterial disease.

Certain poisons and psychical depression act in a similar manner. The necessity for avoiding such inimical agents in disease is thus palpably evident.

Hans Buchner, describing the worth of general

and hydrotherapeutic measures says they are most valuable in disease. The excessive hypervasculisation of the skin attracts great numbers of leucocytes to its surface, and the depletion which ensues in the internal organs is followed by a more vigorous reproduction of new white blood-corpuscles—a general hyperleucocytosis.

A similar action is caused by sun and light baths if moderately and wisely employed.

DRUG TREATMENT.

The value of drugs are decidedly great, although there are at present few recognised specific medicaments which are known to act directly upon the injurious organisms present, without adversely affecting the tissues of the individual for whose benefit they are prescribed. Active drug administration should only be conducted when we have full control of the patient, and for that and other reasons, if possible, rest in bed is expedient; it relieves strain on the heart, and avoids any interference with the operation of our remedies. All agents which dilate the surface arteries tend to produce an increased leucocytosis. Amongst them are opium, belladonna, and antipyretics. These are also useful by reducing oxidation. Their value is enhanced in that they relieve many distressing symptoms, such as headache, pains in the limbs, some of the other numerous uncomfortable local and general sensations, and sleeplessness. Amongst the best drugs for this disease in its early stages are phenacetin and alcohol.

Of this latter, in the "Encyclopædia Medica," edited by Chalmers Watson, it is said, that perhaps the most potent antiperiodic we possess is alcohol; it is useful in catarrh. He sums up the treatment of catarrh in these terms: "Absolute rest in bed, fresh air, and cognac."

Dr. Brampton also tersely and epigrammatically enforces this statement in an article in the *Hospital*, May 4, 1895, when he asks, "What is the key to the treatment of influenza?" Answer: "The cellar key."

Mercury is beneficial in all the early stages of acute catarrh, as, besides its specific and direct influence upon mucous membranes, it clears the digestive tract, and stimulates the elaboration and passage of leucocytes into the blood.

The indications thus outlined are met by prescribing for an adult rest in bed; but, lest the sad fate of Goody Blake overtake him:

"For very cold to go to bed,
And then for cold not sleep a wink"*—

prescribe:

℞ Dover's powder ... ... grs. iv.
Phenacetin ... ... grs. xii.
Pulv. hyd. c. cretæ ... ... grs. vi.

M. Fiat pulv. Sig.: Take at night in some hot demulcent drink with alcohol.

℞ Sp. chloroformi ... ... ♏xx.
Sp. ammon. aromat. ... ... ♏xxv.
Tr. belladon. ... ... ♏v.
Sodæ salicylici ... ... grs. x.
Aq. cinnamomi ... ... ad ℥i.

M. Fiat mist. Sig.: Take occasionally during the night.

---

* "Goody Blake and Harry Gill," Wordsworth.

This mixture can be continued during the whole period of the illness unless the belladonna is thought undesirable, or the sodium salicylicate produces too much depression or sweating. Alkalies are indicated and are effective, as they counteract the hyperacidity of the blood and directly favour the generation of anti-bodies.

Later on quinine appears suggested by its valuable aid in influenza, and its action is improved when combined with salicinum, salicylic acid, and salol. A good formula is:

℞ Quininæ disulphatis ... ... grs. ii.
Sozojodolate of sodium ... ... grs. v.
M. Fiat pulv. Sig.: One t.i.d. in a wineglass of water.

A recent method of combating microbic affections is that adopted by M. Hahn, of the Hygienic Institute of the University of Munich, by the injection of yeast nuclein or nucleinic acid. These substances are found greatly to promote an increase in the normal quantity of the white blood-corpuscles. Hahn states that it doubles the germicidal power of the arterial blood.

Von Mayor asserts that nucleinic acid increases the white corpuscles in the arterial blood by 75 per cent. Dr. Snowmans says Miyake* injected 1 c.c. of a ½ per cent. solution of nucleinic acid into the peritoneum of a guinea-pig; this animal was thereby enabled to resist twenty times the normal fatal dose of a virulent culture of the *Bacillus coli*.

* In an experiment quoted in the *Medical Annual*, 1905.

SERUM.

The prospects of manufacturing a satisfactory protective serum against this disease are remote. The value of an antitoxic serum in any disease appears to be largely proportional to the immunity which one natural attack of an illness confers against a subsequent one. At the present moment it can hardly be said that catarrhal fever confers any prophylactic action against a second onset, or it is of so short a duration as to be practically negligible. Some even go so far as to believe that a previous illness renders not only the local parts more vulnerable, but even the general system more suitable and prone to be affected.

TOPICAL APPLICATIONS.

The old-fashioned remedy of a hot mustard foot-bath, followed by a stiff night-cap of toddy, is based upon a sound *raison d'être;* the warmth and stimulation of the skin cause a free dilatation of its capillaries, the alcohol and free libations quicken the circulation, promote diaphoresis and diuresis, and augment the interchange of gases in the lungs; and thus, by the powerful aid of the three great emunctories of the body, the toxins of the catarrhal process are eliminated.

Clarence Wright extols* the "Biers' method of treating acute inflammation by passive congestion" as a cure for many of the early and distressing symptoms of cold. He says: "The stuffiness, lacrymation, and sense of oppression passes away within a few

* *Treatment*, January, 1906.

hours of its application." The value of this method is acknowledged in local inflammations affecting joints and superficial areas of the skin. Its action is to attract the fluids and cells of the body to the invaded part in large quantities and numbers, which are thus enabled to deal with the offending organism. It is applied as follows in the case of catarrhal fever: Biers used water to moisten the bandages, but Salzcoedel improved the treatment, and recommends bandages dipped in alcohol 95 per cent., as alcohol has the power more than any other chemical agent of dilating bloodvessels, especially arteries, when locally applied. These bandages are applied round the neck somewhat tightly. The pressure must be evenly distributed, and for that reason a flannel roller bandage is preferable. The pressure is an important factor in the treatment, and the surface covered must be as large as possible. Over this tight bandage a layer of cotton wool is wound, and on the outside is placed a layer of gutta-percha tissue or oiled silk. The constriction, if efficient, but not too excessive, causes passive congestion, which in a few hours aborts the attack.

Doubtless the application of compresses, stupes, embrocations, or poultices, acts in a precisely similar manner by causing a superficial, persistent leucocytosis. But Biers' method has the advantage of a more powerful action induced by the congestive tendency of the constriction and the attractive agency of the alcohol.

Clarence Wright advises Formawn wool as a topical application in the preliminary stages of the

rhinitis. He states: "It possesses the capillary astringent properties of menthol, and the tissue-hardening powers of formaldehyde, and undergoes decomposition on exposure to moisture into its component parts." It appears to be also valuable as an inhalent.

TREATMENT OF RECURRENT CASES.

Between the attacks and in the subacute forms it is essential to promote free tissue oxidation and general metabolism. Thus, windows open night and day; a modicum of general physical exercise under healthy surroundings; but, above all, the frequent recourse to respiratory calisthenics, with ample and forced nasal respirations, must be continuously practised.

Where there is any slight impediment in the upper respiratory tracts, such as slight adenoid growth or a tendency to hypertrophied, œdematous, or eczematous mucous membrane, the value of local treatment combined with forced nasal breathing is most marked. Locally, medicaments are best applied to these parts, for long periods of time, in a lard or glycerine base by means of a fine camel's-hair brush introduced through each nostril. When so employed, they are especially valuable in mitigating the obstructive symptoms of the nose, by reducing hypertrophied tissue.

A useful formula for this purpose is:

℞ Resorcin ... ... grs. x.
Suprarenal gland (desic.) ... ... grs. x.
Chloretone ... ... grs. x.
Adipis benzoat. } ... ... āā ʒi.
Adipis lanæ }

M. Fiat ung.

In chronic and recurrent attacks tonics are indicated. A favourite pill recipe is:

℞ Ferri phos. } ... ... āā gr. i.
Quininæ phos. }
Strychninæ ... ... gr. $\frac{1}{32}$.
Acidi arsenic. ... ... gr. $\frac{1}{50}$.
M. Fiat pil. Sig.: One t.i.d.

CHILDREN.

Youth seems specially liable to attacks of colds, and in infants coryza is specially serious on account of the nasal obstruction produced, and the consequent difficulty in feeding, and also because of the more frequent liability to complications such as bronchitis and broncho-pneumonia.

Dr. Ballin,* when discussing the treatment of coryza in infants, strongly advises a persistent topical treatment to the nose. This local treatment, *vide* above, is as valuable in the snuffles of hereditary syphilis, and the mucous congestion of struma, as is the particular specific constitutional treatment of these diseases.

For the prevention of colds in elder children the "out-of-door" school as practised by the Germans is highly desirable and distinctly beneficial, mentally, morally, and physically.

DIETETICS.

Diet doubtless forms an integral part of the treatment of most disorders, and in this disease it deserves attention. Dr. Chalmers Watson† holds the view

* "Die Therapie der Gegenwart," 1905, p. 65.
† *British Medical Journal*, December 2, 1905.

that excess of proteids in the diet is the cause of catarrh. Dr. Alexander Haig supports a similar theory. These suggestions lead us to infer the existence of such diseases as gouty and rheumatic rhinitis, which I think none will dispute entirely. The appropriate treatment is, of course, the prevention of the original dyscrasia by general and medicinal measures.

The holders of the "infective origin" of common colds do not deny that excess of certain classes of aliments, such as proteids, alcohol, or that rheumatic and gouty conditions, the results of incomplete and inefficient metabolism, must tend to degeneration and feebleness in the resistance of the body as a whole, and the mucous membranes in particular, to the inroads of morbific organisms, those of catarrh included. But they deny that these constitute the principal and usual *fons et origo*, and believe that to maintain such a thesis is quite untenable. Simplicity of living and the equalizing of the ingesta to the needs of the ordinary requirements of the body is most assuredly the ideal to be aimed at. These requirements vary with the individual, with his habits of life, occupation, and surroundings. One and all demand attuning to the diverse necessities of the individual, to complete the harmony of perfect functional accord.

H. K. Lewis, 136, *Gower Street*, *London*, *W.C.*