a general idea of the sanatorium, with the *Liegehallen* and the medical director's house. The spacious dining hall and the kitchens occupy a second building in rear of the first, and connected by a covered bridge. The doctor's house adjoins.

The *Liegehallen* stretch out on either side of the main building, and in these the patients lie for at least seven hours a day, with the feet encased in felt boots, and covered, in cold weather, with as many as six blankets, so that they always keep warm. The building is heated by steam pipes, and ventilation is carried on partly by an extraction system, but chiefly by open windows, which are practically never closed. They open partly by louvres and partly by door casements. The sputum is received into various glass and china spittoons, some placed not on the floor or table, but suspended from the walls at a height (about 4 feet) convenient for expectoration. It is emptied into a special receptacle, which passes directly into the principal sewer.

The drainage, like that of Hohenhonnef, is into a series of siphon cesspools one above the other, and thence into the valley below; and the water supply comes from a stream above the sanatorium, and is excellent.

The wards are $4\frac{1}{2}$ metres in height and with ample cubic and floor space, and they contain from two to six patients each. The internal fittings of the sanatorium are somewhat rough, and there is a lack of the comforts visible at the Brompton Hospital.

The patients are douched every day after breakfast, and other baths and massage are employed. They walk out four times a day in all weathers, commencing with half an hour at a time, and afterwards extending their walks to two hours, but they change their clothes if wet, and the rest of their time is spent, when not at meals, in the *Liegehallen*.

The meals are five in number, at 7.30 A.M., 10, 12.30, 3.30, and 7 P.M., and the dietary, good and varied, embraces meat twice a day, much bread, leguminous food and vegetables, with two litres of milk at least. Some of the patients eat more than 1lb. of meat at a sitting. Large gains of weight are registered, in one case 79lbs.!

Dr. Stauffer, the highly intelligent medical director of the sanatorium, told me that only first stage or tubercularisation cases of one or both lungs are admitted, and that cavity cases are as a rule rejected, and sent back to their own homes, and this must be borne in mind when the statistics come to be published. The patients did not present anything startling in appearance; they seemed fairly well, but there was a great deal of coughing and expectoration. According to Dr. Stauffer the average stay is three months, and the payment per head per day is $3\frac{1}{2}$ marks, which is either paid by the patient himself or by the commune to which he belongs. For the small wards, holding one or two beds each, a higher rate—5 marks—is charged. The hospital, with the land surrounding it, cost about £20,000, a large sum in Germany, but which shows that our neighbours are in earnest in carrying out a good work, though they are rather late in commencing it, for, be it remembered, that in the matter of consumption hospitals, London had four of these institutions thirty years before Berlin had one.

REFERENCE.

¹ *Lancet*, November, 1894; *BRITISH MEDICAL JOURNAL*, May 21st, 1898.

A "NON-COMBATANT" IN ACTION.—According to the *Boston Medical and Surgical Journal*, Assistant-Surgeon John W. Bransford, of the United States Navy, was advanced three numbers by the last Congress for the heroism displayed by him in the naval battle of Santiago. Surgeon Bransford was attached to the converted yacht *Gloucester*, which destroyed the Spanish torpedo boat destroyers, and having no wounded to demand his care he took charge of one of the rapid-fire guns with marked effect, his conduct eliciting the official praise of his commanding officer. Dr. Bransford had served eighteen years as an assistant-surgeon in the navy, but had afterwards resigned and was in civil practice when the war broke out. He promptly offered his services, and was given a volunteer commission. A Bill to appoint him as assistant-surgeon in the navy and place him on the retired list passed the Senate, but failed to receive action by the House during the more pressing matters which occupied the latter part of its session.

THE ETIOLOGY AND PREVENTION OF TUBERCULOSIS.*

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THE study of a disease known to be bacterial in origin resolves itself into a study of the life-history and habits of its causal agent—a task by no means so easy as at first sight it appears to be, for this study includes many collateral questions; and preventive measures involve, if they are to prove effectual, precautions varying according as the organism is purely parasitic, able to live and flourish only upon the living animal body, or is a facultative saprophyte, alternating its life in the body by one upon dead organic material, thence to be reintroduced to the body for a part cycle of its existence. The normal resistance of the body to this or that infection varies, too, enormously; and the mode of growth of the bacillus in relation to the body determines whether the disease is an acute, highly communicable, but transient attack, as with the specific fevers, or a less acute, less rapidly spread, and more lingering affection, as with tubercle and leprosy. The tendency of tubercle to spore formation also apparently plays no unimportant part in determining its persistence.

Nor must we forget that associated causes, at first sight of secondary consequence, may play an enormously important part in determining the extension of a disease purely bacterial in origin. Overcrowding, deficient ventilation, lack of cleanliness, malnutrition, dampness of site and dwellings, unhygienic conditions of life at home and of work in the workshop; indeed "poverty" in general, as involving these factors in its connotation, assists indirectly, but none the less effectually, in promoting the survival and transmission of the disease, and especially of its pulmonary forms. In this form of disease, too, hereditary malformation of the breathing apparatus, with deficient lung expansion and consequent insufficient air change and oxygenation, promotes and encourages the implantation of disease. Similarly, tissue injury following certain of the specific fevers predisposes strongly to infection with tubercle.

A point not to be disregarded is the susceptibility of the lower animals to any particular form of infection. Thus in dealing with measles, with enteric fever, or with cholera the problem is simplified by the fact that animals are apparently not susceptible, at least under natural conditions, so that our preventive outlook embraces solely the considerations connected with the transmission from man to man; in the case of measles directly through aerial transmission, in the other cases mainly through specifically contaminated water, but still in direct continuation from the first case, usually after a longer or shorter saprophytic existence out of the body in contaminated soil.

In two diseases at least—small-pox and diphtheria—their existence in greatly attenuated form in certain animals, the cow and the horse, has, so far from introducing an element of danger, pointed to quite exceptional means of prophylaxis and of cure; but in certain other diseases—as, for example, plague and tuberculosis—we are confronted with a marked tendency in certain animals to suffer, in common with the human race, from identical epidemic or endemic manifestations of a particular disease.

No more significant index of the increased difficulty of prevention arising from this fact can be imagined than the oft-repeated and constant history of the epidemic invasion of rats which precedes or accompanies, and no doubt precipitates, a general invasion of plague—a relation so constant that the endemic persistence of this disease over certain parts of Asia appears to be causally connected with the geographical distribution of a particular sub-family of rats (the *Nesokia*).¹

Now, tuberculosis is not only one of the most widely-spread of human diseases, but there is probably no other disease which affects the domestic animals so widely, and amongst susceptible domestic animals cattle are most prone to the disease, not only the lungs and pleuræ but often the abdo-

* Read at a meeting of the Bath and Bristol Branch of the British Medical Association, January 25th, 1899.

minal organs being peculiarly liable to affection, and the udders participating sooner or later in a marked proportion of cases. The returns from Leipzig in 1895 show that 33.2 per cent. of all cattle over one year old slaughtered were tuberculous, and amongst the cows no less than 43.5 per cent.² Pigs also are very commonly affected, and many other animals, but sheep and goats are infrequently attacked.

Here, then, the problem is involved by the necessity not only for consideration of the methods of transmission of the pulmonary forms of tuberculosis, in which personal transmission more or less direct plays the important part, but also of the abdominal forms of the disease, which, there is reason to believe, are very commonly produced, though perhaps not always, by the ingestion of imperfectly-cooked food stuffs derived from infected animals.

Cornet's classical experiments³ with dust from places inhabited by tuberculous patients, examined by the very delicate test of inoculation into susceptible animals, a far more reliable method owing to the sporulating habit of tubercle than a mere examination for the bacillus, demonstrated that while the exaggerated idea of infection universally present in the streets and houses of cities must be negatived, yet that a very large number of places where phthisical patients live and congregate do contain material in the form of dust capable of communicating tubercle by infection. In effect, then, while the danger of contracting tubercle in streets or ordinary rooms is remote, there is a real and positive danger in regard to the actual habitations of phthisical patients. This method of transmission by dried tuberculous sputum distributed in spore form by dust may not be the only way, but it is becoming more and more certainly recognised as one of the most important methods of infection.

Payne asks us,⁴ in considering the tubercle bacillus as a parasite, to regard it as adopting what we may term a selective method of continuing its species in accordance with the general laws of parasitism, establishing itself in a particular part of the body specially suitable to its growth, and discharging thence its offspring in millions in the lung excretions (20 millions in twenty-four hours according to Bollinger), a chain of processes admirably calculated to facilitate the passage of the species from one host to another. "It is self-evident that these processes are not intentional in any sense in which that word can be used, any more than the processes by which the tapeworm's egg upon discharge finds its way into water with which it enters the body of the next host in its cycle of existence; but they may be regarded as the result of an inherited habit by which in its evolution through countless generations this bacillus has been able to assert and establish its continuous existence as a parasitic species. Thus the airborne contagia of small-pox and scarlet fever are determined to surfaces whence they may pass to the air again, the contagia of enteric fever and cholera pass out from the bowels into soil and water, each into the medium best facilitating its continuance as a parasitic species." The negative condition is, he points out, fulfilled by the organism of a true soil disease, such as malaria, which is not known to pass out of the body by any channel, and is, accordingly, not communicable from man to man. Note also the constant determination of the tubercle bacillus to the lung, by whatever channel it gains entrance, excepting, perhaps, tuberculous skin affections, in which frequently, though not always, it remains localised.

It is not necessary to suppose that tubercle has always been a parasite of man. We may indeed imagine a race of nomads, little sheltered, but living in search of food chiefly in the open, to whom tubercle was unknown; until the aggregation into small or large communities, with the inevitable resultant overcrowding in habitations, and the establishment of more sedentary occupations, gave the necessary encouragement to an organism able to live and multiply favourably at the body temperature and in the body tissues, to select an appropriate site for its output, and so in course of time to firmly establish its continuance as a parasite. "The fact of 'overcrowding' is ancient; in cold countries it has always been the custom for men, as well as social animals, to huddle together for the sake of warmth. It is only latter-day ideas which make this a sanitary crime, while ventilation is distinctly a modern virtue."

But, however this may be, consumption of the lungs may be

traced with certainty in the writings of every period as far back as the earliest attempts of the ancient world to deal with medicine according to a method, and it has held at all times and among all civilised peoples a foremost place among the national diseases,⁵ retaining, however, a distinctive habit of attacking the sedentary, the confined, and the overcrowded, and exempting in great part both animals and men whose life is in the open.

Phthisis is communicable from Person to Person, but apparently not directly so: the Sputum is highly infectious, and possibly the chief means of spread.—Inoculation experiments have abundantly proved that the tuberculous sputum does contain the infectious material of the disease, and that tubercle may with great certainty be communicated by this means. We have seen that the sputum is the chief means by which infection leaves the body, and carelessness may readily cause its distribution about living or work rooms. Is it also the chief means by which pulmonary phthisis is acquired? It is not easy to experimentally produce phthisis by inhalation. Tappeiner, however, succeeded in infecting all his experimental animals shut up in a chamber into which large quantities of tuberculous sputum were discharged in the form of spray, and his servant, a robust man in perfect health, who by way of bravado and in the face of serious warning persisted in entering the inhalation chamber, acquired an acute tuberculosis which proved fatal in fourteen weeks.⁶ Though these conditions would not occur in real life, and though the power for contagion of the tubercle bacillus is far less intense, and the human body in general far more resistant to this infection than in the case of the acute specific fevers, such as scarlet fever or small-pox, yet we must remember that the opportunities of infection in tubercle, if less urgent, are far more prolonged; and a patient continues to expectorate over a period of some two to three years a contagion amply virulent, which under conditions of carelessness must continue to be spread about, to dry and diffuse into the air, and to be breathed and rebreathed day after day for many months or years.

The Relation of the Dwelling to the Spread of Tuberculous Disease.—The infection of tuberculous disease is frequently found to attach to houses, and by residence in such houses human beings may become infected. It is an important question how long the infection will persist in its saprophytic form outside the body, and the opinion has been given that usually it would not be long enough to infect a fresh tenant. We must not forget, however, the significant experiments of Delépine,⁷ who showed that the tubercle bacillus is capable of growing even on vegetable matter, kept in suitable conditions of moisture and not much exposed to sunlight. He has also watched colonies of this bacillus grow slowly in glycerinated media for months, without loss of virulence, at the temperature of an ordinary room both in winter and summer. These experiments give an added importance to the observed fact that special prevalence of tuberculous disease attaches to particular dwellings, and even to special streets and localities, and give a part answer to the question whether the disease clings to particular houses, or to houses having the same sanitary defects, defects especially of bad ventilation, of overcrowding, whether in house or workshop, defects especially leading to the rebreathing of expired air, or involving the presence of darkness, dampness, and dirt; for in these circumstances not only is the general health apt to deteriorate and predispose to infection, but infection itself, direct or indirect, is apt in all communicable diseases to be intensified, and its conveyance to be much facilitated by overcrowding.

Ransome⁸ has drawn attention to many striking instances of whole families living in the same house being carried off in succession by the disease; and the Collective Investigation Record gives examples in which the return home of a previously healthy member of a family after contracting phthisis has been followed, within from two to six years, by the infection and death of the majority of the members of each family. In such instances family predisposition might be alleged as a determining factor. Parallel instances are, however, recorded in which this factor is absent, and the most notable of these is the case of the Catholic Nursing Institutions detailed by Cornet, relating to the history of these orders over a period of twenty-five years, and in regard to thirty-eight convents, and

a yearly average of over 4,000 persons. Amongst these it was found that whereas the death-rate of the general public from tuberculosis is from $\frac{1}{4}$ to $\frac{1}{5}$ of all deaths, in the nursing institutions nearly $\frac{1}{3}$ of the deaths, or 62.8 per cent., are due to tubercle alone. The inmates are composed of persons whose health has to be certified on admission as excellent, yet, after the first year, the number of deaths amongst them rapidly attained a maximum, and continued high for the next few years.

A similar significant history is given by Dr. Kempf, of Louisville, U.S.,⁹ of the introduction of phthisis into a convent, with the result that within four months nine sisters, regarded as exceptionally healthy, became consumptive, and four died in the course of the year.

Dr. Niven investigated 3,001 deaths occurring in eleven years at Oldham, and found that in 302 instances 2 or more cases occurred in the same house. Now, on the mathematical chances of a second case in the same house, independently of infection, only 68 houses should have been thus attacked, whereas 274 were actually invaded twice; and whereas only 7.6 houses should have been invaded thrice, 24 were thus affected.

Payne quotes from Engelmann¹⁰ a remarkable instance in which a particular flat in a house remained free for eight years from any tuberculous infection, then followed one year's tenancy by a person already tuberculous. After this, in a period of twelve years, at least 12 cases of tuberculous disease were traced to this source. During this period the house was never vacant, tenant succeeding tenant closely, and during the whole period it was never painted or cleaned.

The facts as to infection of the dwelling are amply corroborated by what has been observed in the case of inoculation experiments on rabbits, which led at one time to the belief that tubercle could be produced in animals by the inoculation of inflammatory non-tuberculous material. Thus Cohnheim succeeded in producing tubercle by this kind of inoculation of rabbits in the Pathological Institute at Berlin; but, on removing to Würzburg, this was no longer possible. The explanation was that the cages for rabbits at Berlin had become permanently infected with tubercle, and to this was due the specific infection of the rabbits.

Amongst the instances of multiple cases occurring in members of the same family, the concurrence of the disease in husband and wife is often observed, but does not appear to require any special theory of direct communication. As we have seen, tubercle may and does spread, when introduced, in associated communities, under circumstances where family predisposition can have no influence, and where the degree of association is general rather than intimate; and the difficulties in the way of admitting direct infection appear to be so great that these instances may also readily fall under those due to house infection.

Hereditary Transmission: Direct Inheritance.—It is evident that if tuberculous disease can be transmitted directly from parent to offspring, as can syphilis, the existence of a large proportion of cases can be readily accounted for, independently of infection. That the bacillus may occasionally be thus transmitted to calves was demonstrated to the recent Royal Commission¹¹ by Professor Bang, but it is found in a very limited number of cases; and although Hillier¹² and Demme found tubercle in newly-born or very young infants, the observed cases are so rare that we must consider this method of propagation as purely exceptional. An extreme view is that of Baumgarten, which assumes that the bacillus, congenitally transmitted, may remain latent in the human body in an inactive condition until the period of adolescence or later, the inhibitory power of the growing tissues preventing its earlier manifestation. There does not appear to be any valid proof advanced to support this suggestion; and when, in order to explain transmission of tuberculous disease from parent to grandchildren, or amongst collateral relatives whose parents are not tuberculous, we are asked to assume a yet subtler degree of latency, the argument, in the absence of proof, becomes so strained that it cannot in any way claim to displace the acknowledged and sufficient explanation of transmission by contagion.

Meat and Milk: Infection from Food.—The Royal Commission on Tuberculosis,¹³ reporting in 1898, make the following comment upon the statistical evidence supplied by Dr.

Tatham, Superintendent of Statistics in the General Register Office.

"We note with satisfaction that death from tuberculous disease, in all its forms and at all ages, has steadily fallen from 3,483 per million during 1851-60 to 2,122 during 1891-95—a diminution of 39.1 per cent.; and also that at every age period for which statistics are available there has likewise been a decrease, sometimes of a very substantial character. Further, taking the age period 15 to 45 years as the period of life when meat forms a very prominent article of food..... we find that the diminution of death from tuberculous disease has ranged from 52.3 per cent. at the age period 15 to 20 years, to 30.3 per cent. at the age period 35 to 45 years..... We must recall the fact that during this age period phthisis is the form of registered death which altogether overwhelms all other forms of fatal tuberculous affections."

Phthisis in these returns may be taken to mean pulmonary phthisis, and not that form of the affection due to infection through the digestive tract.

For the age period 0 to 5 years, the reduction in death from tuberculous disease in all forms has corresponded to a reduction of 27.9 per cent., but little more than half that recorded at the age periods 15 to 20 years and 20 to 25 years; and when we come to examine that form of tuberculous disease, namely, *tabes mesenterica*, which is believed to be mainly due to infection received by the digestive tract, we find that at the age period 0 to 5 years, when milk forms so important an article of diet, the rate of death has shown first increase, then decrease; but this decrease showed for the two periods 1851-60 and 1891-95 a diminution of only 3.0 per cent. Making allowance for errors in diagnosis, the rate of mortality from *tabes mesenterica* must be taken as more than any other to represent tuberculosis in infancy, and it is notable that this disease has not materially diminished, while pulmonary phthisis has so largely decreased, and over a period of time corresponding with a large increase in the general consumption of milk.

The Commission find that while "any person who takes tuberculous matter into the body as food incurs risk of acquiring tuberculous disease," yet that there has been a tendency in some minds to exaggerate the extent of the risk arising from meat. The effect of ordinary cooking¹⁴ appears to be this, that while it may be quite sufficient to sterilise the surface, and even the substance for a short distance from the surface of a joint, it cannot be relied upon to sterilise tuberculous material included in the centre of rolls of meat, especially when these are more than 3 lbs. or 4 lbs. in weight.

Both Royal Commissions attached far greater weight to the question of the milk supply.¹⁵ The Commission of 1895 declared that there was no doubt that the largest part of the tuberculosis which man obtains through his food is by means of milk containing tuberculous matter, and the later Commission of 1898 agrees that the danger from the ingestion of milk is far greater than that from meat.

"In Great Britain and Ireland meat, as a rule, is cooked before it is eaten to an extent which goes largely to destroy infective matter. Milk, on the other hand, is largely consumed in a raw state, especially by children, and there exists a general distaste for cooked milk as a beverage. Among most Continental nations the practice is to some extent the opposite of this, and large quantities of meat, especially in the various forms of sausages, are consumed absolutely raw, while the greater proportion of the milk is cooked before consumption."

The conclusion seems inevitable from the facts presented to the Commission that there is considerable danger to the consumer of meat and milk, and especially in regard to milk. To avoid this danger thorough cooking of all meat consumed, and the boiling of milk, even for one minute, or its "sterilisation" at 80° to 92° C. (176° to 198° F.) for half an hour, are sufficient, and if this could be universally secured it would suffice.¹⁶ But this is attacking the mischief at the wrong end, and the recommendations of the Royal Commission are very pertinently directed to the question of eliminating bovine tuberculosis, and so of preventing all danger of its dissemination by meat or milk. Their recommendations comprise suggestions for securing the general establishment and use of public slaughterhouses, together with full facilities for inspection of all carcasses, the proper qualification of meat inspectors, guidance as to conditions requiring condemnation

and control over foreign dead meat. With regard to milk their recommendations suggest notification of all udder diseases in cows, extension of legal powers with regard to the exclusion of tuberculous cows from a district, and the taking and examination of samples; rigid attention to the proper construction of cowsheds and their sanitary condition; and, most important of all, certain powers of control by a district in which any milk is sold or consumed over its sources of supply in an outside district. With regard to the elimination of bovine tuberculosis, the recommendations urge the general application of the tuberculin test, and the creating of facilities for its application.

The important preventive measures included under these heads are so obviously to be applied only by a local authority under special legislative enactments that I will not take up the time of this meeting in discussing them.

Preventive Measures: Notification.—The public mind seems to be now prepared for definite methods of prevention such as would have been resented a few years ago. It must be remembered that the General Notification Act, dealing with the acute communicable diseases, was not passed until 1889, and even then it raised in many quarters a storm of opposition, as likely to cause friction between the medical attendant, the patient, and the public authority. Now, it is an accepted axiom that these diseases, at any rate, are capable of efficient control only in proportion to the fulness and accuracy of the knowledge afforded by notification as to their distribution, and that friction of any sort need seldom, if ever, arise.

And here arises the further question: Is the notification of tuberculous disease necessary or advisable? Sir Richard Thorne, in his recent "Harben Lectures," has declared that the inclusion of tuberculosis among the notifiable diseases would be impracticable, and would tend to defeat the end in view. His chief point consists in the contrast between the highly communicable specific fevers, rendering the patient physically incapacitated and in need of isolation for a short period only, and the lingering illness of tuberculosis, frequently not incapacitating the patient from his ordinary avocation, not highly communicable, except and almost exclusively by the sputa, to which alone restrictions need be applied, and therefore not calling for any absolute isolation.

Dr. Niven, of Manchester,¹⁷ and others have for some years consistently advocated the notification of phthisis, and the arguments in favour of this have recently been very succinctly summarised by Dr. Wheatley:

"Preventive measures should aim at minimising the danger to the community from the majority of adult consumptives, who not only cannot afford to pay for treatment in sanatoria, but have to continue at work to support themselves and others, and should be allowed to do so without in any way restricting their liberty. The very great danger of spread from person to person cannot properly be grappled with except by notification. The National Association for the Prevention of Consumption has for one of its objects the propagation of knowledge with regard to tuberculosis. Those who have had experience of the distribution of knowledge of this kind know how difficult it is to inculcate it into the minds of those whom it will most benefit. If notification were adopted, the necessary information could be given direct to those most in need of it. It will be found, too, that it is not sufficient to spread knowledge, but it is necessary amongst the more ignorant classes to insist that the principles are acted upon."

Another point is that "Notification, if combined with a careful bacteriological examination of the sputum, which could be arranged for with the Public Health Laboratory, should lead to an earlier diagnosis of the disease, an important matter in regard to the curability of many cases in the early stages. The difficulty in making phthisis notifiable at present is due to the fact that it can only be done by adding it to the list of diseases mentioned in the Infectious Diseases (Notification) Act. This would give to the local authority various powers of enforcing isolation, and of direct interference, which are altogether undesirable."

Indeed, I would prefer to speak rather of "registration" of cases of phthisis than of notification, either voluntarily, so as to secure the co-operation when desired by the medical attendant, rather than the interference of the

public authority; or under special legislative powers quite unconnected with those of general notification, and involving only those special measures and precautions necessary in this particular disease—first, in regard to the patient, and, secondly, in regard to the infected habitation, more especially upon removal or death. Legislation will, I should add, be necessary in order that such notification or registration may be paid for.

Sir Richard Thorne, in criticising the New York experiment of notification, prognosticates that the results will be of small value, except as regards the very poor, and chiefly as a source of statistical information. But surely the very poor are especially those to whom helpful, but not aggressive, interference will prove of the most value, and some knowledge of their frequent migrations will be of the utmost service, so that necessary measures of cleansing and disinfection may be secured.

So much in the tendency to spread depends upon the condition of the dwelling that it may be urged that general house-to-house inspection would bring about all necessary improvement. Doubtless much of the observed improvement in the past has been due to the improvement of general sanitary conditions; but while on the one hand it is difficult to promise that, in a city of this size, say, the 60,000 houses shall be adequately inspected once yearly, it is of far greater importance to deal with, at once and effectually, those known to be potential centres of infection.

Sir Richard Thorne has stated his belief that notification would interfere with a man earning his livelihood; but this need not be feared, as the precautionary measures would be chiefly directed to his house and his home life; while any instructions issued for workshops and workplaces should be in the form of general instructions with regard to chronic coughs and expectoration, and would refer to all persons employed rather than to individuals. The Local Government Board appears at present to be unable to dissociate the registration of tuberculous disease from the Notification Act of 1889, with the drastic provisions of the allied Acts as to isolation—provisions which, we are all agreed, are both inapplicable and inadvisable.

A considerable amount of tentative work has already been attempted in dealing with pulmonary phthisis by many health authorities, but has been somewhat barren of result. Now that the question has been raised under happier auspices, and in such manner that the public may take the initiative in protecting itself, rather than be driven to take precautionary measures at the instigation of the medical profession—a distinction of no little practical and political importance—we may hope for better success.

So long ago as 1891, many towns in England, and Bristol among others, issued concise directions, generally based upon those in use in New York, for preventing the spread of consumption, and for some years these were widely circulated. Manchester adopted a system of periodical disinfection of houses voluntarily notified from public institutions, but this gradually fell into desuetude; and I have personally found applications for disinfection very few and far between. France, Belgium, and the United States were well in advance of England in starting practical preventive work; and New York, which also gave us the lead in the application of bacteriological examination to diphtheria, not only adopted voluntary notification of tuberculosis in 1893, but has extended and improved its system during the past year. Brighton has recently started a voluntary notification system, and is able to secure some effectual disinfection.

Personally I feel that a voluntary system of notification or registration of tuberculosis, on a basis involving only assistance rendered by the public authority on application of the medical attendant, would prove essentially beneficial in cases where only occasional or no medical attendance could be secured; especially in watching and preventing danger from the frequent change of residence of phthisical patients. In seaside places and health resorts this question is one which affects everyone who can afford money or time to take a summer holiday.

The recent formation of the National Association for the Prevention of Consumption and other Forms of Tuberculosis, the objects and methods of which are clearly explained in the leaflets issued by the Association, has given considerable

impetus to the consideration of methods for dealing with the spread of these diseases. Some of the objects of the Association are hardly within the sphere of action of this Association as a purely medical body; but it would seem to be most fitting that this Branch of the Association should express its sympathy with, and take an active part in promoting the welfare of the National Association, and in the formation of a local branch. The details of action to be taken by the Branch, either independently as medical practitioners, or with the co-operation of the public health authority, and the best methods of furthering the objects of the National Association, will require such detailed consideration that it will, I think, be necessary to depute their consideration to a special committee.

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HYSTERECTOMY AS A CONSERVATIVE OPERATION.

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THE title of this paper is sufficient to excite anxiety in the minds of physicians practising midwifery. There need be no alarm; its object is not to advocate hysterectomy, but to demonstrate the effect which a reliable observation often exercises on the theory and practice of surgery. It is very remarkable that the health of a woman during the sexual period of life suffers less from the loss of her uterus (when it becomes necessary to carry out such a dreadful measure) than after the complete removal of the ovaries. This fact is producing extraordinary modifications in the treatment of diseases of the uterus, Fallopian tubes, and ovaries.

THE UTERUS A HOLLOW MUSCLE.

The uterus is structurally a muscle of the unstriped variety, containing, as is usual with this kind of muscle, a central space lined with mucous membrane; in this instance, it has peculiar characters, and is known as the endometrium. The hollow muscles are distinguished from the solid voluntary species by the fact that they act independently of the will, and undergo more or less rhythmic changes commonly known as dilatation and contraction, but in physiologic terms are expressed as diastole and systole. These movements are concurrent with the presence of fluids or solids within the cavities of these muscles. Thus in the œsophagus it is food or drink; in the heart and spleen, blood; in the ureter or bladder, urine, and so on. The duration of the cycle differs in all; in the heart the beat happens many times (70) each minute; in the ureter a few (5) times to the minute, whereas the bladder requires three or more hours; in the rectum as a rule the cycle lasts a day, whilst in the uterus it occupies three-fourths of a year with a long interval for rest.

In nearly all cases the contraction (systole) may be abnormally excited, and when accentuated produces pain of a peculiar character called colic. In the case of the heart, such intensification of the systole usually terminates in death. The uterus is singular among hollow muscles not only in the excessive length of its cycle or beat, but also in the fact that its epithelium is shed with great regularity once a month (menstruation) save when it is occupied by its long diastole, that is during pregnancy.

THE UTERUS THE ORGAN OF MENSTRUATION.

We have positive knowledge that the menstrual organ is the

endometrium, and that menstruation is governed in some obscure way by the ovary. The total weight of two healthy ovaries is about 12 grams, but so completely is menstruation under the domination of this tissue that a piece of ovary weighing 1 gram will, if it contain ovarian follicles and ova, maintain menstruation regularly.

The ovarian influence is not confined to the control of menstruation, but has some effect on what is known as the vasomotor functions. Certainly when the ovarian control is suddenly removed during the sexual period of life, those singular disturbances, "the flushes," annoy the patient. That this flushing is not due simply to arrest of menstruation is absolutely demonstrated by the fact that complete extirpation of the uterus arrests menstruation as thoroughly as complete removal of both ovaries, yet "conservative" hysterectomy—that is, removal of the uterus with preservation of at least one ovary—is not, so far as my observations go, followed by this disagreeable vasomotor disturbance.

It is of great importance to realise that, in order to abolish the ovarian influence over menstruation, complete removal of the ovaries is imperative. Any casual observer studying the periodical medical literature of the last ten years would imagine that quite a crowd of cases could be assembled to prove that menstruation continued after double oöphorectomy. A critical examination decides that they cannot be accepted as evidence. In the first place, the reporters offer no indication that they satisfied themselves that the patients really menstruated. In 1891 I performed double oöphorectomy in a woman aged 31, for what proved to be a gravid Fallopian tube. Six months later she assured me that she regularly menstruated. After I carefully re-examined the ovaries and satisfied myself they were completely removed, I readmitted her into the hospital. She had some internal piles, which occasionally bled; these I removed, and five years later the patient reported that she had not menstruated since.

A close examination and analysis of clinical reports also shows that continued menstruation after oöphorectomy occurs under two distinct conditions: (1) where oöphorectomy has been performed for inflammatory lesions of the tubes and ovaries; (2) where the operation has been carried out to anticipate the menopause in patients with uterine myomata.

It is instructive to find that where double ovariectomy has been performed for ovarian tumours above the size of a turkey's egg, and where the mesometrium has been well stretched, complete removal is certain. In this class post-operative amenorrhœa is complete, whereas in individuals with big, swollen, adherent uterine appendages, it is by no means easy to be quite sure that fragments of ovary are not overlooked.

A case which well illustrates this occurred in a single woman, 25 years of age, who submitted to oöphorectomy by a surgeon in 1894. During convalescence she was annoyed to find menstruation still regular, profuse, and painful. She applied to me for relief, but I refused to interfere; at last her importunity was such that I admitted her into the hospital, and satisfied myself that she really menstruated, then after consultation with my colleagues I operated upon her, and found the stump of one of the ovarian pedicles surmounted by a rounded body full of small cysts, and presenting a well-formed corpus luteum and a ligature (Fig. 1).

Fig. 1.—Stump of Fallopian tube and fragment of ovary with corpus luteum, left after a supposed complete double oöphorectomy.