

ON THE GUIDANCE OF PUBLIC EFFORT TOWARDS THE PREVENTION OF CONSUMPTION.*

By J. ASHBURTON THOMPSON, M.D., D.P.H.,

Chief Medical Officer of the Government of New South Wales.

I MAKE my grateful acknowledgments to the Council of the Congress which has seen fit to call me to this chair, and if the remarks to which I now venture to ask attention should fall below what is properly expected in a Presidential Address, I beg that the defect may be ascribed to engrossing affairs rather than to lack of consideration. They concern the regulation of public effort towards further mitigation of the prevalence of consumption. It is probable that mention of this theme forecasts to you a twice-told tale; but it may be that some things worth attention still remain to be said upon it, and the occasion appears to me to be this. Whatever may have been already done by states towards the prevention of consumption, and by the charitable to alleviate the hard lot of the consumptive poor, it has lately been perceived that an unoccupied field remains in which organized associations of citizens may usefully engage. Accordingly, in several parts of the world, and in Australia no less than elsewhere, such associations have been formed. Now, in Australia it does not yet clearly appear that any definite line of action has been decided upon by executive committees. Prevention has been mentioned by them, but the practical step contemplated appears to be establishment of hospitals or homes for the treatment of consumption. These two notions of prevention and of treatment are not incompatible, it is true, but they are distinctively different in the aims they indicate, in the kind of hope they permit, and in the methods they imply. No doubt the establishment of a hospital for the treatment of consumptives is a legitimate and praiseworthy exercise of benevolence. But the new associations have their origin in a new motive. That hospitals for consumptives are useful has long been known, and many have been instituted; that the prevalence of consumption can be diminished by suitable preventive measures has also long been known, and by such measures it actually has been largely diminished, at all events in England and Wales. The new motive consists in the conviction now generally entertained that the disease itself can be eradicated

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from mankind; or, to speak more prudently, that its present extravagance can be reduced to sober limits. There scarcely can be question, therefore, of the course such associations should take; their energies should concentrate on prevention. But the prevention of consumption covers a very wide field in which the State, the medical profession, and the laity acting under direction and in accordance with knowledge, have each their special place; and, as regards the latter, it is timely and useful to inquire what their place is.

I.—In order to present the factors in the problem of prevention with some approach to clearness, it is necessary to review briefly what has been learned in the past. For consumption is a disease which has been earnestly and persistently studied with success during more than a hundred years, and consequently several facts and sound opinions, often thought to be new, are in reality but our heritage. A hundred years ago the ravages of the disease were much what they are at the present day, unless the statistics of that time warrant a belief that they were somewhat greater. According to Woolcombe and to Southey, physicians who wrote during the first fifteen years of the century, phthisis carried off annually in Great Britain a fourth of the population, in Paris a sixth, and in Vienna a seventh. The now well-known local incidence of consumption was observed by Young, again quite at the beginning of the century. In his "Treatise on Consumptive Diseases" he pointed out that Bristol was the most heavily stricken place in England, and that the deaths were those of the inhabitants, not of visitors to the city; yet he remarked that it had been chosen as a resort favourable to consumptive persons who hoped for recovery, as though in defiance of the natural indications. The communicability of consumptive disease has been taught from antiquity, first by the fathers of medicine, and in every successive age by some among their more distinguished disciples whose names I need not mention. The failure of an opinion possessed of such vitality to win general acceptance was accounted for by Cooper in 1840, on grounds which may fairly be said to correspond with those which the report of the Collective Investigation Committee of the British Medical Association appeared to warrant in the minds of the majority in 1883, namely, that the usual prevalence of consumption was such as allowed the instances of apparent communication of the disease between closely-associated persons to be accounted for on the doctrine of probabilities, better than by appeal to an unestablished quality of the disease. The well-founded teaching of the present day that predisposition and not heredity is of importance

to the maintenance of consumption has also been anticipated. Velpeau and Breschet recorded their fruitless search for tubercles in the bodies of the stillborn children of consumptive parents, while both Orfila and West testified that though they had occasionally found them in similar circumstances, it was but rarely. Hence it was inferred that in most of the numerous cases where tubercles were found in the bodies of young children the diseased action by which they were formed had originated after birth, parents transmitting to their progeny only the tendency to this kind of diseased action, and very seldom the disease itself. This opinion, it will be noticed, might have been given yesterday, and it was based originally on precisely the same class of observations as it is based on now. Perhaps it may be supposed that the special liability of young children to suffer elsewhere than in the lungs, and particularly in the lymphatic ganglions of the abdomen, is a novel observation, made only after the knowledge that tuberculosis could be communicated by the milk of tuberculous cows had been acquired. But it was made by Andral and by Laennec, and their results even go to support the doubt which has lately been raised by a long series of careful dissections whether the mesenteric glands really are primarily affected in a remarkable proportion of cases. They pointed out that children were disposed to develop tubercle in a larger number of parts at once than were adults; they named the parts most likely to suffer in adults, as first the lungs and then the small intestines; but in children, as first the bronchial glands, then the mesenteric glands, then the spleen, then the kidneys, and lastly the small intestine. Again, the present-day treatment of consumption consists in a liberal diet, fresh air, and rest, or, rather, carefully regulated exercise. But towards the latter part of last century Salvadori was famed for his successful treatment by a liberal diet and gentle horse exercise; and then invalids flocked into Tyrol to place themselves under his agreeable regimen, as now they flock to other places on the Continent of Europe with a similar object.

Thus many of the clinical and pathological observations of a century ago, and of the intervening years, were sound. Although our knowledge of that kind has been extended, and although we have lately learned the specific nature of that condition, in the absence of which there can be no tuberculosis, our treatment of the disease has not been lifted thereby from the contingent stage towards the heights of scientific certainty. Post-mortem dissections teach, and long have taught, that many persons recover; but the most judicious physician of the day can no more foretell with certainty in which cases his art will succeed than could his remote forerunners.

Regarding the indications for prevention which were revealed by the same succession of venerable teachers, nothing of that kind can be said. Andral's list of the secondary causes of consumption needs no amendment. In his time diathesis was regarded as all-important in relation to this disease. Yet he had the distinguished merit of pointing out that the tubercular diathesis need not be innate, and could be acquired; and the list of conditions under which it was likely to be acquired was given by him as follows: Residence in impure air; or such as is not renewed often enough; crowding of many persons together; absence of the sun's rays; an habitually damp atmosphere; insufficient food; and excesses which exhaust the strength and nervous influence. It was as far back as 1843 that Baly published his celebrated essay on the "Diseases of Prisons," in which he showed from the experience of Millbank Penitentiary at London that imprisonment was there a cause of phthisis, and of scrofula in persons who were healthy on reception. Further, he showed by inquiries made at other prisons of Europe and of the United States, that this influence of the then usual conditions of prison-life was commonly manifested; and he concluded by defining its components as deficient ventilation, sedentary occupation, want of active bodily exertion, and a listless frame of mind. Again, the Barracks Commission, appointed to inquire into the causes of the vastly greater incidence of pulmonary diseases on soldiers confined in barracks than on persons at similar ages among the civil population, in 1858 reported their opinion that in civil life insufficient clothing, insufficient and unwholesome food, sedentary and unwholesome occupations, and the vitiated atmosphere of unhealthy dwellings, all contribute to the propagation of this class of diseases. On the other hand, they pointed out that the food, clothing, and occupation of the soldier were not of a character to justify the imputation that they were among the causes of the heavy incidence of the disease on the troops, which they ascribed accordingly to "the vitiated atmosphere generated by overcrowding and defective ventilation, and the absence of proper sewerage in barracks," to filth communicated directly and indirectly to the air. Both of these inquiries showed, then, that the excessive incidence of the disease was due to defective ventilation, or, in the already quoted words used by Andral many years earlier, to "residence in impure air, or such as is not renewed often enough." We know that these lessons were at once applied to diminish the incidence of phthisis on the classes of the population just mentioned, and with such success in both cases that not merely did the excessive incidence cease to occur as soon as the supply of fresh air was brought much nearer to that which physiological science had shown to be

requisite, but in the case of prisoners the disease itself may be said to have been eradicated, since in well-ordered gaols it no longer supervenes in those who are free from it at their reception. Again, it was in 1860 that Greenhow, acting as a medical inspector under the Privy Council, made his first report on "Excessive Mortality from Lung Diseases," in which he inquired into the causes of observed variations in the district—prevalence of that class of maladies. He showed that the cause of variation was related to the nature of the industrial occupations in which the inhabitants were engaged, but more closely to the conditions under which they were obliged to carry on their work; and even that in different localities the morbidity of the male or of the female population was highest according as men or women worked under the harmful conditions in the larger proportion. The proximate causes were precisely those given by Andral in the list already mentioned, and legal powers to obviate them were given in several Acts of Parliament which came into force between 1864 and 1867. Lastly, in connection with the historical period to which these remarks are confined, the investigations of Bowditch in the United States (1862), and of the late Sir George Buchanan in England (1867 and 1868), may be cited, which established the connection there is between damp subsoils and high phthisis death-rates. To these acute observations and to practical adoption of the principles revealed by them is due that steady diminution in the prevalence of phthisis which has gone on in England and Wales during the last forty-five years. Other, and possibly even less direct, causes of phthisis have also been removed or modified, but they are still such as were mentioned by Andral. Their gradual diminution has been an outcome of those mechanical inventions and of those altruistic sentiments which have lately given the poorer classes cheaper food of better quality, together with higher wages and more leisure, and which have acted with greater and greater effect in each successive decade of the last half-century. For, if we recognise a special proclivity to consumption in the offspring of consumptive parents, and in persons of a certain constitution, we are also aware that a proclivity to it can be acquired, or, as we now say, that the function of natural resistance to the virus can be impaired. Baudelocque, and before him Andral, as we have seen already, had noticed this; and the latter, while pointing out that persons of what has been called the Venetian type, were specially susceptible, remarked that often the disease also attacked persons of the opposite type—of dark complexion, jet-black hair, and strong muscular development, if they were placed in favourable circumstances.

Thus, after having had our attention directed to conditions attaching, it may be said, to the house, and to the site on which it is built, to the danger which lies in dampness, darkness, filth, and a stagnant air not less foul in its kind than the soil of unsewered urban districts, now a glimpse is caught of the value of the personal factor in determining the occurrence of consumption. To-day we see reason for supposing that the specific cause can scarcely operate in sound bodies though taken into them.

II.—The brilliancy of modern discoveries blinds incautious eyes to old truths, and often endangers sound practice. The tendency at the present day is to lay a too exclusive stress on the importance of conserving the expectorations of consumptives. The specific nature of tuberculosis was practically unknown down to the latest date mentioned, nevertheless much had actually been done towards diminution of the customary death-rate due to consumption. From this fact we are to infer that the causes of disease are seldom single; and in relation to practical hygiene it may be said that they are never single. It is true that the causes of consumption thus far mentioned can be strictly classed only as adjuvant or secondary; but in preventive medicine they are entitled to much greater consideration, and have a much higher practical importance than their scientific classification denotes. In themselves they have no power to cause consumption; and, conversely, the disease can occur in their absence, though only under circumstances seldom encountered in the ordinary course of life. Nevertheless in the social circumstances in which consumption is prevalent and under which it has to be fought, preventive schemes must fail which do not take cognizance of them all—of external conditions as existing in the dwelling, and of internal conditions as related to the nourishment and strength of the body, as well as of the virus itself.

We have now reached that epoch in the ætiology of consumption which was marked by Villemin in his paper on "The Causes and the Nature of Tuberculosis," which he presented to the Academy of Medicine of France in 1865, and which paved the way for the last and decisive discovery to which in this brief review there will be occasion to refer. Villemin stated the conclusions which his work warranted in quite unmistakable terms. They were: (1) That tuberculosis was the effect of a specific agent, and, in fact, of a virus; (2) that this agent must exist in the morbid alterations which it had determined by its direct action on the normal tissues of the body; and (3) that this agent, when introduced into a body capable of being impressed by it, must reproduce itself, and at the same

time must also reproduce the disease of which it was the essential principle and the determining cause. These propositions were for long bitterly opposed, not only by the Academy, which two years afterwards reported that Villemin had failed to establish his position, but also by foreign observers, who adopted a similar conclusion on similar ground. This was, that though what was recognised as tubercle could be produced by inoculation of tuberculous matter, it could also be produced by inoculations of matter which was certainly not tuberculous, and was, indeed, manifestly indifferent or even inorganic. Three years later, in his "Studies in Tuberculosis," Villemin went even further than at first, and enunciated the proposition that inoculated tuberculous material did not act by the tangible and visible morbid product which was introduced, but by a more subtle agent contained in it which escaped the senses; he asserted that the body was but a soil in which this elusive agent could grow, just as the inoculated tuberculous products were not the virus, but merely contained it; and he insisted on the close parallel which he traced and demonstrated between tuberculosis and other diseases acknowledged to be infectious. Nevertheless, his further results were no more accepted by the Academy than those exhibited in his earlier communication; and among contemporaries who repeated his experiments and contradicted his conclusions were some of the most celebrated names—those of Lebert and Weiss, Colin and Pidoux, Burdon-Sanderson, Wilson Fox and John Simon, Cohnheim and B. Fränkel, with many others, all of whom were masters in their time. As years went on, however, a larger and larger body of confirmatory evidence, and a larger and larger body of adherents to Villemin's doctrines, accumulated. Hippolyte Martin furnished the best proof that tuberculosis could not be caused by inoculation of false tubercle; Chauveau established the possibility of communicating tuberculosis to susceptible animals by feeding; and Tappheiner demonstrated the possibility of communicating it by inhalation. Still, it was Villemin who first expounded and insisted upon the virulence of the expectorations of phthisical persons, and in his work on the "Propagation of Phthisis" he attributed the dissemination of the disease to inhalation of the dried and powdered sputum by the healthy. Thus had been reached, by means of that genius for experimental science and for logical generalization which is the distinguishing characteristic of the French intellect, the knowledge of the ætiology of consumption by which we are now attempting to profit. In order to carry conviction to the minds of the many, it remained only to reveal the agent or virus which, as Villemin had divined, lay hid in the tangible products of the disease process.

This, the crown of studies persistently pursued during more than a century, was achieved by Robert Koch, who, in 1882, was able to show the *Bacillus tuberculosis*, and to name it the distinguishing characteristic and essential cause of tubercle. But it took time even for this demonstration to affect the general body of the profession. Perhaps the main argument used by the conservatives was that there was nothing to prove that the bacillus was not rather the result of the disease than the cause of it. But the resistance was not prolonged. The work already done by Pasteur, Toussaint, and by Koch himself, on anthrax and on fermentation, greatly smoothed away many such objections as had been encountered by Villemin.

It may be supposed that then the way had at last been opened for systematic and more precisely directed attempts to prevent consumption. But such efforts are impossible until those who help to form public opinion are either as well informed, or at least as convinced of the possibility of success, as the medical profession itself. The public, however, were far from having reached that stage; nor, perhaps, was the medical profession, regarded as a whole, possessed of the necessary degree of conviction. It was left for Cornet of Berlin to convey this, and if, as has been said, he succeeded only at the expense of arousing a fear of consumptives on the part of the laity which was mistaken, and must have exposed a portion of the melancholy generation then extant to unnecessary hardship, it may fairly be asserted in reply that future safety could not have been secured at any less cost.

Cornet's share in this arduous business, therefore, had the greatest practical importance. It has already been remarked that Villemin, in writing on the propagation of consumption, had laid special stress on the danger attaching to the scattered expectorations of the phthisical; and it is interesting and remarkable to note how that distinguished man had in 1869 laid down those practical rules which at this day—that is to say exactly thirty years later—are still our guides, and are now in a way to become the common knowledge of educated mankind. He said in so many words that as long as the expectorations remained liquid they were hardly capable of doing harm; but that if they were scattered on floors they dried, were resolved into dust, and then caused the spread of the disease by inhalation. He pointed out as places especially liable to become centres of infection by these means prisons, convents, barracks, workshops, etc., adding that if in some dwellings the floors were not covered with expectoration, and danger from that source was consequently avoided, then the handkerchiefs usually substituted for

spittoons, and body and bed-linen which had become soiled, and had been allowed to dry, contributed their infective dust to the air when they were carelessly handled and shaken before being again wetted at the laundry. These are the points on which we lay greatest stress to-day. Now, what Cornet did was this: he furnished the experimental proof that Villemain's teaching was correct, and furnished it in a way so striking and so convincing that from the time his researches were made known Villemain's teaching concerning the dangers of dried sputum has been generally accepted. But besides proving that the dust of places inhabited by consumptives was often infective, Cornet also showed that it was not always infective, but that if the consumptive expectorated exclusively into a spittoon, and if he did not use pocket-handkerchiefs in the usual way, it was free from infectivity. This was just the kind of exception to his positive results which proverbially proves the rule, and establishes it.

Nevertheless the fact remained—puzzling to those who noticed it—that hospitals for consumptives in which no special attention had been turned to conservancy of the expectorations still seemed to be places of no especial danger to the healthy staff employed at them. But Koch himself had pointed out the rapidity with which infective sputa lost their virulence when exposed to light and air; and the free aëration and good lighting usual in such places furnished the conditions necessary to reconcile the two observations, and to show that they were but superficially opposed to each other. We are thus brought back to the point mentioned above, namely, that in applied hygiene the causes of disease cannot be regarded as single, though in strict sense the causes of specific disease necessarily are so. If all phthisical sputa could be completely gathered and destroyed, we are satisfied no doubt that consumption would cease to be the prevalent disease it is at present. But it is clear that such continuous and complete attention never can be secured. The defect, whatever it may be, must be made good by other means, and one of those means is ventilation and lighting of the dwelling.

But in practice even ventilation and lighting alone are not enough. Doubtless infective sputa are rendered harmless by exposure to light and fresh air, as Koch has shown; doubtless also under the most favourable conditions of such exposure they are rendered harmless in less time than that in which they can resolve into dangerous dust, as Ransome of Nottingham has shown. No doubt it is to good ventilation and lighting that the harmlessness of hospitals for consumptives as places of residence for the healthy

was chiefly due several years ago; and yet the practical hygienist is aware that such improvement as he can effect in old or ill-built dwellings under the conditions in which he has to carry on his work would be productive of less benefit than they might yield if they were conjoined with efforts to remedy some other faults at the same time. The latest labours of Ransome, who for many years has occupied himself with tuberculosis and its prevention, and whose repeated contributions on this subject exhibit that combination of sound scientific method and practical utilization of its results which distinguishes the English character in such connections, have thrown light on some other conditions which favour continued virulence of the bacillus of Koch.

Ransome's observations, made in part with Professor Dreschfield, and in part with Professor Sheridan Delépine, may be briefly summarised as follows. They concerned, in the first place, the time during which, and the circumstances under which, the bacillus retained its virulence after leaving the body in expectorations from the lungs, and supported the following conclusions:

1. That finely divided tuberculous matter, such as pure cultivations of the bacillus, or fine tuberculous matter derived from sputum, in daylight and free currents of air is rapidly deprived of virulence.

2. That even in the dark, although the action is retarded, fresh air has some disinfecting influence.

3. That in the absence of currents of air the bacillus retains its power for long periods of time.

And, secondly, they concern the possibility of the bacillus leading a saprophytic existence after discharge from the body, that is, of its being able to proliferate at ordinary temperatures, and in other conditions ordinarily met with. They were as follows:

1. Any one of various organically charged vapours, whether coming from healthy or diseased lungs, from the air of cellars, or from the air of comparatively pure ground, forms an excellent cultivating medium for the bacillus of tubercle when kept away from the disinfecting influence of air and light.

2. This power of promoting its growth is particularly manifest when the supporting substance is common wall-paper, though it is quite apparent when very pure filter-paper is used.

3. It is further proved that on these substances the growth of the bacillus may take place at the ordinary temperature of the dwelling-rooms, and hence that there is no safety against the increase of the bacillus in ordinary living-rooms in which active tubercular dust is present, and in which the natural disinfectants of the bacillus—namely fresh air and light—are not present in sufficient amounts.

It is right to say that while these latter results have not been contradicted, they have not as yet been corroborated; on the other

hand, you are aware that the class-place of Koch's bacillus moves yearly further and further from the schizo-mycetes and approaches more and more closely to the hypho-mycetes. It is scarcely necessary to remind you of the difficulty met with in attempting to cultivate this microbe—that it grows in the laboratory only on specially selected media, and that it strongly prefers special temperatures; but it should be pointed out that these difficulties vastly enhance the value of experiments which seem to show that it can grow with comparative ease apart from special media, and indifferent to high temperature, provided only it be furnished with the foul organic vapour of human breath, or with the foul vapour of damp subsoils. Such vapours commonly pervade much of the poor house property in every city: and in view of common laboratory experience Ransome's experiments furnish just the evidence necessary to explain the persistence with which infection is observed to cling to houses uncleansed after removal of the consumptives who first communicated it to them. So that, just as the necessity of attending to the state of the dwelling as regards light and air appeared before, so now it appears that the effort at prevention must not stop at such improvement of that sort as those can alone make who are obliged to live in houses requiring it. Nor would that measure of improvement suffice, though combined with all the care to destroy infective sputa which is practically attainable. More must be done. Drainage of damp subsoils, the sewer-ing of unsewered neighbourhoods, the scavenging of filthy yards and lanes, and isolation of the interior of houses from the ground air must be secured. Nay, more still, the interior of houses must be kept clean in the sense in which notable housewives interpret that term.

Thus was the ætiology of consumption slowly worked out, and thus, *pari passu* with the stages which marked discovery of the various factors in the complicated problem of its maintenance and diffusion, did we come into possession of the methods of prevention. Our teaching of to-day is based on no happy discovery suddenly made, nor even on the genius of any single searcher. It is the result of a long-drawn series of practical demonstrations of the agency of diverse but correlated conditions. And consequently it advocates no nostrum. It inculcates the importance of conserving and destroying phthisical expectorations, but not that this alone is sufficient. The preventive scheme must have as many branches as there are diverse contributory causes, and its application requires proportionate knowledge, intelligence, persistence, and, be it added, sacrifice.

III.—The more important facts in the ætiology of consumption may be briefly stated as follows. The cause of infection is specific and single; those who suffer from the disease are the source of infection to others; those who are suffering from consumption of the lungs alone give off the infection in quantity, and in ways, which have great importance to others; they give it off almost entirely in their expectorations. Secondly, the infection can maintain its virulence for a long time outside the body from which it has been thrown off; it gains access to others by the air, on which it is borne to them. It follows, consequently, that the common mode of infection is not direct from person to person, but indirect; that localities can be infected by the sick, and can retain their infectivity in absence of the person who has infected them. Thirdly, the infection is easily destroyed by sunlight and fresh air after it has been thrown off, and consequently special conditions are necessary to its long-continued virulence outside the body; special conditions of the uninfected body are also necessary to successful invasion of it; these two sets of conditions may be regarded as practically one and the same, for in the lack of fresh air and light, and in the dampness and the dirtiness which are the conditions necessary to long-continued virulence of the infection, the healthy body deteriorates, loses its powers of natural resistance, and becomes a prepared victim of the virus.

These being the ascertained ætiological facts, they are also those on which preventive measures must be based. They indicate that cognisance must be taken of consumptives themselves, of the locality in which they contracted their disease, of the houses they occupy or have occupied, of their relations to others living in the same dwelling, and of the constitutional state of these latter with reference to the probability of their having or of their retaining a full measure of natural resistance. On consideration it will be perceived that these points mark the whole area covered by social life, or at all events all covered by town life; and phthisis is distinctively a disease of cities. It is in cities, as Professor Verneuil has usefully pointed out, that phthisis is more common, takes graver forms, progresses more rapidly, heals or even improves more slowly and in a smaller proportion of cases, and that slight attacks continue longer, and more frequently tend to become grave; while, on the other hand, in country life remissions are often observed, and a chronic course which is almost equivalent to recovery is common. The inference is, as we have already seen, that the general conditions of life in cities are the cause of the great prevalence of phthisis, and not mere propinquity of the sick to the healthy; and

it follows as a corollary that the share which a Government can take in extirpating tuberculosis from any city it does not own must be limited. It can but legislate on broad lines, and leave the detail to be filled in by the people themselves. It is conceivable that some Government might deal with all consumptives as we here deal with lepers (who, by the way, at the very worst reckoning, are far less dangerous than consumptives), and with all house property in a manner which is certainly desirable on a dozen counts connected with public health, but which owners would probably regard as destructive of all their rights. The death-rate from phthisis, as far as we can see at present, would by those means be reduced very rapidly, and its reversion to the proportions it has at present would be prevented. This would be the direct course, but we know that the first of these speculative measures is impossible, and that the second is only not impossible. Nevertheless, though that which the State can do is necessarily limited, it is essential. Let us first consider what it must do, it will then be easier to discern whether anything remains in which some private association could usefully engage.

In the first place, there can be no doubt that phthisis should be made a notifiable disease (as has been done already in South Australia). No other form of tuberculosis should be notifiable, and the register should be declared strictly confidential as regards names. Next, the State should provide for the free bacteriological examination of sputa; and this also should be a strictly confidential transaction between medical men and the central health authority. Thirdly, it should make the disinfection of rooms from which consumptives have been removed, or in which they have died, before they are reoccupied by any person, obligatory on owners and occupiers of houses, and should require such disinfection to be done to the satisfaction of a legally-qualified practitioner of medicine, who should be required to certify to it in writing. Fourthly, district registrars should be required to notify every death from phthisis as soon as registered by them. Fifthly, good building laws should be enacted, and steadily enforced. Much beyond that I do not think the State should go, at all events at first; but the central health authority should forward by post some brief pamphlet of instructions to the persons whose names are notified to it. That, I dare say, seems to some little enough for a Government to do. But it contains what is essential. It furnishes the means of learning what the number of sufferers is, and the facts as to incidence of the disease on classes, occupations, and localities; and this knowledge is the indispensable foundation of practical

measures of prevention. In order to remove the all-important secondary causes of consumption most expeditiously and most economically the faulty spots must be identified, and occurrence of cases of the disease furnishes the best index to them. Try to imagine, for a moment, a police charged to control unruly characters, but entirely ignorant of their appearance, habits, haunts, and journeyings. It is scarcely possible to do so. Yet that is the position of most States in relation to living consumptives among the population. The information furnished by a well-ordered scheme of notification after being carefully compiled, abstracted, and charted, would in a few years furnish the requisite guide to effective action, and by being communicated to the public would gradually render effective action more completely possible.

At this point it seems necessary to interpose a few words on the notification of phthisis, at which many medical men, and among them several whose opinions command respect, look askance. The objections suggested are diverse, and I venture to discriminate them into two distinct classes. One comprises objections to notification itself, or rather presumed difficulties in the way of it; the other comprises objections which in reality have nothing at all to do with notification, but which relate to the uses it is apprehended might be made of the information furnished by it. For purposes of discussion and agreement that seems to be a distinction of some importance. In the former class are comprised difficulty of diagnosis, and inevitably reduplicated notifications of the same case. As to difficulty of diagnosis, a small proportion of notifications would doubtless be made in error. But it would surely be impractical to renounce the benefits which notification can certainly yield, because a few cases prematurely thought to be in the earliest stage of disease would be wrongly returned, and because a few others undiagnosible with certainty during life would not be returned. After all, in the vast majority of cases, phthisis is recognised—even apart from bacterioscopy of the expectorations—with greater certainty than most other common diseases. As for repeated notifications of the same case, this would be certain to occur rather often with a disease which follows a prolonged course for the most part, and in which sufferers commonly appeal to several different medical men for help. But this is merely a matter of money, and probably of a comparatively small sum, for the really important danger which attaches to it—that of falsification of the register, and, consequently, of the practical indications drawn from it—can very easily be guarded against. It cannot be supposed that the Government of any State would be deterred by the incidental risk of spending a

thousand pounds a year unnecessarily from endeavouring to prevent a disease which cost it a thousand lives a year. The second class of apprehended difficulties fades away as soon as the uses to be made by the State of notification have been defined as they have been defined already above. The whole proceeding should be confidential. States have little to do with individuals. In this matter they could not act successfully except on the general principles by which States are usually guided in legislating. Lastly, on this topic it must be said that to profess to wish that phthisis were prevented—to admit its communicability from the sick, to admit that consumptives are the main cause of its maintenance and diffusion, to admit the facts of local incidence and of house infection (all of which things, I suppose, we all do admit)—and then to oppose notification on any ground short of demonstrated impossibility, seems to be sheer capriciousness or sentimentality.

Suppose the State to have taken the action just described, does anything remain which might be done at once, and which is peculiarly within the province of a private association? I think there are two main things, and there are some which are subsidiary. The two things are these, and, though they may perhaps seem identical, it is very important indeed that they should be kept distinct: (*a*) provision of hospital accommodation, and (*b*) prescription of the terms of admission thereto. I spoke at first rather slightly of hospitals for the treatment of consumption, and it is the case that in relation to prevention institutions primarily designed for the treatment of infectious diseases deserve little consideration. The two functions are not mutually exclusive, of course, far from it. The difference between an isolation hospital and a general hospital really lies in the qualification for admission. An association for the prevention of phthisis must provide itself with a hospital, but it must be primarily a segregation hospital. The qualification for admission to it must therefore be, not alone the fact of suffering from phthisis, *but the ascertained fact of living while so suffering under conditions which necessarily involve danger of infection to others.* This point will be recognised as vital to preventive schemes as soon as it is mentioned, and therefore, no more need be said about it.

I pass on to mention the subsidiary matters which may well engage the attention of such an association, as being of a kind which cannot well be transacted by officials of the State executing a law, and I do so without staying to consider whether the State might not properly be expected to furnish the segregation hospital. Perhaps it might; but though it may probably contribute towards the cost it seems to be recognised that it is very little likely at pre-

sent to provide one. The subsidiary matters are these. In order to decide which cases among all those which present themselves, or which are presented, for admission to hospital, properly fall under the rule mentioned above, the association must visit many of the sufferers in their houses. We are here on delicate ground, but a discreet director, and discreet visitors, can doubtless be found. In many cases the visitor's report would require amplification or support by a statement of the case made by a medical man; and for this, it is not altogether unnecessary to add, a fair fee should be paid from the association's funds. Another matter is the dissemination of information. It is very well to distribute leaflets and the like; in some connections I have employed them very freely in New South Wales. But simple as such documents usually are, and entirely free from difficulty to the highly educated, there are very many people, and not alone among the uneducated, who are unable to put written advice to practical use without some verbal explanation and some slight demonstration. With the task of providing explanations, advice, and encouragement, would naturally be combined that of furnishing spittoons for indoor and for outdoor use to those who were unable, or who seemed unlikely to buy them for themselves. There is yet one more thing that discreet visitors could do, which eventually would be of high service. They should be possessed of sufficient knowledge of healthy house construction to record the character of all houses in which they found consumptives living; or, if they have it not, the association should provide means for instructing them in it. This, together with some record of the ravages often produced by the disease in families, would, if carefully compiled and published, do much towards that education of public opinion on which sound progress in a matter which in many relations of detail is both delicate and somewhat difficult, can alone be made. I do not lay great stress on these subsidiary matters. I have no doubt that the main object of such an association should be to endeavour to secure hospital accommodation for all those whose continued presence at home necessarily involves danger to the rest of the household, and to take care that no others are admitted until all of them have been provided for. Observance of this rule would leave full scope for the treatment and management of those who were admitted; but it will be agreed, probably, that the treatment of consumption, though a charitable and in a measure a useful work, should not be a prime motive with an association for the prevention of consumption. Lastly, every such association should take especial pains to avoid being mistaken for a charitable organization; that imputation would be fatal to its efficiency.

It is not usual to frame an address to be delivered on such occasions as the present on a single subject. Nor have I done so, for the prevention of phthisis can be accomplished only by approaching perfection in the "art of living in towns." Once more, I repeat, viewed from the standpoint of practical hygiene, the causes of consumption are seen to be many; the disease is maintained and diffused by indirect and not by direct communication between the sick and the healthy; the conditions necessary to indirect communication lie in our surroundings, and if all those surrounding conditions which are requisite to the maintenance and diffusion of phthisis were removed, the general death-rate from all causes out of the natural course would be remarkably diminished.

THE PROPAGATION OF DISEASES BY MEANS OF INSECTS.—*W. M. L. Coplin, M.D.* Manson's studies bearing on the inoculation of man by filaria-infected mosquitos may be taken as fully admitted, and the possible dissemination of leprosy by mosquitos is supported by the experiments of Alvarez, who permitted the mosquitos to feast on the leprous sores, and by suitable staining demonstrated within the mosquito organisms which could not be differentiated from the *Bacillus lepræ*. The work of Smith and Kilbourne (1892) on the activity of the tick in the propagation of Texas fever need only be mentioned, as it established a clear chain of evidence.

In support of the belief that bedbugs may disseminate disease, Denevre observed that the brother of a patient dead of tuberculosis acquired the disease from sleeping in the bed previously occupied by the deceased. Examination of the bedbugs, that were present in large numbers, showed that 60 per cent. possessed the power of infecting guinea-pigs. A fly travelling over an infected surface becomes laden with bacteria, and can infect a wound, and food and drink. Apparently the fly has a striking fondness for the sputum of phthisical patients, and, as pointed out by Joly, infects the food, milk, etc., of others, or even exposed or neglected wounds or sores. In experiments in the laboratories insects were caused to walk over the growing culture in an agar-agar plate, and then after intervals of varying lengths the insects, which had been kept under natural conditions, were caused to walk over sterile culture plates. In this way the *Bacillus typhosus* was demonstrated ninety-six hours after infection of the insect. The experiments prove the assertion that any system of disinfection which does not destroy the material transported, and render the carrier harmless, is insufficient and unsatisfactory, and therefore undesirable.—*Philadelphia Medical Journal*, through *Pacific Medical Journal*.