

EPIDEMIOLOGICAL STUDIES IN HUMAN TUBERCULOSIS.

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INTRODUCTION.

THE present inquiry is the first contribution towards an investigation which, it is hoped, may be further developed in the future throughout Wales in order to ascertain how tuberculosis spreads, under what conditions the disease is dangerous, how and when infection or immunity arises in human beings, and, finally, whether tuberculosis of adult life is frequently a sequel of an infection in childhood.

Owing to the conditions peculiar to Wales, where solitary, almost isolated, hamlets are still to be found, and where the evolutionary state of our civilisation predominates, industrial centres are quite separate from agricultural parts; and again mixed types of communities, including agricultural and industrial districts, are often met with. Here, if anywhere, is the place where the manifold problems connected with tuberculosis, brought into prominence during the last fifty years, can find a solution. The material needed for an inquiry of this kind is afforded by that unique movement, the King Edward VII Welsh National Memorial Association, while the technical means for mapping out tuberculosis are afforded by the von Pirquet reaction, and the isolation and identification of the tubercle bacillus. Thus it comes about that, in Wales, we have at our disposal all the means necessary to trace and follow up the infection by scientific methods.

The Br. village, which was chosen for the present inquiry, is a purely agricultural spot in a valley amongst mountains, near a tuberculosis sanatorium, with good bracing air, and with no excessive rainfall. The sanitary conditions of the village are poor, but the village itself is fairly healthy. The hygienic conditions of the inhabitants have improved but slightly during the last twenty years; financial conditions are straitened; there is no immigration or emigration to speak of, or fluctuation in the population. The Medical Officer of Health of the district tells us that there is no less tuberculosis now than formerly; windows are open more often now than a few years ago; people, especially children, are getting better food now than twenty years ago; the infected patients die as quickly as before; no case of the surgical type of tuberculosis is known in the village. Four cases of tuberculosis have been notified since 1912—H. P., O. P., E. D. and P. D.

The von Pirquet technique was used for obtaining the reaction, and the standard controls were never omitted. The reactions were controlled by both of us separately and by Dr. D. B. Evans, whom we thank for his assistance. Old tuberculin, obtained from Burroughs Wellcome and Co., was used throughout the experiments. All the cows of the village have also had the reaction tested according to the standard of the English

Royal Commission. The houses have all been visited and standards have been adopted as follows:—

(a) "*Good*" includes the houses which are well lighted, well ventilated, clean, dry, and in which sufficient accommodation for the dwellers is available.

(b) "*Fair*" includes the houses which are well ventilated, clean, well lighted, not very dry, in which *insufficient* accommodation for the dwellers prevails.

(c) "*Bad*" means the houses that are not ventilated and are badly lighted, dirty, damp, and *overcrowded*.

Tables are appended which show the individual reactions recorded for the inhabitants of the village. Those who clinically presented clear or at least suspicious signs of tuberculosis, forwarded their sputums to the laboratory, and the tubercle bacillus was searched for microscopically, and, whether the latter was present or not, the sputum was always tested through guinea-pigs after the usual antiformin treatment for isolating the microbe. Bovine or human types were distinguished by passage through rabbits, with the result that no bovine type of *Bacillus tuberculosis* was isolated. The only strain in our possession is of "human" type.

We give, first of all, the results of the reaction in cows. Two farms are to be found in the village, viz., P. and H. The results of tuberculin tests in these farms are shown in the following table:—

Farm	No. of cows tested with tuberculin		Positive results			Results of injection milk from the positive cows into guinea-pigs: 1 pint centrifugalised
P.	...	8	...	2	...	No tuberculous lesions.
H.	..	16	...	5	...	Only one positive. ¹

The foregoing table shows that the bovine type of tubercle bacillus does not play any part in the spread of tuberculosis in the village, and in support of this statement we may add that there is not a single case known to the Medical Officer of Health or to us, of lupus, tuberculosis of bone, or other form of what is called the surgical type of tuberculosis. This happy circumstance simplifies our task very much since it ensures that the conclusions are not obscured by complex phenomena.

One hundred and seventeen persons belonging to thirty-one families were tested with the von Pirquet reaction.

In order to facilitate the comprehension of the results of the reactions obtained in man, we have thought it best to group the families according to whether the von Pirquet reactions have been (1) positive in the whole family; (2) mixed positive and negative; or (3) fully negative. Thus we have:—

Group I: Families wherein all the members gave positive reactions.

Group II: Families giving negative and positive reactions.

Group III: Families giving negative reactions throughout.

¹ This cow, owned by an intelligent farmer, was never used for milk-selling.

Group 1.

The families belonging to Group I are numbered 1, 4, 5, 14, 15, 27, 28 and 29.

Family 1.—The father had tuberculosis himself thirty years ago. The eldest son had tuberculosis twenty-five years ago and used to spend much time at the Cock Inn; he died from tuberculosis fifteen years ago in America. The second son (Haydn) became infected, went to London to work, was ill for some two years and came home to die from pulmonary tuberculosis. The third son (Oswald) was in good health until recently, but now suffers from active tuberculosis (T.B. of human type isolated), and has just received treatment in a sanatorium. The rest of the children gave positive von Pirquet reactions.

Family 4 resides at Cock Inn, which it has kept for three generations. This is a known tuberculous family. The brother of the woman inn-keeper spent his life at the inn and died there, in 1915, after several years of cough with sputum. A sister-in-law of the woman inn-keeper came to the inn to live for a few months. This woman, besides originating from a tuberculous family, married the brother of the woman inn-keeper, who was also tuberculous. Every trace of her has been lost. The children of the woman inn-keeper both present a strong von Pirquet reaction, and the doctor of the district informs us that one of the children has already a hilum tuberculosis. Epidemiologically, this is the main active focus of infection in the village, because the inn is the common centre for social life of the surrounding district. The parents of these children would not allow us to test them for the von Pirquet reaction and declined to supply their sputums.

Family 5.—This family appears to have nothing to do with the village infection. The father had advanced tuberculosis about three years ago and died soon afterwards. The family lived about 10 miles from the village and had nothing to do with it until after the death of the father. The sputums of the children were T.B. negative on microscopical examination, and the injected guinea-pigs did not show any tubercular lesions.

Family 14.—Related to Family 1, which represents one of the two foci of the infection which has spread through the village. These two families are very intimate and spend much of their time together.

Family 15.—A family which settled in the village six years ago. The mother presents active signs of tuberculosis and a tubercular family history. Owing to the departure of the whole family after being tested for the reaction we could not obtain the sputums, nor could we inquire further into the matter.

Family 27.—The same remarks apply as in Family 14.

Family 28.—Has resided but eight years in the village, and its history is unknown to us, to the people of the village, and to the Medical Officer of Health (Dr. Jayne) who has helped us in this matter. On the other hand, the family history given to us by the husband and wife was so confused and there were so many contradictions, that it was difficult to rely upon their statements. It is certainly an interesting family, for the baby, who was only 1½ years old when the reaction was performed, presents a positive von Pirquet, which has been controlled by both of us, and by Dr. D. B. Evans.

Family 29.—Related to Family 1, and living next door to it.

It is clear that in this group the infection has spread from tuberculous parents to the offspring, or has been caught by relatives through intimate contact. We know from the relatives, on the other hand, that none of them had suffered from active tuberculosis nor was there any tuberculous history in their families, previous to their actual infection.

The importance of this group lies in the fact that adults, and children as well, without exception and irrespective of age or other factors of environment, present a positive reaction. To this group belong all the adult subjects of the village who suffer from active tuberculosis, and it is amongst the members of this group that tubercle bacilli have been isolated.

We must add that the housing and economical conditions of the families of this group are the best in the village, except in the case of Family 5, which is well off as regards housing conditions, but whose economic conditions are on the poor side. The other families are in quite comfortable circumstances. The cases of people presenting a positive von Pirquet in early age confirm the data collected by other authors that the reaction arises shortly after infection has taken place. The human organism, therefore, appears to respond quickly to tubercular infection, and quickly builds antibodies in this as in other infectious diseases, as the intradermic reaction of Roemer shows to be the case in tuberculous guinea-pigs.

We conclude from the above that the relationship between the known cases of active disease, and between these and the infected families is clearly demonstrated. In fact the notified cases of tuberculosis since 1912 are H. P., O. P., P. D., and E. D. The four cases of active tuberculosis fall into two groups: (1) the first two from the house of Family 1, and (2) the two last from the Cock Inn (Family 4).

It seems clear that the two sources of infection in the village are the Family 1 and Family 4, and that anyone frequenting those places runs a risk of becoming infected. In fact, all friends and intimate people of those two families react to tuberculin. But a fact of high importance for further consideration is that, whereas the infection passes to members of the family and relatives, or to persons who are in intimate contact with infected members who catch the disease in a clinically manifest form, yet, on the other hand, none of the people who do not live permanently in the house have presented until now, any signs of the active disease. It appears, therefore, that the infection takes a *household type*. By this we mean that those in continual contact with the source of infection are those who show the active disease. Naturally enough, these may be either the offspring or strangers who live in the family.

The behaviour of what is called marital consumption is quite in line with our conclusions, except that the data furnished by statistics do not take into consideration what is the most important factor in the epidemiology of infectious disease, viz., the degree of immunity which the wives of tuberculous people may possess before their marriage, which in our view, is the crucial point in this question.

Group II.

(Families 2, 3, 6, 7, 8, 9, 12, 13, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 30.)

In this group, as we have said, are to be found in the same family certain members positive and others negative to von Pirquet tests. The majority of the families of the village belong to this group, and form more than half their total number. We have divided this group, for the sake of clearness, into three sub-groups:—

(a) Those families in which the von Pirquet is positive in the adults or in one of them, and negative in the children. Many of the children are young and many others have entered adult life (Families 2, 3, 6, 7, 8, 9, 13, 30).

(b) Those families in which the positive von Pirquet is not confined exclusively either to the adults or the children, but occurs irregularly in both (Families 12, 16, 20, 24, 25, 26).

(c) Those families in which the parents refused the performance of the reaction upon themselves (Families 16, 17, 18, 19, 21, 22, 23).

Family 2.—We have here the father positive, his employment being to wash the sputum bottles in the neighbouring tuberculosis sanatorium; the mother and the two children, one of 2 years and the other of 1 year, present a negative von Pirquet.

Family 3.—Both parents positive, the child of 5 years negative.

Family 6.—Both parents positive and all the children negative, including one boy of 1 year.

Family 7.—Both parents present a positive reaction, the four children do not react at all.

Family 8.—The same as above. Here it is to be noted that the children are almost grown up.

Family 9.—The same remarks apply as upon Family 6.

Family 13.—This family is very interesting. Here all the family is negative, parents and children as well, except the old grandfather on the mother's side, who is 78 years of age and has a positive reaction.

Family 30.—In this family the parents present a positive reaction, the children a negative one. This family was employed in the sanatorium.

Sub-Group (b).—Families 12, 16, 20, 24, 25, 26.

Family 12.—Here we have both parents positive, the two eldest children positive, and the two youngest negative. It is very difficult to say what the source of infection is in this case. The parents do not present the slightest signs of tuberculosis; they are strong healthy people, their occupation is farming. Probably, if the infection was in the family, all the children would be infected very early and would present a positive von Pirquet, as we have found in Group I. The question of the school being in any way concerned can be ruled out, as we will show later on, and further inquiries will throw light upon this family.

Family 16.—Parents positive, one daughter only, of 16, positive. It is necessary to say a word about this girl. She has been employed as a domestic servant outside the house for at least three or four years. The source of her infection, therefore, was probably outside the house, for should the infection have been caught in the house it would have infected

the other children also, as we found in Group I, and none would have escaped. We could not further ascertain the origin of the infection in this girl, because the family with whom she had been connected had left the village. It has also been impossible to ascertain the source of infection of the son, aged 8.

Family 20.—Here, also, we find the parents both positive, the children all negative, except one, who is married and has been away from home for the last three years. We could not establish what had been the source of infection in this case because the husband, a soldier, died in the War and it was, therefore, useless to inquire further.

Family 24.—Here again, all the members are negative, except one child of 12 years of age. In this case we have not been able to trace any source of infection. We have inquired many times on the subject, but what information we got was not very reliable.

Family 25.—Both parents are negative, and only one child is positive. The parents are farmers, but the boy has been doing outside work for the last three years, as a painter, so that it is possible that he has caught the infection in his employment. The employer, in fact, shows a positive von Pirquet.

Family 26.—The old father presents a slight positive reaction; the son, who has always lived with him on the farm, is negative. We see here that no household infection exists; on the other hand, the daughter who has been away from home for a long time presents a strong positive reaction; evidently the daughter has caught the infection outside the house.

Sub-group (c).—Unfortunately, the parents of families 17, 18, 19, 21, 22 and 23 refused to have the von Pirquet performed on themselves, but allowed us to perform the reaction on their children. We think that we cannot but classify such families separately in order to avoid confusion and useless criticism, hoping later on to be more fortunate in our enterprise. Such families fall into two categories:—

(1) Those in which the children are partly negative and partly positive (Families 18 and 19).

(2) Those in which the children are all negative (families 17, 21, 22 and 23).

Family 18.—The parents refused to have the reaction done, but are sturdy healthy peasants, who were certified by the Medical Officer of Health as free from tuberculosis. The von Pirquet reaction, on the two children, shows that the boy of 15 is negative, and the girl of 18 presents a positive von Pirquet. The habits of these two children have helped us to find the explanation of this condition, which at first sight seems to be puzzling. First of all, these children are not on very good terms, and they are almost isolated one from the other, though in the same house; on the other hand, the girl spends much of her time in very intimate contact with Family 4, which is one of the two centres from which tuberculosis has spread in the village, whereas the boy never goes into that house.

Family 19.—This is probably somewhat similar to Family 18, though we have not been able to perform the reaction on the parents. In this family there are two children, one of 20 years and the other of 14 years.

The child of 14 has remained at home, the other one has gone out as a domestic servant for the last five years, and she presents a positive reaction. Most probably in this case also the infection has not been a household one, but has been caught outside the house, for should the infection have been of household origin it would have affected the other child staying at home.

Very little need be said about the category (2), except that the children all present a von Pirquet negative. This group is extremely interesting, because it affords material which helps us to ascertain whether, firstly, the individuals now presenting a negative von Pirquet are going to present later on a von Pirquet positive; secondly, when and how the infection arises; and thirdly, the time which it takes to develop; further, it will probably show us under what conditions the infection tends to assume the character of the open disease, or of latency or immunity, and how far these types of reaction are connected with the virulence and the type of strain isolated. If we think over the responses to infection shown by this group, we find in contrast to those of the first that there are no cases of open tuberculosis present, and that the parents who have a positive von Pirquet reaction do not show any signs of disease. In these families the disease is no longer infective, and the reaction only signifies that immunity has been acquired. The von Pirquet reaction, therefore, is a reaction of immunity under whatever conditions it may arise, and when it is present in alleged tubercular cases its presence is due to the existence of antibodies. This way of interpreting the above facts may afford us a good practical test, as for instance, when a patient has doubtful physical signs, and in early tuberculosis. In these circumstances, it will be often useful to ascertain the reaction to the von Pirquet test in the whole family, for should all the members respond to the test, then this fact may throw light upon the case in question.

The housing and economical conditions of this second group are fair on the whole. We must conclude that these factors in our agricultural areas play little or no rôle at all, nor has school infection had anything to do with the spreading of the infections in this particular case. There are, as a matter of fact, dozens of school children in this group who have presented a negative von Pirquet; therefore this source of infection is to be excluded.

Group III

(Which comprehends Families 10, 11, and 31.)

In these families the parents as well as the children have a negative von Pirquet. Here we have a number of individuals who seem never to have been touched by tuberculosis. The explanation probably is that a natural isolation of the various families occurs in agricultural villages, the inhabitants of which have peculiar habits, and associate very little with each other.¹ These results are worth keeping in mind and comparing

¹ The reader is to be reminded that in the village there is no social intercourse between the families though they may live almost next door to each other. There is thus an isolation which has the effect of segregation. Without such knowledge as we have been able to acquire, it would have been impossible for us to grasp certain points and to follow up the source of infection. Many of these inquiries have afforded us the key to what would otherwise have been inexplicable.

afterwards with others which will come to light through similar inquiries in communities of different characteristics; for it will probably be found that the conditions differ in different agricultural centres and districts, showing how difficult it is to make generalizations with regard to the epidemiology of human tuberculosis. The problems sketched for the second group are all found again in this third group, but with another factor of importance added, viz., the lack of any infection in past generations. In fact, from the register of the Medical Officer of Health, the memory of the local medical man, and our own knowledge, we are able to state that there has never occurred, in those families, a case of tuberculosis. The parents and children in this group behave like virgin soil in relation to tuberculosis, viz., they are people in whom neither infection nor immunity has left any trace. Therefore, no resistance at all, from any side, has been transmitted or acquired in these families. We are in the presence of a most interesting group, and the watching of these inhabitants very closely would afford valuable material for the further development of a scientific knowledge of tuberculosis. They are almost all healthy labourers and, curious to note, the economical and housing conditions are the poorest in the whole village. In this group also there are children of school age and above, and here again is another proof that the school in our case has not been a centre of infection.

A few words on the school of the village. We have found, on surprise visits, open windows and the school very clean. The children are clean, and there is a certain distance between the children in the benches. This is very satisfactory. Anyhow, the best proof that the school has not given rise to the spreading of tuberculosis is afforded by the fact that a great number of children show a negative von Pirquet. We do not wish, of course, to be misunderstood. We speak only of this particular inquiry, and of the peculiar village in which we have carried out our studies—in another purely agricultural centre the reverse may be found, and all the contrasts must finally be weighed, criticised, and enunciated as a generalisation which covers all the facts. This will only be possible when many inquiries of this kind have been completed.

It follows quite evidently in our inquiry that in this agricultural area great stress, from a preventive point of view, must be placed on *household infection*, as we have defined it above.

Housing, Economical Conditions and other Factors in relation to the spreading of Tuberculosis.—This inquiry shows quite clearly that housing and economical conditions are, in our case, in no relation whatever to the spreading of the disease outside the family. Nevertheless, we admit that poor housing and poor economical conditions may play a rôle in the spreading of infection, not because of these conditions in themselves, but as a helping factor, giving the already existing infection facilities to spread, and preparing a condition of overcrowding (probably the only accessory factor of importance for passing on of the infection from the carrier to the healthy person); for, in the actual state of our knowledge in pulmonary tuberculosis, it would seem that the chief and most important path of infection is the respiratory tract.

It would appear from our inquiry that in the investigations described,

the richer the people the more they suffered from tuberculosis; the poorer, the less. This is a paradox; but it means only that the factors incident to relative wealth and poverty may be of secondary importance—anyhow, it makes it clear that when the infective agent is present in sufficient numbers it does not matter whether the contact arises in a drawing-room or in the hut of a shepherd.

INFECTION AND IMMUNITY.

We have found in this inquiry that, in a certain number of families (Group 2), the disease is not further transmitted; and this is in contrast with the results found in Group 1, where, when one member of the family was suffering from open tuberculosis, the whole family got infected, irrespective of age, sex, environment and housing conditions. From this it appears that the condition *sine qua non* for the carrier being infectious is the existence of open disease.

We have seen that in Group 2 the members of the family are not able to infect further their offspring with whom they are in intimate contact. Tuberculosis for them is a passed danger: it looks as if they are either immunised against any further attacks or the infective foci are shut off. Both hypotheses deserve to be thoroughly tested as to their bearing on tuberculosis. In the light of the facts recorded, it must be admitted that the von Pirquet reaction is a reaction of immunity.

As we have said, we have found foci of infection represented by Families 1 and 4. First of all we find, as regards these families, open tuberculosis, with tubercle bacilli in the sputum of the adults. Up to date only some children are badly infected by open tuberculosis, and we shall see what the future has in store for them; others, while giving a positive von Pirquet reaction, do not present open disease; they, too, need to be watched. On the other hand, when other persons from outside become exposed to these foci they tend to show a von Pirquet positive, and yet, in spite of careful examination, we have not been able to discover any physical signs or any suspicious symptoms which could lead us to suspect chest trouble, either present or likely to arise in the near future. In other words, the exposure to the infecting person in these last subjects has taken place in conditions which did not admit of the production of the active disease. On the other hand, the children of parents with active disease, living probably in the same room with their parents, under conditions highly favourable to infection by continuous contact, have absorbed such quantities of virus as to be above the *limes* that could be absorbed by the child and disposed of; and, therefore, the disease has developed in these children while immunity was acquired by the others. Those examples give us hints how to steer our course in further inquiries into the circumstances of the tuberculous family, *taking into consideration, of course, the stage of the disease in the infectious person (for the experiments in guinea-pigs show clearly that tuberculosis has a cycle of infectivity); the degree of intimacy of the infecting and the to-be-infected person; the conditions of environment when such infection takes place, and further, the degree of immunity of the "contact" individual.*

It is of enormous importance to acquire data about these points for a complete discussion on the subject of the epidemiology of tuberculosis.

CONCLUSIONS.

The present inquiry in an agricultural village shows that tuberculosis has spread from two main foci of infection. From these two foci, the actual cases existing in the village and also the "contacts" have arisen, with the exception of Family 5, which is an independent focus and is subsiding. We have seen that infection takes two lines. It spreads in the family, producing active disease; it infects also strangers or near relatives who come in less intimate contact with the infecting persons, but does not in them produce open tuberculosis. We think these last people to be relatively immune, because they are healthy adults and they do not show, up to now, the least clinical sign or symptom of active disease. Studies conducted in the near future, in the same village, will probably show whether our hypothesis is right or not. In the mixed families their individual reactions are worth recording. The fact that offspring of these families present a negative, whereas the parents present a positive reaction, has led us to conclude that the parents have gone through an infection but that the infection has merely led to an immunisation of the individual. From this observation, we have concluded that the von Pirquet reaction is a reaction of immunity. Should the parents have been infectious they would have infected their children, as seen in Group 1, where we have found in our agricultural village that there are entire families with positive von Pirquet reactions, irrespective of age, associated with open disease in one member of the said families. From this we conclude that the condition *sine qua non* for infectivity in tuberculosis is the existence of open foci in the lungs.

The discovery of a negative von Pirquet reaction in a large number of families is to be attributed to actual absence of disease and to the isolation to which farm people are inclined. Further, in these "negative" families, as the Medical Officer of Health informs us from his register, no tuberculosis has occurred in the past. This is an important group to be kept in mind for study of future manifestation and evolution of tuberculosis, for if infection occurs it will take place in virgin soil. In the village there is not a single case of surgical tuberculosis or lupus. This may be connected with our finding that no bovine types of tubercle bacilli have been isolated. We have tried to emphasise our opinion that the expired air is the chief vehicle of infection, basing our hypothesis on laboratory experiments and on facts assumed from scientific observations in human epidemiology. To prevent misunderstanding we repeat that we are now speaking of pulmonary tuberculosis only. Of all accessory factors for the spread of tuberculosis, overcrowding seems to us to be the most important. It is known that immunity arises in nature, and we have tried to follow and explain the way nature takes to develop immunity. In order that immunity shall arise the contact must take place at intervals, only small quantities of virus being absorbed. Under these circumstances the human organism mobilises its defence and can cope with the infection. Practically speaking, in our investigations, people in intermittent contact with open cases get only a von Pirquet "positive" but not the active disease, deriving benefit, not harm, from the small doses of bacilli to which they are exposed. On the

other hand, the facts brought out through this inquiry show that when the virus is absorbed continually, as in the intimate contact of mother and child, then active tuberculosis arises.

Epidemiological inquiries may yet disclose to us the solution of many riddles, and perhaps we may in this way be enabled scientifically to reconstruct the phylogenesis of tuberculosis in all its aspects, viz., as a disease and as an immunity process. It would be pretentious or absurd to claim that the present inquiry is sufficient to solve the problems which we have enunciated. We have merely sketched the programme; we have merely found some threads which may lead us with profit to a safe path through his enormous field.

Family serial number	Name	Age	Fed in Infancy		Possible source of infection	Economic condition	Housing condition	Occupation	v. Pirquet reaction	Remarks
			Breast	Cows'						
1. Outsider	Father	59	+	..	Unknown	Good	Good	Minister and farmer	Pos.	..
	Daughter	26	+	..	Father	"	"	Shop Asst.	"	..
	Son	23	+	..	"	"	"	Farmer	"	(T.B. isolated)
	Daughter	17	+	..	"	"	"	Home	"	..
	Son	15	..	+	"	"	"	Farm	Slight pos.	..
	Son	13	+	..	"	"	"	Home	"	..
	Daughter	12	..	+	"	"	"	"	"	..
2. Outsider Local	Father	34	..	+	Possibly the Sanat.	Good	Good	Porter	Pos.	..
	Mother	29	..	+	"	"	"	Housewife	Neg.	..
	Daughter	2	..	+	"	"	"	..	"	..
	Daughter	1	..	+	"	"	"	..	"	..
3. Outsider	Father	32	..	..	Unknown	Good	Good	Carpenter	Pos.	..
	Mother	32	..	..	"	"	"	Housewife	Slight pos.	..
	Son	5	..	Savory & Moore's Food	..	"	"	..	Neg.	..
4. Outsider	Father	..	..	..	Unknown	Good	Fair	Publican	Refused	Refused to supply sputum
	Mother	..	..	..	"	"	"	..	"
	Son	10	+	..	Mother	"	"	..	Strong pos.	
	Son	7	..	+	"	"	"	..	"	
	Son	6	+	..	"	"	"	..	"	
5. Local	Mother (widow)	35	..	..	Deceased husband	Fair	Fair	Char-woman	Strong pos.	Sputum inoculated to guinea-pigs with negative results
	Sister of mother	34	..	..	"	"	"	..	"
	Daughter	10	..	Nestlé's	"	"	"	..	"	
	Daughter	8	+	..	"	"	"	..	"	
	Son	6	+	..	"	"	"	..	"	

Family serial number	Name	Age	Fed in Infancy		Possible source of infection	Economic condition	Housing condition	Occupation	v. Pirquet reaction	Remarks
			Breast	Cows'						
6. Out-sider	Father	45	..	..	Unknown	Good	Good	Farmer	Pos.	..
	Mother	26	..	..	"	"	"	"	"	..
	Son	3	For 5 mths.	Boiled milk after	..	"	"	..	Neg.	..
	Son	2	"	..	..	"	"	..	"	..
	Daughter	1	"	..	..	"	"	..	"	..
7. Out-sider	Father	45	..	..	Unknown	Poor	Poor	Carpenter	Pos.	..
	Mother	43	..	..	"	"	"	..	Slightly pos.	..
	Daughter	8	..	+	..	"	"	..	Neg.	..
	Son	6	..	+	..	"	"	..	"	..
	Daughter	5	..	+	..	"	"	..	"	..
	Daughter	3	..	+	..	"	"	..	"	..
8. Local	Father	35	..	..	Unknown	Good	Good	Carpenter	Pos.	..
	Mother	35	..	..	"	"	"	..	"	..
	Daughter	16	+	..	"	"	"	..	Neg.	..
	Son	14	+	..	"	"	"	..	"	..
	Daughter	8	+	..	"	"	"	..	"	..
9. Local	Mother	46	..	..	Unknown	Poor	Fair	Post-woman	Pos.	..
	Daughter	10	+	..	..	"	"	..	Neg.	Love child
10. Local	Father	..	..	..	..	Good	Good	..	Neg.	..
	Mother	..	..	..	..	"	"	..	"	..
	Son	11½	+	..	..	"	"	..	"	..
	Daughter	9	+	..	..	"	"	..	"	..
11. Local	Father	..	..	..	..	Poor	Poor	Labourer	Neg.	..
	Mother	40	..	..	..	"	"	..	"	..
	Daughter	9	+	..	..	"	"	..	"	..
	Daughter	6	+	..	..	"	"	..	"	..
12. Local	Father	48	..	..	Unknown	Poor	Poor	Farm.	Slight pos.	..
	Mother	41	..	..	"	"	"	Char-woman	"	..
	Son	15	+	..	"	"	"	Farm.	"	..
	Daughter	10	+	..	"	"	"	..	Strong pos.	..
	Daughter	8	+	..	"	"	"	..	Neg.	..
	Daughter	3	+	..	"	"	"	..	"	..
13. Local Out-sider	Grand-father	78	..	..	Unknown	Fair	Poor	..	Slight pos.	..
	Father	35	..	..	..	"	"	Collier	Neg.	..
	Mother	32	..	..	..	"	"	Housewife	"	..
	Daughter	5	+	..	..	"	"	..	"	..
	Daughter	7	..	Allenbury Food, then milk, new brand condensed milk	..	"	"	..	"	..

Family serial number	Name	Age	Fed in Infancy		Possible source of infection	Economic condition	Housing condition	Occupation	v. Pirquet reaction	Remarks
			Breast	Cows'						
14. Outsider	Father	60	..	..	Family 1	Bad	Fair	Tailor	Pos.	..
	Son	37	+	..	"	"	"	Baker	Slight pos.	..
	Daughter	36	+	..	"	"	"	Teacher	Pos.	..
	Daughter	34	+	..	"	Good	Good	House-keeper	Slight pos.	..
	Daughter	25	+	..	"	Bad	Fair	Farm 1 Shop-keeper	Slight pos.	..
15. Outsider	Father	40	..	..	To wife?	Poor	Good	School-master	Pos.	..
	Mother	38	..	..	Family history	"	"	Housewife	"	..
	Son	15	..	Boiled milk	Mother	"	"	..	Slight pos.	..
	Daughter	7	..	"	Mother	"	"	..	Pos.	..
16. Outsider	Father	33	..	..	Unknown	Poor	Poor	Labourer	Pos.	..
	Mother	33	..	..	"	"	"	..	"	..
	Daughter	16	+	..	"	"	"	Domestic	"	..
	Daughter	14	+	..	"	"	"	..	Neg.	..
	Daughter	11	+	..	"	"	"	..	"	..
	Son	8	+	..	Unknown	"	"	..	Pos.	..
	Son	3	+	..	"	"	"	..	Neg.	..
17. Outsider	Father	..	..	..	..	..	Fair	Farm labourer	Refused	..
	Mother	..	..	..	..	..	..	..	..	Dead
	Son	10	+	..	..	Good	Fair	..	Neg.	..
18. Local	Father	..	..	..	..	..	..	..	Refused	..
	Mother	..	..	..	..	..	..	..	"	..
	Daughter	18	+	..	Family 4	Poor	Poor	..	Strong pos.	..
	Son	15	+	..	..	"	"	..	Neg.	..
19. Local	Father	..	..	..	..	..	..	..	Refused	..
	Mother	..	..	..	..	..	..	..	"	..
	Daughter	20	+	..	Unknown	Good	Good	Domestic	Pos.	..
	Son	14	+	..	..	"	"	Painter's boy	Neg.	..
20. Outsider	Father	55	..	..	Unknown	Good	Fair	Labourer	Pos.	..
	Mother	55	..	..	"	"	"	Midwife	Slight positive	..
	Married daughter	21	+	..	"	"	"	F.	Pos.	..
	Daughter	14	+	..	"	"	"	..	Neg.	..
	Daughter	10	+	..	"	"	"	..	"	..
	Son	5	..	Nestlé's	"	"	"	..	"	..
21. Outsider	Father	..	..	..	..	..	..	Ganger	Refused	..
	Son	10	+	..	..	Poor	Poor	..	Neg.	..

Family serial number	Name	Age	Fed in Infancy		Possible source of infection	Economic condition	Housing condition	Occupation	v. Pirquet reaction	Remarks
			Breast	Cows'						
22. Out- sider	Father	..	..	..	..	..	..	Farm labourer	Refused	..
	Mother	..	..	..	..	..	..	Housewife	"	..
	Daughter	28	..	+	..	Fair	Poor	Char- woman	Neg.	..
	Daughter	22	+	..	..	Good	Good	Farm servant to family 26	"	..
	Son Baby	7 2	+	.. +	.. ..	Fair "	Poor "	.. ..	" Refused	....
23. Out- sider	Father	..	..	..	..	..	..	Labourer	Refused	..
	Mother	..	..	..	..	..	..	Housewife	"	..
	Daughter	7	+	..	..	Good	Good	..	Neg.	..
	Daughter	5	+	..	..	"	"	..	"	..
24. Local	Father	54	..	..	..	Good	Fair	Farmer	Neg.	..
	Mother	48	..	..	..	"	"	Housewife	"	..
	Son	22	+	..	..	"	"	Grocer's assistant	"	..
	Daughter	16	+	..	..	"	Good	Servant	"	..
	Son	12	+	..	Unknown	"	Fair	..	Pos.	..
	Son	6	For 3 mths.	Milk and M.S. food	..	"	"	..	Neg.	..
25 Out- sider	Father	50	..	..	..	Fair	Fair	Labourer	Neg.	..
	Mother	50	..	..	..	"	"	Housewife	"	..
	Son	16	..	+	To master (?)	"	"	Painter's boy, works out	Pos.	..
26 Out- sider	Father	72	..	..	Unknown	Good	Good	Farm.	Slight pos.	..
	Son	40	..	+	..	"	"	..	Neg.	..
	Daughter	27	+	..	Unknown	"	"	Housewife	Strong pos.	..
27 Local	Father	..	..	..	..	..	..	Shop- keeper	Pos.	..
	Mother	..	..	..	..	..	..	..	"	Dead
	Daughter	28	+	..	Family 1	Fair	Fair	Shop	Pos.	..
28 Out- sider	Father	30	..	..	Unknown	Good	Good	Labourer	Pos.	..
	Mother	25	..	..	"	"	"	Housewife	Slight pos.	..
	Daughter	1½	+	..	Parents	"	"	..	"	..
29 Local	Father	..	..	..	..	..	..	Roadman	Refused	Dement
	Mother	..	..	..	..	..	..	..	"	Feeble- minded
	Daughter	25	..	..	Always with family 1, a relation	Fair	Good	Domestic servant	Strong pos.	..

Family serial number	Name	Age	Fed in Infancy		Possible source of infection	Economic condition	Housing condition	Occupation	V. Pirquet reaction	Remarks
			Breast	Cows*						
30 Outsider	Father	29	..	..	Unknown	Good	Good	Porter sanat.	Slight pos.	..
	Mother	26	..	..	To Father (?)	"	"	..	"	..
	Mother's sister	19	..	..	..	"	"	..	Neg.	..
	Son	4	+	..	To Father (?)	"	"	..	"	..
31 Outsider	Father	54	..	..	..	Fair	Fair	Labourer	Neg.	..
	Mother	53	..	..	..	"	"	Housewife	"	..

THE ORGANISATION AGAINST TUBERCULOSIS IN FRANCE.

By Professor LÉON BERNARD and Dr. G. POIX (Paris).

BEFORE the war antituberculosis organisations in France were practically isolated from each other and their activities did not follow a uniform and methodically applied programme. As a result of this the efforts due to private initiative and those of public authorities were, as a rule, not co-ordinated.

During the war and after, the enacting of two laws for the first time gave a place to tuberculosis in French legislation (the Léon Bourgeois Law on Dispensaries and the Honnorat Law on Sanatoriums). These, on the one hand, and the joint efforts of the Rockefeller Foundation's Commission for the Prevention of Tuberculosis and of the Comité National de Défense contre la Tuberculose on the other, helped to co-ordinate all activities and to develop numerous organisations directed against tuberculosis. They were all created on the fundamental principle of prophylaxis, and followed a uniform method.

These organisations, headed as a whole by the National Committee and managed by departmental committees, are: dispensaries, schools for visiting nurses, child welfare societies, sanatoriums, re-education schools, hospitals for consumptives, isolation wards for tuberculous patients and marine sanatoriums. Taken together they represent the weapons or armament which France possesses against tuberculosis, to use the fitting expression of Landouzy.

The National Committee of Defence against Tuberculosis.—This National Committee, which is presided over by Monsieur Léon Bourgeois, includes a board of 60 directors, among whom are to be found prominent persons in the French medical, administrative or legal world, who are experienced in matters of prophylaxis and social legislation, together