years ago Andral diagnosed a syphilitic ulcer of the stomach from the fact that it was cured by mercury, and Galliard, Lancereaux, Wagner, Hayem, Rosanow, and Marc have all recorded instances in which the nature of the complaint was manifested in a similar manner.

The differential diagnosis of specific ulcer and cancer is often very difficult, especially when the former is accompanied by severe gastritis. In malignant disease, however, a tumour can usually be detected in connexion with the stomach: the loss of flesh and strength are more rapid, nocturnal attacks of pain are infrequent, and the vomit often contains altered blood. The subjects of gastric cancer are also very intolerant of mercury and iodides and after a few days' treatment will usually volunteer the statement that the medicine is making them much worse. In the syphilitic affection, on the other hand, these remedies are the only ones which are found to afford relief. The gastric crises of locomotor ataxia occur at irregular intervals and are seldom excited by the ingestion of food. There is little or no localised tenderness of the epigastrium and the patient presents the usual signs of early tabes. It is important to remember that the gastric disease and the specific lesion of the central nervous system seldom, if ever, coexist.

The diagnosis of syphilitic gastritis is made by the absence of the usual conditions which excite inflammation of the stomach and by the discovery of a strong history or of objective evidences of syphilis. A few days' trial of iodide of potassium will usually clear up any doubt, since in ordinary cases of gastritis this drug greatly increases the dyspeptic symptoms, while the contrary result is observed in the specific disorder.

TREATMENT.

Absolute rest is essential, and much time will be saved if the patient is confined to bed for the first fortnight. Milk should form the staple diet for the first three or four weeks, but as it does not always agree so well as in simple ulcer it may be necessary to administer it diluted with soda water or Vichy water. When vomiting is a troublesome symptom the milk should be peptonised. Clear soups and broths and jellies and junket may also be allowed if they can be taken without discomfort. After the first month, should the case be progressing favourably, milk puddings, soft bread-and-butter, eggs, tripe, and oysters may be allowed, and the diet may subsequently be increased by the addition of pounded fish, finely-minced sweetbreads, and chicken cream. Meat and green vegetables should not be allowed for at least six months. If vomiting is urgent it may be necessary to feed the patient by the rectum. When abdominal pain is severe the epigastrium may be constantly covered with a large linseed poultice, but as a rule the repeated application of small blisters is of greatest value. With regard to medicinal treatment it may be stated at once that mercury should always be combined with the iodides, since the latter are much less efficacious when given alone. In most instances it is sufficient to prescribe a mercurial pill of two grains with an equal quantity of extract of hyoscyamus night and morning, but occasionally drachm doses of the solution of perchloride of mercury are to be preferred. In young children inunctions of mercurial ointment or full doses of mercury and chalk are the most convenient method of administering the drug. If there is any tendency to diarrhoea a small quantity of opium may be included in the prescription. The iodide of potassium must be given in doses of from five to 15 grains, and is conveniently combined with carbonate of bismuth and liquid extract of sarsaparilla, while the addition of 10 minims of glycerine of carbolic acid often helps to prevent the oppression and flatulence experienced after food. Should the bowels remain constipated in spite of the mercury a teaspoonful or more of Carlsbad salts may be given each morning before breakfast. Lavage is chiefly indicated in chronic gastritis accompanied by troublesome vomiting and in cases of partial obstruction of the pylorus; but it must be avoided when the symptoms of ulceration are present. In every instance the patient should be warned of the possibility of a relapse lest he be tempted to discontinue the treatment as soon as the urgent symptoms have subsided.

VACCINATION STATISTICS.—At a meeting of the Bath Board of Guardians held on Sept. 18th it was reported that during 1900 there were 1668 births registered and that of these children 1071 were successfully vaccinated. 40 summonses for non-vaccination were obtained, of which 18 resulted in the defendants being fined, the remaining 22 being eventually vaccinated.

THE INFECTIOUSNESS OF THE MILK OF TUBERCULOUS COWS; THE BACTERIOLOGICAL DIAGNOSIS, AND THE PRACTICAL VALUE OF TUBERCULIN FOR THE EXTERMINATION OF TUBERCULOSIS AMONG CATTLE.¹

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THE frequency and constant increase of tuberculous disease among cattle long ago drew serious attention to the question whether the milk of tuberculous cows is capable of carrying infection to other animals. By means of minute and varied experiments it has been established beyond doubt that such is indeed the case—that tuberculosis can certainly be produced in calves and swine through feeding them with infected milk. Nevertheless, it still remained to be shown how very common this mode of infection is under natural conditions. The magnitude of this danger of the spreading of tuberculosis among animals due to the consumption of milk is best illustrated by the frequent occurrence of tuberculosis among calves and by the alarming increase of the same disease among swine which has been observed within the last few years. About 90 per cent. of the latter cases have been proved to originate in feeding with infected milk. The frequent occurrence of intestinal infection need not be wondered at when we consider the extent of tuberculous disease among milch cows as well as the fact that for a considerable length of time after birth the young calves are almost exclusively fed with their mothers' milk. The increase of tuberculosis among swine is further explained by the fact that the farrows are likewise raised on cows' milk, the principal fodder of pigs in these days of large dairies consisting in the raw dairy residues made up of the deposits and the skim milk left over from the centrifuging process. The transmission of tuberculosis among cattle and pigs by means of milk being established, it now remains to be seen whether the milk of all tuberculous cows contains tubercle bacilli, or whether the infectious properties are confined to special forms of tuberculous disease.

The investigations of Bollinger, Bang, and a great number of other observers many years ago established that the milk of cows suffering either from general tuberculosis or from tuberculosis of the udder contains tubercle bacilli. A few observers, such as Hirschberger and others, have experimentally demonstrated the infectious quality of milk derived from cows with incipient tuberculosis and non-tuberculous udders. Since the important discovery of tuberculin, however, there has been no examination into the question as to whether tubercle bacilli may not be present in the milk of animals which do not show any clinical signs of tuberculosis but which nevertheless are shown by their susceptibility to the tuberculin test to be tuberculous. A positive answer to this question was furnished in 1899 by the joint investigations of myself and Dr. Kempner. We found that tubercle bacilli may be present in the milk in cases of tuberculosis, latent, but revealed by the tuberculin test. If, then, the milk of such cows contains tubercle bacilli, it must needs be regarded as infectious, and such milk must be held no less dangerous for the consumption of young animals than that of milk from cows with advanced general disease or with diseased udders. In these as well as in my subsequent experiments I tested the presence of tubercle bacilli in the milk by means of intra-peritoneal injection in guinea-pigs, as I consider this method to be not merely satisfactory, but indeed the only safe method. The alternative way to prove the infectious character of milk by feeding animals with it is unreliable, since the quantity of tubercle bacilli thus introduced in the course of one experiment or of several experiments is greatly inferior to the amount which the animals would actually consume within a given period of time as part of their food. In the long run even a very slightly infectious kind of milk is bound to produce the disease.

¹ A paper communicated to the British Congress on Tuberculosis, Section III., Pathology, including Bacteriology.

The presence of tubercle bacilli in the milk of cows that respond to the tuberculin test without showing clinical evidence of tuberculosis was proved in the same year by Ostertag in regard to mixed milk and by Adami and Martin in regard to the milk of a number of individual cows. A further proof in support of this theory was furnished by my observations last year on milk supplied to infants in Berlin. I found no tubercle bacilli in the milk taken from cows which had been regularly subjected to the tuberculin test, while the supply obtained from animals not subjected to this test contained tubercle bacilli though they showed no clinical symptoms of tuberculosis. My own bacteriological observations of former years, as well as the more recent investigations chiefly concerning the milk of cows with suspected tuberculosis of the udder, established the following facts:—

The detection of tubercle bacilli by means of microscopical examination of specimens of cream and sediment from centrifuged milk is unreliable, because the absence of acid-resisting bacilli from the specimens examined cannot be considered convincing as their number may be so small as not to be found on every slide examined under the microscope; whilst even a very small number of tubercle bacilli can be detected by animal experiment. Besides, in milk there occur bacteria which with regard to their growth, as well as to the effect which they have on the animal organs, are very similar to the acid-resisting bacilli which were found by Koch in butter, and which under the microscope are unfortunately very difficult to distinguish from tubercle bacilli. These bacilli were not only found by Petri, Beck, Santoni, myself, and others in the ordinary market milk, but we were also able to detect and to isolate them by animal experiments from specimens of milk obtained under aseptic conditions from individual cows. The above-mentioned discovery of the acid-resisting bacilli, so similar in their nature and appearance to tubercle bacilli, in the milk of cows suspected of tuberculous disease made by our observations some years ago has been recently confirmed by the experiments of Kühnau. This investigator was able, both in specimens of mixed milk and also in milk taken under aseptic conditions from individual cows, to prove by animal experiment the presence of these bacilli in from 20 per cent. to 25 per cent. of the cases examined. Whether these bacilli are secreted by the mammary glands or whether they enter the milk ducts of the frequently inflamed udders from without is still uncertain, and for the differential diagnosis of these bacteria is without importance. In the light of recent investigations we certainly need not be surprised to find these bacilli in the milk. Several years ago Severin found the same kind of bacteria in cow-dung, while Olt demonstrated their presence in the contents of the intestine of tuberculous as well as of healthy cattle. Möller further succeeded in obtaining isolated cultures of these acid-resisting bacteria from the cow-dung as well as from the timothy grass used as fodder. The same kind of acid-resisting bacteria, or similar ones, have been recently detected by Cowie on the udder, and by Ludwig Neufeld in the mammary gland, of the cow. Besides these acid-resisting bacteria Nocard and Mollereau, Bang, and others detected, some years ago, saprophytic as well as pathogenic bacteria, especially streptococci, in the udder of cows suffering from mastitis. These discoveries were recently confirmed by the experiments of Ward, as well as by those of Reed and Ward. The last-named observers have even isolated streptococci along with harmless bacteria from the milk of cows which were apparently healthy, showing clinically no signs of mastitis. When the udders of the slaughtered animals were examined streptococci of the same kind were found to be present in all parts of them. The other bacteria, too, which were found in the udder after the cow was slaughtered proved identical with those previously isolated from the milk. That streptococci may be present in the milk a long time after the mastitis has disappeared has recently been proved by the experiments of Lameris and van Harreveld.

In view of these facts the presence in cows' milk of the bacteria which resemble tubercle bacilli is, after all, not difficult to explain, as these microbes, as well as streptococci, can either enter the udder from the outer world through the teat, or they can be taken in with the food and absorbed by the blood and lymph-stream from the intestinal canal and carried thence to the udder. In the present state of our knowledge it is not yet certain whether these bacteria can be the cause of the mastitis, or whether, the mastitis already existing, the inflamed tissue merely furnishes a suitable

nourishing medium for the development of the microbes. As these acid-resisting bacilli are sometimes visible in clusters in a specimen of centrifuged milk, a microscopical differentiation of these from the genuine tubercle bacilli, especially when both kinds are present mixed in one and the same specimen of milk, is rendered extremely difficult or even impossible.

The only reliable method of proving the presence of tubercle bacilli in milk which remains is, therefore, animal experiment—namely, the intra-peritoneal injection into guinea-pigs of a mixture of the cream and sediment of thoroughly centrifuged milk. The following interesting experiment made by Ostertag shows how very susceptible the guinea-pig is when subjected to intra-peritoneal inoculation. The milk of a cow with a tuberculous udder, 20 cubic centimetres of which being given to a guinea-pig by the mouth produced intestinal tuberculosis, was able to produce general tuberculosis when injected into the peritoneal cavity of guinea-pigs, even after it had been diluted 100,000 times. By comparative experiments I was, indeed, able to prove that the last milk obtainable from the udders of suspected cows gave positive results in regard to the presence of bacilli whilst the first milk obtained from the full udders was not able to convey tuberculous infection in the animals. It must further be noted that it is necessary to examine the suspected milk repeatedly and at various times, as a single negative result cannot be considered finally convincing. Although it is easy to prove the presence of a small number of tubercle bacilli by means of inoculation, the result of the experiments may be obscured where changes resembling tubercles are seen in the tissues when examined with the naked eye, but which in reality have been caused by the action of the above-mentioned acid-resisting bacilli. Their pseudo-tuberculous nature can easily be proved when examined under the microscope. But, as we have already seen, real tubercle bacilli may be found in the tissues along with the acid-resisting bacilli; it is therefore advisable to carry on, in addition to a histological examination, inoculation experiments with parts of the suspected tissues until positive results are obtained. Thus the process of diagnosing tubercle bacilli by means of experiments on animals may become very tedious and two or even three months may elapse before we are able to decide whether the milk of the cow suspected of tuberculosis really contains tubercle bacilli.

The presence of tubercle bacilli in the milk does not, as a rule, correspond to the extent of the disease in the animal, as we have already had occasion to mention. It must be admitted, though, that in cases of extensive general tuberculosis or tuberculosis of the udder the presence of tubercle bacilli in the milk may be expected. How very often the clinical diagnosis of tuberculosis of the udder meets with great difficulties, even in the hands of the most competent observers, I had an opportunity to convince myself in the course of my last year's observations. The milk of the cows in question, as well as the results of the clinical examination, were kindly placed at my disposal by Dr. Schütz, professor at the Veterinary School in Berlin, and Dr. Schroeder. I made it my task this time to carry on my experiments on the occurrence of tubercle bacilli in the milk only of such cows as have been proved by repeated clinical examinations to be suspicious or to show tuberculosis of the udder. These 10 cows, the milk of which was repeatedly examined microscopically and by animal experiment, have not been submitted to the tuberculin test. In experiments this year it has merely been wished to ascertain whether the clinical examination of a cow, especially of her udder, allows the inference that the milk of the animal is infectious. It would lead us too far to enter here into details of our experiments. I shall only mention the results of the examination of those cows which throw most light on the subject in question.

In one case where the clinical diagnosis pronounced the udder to be tuberculous the presence of tubercle bacilli was only detected by animal experiment; microscopical examination was negative. In another cow with the same diagnosis the microscopical examination of the milk repeatedly revealed a great number of acid-resisting bacilli, while the animal experiment gave negative results. The necropsy of this cow did not confirm the clinical diagnosis of tuberculosis of the udder; it revealed merely the presence of chronic interstitial mastitis. Inoculation experiments with portions of the suspected udder also failed. In two other cows, in one of which the diagnosis of tuberculosis of the udder was made with great certainty while in the other a

strong suspicion was entertained, microscopical examination repeatedly detected in the milk a great number of acid-resisting bacteria of the nature of which we could not be sure. We thought them at times to be real tubercle bacilli; at other times they seemed more like rod-shaped bacilli merely resembling tubercle bacilli. Inoculation experiments with the milk of these two cows produced in the animals experimented upon suspicious changes which were due to acid-resisting bacilli resembling the tubercle bacilli. Further inoculation with suspected tissues of these animals gave a negative result. Of special interest was a case where the clinical diagnosis of tuberculosis of the udder was confirmed by the post-mortem examination. Neither the microscopical examination nor the experiments on animals could show the presence of tubercle bacilli in the milk. The microscopical examination of sections of the tuberculous udder revealed numerous clumps of tubercle bacilli in the tuberculous interstitial tissue, while there were none to be found in the milk ducts.

From a review of these cases we arrive at the conclusion that the clinical diagnosis of tuberculosis, especially of tuberculosis of the udder, does not enable us to judge whether tubercle bacilli are secreted with the milk of the affected cows. For, on the one hand, our previous investigations, as is seen in the account of the same, have shown tuberculous disease of the udder sometimes to escape detection altogether, or simple inflammation may be diagnosed clinically, while later the histological examination, as well as the results of inoculation experiments with the milk and with portions of udder tissue, prove that it was clearly a case of tuberculosis of the udder. Delépine arrived at the same result in the examination of a cow the udder of which was not found to be tuberculous till examined histologically. The milk of this cow contained tubercle bacilli, although repeated clinical examination as well as the observation of the udder with the naked eye after the necropsy yielded no grounds for suspicion of tuberculous disease. Of course, it is not to be wondered at that the commencement of disease of the udder escapes detection when palpation is used.

On the other hand, the udder may be clinically pronounced tuberculous while both the necropsy as well as the histological examination clearly show that we have merely to deal with a case of interstitial mastitis or of cyst formation in the udder. This fact was not only proved by Dr. Kempner and myself, as may be seen from the above synopsis, but the investigations of Adami and Martin, as well as those of Delépine, illustrated by a series of interesting experiments, led to the same results. Kühnau, in his recent paper on the Extermination of Tuberculosis among Cattle, has further shown that streptococci, which not infrequently invade the udder, as seen before, are occasionally capable of producing changes closely resembling tuberculosis. A third possibility has been also demonstrated in the present year by my own investigations, in which I proved that even repeated inoculation of the milk may fail to show the presence of tubercle bacilli, though the clinical diagnosis of tuberculosis of the udder was confirmed by the necropsy, and though great numbers of tubercle bacilli could be detected with the microscope in the tuberculous interstitial tissue though not in the milk ducts.

The presence or absence of tubercle bacilli in the milk of cows with tuberculosis of the udder is, in our opinion, greatly dependent on the extent of the disease in the organ. It is easy to understand that in a case where the tuberculous foci in the udder are circumscribed and encapsuled the tubercle bacilli will not be able to enter the milk ducts with the same ease as they may do when the disease of the organ is diffused. From examination with the naked eye and under the microscope, as well as histologically, of a number of tuberculous udders which were kindly placed at my disposal by Dr. Reissmann, the director of the Berlin slaughterhouses, I was enabled to convince myself how very much the occurrence of tubercle bacilli in the milk depends on the extent and the local seat of the tuberculous changes in the udder tissue. In many cases of very advanced disease I was only able to detect the presence of tubercle bacilli in the fluid expressed from the milk ducts after having examined a great number of specimens. In several cases I failed to detect tubercle bacilli in the capillary milk ducts under the microscope, while in other cases the milk capillaries were crowded with bacilli. In view of the great variety of bacilli found in tuberculous udders, as seen in my investigations in this field, I venture to express a doubt whether the method (first

recommended by Nocard) of harpooning does always furnish us with a sure means of judging whether in a doubtful case we are dealing with tuberculosis of the udder or not. Besides this the harpooning method has been pronounced recently by Kühnau to be not quite without danger to the animal.

So far we have seen that the clinical examination of milk cows as a means of inferring the presence of tubercle bacilli in the milk is, without the aid of auxiliary methods of research, both insufficient and unreliable. On the other hand, the method of demonstrating the presence of tubercle bacilli by means of experiments on animals may prove very tedious. There remains only the tuberculin test which is the sole quick and sure method. The tuberculin test is recommended by most of the distinguished authors along with the clinical examination as the best means of diagnosing and thus aiding the extermination of tuberculosis among cattle. It is, on the other hand, not difficult to understand that in view of the enormous spread of bovine tuberculosis the farmers should try to discredit tuberculin. But the great diagnostic value of tuberculin can scarcely be diminished by the fact that the failures in the diagnoses only amount to 2.9 per cent. (as Schütz proved) of all the cases subjected to this test. In cases where the diagnosis of tuberculosis has been made with great certainty by means of clinical examination the tuberculin test becomes naturally superfluous. This does away with the argument that about 10 per cent. of the cattle which fail to react to tuberculin nevertheless are tuberculous. These 10 per cent., as is well known, consist of highly tuberculous animals which have themselves produced and contain in their bodies so much tuberculin that they are unable to respond any longer to the tuberculin test: this argument is nevertheless brought forward again and again by the adversaries of our method. The tuberculin test should only be applied to animals which are suspected of tuberculosis, and when thus used failures in the diagnosis never occur, as I am informed by Nocard, who based his opinion on a prolonged experience in France. Bang, in his last year's treatise, also appears as a champion of tuberculin for diagnostic purposes; he still considers it to be the finest and safest means for diagnosing tuberculosis in animals in spite of the many opinions to the contrary.

We must point out the fact that the present scientific data with regard to the extermination of bovine tuberculosis clearly show this to be practically impossible without the aid of tuberculin. Naturally we must, in the first place, make a point of exterminating the cows affected with tuberculosis of the udder and general tuberculosis, since their milk is more than all other to be regarded as infectious. In the second place come the animals in which the clinical diagnosis can only be established by the help of tuberculin. These cows must first of all be separated from the healthy ones. The questions whether they should be killed and as to the proper time for doing so will depend on the quicker or slower progress of the tuberculous disease. That is to say, that of course not all the animals which react to tuberculin need be immediately slaughtered. We may therefore say that combined with the clinical and bacteriological examinations the tuberculin test furnishes us with the safest means of obtaining milk free from tubercle bacilli as well as of rearing cattle free from tuberculosis.

A CASE OF ACUTE DOUBLE PNEUMONIA TREATED WITH OXYGEN; RECOVERY.

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THE treatment of pneumonia, like that of most acute fevers, is chiefly symptomatic and therefore more or less unsatisfactory. The great things expected of the anti-pneumococcic serum have scarcely been realised and one is sometimes tempted to think that the course of the disease has not been favourably altered by its administration.

According to Dr. Andrew Smith¹ of New York in pneumonia the cocci do not enter the substance of the lungs, but are contained in the air vesicles, as in a test tube, where

¹ Twentieth Century Practice of Medicine, article "Pneumonia."