

affection. Tetracocci and abundant lymphocytes were found in the cerebro-spinal fluid, and the post-mortem appearances were those of syphilitic meningo-myelitis. The reporters of the case conclude that the acute myelitis was of syphilitic origin, and think that the tetracocci might have acted as sensitising agents, rendering the patient peculiarly vulnerable. In the case under me syphilitic infection had occurred six years previously, and at the time of the onset of the ascending myelitis the patient was in good health, but nevertheless the subsequent occurrence of tabes suggests that the syphilitic virus had been present at the time of the Landry's syndrome and may be supposed, if it was present, to have taken a part in its causation either directly or by sensitising the patient's tissues to the tetracoccus or by acting upon tissues sensitised by the tetracoccus. The choice of these alternatives must for the present remain conjectural.

The case of my patient is, so far as I can ascertain, unique in the sequence of events it has presented.

Welbeck-street, W.

AN INVESTIGATION OF THE "CHRONIC IRRITATION" CAUSED BY FUMES AND DUST PRODUCED IN THE PROCESS OF MANUFACTURING TIN-PLATES.

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RECENT researches into the causation of warts and ulceration which predispose to epithelioma in the patent fuel (briquette) industry have shown that these conditions are probably due to substances known as auxetics and kinetics. Auxetics are chemical agents which give rise to cell-proliferation, and kinetics are agents which excite amoeboid movements. Both of them are found in some forms of coal, tar, and pitch; and, experimentally, there is reason to believe that together they are the cause of the pathological changes which predispose to malignant proliferation. This has led to a similar investigation being made in connexion with the tin-plate industry. In the process of tinning fumes are given off which have a powerful irritating effect on the mucous membrane, and it is with a view to finding out whether these fumes contain auxetics and kinetics that this research has been undertaken. At the pitch works the pathological lesions are confined to the eyes and skin, but in the tin-plate works the skin remains unaffected, and it is only in the naso-pharyngeal and alimentary passages that the irritation is felt.

For a full description of the tin-plate industry the Home Office Report,¹ by Dr. E. L. Collis, H.M. Medical Inspector of Factories, and Mr. J. Hilditch, H.M. Inspector of Factories, may be consulted; but we may briefly mention here some of the details described in that report which are material to this investigation. The industry is a large one employing several thousands of men and women, and it has been going on for about 300 years. Latterly some labour-saving devices have been introduced, but the general principles of the process are the same to-day as they have been for generations past. Tin-plates are thin iron or steel plates coated with a veneer of tin. The plates first undergo treatment to remove any trace of oxide, and are then placed in a water tank ready for the process of tinning. It is in the process of tinning in the "tin-pot" that irritating fumes are given off. The tin-pot consists of a cast-iron receptacle holding about three and a half tons of tin which is kept molten (at about 500° F.) by means of furnaces under it. Shallow partitions, which just dip into the molten metal, divide the surface of the tin into two main portions—the narrow flux box and the wider grease box. The flux box contains floating on the surface of the tin a layer of a solution of zinc chloride (which is now used as the flux instead of palm oil), and the grease box a thick layer of grease (which consists now, as it

always did, of palm oil). Both the flux and the oil are in direct contact with the surface of the tin, and are therefore kept at practically the same temperature as the molten metal—i.e., 500° F. The plates are thrust into the tin through the zinc chloride, which helps to prevent oxidation as the two metals meet, until they are seized between rollers kept revolving in the mass of molten tin by machinery, and are thus passed on through the whole length of the tin-pot, whence they finally emerge through the thick layer of grease. They are at this stage found to be completely coated with tin, and are seized by workmen who drop them into the cleaning machines. Fumes are given off from both the palm oil and zinc chloride which are continually boiling (frizzling) on the surface of the tin. The zinc chloride is strongly acid; the palm oil when fresh is neutral, and gives off acrid fumes characteristic of burning fat. And from the fact that the zinc chloride frequently becomes mixed with the palm oil on the surface of the tin-pot, the men are usually subjected to the fumes from the mixture of the two. The cleaning machines are contrivances in which the tinned plates are rubbed over with "pink meal," a mineral spar consisting largely of lime and silica. The pink meal is sometimes mixed with sawdust or even soot to give the plates a polish; and, as the machines are not covered, the air in the tin house is so laden with dust that one can only with difficulty see the length of the building.

In considering the effects of this process of tinning on the mucous membranes, therefore, we have to investigate the three factors concerned—i.e., the fumes from the flux, the fumes from the grease, and the pink-meal dust. These factors must be considered separately and in conjunction with each other; for the pink-meal dust is saturated with the fumes.

The actual technique and the details of the experiments which have been made need not be described here; the former has already been published in connexion with the pitch inquiry,² and the latter will be printed in full on a future occasion. But watery and acid extracts of the flue dust, pink-meal dust, palm oil, and zinc chloride were made and tested by means of jelly films on individual human blood-cells. Observations were made for both auxetic and kinetic action. In samples of the flue dust, which is a mixture of all the factors in the process, both auxetic and kinetic were detected; in other samples one or other was present, and yet in a third number of samples neither was present. But even when both auxetic and kinetic were present their action was not so strong as that found in coal, tar, or pitch.

A second series of experiments was then made with a view to isolating the factor responsible for these chemical agents in the flue dust. But this was only partially successful; the pink-meal contained neither auxetic nor kinetic; sawdust (not clean) contained a slight trace of kinetic; the zinc chloride was too powerful a dehydrating agent to obtain any satisfactory test with; and the palm oil (fresh samples) contained active kinetic but not auxetic.

The question then arose as to the source of the auxetic, and after several negative experiments, such as burning the palm oil, an event which often happens at the works, mixtures of the several factors were made. It was on testing the mixture of zinc chloride and palm oil that the source of the auxetic in the flue dust was detected. The fumes from a mixture of equal volumes of the two substances, when collected in water and made up with "coefficient jelly" (0.5 c.c. to 10 c.c.), give a powerful auxetic action. The palm oil or grease, therefore, seems to be the source of the kinetic, and a mixture of the flux and grease the source of the auxetic. The actual chemical process which occurs in the production of the auxetic during this mixture is a matter for further research.

In the meantime it is necessary to consider what steps can be taken to alleviate the conditions at the tin-plate works and to prevent this mixture being made. With this object in view, we now publish this preliminary note containing the following suggestions and ideas. It is proposed to employ a substitute or substitutes for the palm oil, such as a mineral oil or wax (e.g., a petroleum fraction), or any suitable substance which is auxetic-free, and which when mixed

¹ Published by H.M. Stationery Office, 1912 (Cd. 6394). Price 10½d.

² The Problem of the Gasworks Pitch Industries and Cancer. London: John Murray. 1912. Price 6d.

under the industrial conditions with a flux is still auxetic-free. It is proposed that a suitable substitute be tried for the flux, or it may be found more practicable to treat the palm oil or flux, or both, by reagents in order to oxidise the auxetics or to fix them by the Sorenson reaction. Further, it may be advisable to separate the stages of the process of tinning by suitable covering of the various parts of the process or by isolating the workmen.

Owing to difficulties which have occurred in the past, the foregoing suggestions and practical measures are hereby published in accordance with the desire of Mr. J. H. McFadden, the patron of this Research Fund, already communicated to H.M. Government, that no improvement in any manufacturing process arising out of work done at this Research Foundation shall be exploited commercially.

A CASE OF VOLVULUS OF THE SMALL INTESTINE COMPLICATING GENERAL PERITONITIS; RECOVERY.

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VOLVULUS of the small intestine is a rare surgical event, and recovery from it is still more so. Occurring in a patient who is already suffering from general peritonitis, the combination terminating successfully must be reckoned as something of a "curiosity."

The clinical history of the case is as follows. On April 17th the patient, a thin, somewhat delicate-looking woman, aged 28 years, was seized with symptoms of acute appendicitis. She gave a history of frequent previous attacks, all of a slight nature. The physical signs were localised; the general symptoms were not very severe. The leucocytosis was 32,000. The same day Mr. G. E. Gask removed the appendix, the tip of which was gangrenous and perforated. The region was wiped dry and a tube inserted in the usual way. The temperature and pulse fell, and for some days the patient's condition was satisfactory. On the 21st, however, slight abdominal distension was noticed. The next day this rapidly increased, the temperature rose to 101°F. and the leucocytosis to 42,000. The patient vomited several times. Accordingly, that evening the abdomen was opened again. The original wound was clean and well shut off by adhesions from the general peritoneal cavity. When the adhesions were broken down a secondary abscess was discovered and a large quantity of stinking pus was evacuated. A second opening was made above the pubes, and one drainage tube passed into Douglas's pouch and a second from the first to the second wound under the abdominal wall. The patient was returned to bed in Fowler's position, and continuous rectal salines were administered. Cultures of the pus showed bacillus coli and streptococcus brevis, and an autogenous double vaccine was prepared, the first dose being given the day following.

The patient's condition was grave, and was further imperilled by a smart secondary hæmorrhage from the fresh incision, producing temporary blanching and collapse. Both wounds became gangrenous and exceedingly offensive, and for some days the condition of general toxæmia was profound. Indeed, on the 25th she appeared to be sinking, being unable to retain any fluids by mouth or rectum. She rallied, however, the next day and began to emerge from the toxæmia, an improvement due in part, no doubt, to the effects of the vaccine, which was being given on alternate days in doses of 5,000,000 of each organism. By May 4th she seemed to be getting "round the corner." That night, however, she complained of colicky pain and she vomited. The symptoms increased and the vomit became fæulent. At first flatus was passed with the help of enemata, but by the afternoon (May 5th) it was evident that complete obstruction had occurred.

The abdomen was opened for the third time by Mr. Gask, in the middle line through the umbilicus. As the two former wounds were still suppurating freely, the difficulty of preventing fresh infection was considerable, inasmuch as the coils of small intestine, greatly distended, had to be lifted out of the abdominal cavity. Eventually a volvulus of the small intestine was made manifest. It appeared to have arisen round an adhesion deep in the pelvic cavity.

A loop of small intestine was completely twisted upon itself and fixed by recent adhesions. These were gently separated and the loop cautiously untwisted. These manipulations produced a good deal of shock. The distended loop was rapidly sewn into the wound and a small puncture then made into it, from which escaped much gas and fluid. While recovering from the anæsthetic the patient vomited quantities of fæulent fluid. Two days later the fistula was discharging bile, suggesting that the opening was high up in the small intestine. All distension subsided and the bowels were opened daily by enemata, but the patient suffered much from the constant discharge from the fistula and the excoriation of the skin produced by it. On May 14th the edges of the puncture were drawn together by a suture, but as this cut out, on the 16th the abdomen was opened for the fourth time and the fistula closed in the usual way with a double row of Lembert sutures and the coil of intestine freed from the wound and dropped back into the abdominal cavity. The abdominal wound was then closed, leaving the skin layer gaping on account of its septic condition. The patient made a good recovery, and by June 15th was sufficiently convalescent to go for a drive. On June 17th she was again seized with symptoms of acute obstruction; and for the fifth time Mr. Gask opened the abdomen and found that the small intestine was obstructed by an adhesion, which was easily separated. From this date recovery was speedy and uninterrupted, and the patient is now in excellent health.

The case is, I think, remarkable for several reasons. The rarity of volvulus of the small intestine and recovery from it under such disadvantageous circumstances (for at the third operation the presence of generalised peritonitis was conspicuous to the eye); the singular fate of a patient to have to experience five abdominal sections in such a short time, and her strange good fortune to have survived these ordeals, unite to make a remarkable combination. The fortitude with which the patient bore her vicissitudes had much to do with the happy result.

My best thanks are due to Mr. Gask as surgeon and to Mr. W. Stanley Rooke as anæsthetist at each operation. I have also to thank Mr. E. C. Cunningham for kindly collecting from the records at St. Bartholomew's Hospital statistics of all cases of volvulus admitted to that institution in nine years, which I add for the sake of comparison. Sixteen cases: 4 of large intestine, 11 of small intestine, and 1 unidentified. Of those identified, 2 of the large intestine recovered and 1 of the small intestine. The remainder were fatal.

Finchley, N.

THE PREVALENCE OF CHRONIC GASTRIC DISEASE IN SPAIN:

NOTES ON MEDICAL AND SURGICAL TREATMENT.

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In Southern Spain the line between medicine and surgery is ill-defined. The beaten track of the specialist is still untraced; this record, therefore, of gastro-enterostomy has been made in a practice both medical and surgical. In the selection of cases for operation most types of dyspepsia have passed through our hands, and though in many cases of chronic gastric and duodenal ulcer the brilliant results of surgery are convincingly evident, in others we recognise the merits of careful medical treatment by daily enforcing it before advising operation.

Chronic disease of the stomach is very common here, and is most inefficiently treated; relapses are frequent. Patients suffering pain and vomiting are rarely ordered rest in bed, that essential of successful treatment. Frequently such patients come anticipating operation because organised treatment has been totally wanting. They find their symptoms disappear rapidly under rest and appropriate régime.

Ulcers in many cases begin most insidiously without history of acute attacks. In this country among all classes and both sexes, but more so among males, there is a great irregularity of meals. Much raw indigestible food is