

have been seen in the retina have been reported from the German clinics.

It happens, then, that man may become the intermediate host, and because of the consequences the condition is a serious one. There are various theories as to how this may occur. The usual reasoning is that man may eat some vegetables or drink water contaminated with the segments or ova and thus become the intermediate host (or pig), with the same cycle of development of the parasite. It can occur, however, that man is both the host and intermediate at the same period; that is to say, that a man infected with the *Taenia solium* may also be infected with the *Cysticercus cellulosae*. It is thought that this accident may be caused through the regurgitation of the ripe proglottides into the stomach in an act of vomiting, but it is more likely that the irritation of the proglottides passing from the anus, which they may do spontaneously and under their own motility, leads to the soiling of man's fingers and the transference of the ova to the mouth.

A man, aged 44 years, a hairdresser, was sent to me for consultation by his doctor in April, 1926. He complained of pains in the left knee joint of some five years' duration which he described as "rheumatic." A sinus had developed upon the medial surface of the knee some two months before I saw him; it was about a centimetre in diameter and of about the same depth, and there was a purulent discharge from it. For the last ten years the patient had suffered from "fits" of epileptiform type at approximately monthly intervals. He would lose consciousness and fall down in the street. He did not recollect having bitten his tongue during one of the seizures. It was on account of these fits that he was discharged from the army, the condition being thought to be due to neurasthenia following shell-shock. He was in India from 1908 until 1911 in the army, from which he was discharged in 1916 after active service in France. There was no history of infection by intestinal parasites.

The man appeared to be healthy. There was a discharging sinus upon the medial aspect of the left knee. The chest appeared to be normal; special attention was paid to the rhythm of the heart as cases have been reported where it was irregular when the heart muscle contained the *Cysticercus cellulosae*. No abnormality was found in the eyes, and no subcutaneous nodules could be felt.

Radiograms were taken of the left knee-joint and the condition shown in Fig. 1 was discovered. Scattered throughout the muscles around the knee-joint were some eighty opaque, ovoid, disc-like bodies, which were doubtlessly in the nature of calcifications. They measured about 1 cm. by 5 cm., with regular edges. The centre of each mass was less dense than the peripheral margins, where the shading was "ringed" and concentric.

It was decided to examine every other part of the body, and this was done. Radiograms selected from this examination are reproduced in Figs. 2 to 4; some of the others yielded negative results. It will be seen that a similar condition to the one found in the knee exists in nearly every part, but with the main grouping of the calcifications in the extremities, as far down as the ankles and the wrists. The pectoral group of muscles upon each side contained a large number, and they were also found in the muscles of the neck and in the deep muscles around the vertebral column. The lungs were apparently unaffected and no abnormality could be detected in the heart shadow. None was located in the liver substance. Three, at least, of the bodies were seen to be lying in the pia mater of the brain, one of which was localized in the middle of the motor area upon the left side. These cerebral calcifications were similar to those seen in the other parts, and were not irregular, branched, or of undue size, as they have been described as seen in some autopsies. A calcification was localized as lying at the bottom of the sinus in the left knee-joint, which was thus explained.

It was determined to remove one of the bodies for pathological investigation, and a superficial one in the right forearm was localized and taken out under a local anaesthetic. It was creamy white, uniformly regular in consistency, and of stony hardness. Sections were prepared after decalcification, and the photo-micrographs which were taken of them are reproduced in Figs. 5 and 6.

Under a low objective the majority of the section was seen to consist of degenerated keratinous material, surrounded by a fibrous capsule in intimate association with the muscle substance in which it was embedded. In the portion of the section which is reproduced an area of specialized tissue was seen, which, under a higher power of magnification, was found to consist of what is doubtlessly a cestode head with its four suckers and its hooklets, representing in every respect the degenerated scolex of the *Taenia solium*. This is well shown in Fig. 6.

It was thus established that the sinus formation in the left knee-joint and the "fits" from which the patient had suffered for so many years were caused by infection by the *Cysticercus cellulosae* stage of the *Taenia solium*, of which he was the intermediate host. It is to be supposed that he became infected whilst in India, and that as the calcification process was completed in the embryonic positions the manifestations of them began to appear.

The sinus has commenced to heal under appropriate surgical treatment, and between his seizures the patient

is not otherwise inconvenienced by the widespread nature of his lesion.

I should like to acknowledge my indebtedness to Sir Bernard Spilsbury for his kind assistance and advice, and my thanks are also due to Miss Vaughan of the Dunn Laboratories of the Surgical Unit of St. Bartholomew's Hospital for the photo-micrography of the sections.

A CASE OF EXTENSIVE SOMATIC DISSEMINATION OF CYSTICERCUS CELLULOSAE IN MAN.

BY

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As the opportunity seldom arises for observing in a living patient such large numbers and such a wide distribution of *Cysticercus cellulosae* throughout the body tissues, this case is, I think, worthy of record.

Pte. L., aged 24 years, had been a tramway worker in Lancashire before enlistment in April, 1920. After enlistment he had been able to carry out his full duties until October, 1925, when he was admitted to hospital for abdominal pain, vomiting, and fever, and it was then noted that his liver was enlarged to the extent of three fingerbreadths below the right costal margin. In November he had a similar attack, from which he recovered and was able to return to duty. So far as he was aware he had never passed any segments of tapeworm. On November 24th, twelve days after discharge from hospital, he had pain in the calf muscles which he noticed to be swollen. He could not walk far because of pain in the legs and shortness of breath. He reported sick again on November 28th, when it was noted that the muscular enlargement was not confined to the calf muscles, but that the muscles on contraction appeared nodular: certain nodules beneath the skin of the forehead and in the gastrocnemii were noted also. There was no oedema and the urine was normal. There was eosinophilia up to 4 per cent. On December 24th he had a "fit" during which the pulse was irregular and the rate rose to 120. When he came under my care on December 28th, 1925, he was pale and the face appeared puffy, but the two outstanding features were the chain of nodules visible on the forehead and the greatly enlarged, apparently well developed and powerful muscles.

The patient says he noticed the nodules first late in October or early in November. They are found in the subcutaneous tissues of the forehead, scalp, beneath the left eye, in the neck, and in the tissues of the cheek. They occur singly or in groups of two or three of varying sizes. When single they are ovoid, flattened ovoid, or spherical according to the amount of pressure exerted by the surrounding tissues. In size they range downwards from half an inch in the longest diameter. They are found in the aponeuroses of the abdomen, elbow-joints, thighs, and legs. In the muscles they can be felt singly, in groups, and in chains. One cyst is present in the left eye. They have not increased in size during observation. They may be described as fibro-cystic and are not and never have been painful. They are movable and not at all adherent to the skin.

Nearly all muscles are enlarged, especially those of the shoulder girdles, and on contraction the affected muscles present a nodular appearance. He gives the impression of being a powerful man of "Sandow" type development, but the muscle power is in fact very feeble. Enlargement is due to the presence of cysticerci and to the concomitant myositis. The muscles are tender. Vision at first was somewhat impaired in the left eye, but during the period of observation it deteriorated considerably. The heart does not appear to be enlarged, but the heart sounds are distant and not quite clear, and it seems probable that the heart also is invaded. In the central nervous system no localized lesion can be elicited, but during observation he has had five fits. They occur at any time, and on one occasion when he was asleep. They are accompanied by muscular twitching and jerking, sometimes by cyanosis, sometimes pallor, and the pulse becomes irregular and the rate rises to 120. On one occasion the temperature rose to 99.2° F. He remains unconscious for four to five minutes, and this is followed by drowsiness and headache in the frontal region, especially over the left eye. He has no loss of sphincter control. His mental condition is not bright or quickly responsive, but his memory is good. The white cell count shows slight leucopenia, with a relative eosinophilia ranging from 12 to 6.5 per cent.

Vomiting occurred three times during the period of observation; it was not related to food; it occurred after a fit on one occasion, and at other times quite independently. No segments were seen in the vomit. The stools have been carefully searched daily for segments and ova, but without success up to date, even after the administration of anthelmintics. The urine at first contained traces of sugar, but since then has shown no abnormal constituents. The skin has never exhibited any evidence of urticaria.

On January 5th, to confirm my tentative diagnosis of generalized cysticercosis, two cysts were removed—one from the subcutaneous and one from muscle tissue. At the time of removal under local anaesthesia it was observed that the muscle (deltoid) was extensively invaded.

The following report on the removed cysts was received: "After removal of the ectocyst, they are found to be small oval cysts

showing at one point a darker area about the size of a pin's head. They contain a clear fluid and the dark spot proved to be the invaginated single scolex of the intermediate form of *Taenia solium*."

On January 6th the eyes were examined and the following report made: "The pupil reactions and all movements are

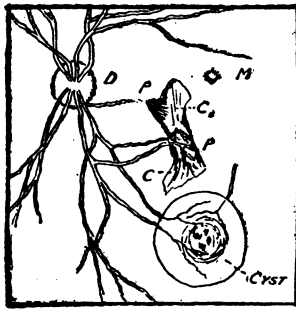


Diagram of left fundus. D—Optic disc. P—Retinal depigmentation. C—Choroiditis and fibrous bands. Cyst—Cysticercus cellulosae. M—Macula.

normal. The left optic disc (D) is woolly at the edges, the blood vessels more engorged than usual. About a disc's diameter from the temporal side in a horizontal direction there is a small area of retinal depigmentation (P), a patch of choroiditis (C), fibrous bands with shallow opaque detachment of the retina leading downwards to a large subretinal cyst over which the vessels are stretched. The cyst shows a clear and well defined edge, is bluish in the outer portion, while the central area is hazy and opaque in which three or four dots can be seen. The cyst extends into the vitreous up to 5 D. The appearance presented is one of chorio-retinitis with a subretinal cyst due to the presence of a cysticercus."

As there is no evidence of the patient harbouring a *Taenia solium* now, and no history of his ever having acted as host to such, it is presumed that he must have ingested extraneous segments or ova. And as the digestion and dissemination of such is usually accompanied by constitutional disturbance, it is further presumed that the attacks of abdominal pain, vomiting, and fever were resultant to such dissemination, soon to be followed by painful muscles. In substantiation of this presumption is the fact that no nodules made their appearance prior to this illness in October. Up to the time of invaliding from the service he has received treatment by calcium salts and potassium iodide, and later by intravenous injections of novarsenobillon.

I am greatly indebted to Major Hood, R.A.M.C., for the pathological reports, to Captain Bell, R.A.M.C., for removing the cysts, and to Captain Kumar, I.M.S., for the ophthalmic examination.

British Medical Association.

PROCEEDINGS OF SECTIONS AT THE ANNUAL MEETING, NOTTINGHAM, 1926.

SECTION OF MEDICAL SOCIOLOGY.

C. J. BOND, C.M.G., F.R.C.S., President.

PRESIDENT'S OPENING REMARKS.

THE PRESIDENT said he regarded it as a great privilege to preside over the Section of Medical Sociology for two reasons: first, because the subject of discussion—namely, "The effect of fatigue and monotony in industry," was a factor of increasing importance in the health and welfare of the industrial population; and secondly, because it was very desirable to enlist the interest of the medical profession (including medical officers of health and general practitioners) in the recent advances made in this field of industrial physiology and psychology.

This Section provided an excellent opportunity for bringing before the notice of their medical colleagues, as well as the public generally, the important work which was being carried on in industrial life by the Industrial Fatigue Research Board, the National Institute of Industrial Psychology, and by other societies and welfare workers interested in industrial hygiene.

A sound system of industrial psychology and physiology must be built on two principles: first, that every normal human being should strive to obtain some sense of satisfaction from energy expended and work done; failing such requirement, effort became reduced in volume or was diverted into other channels. The actual doing of the work itself must provide a fuller sense of satisfaction.

If industrial toil were less exhausting to mind and body, more stimulating, more health-giving, more interesting, then the growing demand for higher wages and shorter hours would be less insistent and greater benefit would be conferred on the worker. Consequently, a discussion of the factors in industrial life which tended to promote or to diminish the attainment of this sense of satisfaction must be of great importance. Among these factors the questions of monotony and fatigue had a very important aspect. The second principle was that the industrial problem was essentially an evolutionary one. It was largely a problem of adaptation to the industrial environment. If the worker was not fitted by nature, or had not been fitted by training, for his particular occupation, then he had not become adapted to his industrial environment. This opened up the important problem of vocational selection and vocational guidance in industry. In fact, it was not too much to say that the fitting of the work to the worker and the worker to his work was one of fundamental and growing importance, not only to the future of industry in our own country, but to the future of industry in the world.

DISCUSSION ON THE PHYSICAL AND MENTAL EFFECTS OF MONOTONY IN MODERN INDUSTRY.

OPENING PAPER

BY

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MONOTONY and fatigue are two aspects of a problem that affects the happiness and health of hundreds of thousands of workers in our civilization. It is not so easy, as mere separation on a notice of meeting would imply, to mark off two clearly defined fields of inquiry, and I think it is safe to say that in talking about monotony we shall find ourselves dealing simultaneously with some of the questions which will come up for discussion this afternoon. For although in our minds we can separate the more or less crude conceptions of fatigue and monotony, yet, when dealing with facts, and with situations in industry, it is often impossible to define clearly the responsibility due to either of these two factors, and frequently the remedies which we propose for one are directed to the relief of both. In other sciences data which at first lack sharpness respond to the refined treatments of the laboratory, but in dealing with human beings so many of the essential factors vary, when conclusions are sought in the midst of work, that in proportion to the extent by which we are forced to depart from objective controlled measurement, the possibilities of forming a clear opinion dwindle away.

The overlapping of work on fatigue and on monotony is explained by the fact that all evidence leads us to treat monotony as in some ways a special case of fatigue. To a limited extent we are justified in treating fatigue objectively. It has results which under suitable conditions can be expressed quantitatively. When work of any kind is done feelings of weariness, of disinclination for further work, and of desire for rest become prominent after a time. Muscular work causes diminished capacity for further activity, a decreasing rate of output (when the first slight stimulating effect of fatigue is past), an accumulation of waste products in the tissues, and finally increasing nervous inco-ordination. These effects can often be translated into terms of quantity. Physiological changes are not so obvious after mental work, but the general effects on rates of output and on accuracy of work are comparable with those following muscular activity.

Monotony is more elusive. It has no immediate physiological results distinguishable at present from those of fatigue—indeed, if we look on monotony as a special kind of fatigue this is not to be expected. It is not universal in its incidence under any given set of conditions, and it is not necessarily relieved by any particular remedy. In all