that infection to the pig, while some years ago the possibility was suggested that they might even act as a reservoir for the virus of rabies. Mice are not generally indicted as disseminators of anything worse than favus. The mice of the trenches, however, are not the ordinary house mice that have always lived in domestic association with humanity, but are mainly field mice of the species particularized zoologically as the long-tailed field vole, a creature which, it is well known, is subject to extensive epizootics of high mortality while living in a state of nature.

These field voles, like certain other creatures—the sub-arctic lemming, the sand grouse of Tibet, the clouded-yellow butterfly, and so on—seem to follow a vague periodic law of irregular waves of excessive multiplication, and on reaching the summit of their wave of increase they fall victims to the action of another vague law, whereby upon the specific population having exceeded a certain (unknown, but no doubt quite definite) figure to unit area, it adjusts itself with great suddenness, owing to the rise and rapid spread of some virulent infection, the progress of which offers many parallels to the incidence and spread of typhoid and other intestinal infections in the past in crowded camps of soldiers unprotected by appropriate inoculation, or in congregations of pilgrims in the East. The infective agents in these sudden epizootics do not all seem to have been traced, but in the case of guinea-pigs, bred in overcrowded hutches, it is probably the paratyphoid bacillus.

In the trenches field voles have been observed (as is only natural) lying dead in considerable numbers as the result of a gas attack, and the stray trench cats doubtless do something towards keeping down their numbers.* There is some reason to believe that weasels are on the increase in the neighbourhood of the trenches, and from a French source I understand that owls have been seen quarrying the ground near the firing line hunting for mice; but any checks on their increase have as yet been only temporary.†

Field mice have been blamed as the source of a disease now extinct, the sweating sickness or *sudor anglicus* of the Middle Ages, of which a small epidemic, however, is said to have broken out in the south-west of France in the early years of the present century; it seems reasonable to suggest, in view of what has gone before, that they may perhaps be the source from which the infection of this new "trench fever" is derived as well.

There are innumerable opportunities for the spread of infection from the rodents in the trenches, apart altogether from dissemination by their parasites. I have made no flea census of either the mice or the rats in the trenches,† but at present fleas give little or no trouble to the troops during their turns in the trenches, though body lice, and to a lesser extent crab-lice, do. The field mice (and the rats), however, run about over their food, get into the men's mess tins at night, and eat their way into the bags of provisions that come up as rations; I have caught a mouse in my own iron ration in its bag. In the food their habits are never of the most sanitary, and even where they do not obviously soil it they nibble here and there where it is not noticed, and rub their bodies over everything as they scramble about. I have even seen the leather lining of the brim of an officer's cap nibbled away by these trench mice (and since writing this they have attacked my own in the same way, and tunneled a hole into my greatcoat as I lay wrapped up in it for warmth at night), and I have heard, at second hand, of a man's ear being bitten during his sleep; they nibble books and magazines, tear letters to shreds, and make their nests with the fragments; I have

* Human beings seem much more easily affected by chlorine gas than are other forms of life. After a German gas attack I have seen larks, swallows, sparrow, and blow-flies in apparently undiminished numbers, while partridges were still present near the trenches. Dead rats lay stinking over the top of the parapets and breeding maggots, but all the rats were not killed, and plenty of field voles survived, being less affected than are the rats.

† The Danysz virus has been used to a certain extent against the rats in the trenches, phosphorus, strychnine, and arsenic are too dangerous to be made use of where there are so many human beings; rattling with dogs or ferrets has many obvious drawbacks, but it is said that powdered squibs seem to offer some prospects of usefulness as a safe poison for trench rats if laid down well mixed with food. Traps and wire snares are comparatively useless; the rodents are too well fed to be tempted by the former; while humanity forbids the use of such means as cork chippings fried in suet, or the mixture of dry pea-flour with plaster of Paris. The buried pitfall for field mice that is said to act well at home—an empty jam-pot or pickle jar sunk into the ground so that its open mouth is flush with the surface, cannot be made use of in the trenches.

† Short-tailed field voles examined in May were infested with ticks.

even caught them running off with latrine paper to furnish their happy homes. The chances of infection by organisms carried by the field voles in the trenches are endless.

It appears safe to predict that if the increase of these rodents, rats and voles alike, is not checked in some way or other, their rate of multiplication during the warm weather will result either in the excess of this four-footed population overflowing the districts adjacent to the line held by our troops and causing considerable damage to the crops as they migrate from what may be described as their "endemic centre"; or else in the development of a sudden epizootic of some virulent disease which will effectually keep down their numbers. In this latter case, if trench fever has anything to do with these creatures, the possibilities of human infection will, of course, be greatly increased.

A CASE OF ULCERATING GRANULOMA SUCCESSFULLY TREATED BY INTRAVENOUS INJECTIONS OF ANTIMONY.

BY

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ULCERATING granuloma, also called ulcerating granuloma of the pudenda, granuloma pudenda, sclerosing granuloma, granuloma venereum or granuloma inguinale, is a disease very rarely seen in England. In some parts of the tropics the condition is, however, far from rare, and causes serious ravages amongst the population. It is very common, for example, in British Guiana, Brazil, and other parts of South America, while it has also been reported from the West Coast of Africa, Australia, India (Madras), South China, and other places.

It is a true venereal disease—for example, is acquired by sexual connexion, but has nothing to do with syphilis or the other usual venereal diseases. The character of the lesions resembles in some ways the type of change seen in lupus or rodent ulcer, and the ulceration most frequently attacks the groins, pubis, and body of the penis in the male, and the labia majora and other parts of the vulva in the female. The glans penis is not so frequently attacked, perhaps, but, as the case to be described shows, does not entirely escape. Once started, the disease slowly progresses and new areas appear.

The lesions are auto-inoculable—for example, from the side of the scrotum to the contiguous thigh, or from one labium majus to the other in the female. The ulceration spreads concentrically, healing or a tendency to healing occurs in the centre, and is accompanied by scarring, resulting in dense fibrous tissue formation. Ultimately the whole of the sexual parts with the perineum and anus become involved, and horrible lesions are produced, which resist most forms of treatment, such as mercury and iodides, local escharotics, and canterization. The only treatment hitherto found in any way effective has been by x rays, which has quite frequently been successful in cases seen in Madras. South American cases, however, have not done so well under its influence, though de Souza Araujo in Brazil reported as recently as 1915 a cure, and at the same time drew attention to the pioneer work of MacLeod and Sequiera in this connexion.

The disease is believed by some to be of protozoal nature; Donovan and Carter in India, Cleland, Strangman, and others in Australia, Wise in British Guiana, and Flu in Surinam, have all seen and described bodies of an apparently identical nature in the lesions. The true nature of these bodies and their zoological affinities are nevertheless still unknown.

The use of antimony in tropical medicine was first suggested by Mesnil and Nicolle for trypanosomiasis in 1906. Plimmer and Thomson followed this up by employing the potassium and sodium tartarate of antimony in rats infected with such parasites. Subcutaneous injections of this drug quickly cleared the parasites from the blood and

no very serious action appeared to be caused locally. So promising were these results that Sir Patrick Manson tried a similar treatment on some of his human cases in 1907, but the local reaction on the tissues was so severe that it had to be discontinued. He then gave it by the mouth. About this time Broden and Rodhain, and independently of them Leboenf, tried intravenous injections of tartar emetic in natives of West Africa suffering from sleeping sickness. No bad effects followed and the improvement of the patients was rapid. Still later Kérandel, a French doctor, who had himself become infected with trypanosomiasis, adopted the same line of treatment with completely satisfactory results. Since that time intravenous injections of antimony tartaratum have been constantly used in cases of human trypanosomiasis under the care of Sir Patrick Manson and Dr. Daniels at the Albert Dock Hospital, London School of Tropical Medicine.

Stimulated by these results, within recent years, different authors have employed antimony intravenously in the treatment of ulcerating granuloma, American leishmaniasis, Mediterranean and Indian kala-azar, and Oriental sore. To Aragao and Vianna, in Brazil in 1913, we are indebted for its use in the first named of these diseases. In one case they gave twenty-one injections as follows: First day 0.05 gram, second 0.08 gram, third to thirteenth 0.1 gram, fourteenth to seventeenth 0.08 gram, eighteenth to twenty-first 0.1 gram, or a total of about 1.8 grams. In another case, a woman, ten injections were given within a period of thirty days. Rapid healing of the lesions took place in both these cases, as in others, the results being permanent.

Terra and Rabello confirmed this work, using the same method of treatment for their cases. Intravenous injections of a solution of tartar emetic, dissolved in physiological saline, were given one every day at first, and then one on alternate days; after a few injections the ulcers began to show signs of healing, and completely disappeared after the fifteenth injection. According to their experiences tartar emetic is a specific for this disease.

Recently Mr. Cantlie asked one of us (G. C. L.) to see a peculiar case of ulceration on a man's penis, which had been treated with antisyphilitic remedies without effect. A knowledge of such cases acquired in British Guiana enabled it to be said that the condition was ulcerating granuloma, and Mr. Cantlie kindly consented to the patient's admission to the Albert Docks Hospital, London School of Tropical Medicine, for treatment by injections of antimony intravenously. Dr. Daniels saw the case before treatment was commenced and confirmed the diagnosis, and full advantage was taken of this chance of confirming Aragao and Vianna's South American work.

History of the Case.—The patient, a man aged 36, had served on the Gold Coast with usual leaves home since 1908; on the whole he had enjoyed good health there.

Previous Illnesses.—Pneumonia left lung 1914, ill six weeks; gonorrhoea 1913, malaria once, no dysentery; climatic buboes fifteen months ago; both groins operated upon; bubo in left groin when young. As far as he is aware has never had syphilis.

Present Illness.—In the beginning of 1916, when on the Gold Coast, he had a casual connexion with a black woman, about whom he knew nothing, never having seen her before nor since. Two days after this a small sore appeared on the under aspect of the glans penis beside the frenum. As this spread, and showed no signs of healing, it was treated with mercury perchloride washes. This did not do very much good, but four and a half months afterwards apparent healing had taken place. Six weeks later, however, when in England, another sore appeared just at the same place. A diagnosis of syphilis was made; three injections of salvarsan, and seventeen injections of mercury were given, but had not the slightest effect on the lesion. It progressed, and two other sores appeared, one on the point of the glans just below the meatus, the other on the skin of the body of the penis a short distance above the glans. Destruction of tissue in all of these was rapid, especially in the initial sore, which soon burrowed into the substance of the glans, and almost penetrated the urethra.

Condition on Admission, May 1st, 1916.—The patient was healthy looking; there was nothing abnormal in the heart, lungs, or abdomen. The liver was not enlarged, the spleen was perhaps slightly enlarged, but nothing of importance. There were old scars in the groins. The urine did not contain albumin, blood, or sugar. The skin was perfectly healthy, and there were no eruptions or spots.

Penis.—A deep crateriform ulcerated and eroded area, over half an inch in its longest diameter, was present on the under surface of the glans penis. This passed into the substance of the organ for a considerable depth, the edges being raw and irregular, with a semi-purulent to purulent discharge coming from the interior. The sore on the point of the penis was

circular, ulcerated, but not to any great depth. The sore on the skin of the body of the organ was just commencing. It was oval, and quite typical of ulcerating granuloma. At this time the condition distinctly resembled a rodent ulcer, and, as a matter of fact, this diagnosis had been actually made. Epithelioma was also suggested, but the age of the patient and the history were against this. Former experience of the condition in British Guiana enabled us, as already stated, to diagnose the case correctly as ulcerating granuloma. Wassermann's reaction was negative. The treatment was begun on May 1st, 1 grain of antimony tartaratum dissolved in 2 oz. of normal saline being injected intravenously on that day.* The patient fortunately had large veins, and the injections could therefore be given directly into the vein, dissection being unnecessary. By this method also the same vein has been used time after time for the different injections. The injections have always been well borne; no rise of temperature has followed them, and, apart from a general feeling of lassitude amounting to a definite seediness on the day of the injection, other symptoms have been negligible. Slight coughing, which so often follows these injections, was not observed in this case. The following table shows the number of injections given, with notes on the appearance of the lesions from time to time. From this it will be seen that the injections were given bi-weekly.

Date.	Dose of Ant. Tartaratum Injected Intravenously	Remarks.
1916.		
May 1	gr. 1	
" 4	gr. 1	Condition looks a little better if anything.
" 8	gr. 1½	Distinct improvement of sore on point of glans.
" 11	gr. 1½	
" 15	gr. 2	Both sores on glans healing now fast; one on body of penis cleaner, a tendency to healing.
" 18	gr. 2	Sores about the same, tending to heal, but slowly.
" 22	gr. 2½	Condition seems a little worse.
" 25	gr. 2½	
" 29	gr. 2½	Sore on body of penis in very good condition, that on the under-surface looks worse. That at meatus healing at one side, but poor at the other side.
June 1	gr. 2½	Sore on body healed, that at meatus much better, epithelium spreading in at side. That underneath also much better.
" 5	gr. 2½	Progressing favourably, epithelium has spread further in, sore at meatus almost half covered; that underneath also much better.
" 8	gr. 2½	Progress continuing.
" 12	gr. 2½	Progress continues, but very slow.
" 15	gr. 2½	Improvement more noticeable to-day after dry dressing.
" 19	gr. 2½	Slight improvement since last time.
" 22	gr. 2½	
" 26	gr. 2½	
" 29	gr. 2½	Practically cured, only two little places open now.
July 3	gr. 2½	Only one tiny place open at side of sore on under surface. That at meatus healed.
" 6	gr. 2½	Place still open.
" 10	—	Tiny spot size of pinhead.
" 13	—	Same condition.
" 18	—	Place still open, and looks a little inflamed round edge.
" 20	gr. 2½	Place if anything a little larger, and looks as if it might spread. Begin injections again to-day.
" 24	gr. 2½	Place looks better again—almost healed.
" 27	gr. 2½	
" 31	gr. 2½	Place completely healed now.
Aug. 3	gr. 2½	Place completely healed now.
" 7	gr. 2½	Place completely healed now.
" 17	—	Place completely healed now. No signs of breaking down.

An examination of the table shows that the case under discussion was an even more stubborn one than those described by Aragao and Vianna, for it was necessary to give 53½ grains in order to effect a complete cure. A halt was made at 43½, but as it looked as if the small unhealed place would break out again it was considered advisable to go on with the injections. Four other injections (10 grains) were therefore given, and complete cure resulted, but two additional injections were given as a precautionary measure.

As a result of the injections, then, the course and progress of the disease has been arrested; this bears out Aragao's and Vianna's observations in Brazil.

Since writing this paper a review of a thesis by Dr. do Souza Araujo has appeared in the BRITISH MEDICAL JOURNAL (July 26th, 1916, p. 146). In this it is stated that the author and his colleagues have used the method of intravenous injections of antimony in 25 cases of granuloma, with three relapses; two patients, old and grave cases, dying. Good results are also stated to have been

* Two oz. = 56.8 c.cm.—roughly, 60 c.cm.

obtained by means of x rays. We purposely did not employ x rays in our case as we wished to try the pure antimony treatment alone.

That the treatment by antimony alone may succeed is thus proved, and this is saying a great deal, as granuloma up to the present time has been a most intractable disease. In the present instance it meant much to the patient, as otherwise, apart from x rays, there was nothing left but amputation of the penis.

A judicious combination of x rays and antimony injections might be worthy of trial, and might shorten the length of the treatment, which is, of course, very prolonged, and requires a fairly long stay in a hospital. After it was seen that the injections did not cause the patient any great inconvenience, however, he was allowed up the day after the injection, and only took to bed again just before having the next.

It is, perhaps, too early to say yet that relapse may not occur in this case, but the places are so perfectly covered with new epithelium that it seems by no means likely. Workers in the tropics meeting with such cases should certainly try this new treatment, as much useless suffering can be saved, and distinct hopes of a cure can reasonably be held out, especially if the case is seen at an early stage of the disease.

LAMBLLIA INFECTIONS IN MEN WHO HAVE NEVER BEEN OUT OF ENGLAND.

BY
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AND
J. R. MATTHEWS, M.A. EDIN.

IN view of the prevalent idea that infections of *Lambllia intestinalis* are associated with residence abroad, it may be of interest to record the occurrence of this flagellate in two soldiers who have never been out of England. These cases were discovered by us in the routine examination of stools conducted at the Liverpool School of Tropical Medicine.

CASE I was that of a non-commissioned officer who joined the army in August, 1914. Owing to gastric trouble he proved unfit for service abroad and had ultimately to be treated in hospital for gastric ulcer. While under treatment his stool was examined and was found to contain the cysts of *Lambllia intestinalis* in fair number. The patient had previously suffered slightly from diarrhoea. Before he joined the army he was a clerk and had never been out of England. We have been unable to follow this case further, as the patient has been discharged.

CASE II was that of a man called up to join the army on June 5th, 1915. He had six weeks' training and then entered hospital to be treated for diarrhoea. Before he joined the army he was a farmer in Shropshire and had never at any time been out of England. He suffered from diarrhoea at irregular intervals for twelve years. During the more acute attacks he passed four or five or even more stools daily. This diarrhoea was very liable to follow exposure to cold. His stool was found to contain on three successive occasions while he was in hospital many *Lambllia* cysts. This case is being kept under daily examination.

CASE III.—In addition to these two cases relating to soldiers, mention may here be made of the case of a sailor whose stool contained cysts of *Lambllia intestinalis*. As this man has only been out of England for two days, which were spent in Holland, he comes almost into the same category as the two previous cases. Before the war he was a fisherman in the North Sea, and it was during this period that he spent two days in Holland. At the outbreak of war he joined the navy, and was somewhere in the North Sea. He was sent from his ship into hospital suffering from cardiac and gastric trouble. Two examinations of his stools were made. In the first, *Lambllia* cysts were found in very large numbers along with a few free *Lambllia* flagellates. In the second, cysts were still very numerous, but no free flagellates were found. The man recovered from his ailment and was discharged from hospital so that we were unable to follow the case further.

The interest of these cases lies for us in the fact that certainly in the first two and almost certainly in the third the infection of *Lambllia* was contracted in England. As to the probable date and circumstances of the infection, and as to the possible or probable connexion of the *Lambllia* infection with the attacks of diarrhoea we do not make any observations, for on these points the facts at our disposal afford no evidence. It may be observed that it is almost impossible now, and will shortly become quite

impossible, to offer any evidence as to whether *Lambllia* is indigenous in England. The presence of the very numerous cases of returned soldiers carrying *Lambllia* will make it impossible to state whether any future case is of native origin.*

We publish this note at the suggestion of Professor J. W. W. Stephens, whose interest in this work we take the opportunity of acknowledging.

A CASE OF INTRAUTERINE SCARLET FEVER.

BY
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DURING a recent small village outbreak of scarlet fever in the practice of one of us a case of rather unusual interest occurred under the following circumstances:

Four of the five children of Mrs. B. developed scarlet fever and were removed to the isolation hospital on May 26th. Mrs. B. was expecting to be confined at any time, and was therefore warned to keep away from the children as soon as the first suspicion arose as to the nature of their illness. No doubt, however, some contact took place prior to May 25th and especially whilst the children were in the incubation stage.

Mrs. B.'s child was born on June 6th, and after a thorough washing, which removed all traces of lanugo, was found to be desquamating freely over the whole of the trunk and limbs. The desquamation continued for several days, and the urine showed distinct traces of albumin. Apart from these two features, the child appeared perfectly healthy and is now quite normal. These features were so typical that we agreed on the desirability of notification of the case as one of scarlet fever.

Mrs. B. had been rather unwell during the last week or so of her pregnancy, and complained of a "burning pain inside." She had no sore throat or rash, and her temperature was normal. She is positive that she had a severe attack of scarlet fever when about 10 years old, and describes the desquamating stage vividly.

It would seem that the fetus was infected *in utero* some time prior to May 26th, but that the mother escaped infection through the protection of her previous attack. Presuming the fetus to have been infected from the children of the family, the period elapsing between the infection and the peeling stage must have been only about a fortnight. But as other cases of scarlet fever were present in the village previously with whom the mother may have had direct or indirect contact, one cannot definitely conclude that the course of the disease in the fetus was unusually short.

There does not appear to be a great deal of literature on intrauterine scarlet fever. Galabin states that it has been inferred that the disease may be conveyed to the fetus *in utero* because the child, at or shortly after birth, has sometimes shown desquamation of the skin or other sequelae of the disease.

Goodall says that it is extremely doubtful whether infants have been born suffering from the disease, but they may become affected within a few days or weeks of birth.

Osler's statement that sucklings are rarely attacked is borne out by our common experience. It is a usual practice when a nursing mother contracts scarlet fever and cannot be properly isolated at home, to send mother and infant to hospital. No infant so admitted locally has contracted the disease.

Whilst the rarity of the condition may be somewhat against the diagnosis in this particular case, the clinical facts were so striking that it seemed to us worthy of note.

* Fuller particulars of these and other cases of interest occurring in our investigations will be published later in the *Annals of Tropical Medicine and Parasitology*.

THE California State Board of Health is conducting, in co-operation with the University of California, a malaria mosquito survey under the supervision of Professor W. B. Herms, Consulting Parasitologist to the State Board. The work began on May 10th, and was continued through the summer. Probably three summers will be required for a complete survey of the State. Thus far endemic malaria has been found at a maximum elevation of 5,500 ft., and anopheline carriers have been located. Two or three new species of mosquitos have been found.