total of gr. 25 to 30 for a course of injections which we have elsewhere laid down was suggested rather as a maximum dose advisable in one course; the absolutely necessary killing dose is probably smaller, perhaps much smaller, and probably it varies for different patients. The right dose to give will doubtless be discovered by experience, but in the meantime we continue the injections until what we see under the microscope tells us that no more are necessary. The less antimony introduced into the human body the better; it is a poison when all is said and done, and, incidentally, medication by the process of introducing needles into veins is an unpleasant one, and should be practised as little as possible.

At what stage do the parent worms in the portal vein die?

A man who has had hæmaturia for six years passes ova constantly which will hatch out under favourable conditions in three or four minutes.¹¹ When he is injected with antimony tartrate for four days this same process takes place, but on about the fifth day after, roughly speaking, gr. 3½ have been injected, a very noticeable change (first improvement) takes place in the appearance of the urine; it clears up considerably and becomes free from visible blood; microscopic blood remains. Again, after about gr. 12 have been injected another (second) improvement is noticed in the appearance of the urine; some of the ova will not hatch out and there is a distinct change in their appearance. Some of the ova are to all appearances the same as before, but some are granular, smaller, and more shrunken, and rigid and frozen-looking, others are distinctly tinged with and stained black.

Does the first change in the urine denote the death of the parent worm? Perhaps it does. The second change certainly denotes the time when the ova are being affected by the antimony.¹² The ova are deposited in the small venules and so are directly affected by the antimony in the circulation. Possibly this is explained by the fact that antimony is a cumulative poison, and when the antimony circulates in the blood at a certain concentration the environment of both worm and ovum becomes sufficiently poisonous that they die, the worm first, later the more resisting ovum. This poisonous concentration of the blood is, expressed in grains, given by intravenous injection, the required dose. It may be, and probably is, a good deal less than 25 or 30 grains, and it probably varies according to circumstances, &c.

I am of the opinion that antimony tartrate given by intravenous injections, as described in THE LANCET of Sept. 7th, 1918 (p. 325), with due care and circumspection and with due regard to the fact that it should only be given with the greatest caution when any important organs—kidneys, liver, heart, lungs, &c.—are not sound, is a radical cure for bilharziasis, and that it may safely be employed. It has, however, a cumulative action, and it acts over a long period owing to its slow elimination from the tissues of the body, although he it stated that antimony is found in the urine after only gr. ½ has been injected.

The cases which have formed the basis of this paper have been under the care of Dr. Ferid Masoud, medical officer at the Khartoum Civil Hospital, who has done for me many of the injections and in other ways assisted me, and I have especially to thank Mr. J. R. Newlove, pathological assistant at the hospital, who made the daily microscopical and other examinations of the urines with so much skill and enthusiasm, and who devoted so much of his time to the work.

Khartoum.

¹¹ The patients on whom these observations were made were not kept in bed or "dietet." They were up and about in hospital.

¹² In some cases of untreated bilharzia "black" ova are occasionally met with, but not at any time in the same numbers as in cases treated with antimony.

THE trustees of the Peter Coats's Trust have contributed £1000 to the endowment fund of the Lord Mayor Treloar Cripples' Hospital, and £1000 to the Royal National Hospital for Consumption, Ventnor.

THE MEDICO-LEGAL SOCIETY.—The annual general meeting of the society will be held at 11, Chandos-street, Cavendish-square, London, W., on Tuesday, June 24th, at 8.30 P.M., when reports will be presented and officers and council elected for the session 1919-20. At the conclusion of the general meeting a paper will be read by Dr. Lionel Weatherly, entitled "A Point of General Importance—the Interpretation of Secs. 47 and 321 (ii.), The Lunacy Act, 1890."

AN ATYPICAL STRAIN OF *B. PARATYPHOSUS B.*

BY W. BROUGHTON-ALCOCK, M.B.CANTAB., M.R.C.S.,
MAJOR, R.A.M.C. (S.R.); SPECIALIST IN BACTERIOLOGY, NO. — GENERAL
HOSPITAL, ITALIAN EXPEDITIONARY FORCE.

THE atypical characters found in a micro-organism temporarily classified as a strain of *B. paratyphosus B* isolated by Dr. Lagane and myself from the blood of an enterica patient, who showed characteristic clinical symptoms of such an infection, appear worthy of recording, and bring forward an example of the marked variation that exists amongst strains within a group of micro-organisms.

Results of Tests.

In the serological examinations upon this strain it was found at the time of isolation that the serum of the patient agglutinated an emulsion thereof and an emulsion of a stock strain of *B. paratyphosus B* almost immediately by my rapid slide method in low dilutions and to a high titre by the long method, while having no action upon *B. typhosus* and *B. paratyphosus A*. The blood sera of a considerable number of other patients suffering or convalescent from enterica infections have been tested while comparatively employing an emulsion of this strain and of a typical strain of *B. paratyphosus B*, and the like results have shown the sensitiveness and specificity of its agglutinability.

It was frequently employed to compare its action with that of typical strains of *B. paratyphosus B* when direct and cross absorption tests were made; and again the results were similar. Absorption and agglutination tests were carried out upon it and a typical strain of *B. Aertrycke* and one of *B. Gaertner*. They showed it to have characters that distinguish it from these allied groups.

The results from serological tests lead one to classify, at least temporarily, this strain in the group of *B. paratyphosus B*.

When submitting it to the usual fermentation tests it produced the fermentation changes characteristic of the *B. para B* group, save that no acid or gas was produced in dulcitate peptone water when kept at 37°C. or at laboratory temperature for two months. A subculture was sent to Colonel (then Major) Lyle Cummins, A.M.S., at the R.A.M. College. He also found that dulcitate remained unfermented.

It is also non-motile, and is therefore a strain that failed on isolation in two of the characters common to the group. After subculturing on Witte's peptone broth agar during five years it has not altered in biological characters.

Fermentation Tests.

The following experiment, which on thrice repeating gave similar results, showed that the property of dulcitate fermentation may be so developed as to slowly, and then readily, show its action. The medium employed was a solution of 2 per cent. dulcitate (Paulenc Frères, Paris) in peptone (Witte) water with litmus (prepared by Kubel Thieman's method) as an indicator. All subcultures were kept at 37°C.

First subculture*	...	...	No change in 2 months.
Second	"	(1)†	...
Third	"	(2)†	... Slight acidity fourth day. No gas. No further change in 2 months.
Fourth	"	(3)†	... Acidity net and trace of gas third day.
Fifth	"	(4)†	... Acidity 24 hours, with trace of gas 48 hours.
Sixth	"	(5)†	... Acidity 24 hours, with gas 48 hours.
Seventh	"	(6)†	... " " "
Eighth	"	(7)†	... " " "
Ninth	"	(8)†	... " " "

* The first subculture was in dulcitate from agar and the remainder in dulcitate from dulcitate.
† After 7 days.

A similar experiment made with a subculture after sowing for three weeks in bile gave identical results. Another experiment made by making daily subcultures from dulcitate to dulcitate showed that the production of acid appeared in the fifth subculture after 14 days, in the sixth after four days, in the seventh after three days.

All the above cultures and others made in series of broth, agar condensation water, bile, and peptone water were examined after 18, 24, and 48 hours, and occasionally when older, but no motility of the strain has been seen.

Subcultures on agar made monthly from the above No. 9 dulcitate-fermenting subculture during the last six months

have retained to the full this property during the last three years.

Further Tests.

Three series of experiments to test for the direct development of the property of dulcitate fermentation and motility by culture of the strain in mice were made. The culture of the blood of the first mouse sown direct into dulcitate peptone water produced no change, that of the second mouse (first passage) gave similar results, but that of the third mouse (second passage) produced an acid change in 24 hours and a trace of gas also in 48 hours. No motility of the strain was obtained.

Michaelis acid agglutination test gave a negative result.

Morphologically this strain since isolation and on all the media employed for its growth has been relatively longer by half than a typical *B. paratyphosus B* grown under the same conditions. When inoculated into man it produced antibodies specific for typical strains of the *B. paratyphosus B* group, as also for itself. These have been recorded in detail (Strain *B. paratyphosus B* "M").¹

The virulence for the mouse when injected subcutaneously corresponded to that of typical strains and gave rise to a generalised septicæmia. 0.25 c.cm. of broth culture always killed in 24 hours. Given orally the results were negative.

Of some hundreds of strains of *B. paratyphosus B* isolated and tested by my colleagues or self in France, Malta, or Italy, no other strain of the group of *B. paratyphosus B*, or of the groups *B. Aertrycke* and *B. Gaertner B*, has failed to produce readily acid and gas in dulcitate media from its original culture, and all have shown motility, and these characters have persisted when any later subcultures were tested.

I would like to thank Lieutenant-Colonel J. W. West, C.M.G., R.A.M.C., for permission to publish this article.

A CASE OF

MEDULLARY SYMPTOM-COMPLEX

DEPENDENT ON A LESION (? HÆMORRHAGIC) OF THE LEFT POSTERIOR INFERIOR CEREBELLAR ARTERY.

By SYDNEY A. OWEN, M.D. CANTAB., M.R.C.P. LOND.,
ASSISTANT PHYSICIAN, WEST LONDON HOSPITAL, ETC.;

AND

PATRICK ALEX. LEIGHTON, M.D. EDIN.,
SURGEON, ELTHAM COTTAGE HOSPITAL, ETC.

THE following is a summary of the condition of the patient, a female, aged 47, laundress, single, after she had been taken ill on August 25th, 1916, and transferred to Eltham Cottage Hospital a few days later.

Left-sided occipital headache the only premonitory symptom. Acute onset, without loss of consciousness or convulsion, but with vomiting (once), persistent uncontrollable hiccough, tinnitus (left ear), and intense giddiness; forced movements towards left, left-sided cerebellar hypotonia and ataxia (slight), with nystagmus on looking to left; inability to swallow, with paralysis of left vocal cord, dysarthria and paralysis of palate (R. and L.); left pseudo-ptosis, enophthalmos and small pupil; paresis of left sterno-mastoid and trapezius; analgesia and thermo-anæsthesia right side of body and face, and left face. Tactile sensibility, joint sense, vibration sense, all normal. Hypertrophied heart; high systolic and diastolic blood pressure, no albuminuria; Wassermann reaction negative.

The onset is best described in her own words:—

"I was getting into bed and suddenly felt very queer. Something seemed to click in my head and I felt myself suddenly being pushed violently towards the left and almost thrown on to the bed, which seemed to rise up and meet me. I was unable to stand up. There was a loud buzzing in my left ear. I became breathless. I could not see. I thought I was paralysed down my left side and found I could not swallow. I could not speak."

At our examination on August 30th a tentative diagnosis, lesion of the left posterior inferior cerebellar artery, was made. A second, more detailed examination on Sept. 7th, confirmed this diagnosis, when the following notes were made. General condition slightly improved, no fever throughout. Headache slight, only severe as premonitory

symptom. Hiccough, very distressing symptom at onset, now ceased. No return of vomiting. Oral sepsis marked. Tongue clean, protruding normally, neither tremulous nor atrophied, symmetrically disposed in floor of mouth. Now prefers to feed herself with œsophageal tube. Any voluntary attempt to swallow, fluids or solids, still quite impossible. Ocular movements full. No diplopia. Coarse slow nystagmoid jerks on looking to left. Left lid much drooped (= pseudo-ptosis), left palpebral fissure smaller than right. Left pupil now larger than previously, reaction to light now sluggish, outline irregular, cornea steamy, iris muddy, ocular conjunctiva still intensely injected. Low grade of iritis now present. Condition quite painless; douching eye painless; visual acuity, R. = good; L., previously good, now impaired. R. fundus (dilated pupil) normal; imperfect view of left obtained now, previously normal. Owing to iritis no attempt made to test skin pupil reflex. Voice less husky, but speech, though trifle "thick," quite intelligible to a stranger. Complete paralysis of left vocal cord persists. Palatal reflex (R. and L.) not obtained. On phonation R. palate only moves slightly. Left sterno-mastoid and trapezius (upper part) definitely flabby and paresed, though not to same extent as previously.

Patient still feels she must lie with head turned towards left side of pillow; cannot sit up alone and still tends to incline heavily to left when propped into sitting posture. Has made no attempt to stand. Is no longer giddy when attempts to sit up with assistance. Limbs now seem natural to her. Movements of left arm and leg slightly incoördinate as at previous examination. Nose finger test on left imperfectly executed. No static or intention tremor. No involuntary movements or dysidiadocokinesia. No gross evidence of cerebellar asynergia or dysmetria can be elicited. No motor deficiency. ? Slight hypotonia of left upper persists. No muscular wasting. No return of tinnitus. Can hear a watch well, better on left (history of right ear discharge some years previously). Muscles supplied by motor. V. normal. No facial paralysis or paresis.

Reflexes deep and superficial, normal, except slight relative diminution, at onset, of left knee-jerk and sluggish abdominal reflexes throughout. Lack of perspiration on affected side of face, symptom not infrequently seen in this type of case, not present. No attempt made to produce reflex sweatings. Salivary secretion appears normal. Vigorous pin-pricks on analgesic parts (skin) at no time produced bleeding. Comparison of temperature in right and left axilla not tested. No trophic or vaso-motor changes noted. Sphincters normal.

The sensory side.—Subjectively: Patient states left side of my face "burns" sometimes; on other occasions it feels "numb like menthol." This sensation increased by rubbing part with handkerchief. No abnormal subjective sensations on right side. Objectively: Tactile sensibility (tested with camel's hair brush). Beyond definite blunting on left cornea and conjunctiva, tactile impressions appreciated normally, in all areas tested on both sides. Light touch on tongue, palate, and pharynx normal. Light touch, with cotton-wool, seemed just as "tickly" on either side of face and in either nostril. Tactile discrimination: Compass points appreciated normally on face; localisation of tactile stimuli normal on all parts. Joint sense and muscle sense: Normal everywhere. Tuning-fork: Vibrations of tuning-fork were appreciated quite well on both sides of body (limbs, face, and head).

Cutaneous pain (tested with sharp pin).—Right side of body (face, neck, and limbs) completely analgesic to pin-point, whatever degree of stimulus. Right tongue, palate, and pharynx also appear analgesic; except on trunk at level of fourth cartilage and on abdomen at level of umbilicus the analgesic area is bounded by middle line. At these areas mid-line was encroached upon to $\frac{1}{2}$ in. Each stimulus felt as a touch and accurately localised. On left side of face (peripheral trigeminal area) and on ear pin-point caused no sensation of pain. Response to pin-point over left posterior end of lower jaw, neck, limbs, and trunk normal. Left tongue, inner cheek, pharynx, and palate analgesic. Pulled hairs (right and left) on forehead, caused no pain. "She can just feel it."

Pressure pain (tested with blunt, rounded end of whale-bone knee-jerk hammer).—Some conflicting results. Very firm pressure, even to extent of producing pitting of skin, on any part of body, face, forehead, and limbs, did not give

¹ Paratyphoid Inoculations, THE LANCET, 1914, ii., 743.