last, and which at that date I had described in the nineteenth appendix of the Museum catalogue then printed, as follows:

"2906 D. C. An enlarged thyroid gland together with the tongue, trachea, oesophagus, thymus, etc., from a case of Graves's disease.

"The thyroid is considerably and uniformly enlarged, each lateral lobe measuring about three and a half inches in its chief diameter. The divided surface presents to the naked eye no vesicular structure and no colloid, but is uniformly solid and homogeneous. At the back of the preparation on the left side, one of the parathyroids has been dissected out. The body in question, beneath which a fine rod of pink glass has been passed, is quite distinct from the thyroid gland, and is of narrow, somewhat oval form, 0.9 cm. (three-eighths of an inch) in length; it lies in the groove between the lateral lobe and the pharynx, and above the entrance of one of the main branches of the inferior thyroid artery, into which a piece of red glass is inserted.

"Microscopic examination of the thyroid shows it to consist of a compact tissue made up of the walls of closely-set narrow spaces of complex form, variously lined with cubical and columnar epithelium. No colloid is present, the scanty contents of the gland spaces being of a finely granular character. The stroma is in places the seat of abnormal lymphocytic infiltration. The microscopic sections of the parathyroid, which were made so as to include the whole of the gland, display groups of fat cells fairly abundantly scattered amidst the proper glandular tissue, which is itself so compact as in a general and superficial way to resemble lymphatic tissue. Well-formed arterioles run in conspicuous numbers in the primary trabeculae of the interstitial connective tissue. As studied under a high power the gland cells are for the most part so closely arranged that no disposition can be discovered. In character the cells themselves are polyhedral, the cell body of conspicuous size, and furnished with a spherical nucleus. At the borders of the intraglandular trabeculae of connective tissue a certain grouping, but no definite arrangement, of the gland cells is brought about by the penetration of the capillaries which ramify in the mass. There is nowhere any trace of lumen in the cell groups.

"E. L., aged 20, admitted into St. Thomas's Hospital, June, 1897, with no history of previous illness except asthma. The onset of the disease was subacute; the patient first noticed gradual increase in the size of her neck, and this was followed by palpitation, tremor, and loss of flesh. She had suffered from several digestive crises, during one of which she was admitted. She was then well nourished, with marked exophthalmos, and suffering from severe diarrhoea and vomiting, with profuse perspiration. The thyroid was large, with a marked thrill over it. The patient had two attacks of syncope within twenty-four hours of admission, during the second of which she died. The autopsy was conducted by Dr. Hector Mackenzie. The body was much wasted, with very little subcutaneous fat, and no exophthalmos. The larynx was egg-shaped as a result of compression. The bases of the lungs were in a state of partial consolidation. Nothing suggestive of myxoedema is noted in the *post-mortem* report."

It will be seen from the foregoing histological description that there is nothing present beyond an insignificant degree of fatty infiltration of the connective tissue within the gland, the proper cells of which remain normal. I have indeed seen as many fat cells in the stroma of the human parathyroid quite apart from Graves's disease. Under $\times$ the cytoplasm of the gland cells presents a normal structure. That the condition of the parathyroid in this case may be regarded as the regular one is fully shown by the further observations of Dr. Laurence Humphry already alluded to.

The last paragraph in the history appended to the preparation was inserted mainly because it bears on a view held by Dr. Arnold Lorand (Carlsbad).

The abnormal structure presented by the thyroid in Graves's disease was regarded by Greenfield—by whom it was first described—as indicative of hyperactivity; the secreting area of the vesicles is increased by ingrowths from their walls. The histological argument—especially advanced by Edmunds—in favour of this view is that after partial excision of the thyroid in the dog the portion left, as was observed by Sir Victor Horsley, comes during its compensatory overgrowth to exhibit a precisely similar construction. This particular appearance is interpreted by Lorand in a directly contrary way—namely, as marking an exhausted phase of the gland—the vesicles once distended have ceased to secrete, their simple walls have in consequence collapsed, and the complex infold-

ings so conspicuous in the microscopic section have thus their explanation; under such circumstances of gland-exhaustion the symptoms of Graves's disease give place to those of myxoedema.

In the case in question, however, no marks of myxoedema were present, notwithstanding the fact that no trace of vesicular structure remains recognizable to the naked eye in the entire section of the lobe, and none beneath the microscope, in the portion of the gland submitted to histological examination.

Although the description of the parathyroid glands in man, by Sandström, is so comparatively recent as 1880, it is interesting to note that they were recognized in the rhinoceros by Owen so long ago as 1862. In his paper On the Anatomy of the Indian Rhinoceros, in the *Transactions of the Zoological Society of London*, vol. iv, p. 48, Owen's description runs as follows:

The thyroid gland consisted of two elongate subtriangular lobes extending from the sides of the larynx to the fourth tracheal ring. . . . The structure of this body is more distinctly lobular than is usually seen; a small, compact, yellow, glandular body was attached to the thyroid at the point where the veins emerge.

ON THE PATHOGENIC TICKS CONCERNED IN THE DISTRIBUTION OF DISEASE IN MAN

WITH SPECIAL REFERENCE TO THE DIFFERENTIAL CHARACTERS IN *ORNITHODOROS MOUBATA*.*

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It would be difficult to name any biological discovery that has made greater advance in medical and veterinary science, during recent years, than that of the extraordinary part which blood-sucking flies and ticks play in the dissemination of disease in man and his domesticated animals. Professor Ross has long since demonstrated the correctness of the mosquito-malaria theory, and this has undoubtedly led to the discovery by others that animals other than mosquitos are responsible for the transmission of disease in man and animals.

The association of ticks in the transmission of disease has engaged, and is still engaging, the attention of the medical and veterinary profession, the bacteriologist and the entomologist, with the result that questions of the greatest economic importance have been solved and the findings turned to profitable account. I refer more particularly to the extensive experiments which have been made in the United States of America and in South Africa, to test the practicability of eradicating the various tickborne diseases in cattle and of suppressing the ticks responsible for the transmission of the diseases. While it is very encouraging to be able to report such a substantial progress in the treatment of tickborne diseases in cattle, one cannot say that such marked progress has been made with regard to the suppression of tick fever in man, or anything devised for the elimination of the animals which transmit the disease. But seeing that the complete life-cycle and much valuable information regarding the habits of the tick (*Ornithodoros moubata*) concerned in the transmission of spirillum fever in man has been so thoroughly worked out by the late Dr. Dutton and his colleague, Dr. Todd, there can be little doubt that the result of their laborious studies will be put to some practical account.

The objects of the present paper is to briefly summarize the pathogenic ticks concerned in the distribution of disease in man, with special reference to the differential characters in the external anatomy of *Ornithodoros moubata* (Murray) together with an account of its life-history.

THE SYSTEMATIC POSITION OF THE TICKS.

Ticks (Ixodoidea) belong to the great class Arachnoidea—spiders, mites, etc.—and are closely related to the mites which produce acaricidiosis in man and animals. This superfamily is divided into two subfamilies—the Argasidae and the Ixodidae. The former is composed of two genera: *Argas* and *Ornithodoros*, while the Ixodidae comprises nine genera. The members of the first division are recognized by the absence of a dorsal scutum, and the capitulum is more or

* Read in the Section of Tropical Medicine, Annual Meeting, Leicester, 1905.

less hidden under the projecting anterior margin. In the second division the capitulum projects from the anterior margin of the cephalic area, forming a projecting, beak-like prominence; and immediately behind the capitulum, on the dorsal area, is a large scutum or shield. The buccal organs are highly organized in all the members of the Ixodoidea, and are composed of four distinct bilateral parts. When about to take food from its host the animal fastens itself firmly by its legs, depresses its rostrum, and implants the toothed mandibles, and in proportion as these penetrate, the hypostome follows, and the retrograde teeth on the undersurface fixes this organ in the wound. In this way the hypostome and the mandibles are driven into the wound to their full extent, and so firmly do they become fixed into the derma that it is often impossible to remove the tick without leaving the mouth organs attached to the host, or tearing away a small portion of the skin.

A fully engorged tick acquires considerable size, and after fecundation invariably falls from its host. Egg-laying takes place shortly afterwards, and the animal subsequently dies. The eggs are usually concealed beneath some object. The young larvae on hatching swarm up the herbage, or, as in the case of the domestic species, over the floor of the native huts seeking any convenient spot in which they can conceal themselves, only to sally forth in the dark to seek a new host.

Some species of ticks pass the whole of their lives from the larva to the adult stage on one host. Others have two or three hosts; but the members of the genus *Ornithodoros* and *Argas* have an indefinite number of hosts, and may live for several years. The ticks concerned in the transmission of human diseases are three in number: *Ornithodoros moubata*, *Argas persicus*, and *Dermacentor reticulatus*.

Of the Miana bug (*Argas persicus*) very little is known with regard to its injury to man, but it is said to be a terrible scourge to travellers both in Persia and Beluchistan. This species, or the closely-related *A. miniatus*, is also responsible for the transmission of the spirillosis of the domestic fowl, a disease which is very prevalent in South Africa and Australia, but it does not affect man in those regions.

Ornithodoros Moubata (Murray).

Ornithodoros moubata, Murray, *Economic Entomology*, Aptera, p. 182, No. 31, two figures, 1877.

Nec Ornithodoros savignyi (Audouin), Neumann, *Mem. Soc. Zool. France*, ix, p. 26, 1896 (*ubi synon.*).

(?) *Ornithodoros savignyi*, var. *coecus*, Neumann, *op. cit.*, xiv, p. 256, 1901.

Ornithodoros moubata (Murray), Pocock, Thompson-Yates, and Johnston Laboratories Report, vol. v, pt. I., p. 188, pl. xv, 1903.

(?) *Ornithodoros savignyi*, var. *coecus** (Neumann), Lancaster, *Journ. of Trop. Medicine*, p. 124, 1905.

Adult female: Dorsum dusky brown, with irregular confluent blotches, rarely lines, of dusky ochreous yellow. In some examples the blotches were confined to the anterior region; in others they extended almost to the posterior margin; under side usually somewhat paler than the dorsum; abdominal region largely occupied by dull orange-ochreous blotches which gradually merge into the darker ground colour. Legs and rostrum of a pale translucent, ochreous white. Sculpture of dorsum fairly constant, but less pronounced in a partly engorged female than in the old and shrivelled examples. Capitulum hypostome not much wider at the base than at the anterior third, margin converging inwards, teeth in three bilateral rows; mandibles when fully extended reaching to the second articulation of the palpi, digit with a blunt terminal tooth, exterior apophysis with two widely separated teeth; interior apophysis bidentate; palpi tapering towards the extremity, second joint much the longest, sides of all the segments highly chitinated. Dermal cells, large irregularly ovate with one or two extremely minute spines at or near the margin and surrounded by a band of dark chitine, the latter character being much more pronounced in the region of the posterior margin. Stigmata lunular, peritreme finely pitted, and strongly chitinated. Dermal glands, irregular in outline and variable in size, the subcutaneous tubes attached to these organs are branched and appear like bundles of muscular fibre; there is a group between the base of the capitulum and coxa 1, another between the coxa 1 and 2, and a third between coxa 3 and 4, there is also a long bilateral series commencing immediately posterior to the genital pore. Legs normal. Margin of genital

pore deeply crenulated. Nymph: Colour, pale ochreous-brown, legs translucent white with, in certain lights, a faint pale ochreous tinge. Form broadly ovate. Dorsum thickly studded with minute papillae, increasing in size posteriorly, forming at the margin a regular crenulated fringe. Sculpture of dorsum somewhat resembling that of the adult females. Capitulum partly projecting beyond the margin. Hypostome with two bilateral rows of teeth, basal pair minute, the remaining teeth are large and equal in size, mandibles strong, digit blunt, terminal. Palpi broad stout, third segment the shortest, apical segment about equal in length to the second and bears two or three short spines at the tip; all the segments have a broad marginal band of chitine. Legs sparsely spinose, rather long; leg 1 of seven segments, Haller's organs present, leg 2-4 of eight segments with the femora more dilated outwardly than in leg 1. Anal orifice placed a little posterior to the insertion of leg 1. Vaginal orifice absent. Spiracles minute, placed opposite insertion of leg 3.

The adult female of this species may readily be distinguished from *O. savignyi*, not only by the absence of eyes—as has already been pointed out by Pocock (*loc. cit.*)—but also by the presence of the interior bidentate apophyses and the apparently narrower base of the hypostome. Drs. Dutton and Todd have called attention to the singular fact “that a clear fluid in fairly large quantity may ooze intermittently from between the bases of the first and second pair of legs.” They were, however, unable to find “any trace of an opening.” I find on examination that there are groups of glands in the situations indicated, and also a third group between the base of the capitulum and the first pair of legs, and in addition to these there is a long bilateral series immediately behind the vaginal opening. All the glands have subcutaneous tubes, which later are finely branched, and, as already stated in the diagnosis, these organs have much the appearance of bundles of muscular fibres. I find also that a group of similar organs exists in *Ixodes hexagonus* (Leach), but in this species the subcutaneous tubes are comparatively short and unbranched, but they bear a very striking resemblance to the so-called tubular spinnerets found in the Lecanid group of the Coccidae.

It is important to note that the cotypes of the species, which were kindly identified by Pocock (*loc. cit.*) as *O. moubata*, are still in the collection of the School of Tropical Medicine. Some of these specimens were prepared for microscopical study, and were found on examination to be specifically identical with the specimens recently received from the Congo Expedition. There should be no doubt, therefore, as to the correct identity of the species. I have placed Neumann's var. *coecus* as a doubtful synonym, as, unfortunately, I have not been able to consult Neumann's original description, but Pocock considers it to be the same as Murray's *O. moubata*. On the other hand, Ray Lancaster (*loc. cit.*) has quite recently (1905) identified some examples of *Ornithodoros* from Angola, West Africa, as belonging to Neumann's var. *coecus*.

Seeing that the specific characters of *O. moubata* are now found to be so markedly distinct from *O. savignyi*, there should be no difficulty in clearing up these somewhat important discrepancies by those who are in possession of the types. In many respects the habits of this species are not unlike those of *Argas persicus*, but, so far as I have been able to ascertain, the inert character of the larva of *O. moubata* is unique among the Ixodinae, in that it passes the whole of its life within the egg.

Experiments with the Ticks imported from the Congo Expedition.

Experiment I. June 19th.—Thirteen nymphs were placed in a hollow bamboo, which was fastened to the axilla of a young macaque monkey (*Macacus cynomolgus*). The ends of the tube were securely corked, and a large section was cut away providing the young ticks with ample means of access to the host. As a further means of precaution against admission of light the tube was covered with a thick cloth. Under these conditions the ticks were allowed to remain on the host for a period of about five hours. Result, *nil*. All the ticks refused to feed.

Experiment II. June 19th.—Five adult female ticks were put into a similar tube to that in which the nymphs were placed, and fastened to an adult macaque; but, as the ticks refused to feed, they were subsequently removed and placed together on the monkey in the hollow below the knee of the left leg, and carefully covered with a chamois leather. One of the ticks almost immediately attached itself to the host; this took place about 1.30 p.m., and the female left the host, fully engorged, at 3 p.m.

Observations on the Engorged Tick and her Progeny.

The female became very restive after feeding, and made repeated attempts to escape from the bright sunlight. She

* Calman, who contributes the article, gives the name *Caecum*, evidently in error.

was put into a Petri dish on a deep layer of dry sand, in which she rapidly buried herself, and placed in a dry incubator at an even temperature of 29° C. After laying the first batch of eggs she was placed in a partly-hollowed-out banana and enclosed in a cardboard box. The animal immediately left the banana and took up a position in a broad groove where she was partly concealed, in which position she remained fixed and inert until long after the third batch of eggs was laid. No attention was paid to the banana; indeed she made a hasty retreat from the fruit, and got as far away from it as the limits of her cage would permit. Here two more batches of eggs were laid, both lots being protected for a few days beneath the body of the parent; but both lots finally slipped from beneath her and fell intact to the bottom of the box. She defaecated three times during the period of egg-laying; the white, fluid-like faeces, when dry, left a white deposit resembling French chalk in texture. The actual process of egg-laying was not observed. The length of the tick before feeding was 7 mm. The weight before feeding was 0.0270 gram, after engorgement 0.2602 gram, or an increase of about ten times her original weight. This was not a very marked increase as compared with certain other species of female ticks, which are known to increase to about thirty times their original weight after engorgement. Batches of eggs were laid on the following dates, during the night:

June 29th. First batch of seventeen eggs. These were found in a little cluster at the bottom of the Petri dish. July 2nd. Second batch of fifty-one eggs laid. These were protected for a few days beneath the body of the parent. July 10th. Third batch of twenty-six eggs laid. These were also protected by the parent for a few days.

Development of the First Batch of Eggs.

June 30th. First day—subcutaneous reticulation evident; poles slightly cloudy. June 31st to July 3rd. Second to fourth day—no change. Fifth day—subcutaneous reticulation more distinct. July 5th. Sixth day—form decidedly flattened, legs and capitulum of larva showing faintly through the cuticle of the egg. July 6th. Seventh day—form unchanged; legs more evident. July 7th. Eighth day—"arrow-shaped" patch of secretion formed beneath the cuticle of the larva near anal orifice. July 8th. Ninth day—egg shell split; larva fully formed. July 14th. Tenth to fifteenth day—cuticle of both egg and larva increasing in opacity, finally forming a dull white disc. July 15th. Sixteenth day—nymphs hatching. Several examples were seen to escape from the larval exuviae anteriorly.

Development of the Second Batch of Eggs.

Although these were laid four days later than the first batch, some of the nymphs appeared simultaneously with those of the first batch—that is, on July 15th.

Development of the Third Batch of Eggs.

These were laid twelve days after the first batch, or eight days after the second batch, and the first nymph appeared on July 18th, just three days later than the earliest appearance of the nymphs from the first batch. It should, however, be noted that the nymphs from all three batches were quite erratic in their appearance, as examples from each lot of eggs continued to emerge over a period of twelve days, the last appearing on July 27th.

Dermacentor reticulatus.

This is the tick which Surgeon John F. Anderson thought to be responsible for the transmission of spotted fever or tick fever of the Rocky Mountains region in the United States of America. Anderson founded his theory on the ground that the fever was always found where there was a history of tick bites about one week before the onset.

Claim not substantiated.

ON THE ETHICS OF A PRESCRIPTION.*

By G. A. BATCHELOR, M.D.,
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IF we take a rapid and very cursory view of the history of medicine, we find that the ancient man of medicine gathered his herbs and made decoctions in secret, and retained his nostrums for his sole use in the treatment of his patients. In this way he created for himself a monopoly. When the patient wished to be treated he went to the man of medicine and obtained

his potions, and when he wished for further treatment he was obliged to return to the man of medicine. By a rapid step we come to the general practitioner of some years ago, and who still exists in country places. He was a man who dispensed his drugs and sent out his combinations in carefully-labelled and corked bottles, treating the case that applied to him with mixtures the composition of which was his own property. He in this way insured to himself gain for every repetition. To-day, for our own convenience, we write prescriptions, which are dispensed by the chemist. It is in reference to the ethics of these prescriptions that I wish to bring before you certain points for your discussion. Before going any further it is necessary for us all to accept the position that the prescription is written for the purpose of the treatment of the ailment of the person applying to us for relief. In writing the prescription our objective is to supply the patient with certain drugs indicated in the treatment of the attack for which he applies. Consequently, the prescription does not take a practical form until it has passed through the hands of the chemist and has become a bottle of medicine or a box of pills, etc. The chemist acts as our mediary or agent, and does the work which was formerly done by the man of medicine and the practitioner. The first question which will present itself to you is, Who is responsible, the prescriber or the druggist who makes up the medicine? I venture to think that you will agree with me that the prescriber must be held responsible, and that his responsibility does not end at the moment he hands the prescription to his patient; as a fact, the responsibility does not take a practical form until the prescription has taken the form of a bottle of medicine, etc. The prescriber is then responsible for the effects produced by the drugs exhibited. The only responsibility the chemist has is in the correct reading of a prescription and its correct dispensing. His responsibility should be to the prescriber and not to the patient. This does not appear to be quite the position held by the chemist. He appears to acknowledge his responsibility to the person presenting the prescription. We not infrequently see written up in a chemist's shop or his window, "Prescriptions accurately and carefully made up," as an inducement to the public to bring their prescriptions. If the position I have suggested be the right one, then the chemist should send circulars to us writers of prescriptions stating their ability to make up our prescriptions accurately and carefully.

If we accept the position that the prescriber is responsible to his patients for the effects of his prescription, the next question which naturally follows is, How long shall the prescriber's responsibility last?

It appears to me that, in the present state of the conditions connected with a prescription, the liability is unlimited, at least it is unlimited as long as the prescription continues to exist and is negotiable into drug form, the person to whom the prescription has been given being in a position to have the prescription made up an unlimited number of times, either by the same chemist or any other chemist. Chemists are willing to repeat the mixture, etc., having for their authority for so doing only the request of the patient or his messenger. This state of affairs, I would submit to you, is both undesirable and loose. That we as a profession should be held responsible for something over which we have no control is unscientific from a medical point of view and is distinctly unbusinesslike from a commercial point of view. Such a state of affairs would not be tolerated in any other walk of life, and is ethically wrong.

The next question, and a natural sequence to the above, is: To whom does the prescription belong? I believe that it is held generally that the prescription belongs to the patient to whom it is given, and I wish to place this under review for discussion. The patient, in the first instance, applies to us for treatment, and, in order to suit our convenience, we hand him a prescription, by means of which he is able to obtain from our agent, the chemist, the necessary drugs for the carrying out of the treatment. He does not apply to us for a prescription; if he does, he does not mean what he says. He has slipped into a professionalism to which he is not entitled. After he has been supplied with the drugs indicated by the prescription, to my mind the prescription should be of no further use, either to the patient or to the chemist, for his further gain by the remaking of a prescription when not authorized by the writer, who is, as we have seen, the responsible party. Otherwise the prescription becomes a sort of blank cheque upon his reputation as a reputable and careful medical man. Let us take an instance of what not infre-

* Read before the Capetown Branch of the British Medical Association.