named by them the *cortical hormone*. The method of preparation of this cortical hormone has been fully given, so that there is no secret about it. The extract has been shown to be effective in substituting for the cortical hormone in adrenalectomized cats and is therefore an effective extract. Previously described extracts have not been proved to be effective in preventing symptoms in adrenalectomized animals.

So with an adrenal cortex extract of proved efficiency, experiments were made upon cancer animals. Those chosen were mice with spontaneously developing carcinoma of the breast of a long-established stock. These mice have cancer occurring spontaneously in approximately 20 per cent. of the females. The disease progresses to a fatal result with a known duration and such spontaneous cancers are not subject to the remissions and disappearance of the tumor as are the transplanted, grafted or induced cancers in rats and other animals. In addition, the character of the tumor and its course are more like human breast tumors.

The adrenal cortical extract or cortical hormone was prepared for us by Swingle and Pfiffner[12] and was periodically obtained fresh from their laboratory. There was, therefore, the association of a freshly prepared cortical extract of known and not secret composition and a definite cancer tumor of known character and one which is not subject to remissions.

The subcutaneous dose suggested by Drs. Swingle and Pfiffner was 0.03 cc. This amount, for a mouse weighing 30 gm, would be equivalent to 60 cc in a 60 kgm man. Assuming a life-span for the mouse of 3 years, and for man one of 60 years, 3 months' observation on the mouse would correspond to 5 years on man.

The material was first tested on normal animals, daily injections being given to new-born and premature mice. They did not show any ill effects and developed well, as did their controls, even when the dose was greatly increased. In other words, no stabilization of growth could be demonstrated.

Injections of the same material given to the tumor mice were without any appreciable effect on spontaneous neoplasms of this species; these grew steadily, taking their usual course quite uninfluenced by the treatment. Even when a large dose was given this was also the case. Not a single tumor in two dozen mice was arrested clinically, the results having thus been entirely negative. Death occurred at the customary times in all the animals, and the injections were without effect.

[12] The laboratory wishes to express here sincere thanks to Drs. W. W. Swingle and J. J. Pfiffner, of Princeton University, for their courtesy and their generous gift.

As spontaneous growths of the mouse are analogous with those of man,[13, 14, 15] it is very probable that the treatment here described would be useless in the human patient. The charting of the tumors was done by measurement weekly, and inspection of these shows a continuous and progressive growth in spite of injection of adrenal cortex extract of known efficiency in substitution for the cortical hormone in adrenalectomized animals.[16]

CONCLUSIONS

Spontaneous breast carcinoma in the mouse was treated by the adrenal cortex extract of Swingle and Pfiffner without any curative or restraining effect upon the tumors. No therapeutic value in the treatment of such animal cancers was shown in the cortical hormone, although the efficacy of this preparation in substituting for the adrenal cortex hormone in adrenalectomized animals has been thoroughly proved. The use of such adrenal cortex extract in human patients is not therefore to be recommended as a treatment of cancer but this in no way detracts from the value of this adrenal cortex extract of Swingle and Pfiffner in other conditions than cancer, as it has been proved to be effective as a substitute for the cortical hormone.

SHIGEMITSU ITAMI
ELLICE MCDONALD

THE LIFE CYCLE OF THE PARASITE OF EAST COAST FEVER IN TICKS TRANSMITTING THE DISEASE. (PRELIMINARY NOTE)

EAST COAST fever is a disease of cattle of considerable economic importance which is found on the eastern half of the African continent from the Sudan to the Cape of Good Hope. The causative agent *Theileria parva* is one of a large group of parasites which inhabit red blood cells and are called piroplasms. Perhaps the widest known among the group is *Babesia bigemina,* the organism causing Texas cattle fever, which holds the distinction of being the first parasite definitely proved to be insect (*i.e.,* arachnid) transmitted (Smith and Kilborne, 1893). Despite this early epoch-making discovery the actual life cycle of not a single piroplasm has been completely worked out in the tissues of the transmitting ticks, though many attempts have been made.

The following is a preliminary report of some results secured in an experimental study of the parasite of East Coast fever in ticks (*Rhipicephalus*

[13] F. C. Wood, *J. A. M. A.*, 66: 94, 1916.
[14] W. H. Woglom, *Jour. Cancer Res.*, 7: 379, 1922.
[15] S. Itami, *J. A. M. A.*, 72: 934, 1919.
[16] Illustrations showing the growth will be included in a reprint which will be sent to scientific men who may be interested.

appendiculatus) undertaken at the invitation of the colonial secretary, Lord Passfield, acting for the Government of Kenya, and on the recommendation of Sir Arnold Theiler. The experiments were conducted in the Government Laboratories at Kabete near Nairobi. To both the director of agriculture, the Honorable Alexander Holm, and the chief of the Veterinary Research Laboratory, Mr. James Walker, we wish to express our thanks for many courtesies. We are grateful also to Mr. R. Daubney, who was acting chief of the laboratory during a part of our stay in Kabete; to Dr. E. A. Lewis and to Mr. W. B. C. Danks, both of whom helped us in the actual conduct of our experiments.

The observations were made on six principal series of ticks: (1) Infected as larvae; (2) control, fed on a clean animal as larvae; (3, 4 and 5) infected as nymphae; (6) control, fed on a clean animal as nymphae. They were complicated and difficult for three reasons. First, because in some cases only a relatively small percentage of ticks fed on blood containing parasites retain them throughout their life cycle. Second, the uniform presence of symbionts was a confusing factor in the study of smears soon after engorgement. Lastly, the large majority of the ticks, both infective and clean, contained a protozoan parasite, different from that of East Coast fever, with multiplicative phases in the macrophages in the tick's body and to a lesser extent within the intestinal epithelial cells. All the animals used for the feeding of ticks were carefully reared and free from other tick-borne diseases.

We have found that the life cycle of *Theileria parva* in ticks is divisible into the following stages:

(1) Emigration of parasites from the red blood cells into the gut of the tick begins soon, but parasites may remain in the red blood cells for as long as six days after the ticks drop off engorged.

(2) In the lumen of the gut what appear to be male and female forms are distinguishable, and further examination of the material collected may show that it is here that conjugation takes place.

(3) Many of the free forms in the gut are destroyed *in situ;* others are taken up by the intestinal epithelial cells and digested within them in association with digestive spherules; still others penetrate intestinal epithelial cells, which are not provided with digestive spherules, and grow.

(4) These intra-epithelial parasites make their appearance about the sixth day. From the sixth to the twenty-third day their diameter increases approximately five times. They are recognizable up to the thirty-first day, that is to say over the period of moulting which was accomplished in the several infected series on the twenty-fourth, twenty-fourth, twenty-fourth and eighteenth days after engorgement.

(5) From the day before moulting through the actual moulting and as late as the thirty-first day these intra-epithelial forms change into motile euglena-like forms. These euglenoids penetrate the wall of the intestine and enter the body cavity. They make their way to the salivary glands, where they may be seen in contact with the cells. They were last detected in the four series on the thirty-third, thirty-fourth, thirty-fifth and twenty-ninth days, respectively.

(6) Over a period of several days after their formation the euglenoids enter the salivary gland cells. Their entry was not observed in the larval series, but in the three series of nymphae they were seen as early as the twenty-fifth, twenty-third and twenty-second days.

(7) Once within the salivary gland cells the euglenoids rapidly change into deeply staining spore-like structures, which increase in size to form mulberry-like masses. The peripheral swellings on the mulberries give rise to small forms of the parasite which resemble closely those first observed in sick animals. This is the condition of the parasite usually seen in the salivary glands at the time that the next feeding began on the thirty-third, thirty-sixth, thirty-fifth and twenty-ninth days after engorgement.

(8) During the first four days of feeding the small forms increase greatly in number at the expense of the mulberry-like masses. Many of them are discharged into the lumina of the salivary acini, but some were still seen in ticks as late as the twelfth day after attachment.

The bites of ticks belonging to the series containing these parasites in their salivary glands produced East Coast fever in susceptible animals, whereas those of the control, clean ticks which did not possess parasites failed to do so.

E. V. COWDRY
ARTHUR W. HAM

ANATOMICAL LABORATORY,
WASHINGTON UNIVERSITY

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