To date, no other tumors have appeared in either series of animals.

Apparently, for the first time, a factor has been extracted from primary human cancer which is capable of producing tumors in an experimental animal. Further trials of the above experiment are now under way, in addition to the obvious control experiments that will be necessary to establish this finding. Also, an attempt is being made to isolate the active factor from the pooled extracts of several human cancers. These results will be reported when they are completed.

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## INSECT LIFE WITHOUT VITAMIN A

IN a series of earlier studies[1] it was found that *Blattela germanica* L., the ordinary cockroach, could grow to maturity upon a synthetic diet of purified casein, starch, salt mixture and yeast or yeast extract. Since this diet was very low in vitamin A, this species must either have synthesized this factor or have had no need for it. Inasmuch as vitamin A seems essential for all the higher vertebrates that have been studied, it is interesting that it may play no part in the life of one or possibly many species of insects.

A new series of experiments was devised to check the earlier results showing no dietary need for this vitamin. The work was then extended still further to determine whether or not the cockroach could synthesize this factor within its body when fed diets devoid of vitamin A or its precursor carotene. The stock diet that has been in use for many years by us for producing cockroaches is a mixture of equal parts of whole wheat flour and dried skimmed milk. This diet was exposed to hot air for six hours at 115° C. to destroy any carotene. The young cockroaches, started two days after emerging, grew better upon this heat-treated diet than upon the original. The purified diet deficient in vitamin A and used in the usual assay procedure for vitamin A was then tested as a stock diet. All these studies indicated that the cockroach could thrive upon diets that are so deficient in vitamin A that they will not support the growth of rats.

The next step to determine if this insect could carry on its body functions without vitamin A consisted in producing large numbers of the insects upon an A-free diet, extracting the fat from these insects and testing this fat for this vitamin.

By the use of large cages 2.5 kilograms of live cockroaches were produced in the course of ten months. These were reared upon the vitamin A-free diet used in the U. S. P. method for the vitamin assay with rats. From these insects were extracted very carefully in the cold 150 grams of oil. This oil was tested colorimetrically for vitamin A but gave only a negative test. It was then fed to rats in accordance with the usual procedure for the assay of vitamin A. Levels of 0.1 and 0.01 grams were fed daily in this assay. Neither level gave any indication of containing vitamin A. In the same assay the reference cod liver oil gave the usual response in growth and prevention of eye symptoms.

From these results it is evident that the cockroach needs no vitamin A in its diet and that its body can function normally throughout its life cycle without this vitamin. Therefore vitamin A is not of universal importance in the life of animals.

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# SCIENTIFIC APPARATUS AND LABORATORY METHODS

## A DIFFERENTIAL METAL BELLOWS MANOMETER FOR THE MEASUREMENT OF BLOOD FLOW

THE differential rubber membrane manometer described in an earlier report for the measurement of blood flow by differential manometry[1] has been replaced by a pair of metal bellows manometers, arranged to record mechanically the difference in their pressure readings. The calibration of the manometer couple in this arrangement has remained constant over a period of eight months in almost daily use.

The bellows is a deeply corrugated thin-walled cylinder, which elongates under application of internal pressure.[2] The most flexible small bellows obtainable has an outside diameter of 25 mm and a length of 30 mm. Without load, it responds to internal pressure with elongation at the rate of approximately 0.04 mm for 1 mm Hg in roughly linear fashion up to at least 200 mm Hg. To adapt the bellows for differential manometry, a pair of them was mounted on suitable bases (Fig. 1, *a*) and clamped in position with their movable faces apposed so that each bellows exerted its full thrust against the other. Magnified mechanical recording of the movement at the apposed faces was accomplished by inserting between the faces a short sleeve (Fig. 1, *b*) bearing a rod onto which the short arm of a recording lever was slotted (Fig. 1, *c*). The

[2] Finney-Howell fellow in cancer research.
[1] C. M. McCay, *Physiol. Zool.*, 11, 89, 1938.
[1] Hampden Lawson and J. P. Holt, *Jour. Lab. and Clin. Med.*, 24: 639, 1939.

[2] The courtesy of the Fulton Sylphon Company, Knoxville, Tenn., who supplied the bellows from special stock, is gratefully acknowledged.