non-cancer tissue, and that the spectra are different. The number of specimens which have shown these differences is not stated. Such a result would be most agreeable, but here we have so far failed to show any differences in fluorescence between fatty extracts of cancer and non-cancer tissues. I have not used the method of extraction which Dr. Penn considers to yield a solution of "lipo-protein" in acetone. However, this subject is still under investigation.

Dr. Penn's fluorescence spectrum of methylcholanthrene suggests that he has been the victim of an unfortunate mistake. A sample made from deoxycholic acid by Prof. Cook in 1933 and a synthetic sample made in 1938 give very much the same fluorescence spectra: three massive bands extending over about 800 units of wave-length, the well-marked mercury line 4047 lying near the interval between the first and second bands (see figure). This hydrocarbon fluoresces very powerfully in the most sensitive region (violet) of the photo-sensitivity curve of an ordinary plate, and a concentration of 1 in 400,000 is quite enough to give a strong negative in the spectrograph.

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Biotin as a Possible Growth Factor for Insects

IT has been shown for several insects, namely, Lucilia[1], Drosophila[2] and Tribolium[3], that the larva requires a growth factor which is contained in the water-insoluble fraction of yeast and is not fat soluble. This can be easily demonstrated with *Tribolium confusum*. This beetle, which normally breeds on wholemeal flour, grows almost equally well on a diet consisting of casein, glucose, yeast, cholesterol, salts and water added to make a water content of about 15 per cent. If a water-soluble yeast extract (prepared according to Chick and Roscoe[4]) is supplied instead of yeast, growth is very much retarded (1) (see accompanying table), but normal growth is restored by adding the water-insoluble fraction of yeast (2). The same result has been obtained with the following three species of beetles which are all common pests on stored food: *Sitodrepa panicea*, *Lasioderma serricorne* and *Silvanus surinamensis*. The need for an 'insoluble' factor in yeast seems, therefore, to be of general occurrence in insects. This factor is not fat-soluble, because the adding of a chloroform-soluble extract of yeast (3) or of wheat germ oil (4) only very slightly improves diet (1).

BASAL DIET: 50 parts casein, 50 parts glucose, 1 part cholesterol, 1 part McCollum's salt mixture and 15 parts yeast extract.
20 larvæ in each test.
Temperature 25° C., relative humidity 70 per cent.

Additions to basal diet	Period in days during which first 10 pupæ were formed
(1) None	45–53
(2) Insoluble yeast	26–31
(3) Chloroform extract of yeast	40–46
(4) Wheat germ oil	40–44
(5) Three times quantity of yeast extract	34–41
(6) None, but liver extract instead of yeast extract	43–56
(7) Marmite	32–36
(8) Lecithin	40–45
(9) Vitamin-H concentrate from yeast	34–40
(10) Biotin-concentrate from yolk	29–34
(11) None, but starch instead of glucose	30–33

It is not considered to be entirely absent from yeast extract because in that case development would presumably be impossible. This view is supported by the fact that tripling the amount of yeast extract improves the diet considerably (5). A water-soluble liver extract shows about the same deficiency (6) as the corresponding yeast extract (1). The filtrate of autoclaved yeast improves diet (1) and so does marmite (7) (which is virtually an autolysed yeast extract).

These and other properties of the insoluble factor suggest a similarity to György's vitamin H which has recently been shown to be identical with biotin and been recognized as an essential food factor for the rat[5]. Kögl[6] has shown that commercial lecithin always contains traces of biotin and, in fact, diet (1) is slightly improved by the addition of lecithin (8). György[7] prepared a vitamin-H concentrate from the water-insoluble residue of liver by autoclaving and treating the resultant solution in turn with acetone and with alcohol. The same treatment applied to the insoluble fraction of yeast yielded an extract which, when added to diet (1), improved it very considerably (9). Kögl's[6] original isolation of biotin from yolk was started by boiling in water and removing in turn all that precipitates with acetone and alcohol. The same treatment applied to the yolk of one egg yielded a solution which when added to diet (1) improved it almost to the efficiency of diet (2) which contained the insoluble fraction of yeast (10).

These results make it very likely that the 'insoluble' factor in question is in fact biotin. The final proof must, of course, wait until a test can be performed with pure biotin in place of insoluble yeast fraction. Although biotin has recently become available in the United States, we have so far not been able to procure a sample and have to postpone this experimentum crucis until it arrives.

It is noteworthy that a 'biotin' deficiency cannot be demonstrated with Tribolium when the carbohydrate in the diet is starch instead of glucose (11). This suggests that the purest samples of starch which are available contain sufficient traces of biotin, and presumably explains why a biotin deficiency of rats has hitherto only been demonstrated as the so-called egg-white injury (that is, in a diet which contains large amounts of egg-white). It has often been stated that rats can be grown well on a diet in which the vitamins of the B-group are supplied in a water-soluble yeast extract. Such diets should be, on paper, deficient in biotin. It may be suggested that this deficiency is usually made good by traces of biotin in starch which is almost invariably the carbohydrate used in dietary experiments. In fact, it has recently been shown that diets in which starch is replaced by sucrose are apt to give inferior results[8,9].

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