that possible defects in the metabolism of purines or of alloxan in man may play some role in the etiology of diabetes. If the diet contains sufficient nicotinic acid, it might combine with alloxan so formed and thereby prevent its action. Nicotinic acid thus might play some part in the prevention of diabetes.

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Transmission of the Bunchy Top Disease of Papaya (*Carica papaya* L.) by the Leaf Hopper *Empoasca papayae* Oman

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In 1946 Adsuar (*1*) reported the successful transmission of papaya bunchy top by a leaf hopper of the genus *Empoasca*, presumably identical with the one previously used experimentally by Jensen (*2*) in 1938. In their experiments, Adsuar and Jensen used as vectors the leaf hoppers collected on diseased papaya plants in the field but did not identify them specifically. Specimens collected on papaya in Puerto Rico were described by P. W. Oman (*3*) as *Empoasca papayae*, but as more than one species of *Empoasca* may occur on papaya, the specific identity of the vector used by Adsuar and Jensen can only be presumed.

Specific identification of the females of the genus *Empoasca* being practically impossible, the senior author followed a simple method of elimination which permits the use of males only as vectors. Specimens of both sexes collected from diseased papaya trees were exposed to the vapors of ether to render them quiet long enough to permit the separation of the males from the females under the binocular. The desired number of males were released inside cellophane casings inserted on the upper part of the stem and tender leaves of healthy papaya plants.

The identification of the 169 male leaf hoppers recovered dead two or three days later, when the casings were removed, was confirmed by P. W. Oman, of the U. S. Department of Agriculture, as his *Empoasca papayae*.

Out of 30 healthy papaya plants, on each of which from 5 to 10 males were isolated, 9 plants developed the symptoms of bunchy top in about a month and a half. Thirty similar check plants, kept with the others in a greenhouse from which leaf hoppers were excluded, remained healthy. This experiment conclusively demonstrates that *Empoasca papayae* Oman is a vector of the bunchy top disease of papaya.

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Fluorescein as an Agent in the Differentiation of Normal and Malignant Tissues[1]

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For many years investigators have noted and described the differential appearance of various tissues under ultraviolet light. In 1934, Danckwortt (*1*) wrote an extensive monograph encompassing the entire subject.

Several authors have reported the use of ultraviolet light as an aid in distinguishing neoplastic tissue. Some have even claimed a specific fluorescence for certain tumors. This, however, has never been consistently substantiated.

Herly (*2*), in 1944, reported that differences in the macroscopic appearance of benign and malignant tumors of the breast were enhanced when viewed under ultraviolet light. Using this technique, in a series of 200 breast tumors suspected of malignancy only one error in diagnosis was acknowledged.

Since October 1946, sodium fluorescein has been injected into patients subjected to laparotomy for gastric carcinoma, with the hope that it might accentuate the differences in appearance of normal and malignant tissues as revealed under ultraviolet light. Initially, 5 cc. of 20 per cent sodium fluorescein was injected intravenously after the viscera were exposed, and then inspected with an ultraviolet lamp emitting rays at about 3,600°. In these first cases no difference in fluorescence of normal and tumor tissues was noted. Next, the dye was injected at various times prior to the operation. It became evident that, when the interval between injection and examination was between 3 and 8 hours, a difference between normal and malignant tissues could be observed. Carcinomatous implants of tumor tissue on the peritoneal surfaces were readily seen. These fluoresced with a vivid yellow color. When, however, the tumor tissue was situated more than a few millimeters below the surface, no fluorescence was observed. This might be related to the fact that ultraviolet light can penetrate only a few millimeters of tissue.

TABLE 1

OBSERVED CORRELATION BETWEEN FLUORESCENCE OF TUMOR OR TUMOR FRAGMENTS AND ULTIMATE HISTOLOGICAL DIAGNOSIS

Site of tumor	Total cases	Correlation*		
		Good	Poor	Failure
Gastrointestinal tract	17	11	3	3
Brain and spinal cord	12	11	1	0
Miscellaneous	17	9	2	6
Total	46	31	6	9

* Good indicates high grade of fluorescence with verified microscopic diagnosis; poor, only slight fluorescence; and failure, that the tumor or tumor fragments did not fluoresce.

To date, 46 neoplasms have been examined with this tech-

[1] These researches were supported by the Malignant Disease Fund for Research.

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nique. A histological diagnosis of a malignant neoplasm was made in each instance among the tabulated cases. The observation of fluorescence in the tumor was correlated with the ultimate diagnosis established by microscopic examination of the tumor (see Table 1). The majority of the 9 failures have occurred in attempts to fluoresce large, bulky, abdominal tumors. Carcinomata of the colon, stomach, and breast were found to be less likely to fluoresce. This might be related to the factors of dosage or the lack of a sufficient time interval between injection of the dye and examination. It has also been found that areas of edema and cyst formation will retain the dye for many hours. This is a source of confusion in attempts to fluoresce abdominal masses. In addition, it should be noted that necrotic tissue will not fluoresce, since dead cells are not stained by the dye.

The most consistent results have been obtained in the examination of brain tumors. Twelve cases suspected of having an intracranial neoplasm were examined with the fluorescein technique (Table 1). In subcortical lesions this test has been of particular value. Tumor tissue secured from suspected areas by aspiration needle biopsies was readily recognized by the exaggerated fluorescence observed under ultraviolet light. Both the glioma and meningioma groups of brain tumors have been recognized correctly as tumor tissue by this method. In each case, the fluorescent areas have been subsequently proven neoplastic by standard methods of pathological examination.

An attempt has been made to quantitate by fluorometric methods the amount of dye present in both tumor and normal tissues after varying time intervals.

In additional studies, employing iodine substitution products of fluorescein, an increased visualization of certain mouse tumors by X-ray was noted. The possibility of using radioactive iodine in these substituted dyes has been considered.

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IN THE LABORATORY

Methods for Culturing Termites

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Progress in the study of the determination of castes in termites is dependent upon the development of satisfactory methods of culturing groups taken from both large colonies and incipient primary colonies (*2*).

Maintenance of groups of termites in the laboratory under conditions sufficiently standardized to permit a comparison of results necessitates: (1) a satisfactory source of food material; (2) the continued presence of moisture but avoidance of excessive moisture, especially free moisture; (3) visibility for observation without taking down the cultures; and (4) avoidance of conditions conducive to extensive development of microorganisms.

A method employing agar has been in use by the senior author for several years (*3*). The junior author has had much to do with the recent use and development of this method.

The standard procedure is as follows: A quantity of altered Monterey pine sawdust is first screened to remove very coarse wood chunks, bark, etc. and then sifted to remove fine, dust-like particles. To 2.8 grams of this sawdust, which is placed in the 1-ounce jar commonly used, is added 9 cc. of 3 per cent agar at a temperature low enough to prevent extensive absorption of agar by the particles of wood, yet high enough to allow complete mixing with the sawdust. Quantities are altered correspondingly for larger or smaller containers. When the agar is thoroughly mixed with the sawdust, the whole mass is pressed down firmly and leveled with the fingers. When the sawdust-agar mass has cooled, with the lid off, 4 or 5 cc. of 4.5 per cent agar is added just hot enough to pour (it is desirable to avoid large bubbles in the cap). Following solidification of the agar cap a hole is punched to the bottom along the glass through cap and agar-sawdust mass. A cork border is convenient for this purpose, the size depending upon the size of the species to be used and of the group. For small species a hole punched with a wire rod is sufficient. It is important to make this hole along the glass in order to facilitate observations.

The termites, which are placed on the agar surface, will usually enter the hole at once and begin working in the sawdust-agar mass, also usually sealing up the hole and thus conserving the moisture.

To prevent the excessive development of microorganisms, the jars should be thoroughly cleaned and autoclaved or boiled, and the termites should be carefully selected and handled as gently as possible. All inactive or injured ones should be removed and exposure to the air reduced to a minimum. If some die on the agar surface, they should also be removed. For methods of handling termites, see Light and Illg (*3*).

The size of the container and the amount of culture medium must be regulated to suit the number of termites to be supported. Small groups of termites cannot effectively control excessive development of microorganisms if a large quantity of culture medium is isolated from the termites. Free moisture occurs most commonly if the jar is closed before the agar has cooled.

In the sawdust-agar mass the termites work largely against the glass, making it possible to observe changes in individuals or the group. The agar in the mass and the cap serves to hold water; the cap, prevents escape of moisture from below and