It is apparent from these results that the endosperm tissue in culture does improve the growth of the excised embryos. The growth of the older embryos is better than on the nutrient medium alone. It stimulates some growth of the younger embryos. Crown gall tissue does not improve growth of the embryos. It is noted that the addition of tomato juice improves the growth of the embryos on the basal medium. It may be concluded that the cultured endosperm has retained its endosperm function.

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¹ LaRue, C. D., *Amer. J. Bot.*, **34**, 585 (1947).

² LaRue, C. D., *Amer. J. Bot.*, **36**, 10 (1949).

³ Ziebur, N. K., and Brink, R. A., *Amer. J. Bot.*, **38**, 253 (1951).

⁴ LaRue, C. D., *Bull. Torrey Club*, **63**, 365 (1936).

A New Technique for the Sterile Culture of Plant Embryos *in vitro*

THE two essentials for successful tissue culture are a sufficient supply of nutrients and adequate aeration. In the culture of plant embryos from an early stage of development it is also often desirable that cultures shall be suitable for microscopical examination.

The relative merits of different culture containers are discussed by White¹, and the technique here described combines the simplicity and freedom of manipulation of the flask method with ease of microscopical examination afforded by the hanging drop.

The embryos are grown on two strips of filter paper (No. 1. 4 × 1 in.) supported on a glass strip (3 × $\frac{1}{2}$ in.). This is placed in a boiling tube (6 × 1 in. 'Pyrex') containing 5 c.c. of liquid medium so that it rests nearly vertically with one end in the medium. The tubes are afterwards plugged with cotton-wool and sterilized ready for inoculation. The medium is absorbed by the filter paper and is readily available to the embryos, which are thus surrounded by a film of nutrients and also have free access to the air. If, however, the dimensions of the filter paper do not exceed those of the slide, the medium is less accessible to the embryos.

Embryos placed centrally on the slide can be examined in detail during all stages of development through a microscope with a 1-in. objective without their being removed from the tube. Tubes can be placed horizontally, or nearly so, without spilling or wetting of the cotton-wool plugs by the medium; the dimensions are such that the liquid runs down beneath the slide, and with care there is little danger of the embryos being washed out of position. Measurements can therefore be made with an eyepiece micrometer and camera lucida. In later stages of development the seedling grows in an upright position and can be measured against a scale on the filter paper or a ruler with reasonable accuracy.

Cultures are economical and easy to maintain over long periods of time. Evaporation from the tubes is low, and it has been found that a change of medium once a fortnight is satisfactory. This can be done by removing the embryos singly with forceps into a new tube, or by transferring the whole slide from one tube to another with no disturbance to the embryos.

Large numbers of samples can be maintained at any one time in a small space since tubes are easy

to store, and in the early stages of development five, or even ten, embryos can be grown in one tube.

It is possible that this method may prove equally satisfactory for culturing tissues other than plant embryos, where a liquid medium is required without the disadvantages of immersion.

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¹ White, P. R., "A Handbook of Plant Tissue Culture" (1943).

Autonomic Ganglion Depressant Properties of Barbiturates

THOUGH the central nervous system depressant and anticonvulsant properties of the many derivatives of barbituric acid have been extensively studied, relatively little is known of their effects on the autonomic nervous system.

Depressant effects of amylobarbitone on the cardiac vagus were first described by Lieb and Mulinos¹, and have been confirmed by other workers. Depressant effects on salivary secretion were shown by Stavrakys², for amylobarbitone, and by Emmelin³, for hexobarbitone. It is not clear from any of this work whether the depressant effects were exercised at the autonomic ganglion or more peripherally.

Initial experiments showed that amylobarbitone sodium, administered intravenously to the cat in doses of the order of 5 mgm. per kgm., depressed ganglionic transmission without depressing the peripheral structures. By a method involving periodical electrical stimulation of the pre-ganglionic trunk of the cervical sympathetic, and recording of the contractions of the nictitating membrane, ganglion depressant effects of amylobarbitone were compared quantitatively with those of tetraethylammonium iodide; amylobarbitone was about one-quarter as potent as tetraethylammonium iodide. In a similar manner, the depressant properties of some fifteen of the commoner barbiturates were compared with those of amylobarbitone. The accompanying table shows the results obtained with a few of the more interesting derivatives.

Barbiturate (as sodium salt)	(A) Mean potency on sup. cerv. gang. ± stand. errors	(B) Relative anæsth. potency	Ratio $\frac{A}{B}$
Amylobarbitone	100.0	100.0	1.00
Butobarbitone	99.1 ± 6.2	71.0	1.40
n-Hexylethyl	43.4 ± 2.7	69.2	0.63
Pentobarbitone	42.5 ± 1.5	163.6	0.26
Hexobarbitone	31.7 ± 2.9	186.2	0.17
Barbitone	17.1 ± 1.3	23.1	0.74
Phenobarbitone	14.2 ± 0.6	40.3	0.35
Thiopentone	12.8 ± 1.2	450.0	0.03

The first two columns show: (A) mean ganglion depressant potencies determined from a number of experiments, and (B) relative intravenous anæsthetic potencies (calculated from data of Butler⁴). The figures are expressed in terms of amylobarbitone, which has been allotted the arbitrary figure 100.0 in each instance. It is interesting to note that, for the different drugs, ganglionic and anæsthetic potencies show no direct correlation one with the other; amylobarbitone and butobarbitone show the highest activity on the ganglion and thiopentone the lowest. Pentobarbitone, which is isomeric with, and more