BEHAVIOR OF LACTOFLAVIN FED RATS ON VITAMIN B_1 DEFICIENT DIET

	Males			Females		
Maternal diet	1	2	3	1	2	3
Initial weight—gm..	44	57	51	44	43	48
Final weight—gm ..	39	41	43	34	36	36
Maximum gain—gm (2 weeks)	15	21	22	15	20	17
Days of survival ..	31.6	35.0	37.6	34.6	37.6	45.3

The growth and length of survival during the period of vitamin B_1 deficiency was directly dependent on the lactoflavin content of the maternal diet. While the number of cases was small, the regularity with which the age at death depended on the previous lactoflavin intake leaves little room for doubt that this vitamin, in some as yet undetermined way, spared the vitamin B_1 reserves of the body. These results are in agreement with those of Evans and Lepkovsky,[4] who fed autoclaved yeast as the source of vitamin B_2 at different levels during the experimental period.

The sparing action has been found so far to be specific only for vitamin B_1. A similar group of 28-day rats when fed the Sherman-Spohn diet,[5] deficient in all the water-soluble vitamins, showed no such regularity of survival or growth response. In this case the first limiting factor of the multiple deficiency was probably vitamin B_6, since the growth was poorer than on either a vitamin B_1 or lactoflavin deficient diet.

This sparing action is being investigated further. Both vitamins are required for normal carbohydrate metabolism, though the sites of their influence are apparently widely separated; and both vitamins contain a pyrimidine nucleus. The possibility that, through a similarity of chemical structure and physiological action, the two vitamins can substitute for each other for a short space of time in an emergency and thus in turn be spared opens an interesting field of study.

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PARTHENOCARPIC FRUITS INDUCED BY SPRAYING WITH GROWTH-PROMOTING CHEMICALS

PARTHENOCARPY, a not uncommon phenomenon, occurs in some plants without the aid of an outside stimulus and has been artificially induced in other plants by a number of means. Gustafson[1] was able to cause fruit development in several species which do not normally exhibit parthenocarpy, by dabbing lanolin mixtures of growth-promoting chemicals on the styles, which were first shortened by cutting them off close to the ovary. Hagemann[2] also reports parthenocarpic fruits in Gladiolus obtained with indoleacetic acid in lanolin. Recently, the authors produced parthenocarpy by spraying blossoms with dilute aqueous solutions of growth substances and without first altering the floral organs.

Of the various plants experimented with, the most notable success was encountered with the native American holly, *Ilex opaca*. As is well known, this plant is dioecious and is therefore particularly well adapted for tests of this kind, since young pistillate flowered plants involve no emasculation and can easily be isolated from any possible chance of pollination. Previous attempts to induce fruit setting in this species with pollens of miscellaneous unrelated species have resulted in complete failure. The application of *Ilex opaca* pollen, however, normally results in 100 per cent. fruit setting.

The holly plants used were propagated by cuttings from a bearing tree during the summer of 1936 and were well supplied with flower buds which had differentiated before the cuttings were removed from the parent tree. Planted in small pots, these miniature holly trees put forth vigorous new growth and blossomed in May, 1937.

When the plants were in full bloom the flowers were sprayed with four different growth substances, namely: indoleacetic, indolebutyric, indolepropionic and naphthaleneacetic acids in aqueous solutions ranging in concentrations from 1:1000 to 1:1,000,000. Although each of the four substances induced parthenocarpy, naphthaleneacetic acid was by far the most potent, causing all the flowers to set fruit when used in .006 per cent. concentration. Even a solution of 1 part per million induced 10 per cent. of the flowers to set fruit. Acetic acid in comparable concentrations and also in considerably stronger ranges than used with the above-mentioned growth substances produced no parthenocarpic effect. The details of the experiments showing the relative effectiveness of these four chemicals in producing parthenocarpy will be presented at a later date.

At the present writing the parthenocarpic holly fruits compared with those obtained by pollination have developed in an apparently normal fashion and have reached mature size.

Some fruits were also set on the holly by watering the soil around the young plants while in bloom with a relatively strong solution (.15 per cent.) of indoleacetic acid. Sufficient solution was added in each of two successive waterings so that considerable drainage from the pots ensued. Strangely enough, the concentration of .15 per cent. produced no apparent injury and no epinasty. Plants watered with a .02 per cent. solution of indoleacetic acid did not set any fruits.

In addition to holly, individual potted plants of a pistillate strawberry selection were sprayed with in-

[4] *Loc. cit.*

[5] H. C. Sherman and A. Spohn, *Jour. Am. Chem. Soc.*, 45: 2719, 1923.

[1] F. G. Gustafson, *Proc. Nat. Acad. Sci.*, 22: 628–636, Nov., 1936.

[2] P. Hagemann, *Gartenbauwiss*, 11: 144–150, April, 1937.

doleacetic acid in concentrations of .1, .05, .025, .01 and .005 per cent., respectively. In all concentrations there was apparently normal development of the achenes which, upon subsequent examination, proved to be empty seed coats. With the .05 and .1 per cent. concentrations a number of the receptacles or fleshy portions developed and ripened into apparently normal fruits. In the lower concentrations, however, the receptacles made only an initial growth, which soon stopped. Unsprayed flowers made no development of receptacle or achenes.

Trees of the Starking apple, a self-sterile variety, were protected from cross-pollination and, when in bloom, sprayed with indoleacetic acid in concentrations ranging from .01 to .06 per cent., but no fruits developed. Likewise, the Brighton grape, which is self-unfruitful, failed to respond to naphthaleneacetic acid in concentrations ranging from .0005 to .01 per cent. These concentrations were of course arbitrarily selected and, having failed, there was no opportunity to try other concentrations, since the flowering period had passed. Perhaps these plants might also have responded if the proper concentration had been applied. In the case of the grape, which has a very short style, as has also the holly, it was thought that the stimulus should have little difficulty in reaching the ovary.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE PRESERVATION OF BIOLOGICAL SPECIMENS BY MEANS OF TRANSPARENT PLASTICS

SOME months ago it occurred to the writer that the transparent type of plastic more or less typified by polymerized methyl methacrylate would make a suitable medium for the mounting and preservation of specimens of all descriptions. Some botanical specimens, such as leaves, flowers, small plants and petals, and biological specimens, such as a chicken heart and various types of insects—bees, beetles and lately butterflies—were consequently mounted in this medium. The results have exceeded expectations. There is no apparent deterioration, even though some specimens have been exposed to full sunlight for several weeks.

The method lends itself to easy manipulation, and the resultant product is a hard, water-clear case for the article which is to be preserved. This case or covering can be made in any reasonable thickness and shape. There is no danger of breakage and any face may be ground and polished or sawn with ease. This property facilitates the preparation of thin specimens. Once hardened, there is no softening of the polymer within the temperature ranges one is likely to encounter. Inorganic materials susceptible to attack by vapors or humidity may likewise be preserved intact as well as fragile specimens of archeological interest.

The primary advantage of this medium rests in the ease of preparation, in its superior physical and optical properties, and in its capacity to preserve material which would otherwise deteriorate.

Not only may different plastic materials be used, but the manipulative procedure may be varied over a considerable range. This procedure is as follows: Methyl methacrylate monomer is first given a preliminary polymerization by heating to approximately 80° C. This increases the viscosity of the liquid from that of a relatively thin liquid to one that approximates the viscosity of ethylene glycol or glycerine. The degree of polymerization desirable at this point depends on the specimen. The greater the rapid polymerization under heat the less time necessary to complete the reaction in the cold. However, if the solution is too viscous, then the elimination of bubbles becomes more difficult. The specimen which is to be preserved is first treated briefly with a dilute solution of formaldehyde—if it is an organic specimen, although on occasion this step may be omitted. It is then dried rapidly in vacuum and immersed in the partially polymerized methyl methacrylate, taking care to remove any bubbles. This may be facilitated either by immersion in vacuum or evacuation of the air after immersion.

The final solidification or complete polymerization may be hastened either by exposure of the liquid containing the specimen to the radiation from a glass mercury arc, sunlight or other suitable source of light or by the addition of a small amount of benzoyl peroxide, sulfur trioxide or other suitable agents to the liquid. This will cause the complete polymerization in not more than a few hours, the exact time depending on the amount of initial polymerization. This final step can be carried out at a temperature sufficiently low so that there is no destruction of the specimens.

The vessel containing the methyl methacrylate may be of any desired shape, thus permitting any orientation of the specimen in the final solid. If it is desirable to have only a thin layer of the polymer over a cross-section of the specimen for microscopic examination, the specimen may be first totally immersed but after solidification a section sawn through the specimen at any point, thus exposing anew any desired face.