of narcosis by such substances in the living cell. At the optimum temperature, pressure has little effect on the luminescence intensity of normal suspensions. If this intensity is first reduced by the addition of any of a series of lipoid soluble narcotics, pressure will largely or completely abolish the inhibition. Compounds included in this group are ether, alcohol, chloroform, ethyl carbamate, phenyl carbamate and novocaine. According to the views already expressed, these substances must cause a shift in the RD equilibrium, leading to the increased volume of the denatured molecule, reversible by pressure. Another group of narcotics decreases luminescence in a manner that is not reversible by pressure, although the inhibition is largely abolished by removing the substance from the suspension medium, or in certain cases by temperature. Barbiturates, chloral hydrate, sulfanilamide and p-aminobenzoic acid belong in this latter group, which must act by a different process, perhaps a chemical or adsorptive combination with the enzyme. Members of both groups, *e.g.,* urethane and sulfanilamide, have been found to act on the enzyme, without affecting the total luminescence, of extracted *Cypridina* luciferase and purified luciferin.[6] The significant point is that pressure effects make it possible to identify the probable action of the first group, in spite of the diversity of the chemical structure, as affecting the reversible denaturation of the enzyme, and to distinguish this from the action of another large group of narcotics.

Although the foregoing discussion has been restricted primarily to bacterial luminescence, it should be emphasized that the principles developed apply equally well to the energy exchanges of muscle. Here it can also be shown that the RD reaction determines the augmentation in tension which is obtained when pressure is applied at temperatures above the optimum, whether in muscles from tropical or temperate animals. Deviations from the Arrhenius relation may be shown to depend on the interference of a reversible denaturation with a high μ value. For this reason we would expect to find the RD processes conditioning the effects of temperature, pressure and chemical agents generally. The further delimitation of this type of reaction would seem, therefore, to be of the utmost importance.

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[6] F. H. Johnson and A. M. Chase, *Jour. Cell. Comp. Physiol.,* in press.

SUCCESSFUL REARING OF A SECOND GENERATION OF MICE ON AN ARTIFICIAL DIET

IN view of the known difficulty in raising mice on highly artificial rations we offer this preliminary report of the rearing of a second generation of this species on such a diet. The basal ration, as used, consisted of Labco casein, cerulose, crisco, Osborne and Mendel salt mixture with added zinc carbonate, agar, wheat germ oil and 3 per cent. rice polish filtrate factor II. This basal mixture was supplemented with cod liver oil concentrate, thiamine, riboflavin, pyridoxine, nicotinic acid, calcium pantothenate, choline, para-amino benzoic acid and inositol.[1] During the past month, linoleic acid has been added. The actual proportions of components used in the above diet (Diet A–2) as worked out by McElroy will be published later.

A group of 14 strain C_{57} black mice,[2] 5 males and 9 females, were placed on Diet A–2 at weaning. Of these 14, all 5 males and all but 2 of the females are alive and well after 184 days of subsistence on this diet. Growth curves of the whole group and their descendants in addition to the history of 10 of the original animals will be reported later, as not all the females were allowed to mate as soon as they were mature. Three females (Nos. 9, 8 and 12) were mated with a sibling male initially. To date female 9 has had 3 litters with a total of 10 live and 4 dead young. She did not lactate until the third litter was born on the 157th day of subsistence on the diet. Of this third litter of 4, she has successfully raised to weaning 3 young.

As a result of the first mating females 8 and 12 had litters totalling 10 live and 1 dead young on the 55th day on the diet. Both females lactated and 8 of the young (f_1) were raised to weaning and placed on Diet A–2; one young male died subsequently from an accident. At 69 days of age the 4 young females (f_1) were allowed to mate with two male siblings. All these females became pregnant readily, but one died of peritonitis 9 days after a vaginal plug was found. When 91 days of age, the 3 remaining females had litters totalling 16 live and no dead young. One of the young from each litter died during the first day of life. Although these were first litters, all three mothers lactated. Lactation gradually ceased in 1 mother and her 3 young were dead by the 13th day. The other 2 mothers reared their litters of 4 and 6 young successfully to weaning at 21 days of age. These 10 second generation (f_2) mice are now alive and growing well on Diet A–2 at 41 days of age.

The two original females (Nos. 8 and 12) have

[1] We are indebted to Merck and Company for supplying in pure form the various members of the vitamin B complex used in these experiments.

[2] Supplied by Dr. L. C. Strong.

successfully reared second litters, weaning 9 out of 11 young born alive on the 135th day of subsistence of these mothers on Diet A–2. Obviously the stock diet fed to these mice (Nos. 8 and 12) prior to the start of the feeding experiment in which Diet A–2 has been used, can not be regarded as playing a role in determining the success in reproduction and lactation of these mice with their second litters.

It is interesting to note, in reporting our success with the C_{57} mice, that there may be a strain difference in mice as regards reproduction and even continued maintenance of life on artificial diets, since attempts to duplicate our results using Diet A–2 and a different strain of mice have been unsuccessful to date.

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FERTILE TETRAPLOIDS OF SESAME, SESAMUM INDICUM LOEW, INDUCED BY COLCHICINE

Sesamum indicum Loew is a plant of the family Pedaliaceae which originated in tropical Asia and has been cultivated since ancient times for the high quality oil of its seeds. Although it has been used in all the tropical and subtropical countries for so many years, it is known only in its diploid form of 26 chromosomes.

In September, 1940, the axillary buds of some sesame plants were treated with 0.5 per cent. colchicine in lanolin and others with 0.4 per cent. colchicine emulsion.[1] With either of the two preparations severe burning and dying back of the leaves occurred, followed by the formation of callus-like tissues and new buds.

When new branches developed the four-celled mucilage-producing glands of the leaves were larger on some than on others. Leaves with larger glands had correspondingly larger but fewer stomata than those with smaller glands. Chromosome counts in the pollen mother cells of the branches with large glands revealed that a few of them had the tetraploid number, 52, while others had between 26 and 52. Some of the branches with 52 chromosomes were fertile. It is highly probable that if only a small number of plants had been treated with colchicine, no fertile branches would have been obtained.

Most of the normal branches were severed, but a few were left to furnish material for a direct comparison between fertile tetraploids and diploids on the same plant. The data in Tables 1 and 2 were obtained from 20 of these plants.

TABLE 1

Type of branch	Number of glands per cm² of leaf area	Size of glands	Total volume of glands per cm² of leaf area
	per cent.	per cent.	per cent.
Diploid ...	100	100	100
Tetraploid.	68	264	180

TABLE 2

Variety	Type of branch	Average number of seeds per pod	Average weight of 1,000 seeds	Average weight of seeds per pod	Comparative weight of seeds per pod
			grams	grams	per cent.
Jaffa	Diploid	91	3.41	0.310	100
	Tetraploid	90	5.04	0.454	146
Colombiano	Diploid	58	2.60	0.151	100
	Tetraploid	55	4.23	0.233	154
Criollo	Diploid	55	2.56	0.141	100
	Tetraploid	56	4.12	0.231	164
Selection 3	Diploid	53	2.58	0.137	100
	Tetraploid	52	4.19	0.218	159

The average increase in size of seeds obtained by doubling the chromosome number was 56 per cent. There was no reduction in the number of seeds per pod nor in the number of pods per branch.

By subsequent colchicine treatment, hybridization and selection, haploids, diploids, triploids, tetraploids, hexaploids and octoploids have been obtained. Field tests of the comparative seed yields, quantity of mucilage, and per cent. of oil of the various types have not yet been completed.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MODEL GEYSER

GEYSERS, which are special types of hot springs that gush or erupt into the atmosphere at various intervals, are one of the most intriguing of natural phenomena and have held the interest of geologists and laymen alike for many years. As a result of this interest, many theories and modifications have been presented to explain the cause and manner of the eruptions. In addition, there have been a number of experimental geysers constructed throughout the last 100 years,

[3] The expenses of this investigation were defrayed in part by a grant to G. R. C. from the Research Fund of the Yale University School of Medicine.

[1] Prepared by L. F. Randolph, of the Department of Botany, Cornell University, and Division of Cereal Crops and Diseases, Bureau of Plant Industry, Washington, D. C.