TABLE I.

Material injected	Dilution	Amount, cc	No.	% cancerous
Plasma*	0	1	15	7
Cell-suspension*	1:2	1	10	60
Plasma†	1:2	1	10	50
Plasma†	1:2	0.5	11	36
Cell-suspension†	1:2	1	22	18
Cell-suspension†	1:2	0.5	13	46

† Donors—mice with spontaneous mammary cancer, preliminary data.
* Donors 75 to 105 days of age.

TABLE II.

Dilution	No. injected	% cancerous	No.	% cancerous
1:5000	22	41	41	46
1:1000	19	53		
1:100	18	28	18	28
1:10	19	11	50	8
1:5	31	7		

nursing influences the incidence and/or average cancer age, this may not be the case in older mice that receive injected material.

When mice 3-5 weeks of age were injected intraperitoneally with extracts of mammary tissue containing the milk agent, more mammary tumors have been observed in the mice that received the more dilute suspensions. Although many of the animals are still under observation, the data indicate that further work is essential to account for the results. There are several possibilities: (a) the presence of an inhibitory agent; (b) destructive effect by autolysing enzymes; (c) the development of active immunity with the injection of massive doses; (d) genetic differences between hosts and donors; etc.

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Dental Caries in the Cotton Rat. V. Influence of Strain Variation on the Caries Susceptibility.*

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The effect of diet on the extent of tooth decay in the cotton rat has been studied in a series of investigations.[1,2,3,4] Considerable variation was observed in the incidence and

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TABLE I.
Effect of Strain Variation on Incidence and Extent of Carious Lesions.

Parent stock No.	Cariogenic diets							Non-cariogenic diets				
	No. of animals	No. of carious lesions		Analysis of variance (F value)	Extent of carious lesions		Analysis of variance (F value)	No. of animals	No. of carious lesions		Extent of carious lesions	
		Range	Avg		Range	Avg			Range	Avg	Range	Avg
2	13	16-39	28.7	2.0	21-148+	89+	1.4	7	0-16	6.7	0-33+	16+
5	18	22-37	31.3		63-131+	100+		—	—	—	—	—
6	16	25-39	32.4	.5	53-153+	102+	.1	3	8-17	11.3	9-22+	16+
7	13	12-34	19.9	36.9*	18-110+	51+	31.8*	2	0- 2	1.0	0- 5+	3+
9	3	30-34	32.3		86-126+	101+		2	1- 5	3.0	5-10+	8+
10	3	33-35	34.0		86- 99+	94+		3	0-13	6.3	0-18+	11+
11	7	5-23	13.0	71.0*	13- 60+	30+	84.6*	—	—	—	—	—
12	13	0-33	19.8	24.3*	0-109+	55+	28.4*	1	0		0	
13a	2	29-31	30.0		106-120+	113+		1	0		0	
14	11	28-39	33.7	2.43	77-156+	113+	2.37					
16	5	22-37	28.2		60-116+	89+						
16a	3	26-40	31.0		78-158+	113+						
17 (12♂, 14♀)	3	15-37	26.7		29-124+	80+		—	—	—	—	—
18 (12♂, 12♀)	2	14-20	17.0		34- 39+	37+						
19 (12♂, 12♀)	3	5-16	11.7		10- 48+	33+						
101	2	21-27	24		63- 83+	73+		2	0		0	
103	3	22-30	24.7		38-102+	63+		3	0		0	
X	6	10-19	14.1		17- 41+	[illegible]		5	0- 3	1.2	0- 4+	2+
200	3	19-28	24.3		33- 83+	66+		3	0-14	4.7	0-22+	7+
203	4	14-27	18.3		23- 83+	44+		4	0- 3	1.0	0-11+	3+

* Highly significant as compared to No. 5. The 1% values for F ranged from 7.60 to 7.88 for the groups statistically analyzed as obtained from *Statistical Tables for the Biological, Agricultural and Medical Research* by R. A. Fisher and F. Yates (Oliver and Boyd, 1938).

extent of carious lesions in offspring from different parents. A study of these variations is presented in this paper.

Experimental. The incidence and extent of carious lesions were observed in rats when fed diets containing soluble sugars and when fed dextrin or stock rations by the procedures outlined in earlier work.[1,2] The former rations are referred to collectively as cariogenic and the latter as non-cariogenic. Pairs of stock animals designated from 2-19 inclusive are from our stock colony, and pairs 101-103 were purchased as adults from Florida.† Young animals (30-50 g in weight) were obtained from Michigan.‡ Six of the latter animals were fed the sucrose basal diet[1] and 5 were fed a stock ration for 14 weeks. These groups have been designated X. The remainder of the animals from Michigan were used for the stock colony (pairs 200-205). Offspring from these animals were used to test their susceptibility to caries as described in earlier work.[1,3] The incidence and extent of the carious lesions in offspring from each pair of parent stock from the Wisconsin, Florida, and Michigan strains are presented in Table I. A statistical analysis of the data for offspring from our stock colony is also presented. The incidence and extent of caries in each case are compared to those of the offspring from parents No. 5. Only those groups where 7 or more animals are represented have been statistically analyzed.

Results. It is evident from the data that offspring from different parents as well as animals from the same parents show a wide variation in caries susceptibility. It should be pointed out that the offspring represented in the Wisconsin strains (Nos. 2-14) are representatives of litters obtained over a period of 16 months. This long period may increase the variation within the total number of brother-sisters tabulated. Within the Wisconsin strains, offspring from parents No. 2, 5, 6, 9, 10, 13a, 14, 16, 16a, and 17 have a much higher average incidence and extent than those from parents 7, 11, 12, 18, and 19. Within any experimental series, animals from the latter stock have a lower incidence and extent than those of the former. The differences between the offspring from No. 5 and those from No. 7, 11, or 12 are highly significant. The small differences observed when offspring from No. 5 are compared to 2, 6, or 14 are not significant by statistical analysis. An extremely low incidence is observed when the non-cariogenic diets were fed as compared to the caries index of the brother-sister animals receiving the cariogenic diets. Offspring of the less susceptible strains can be used for experimental comparisons since an adequate difference in the incidence and extent of tooth decay has been observed between the animals fed the cariogenic and non-cariogenic diets.

It has been observed that offspring from parents No. 12 have been the most variable in the degree of tooth damage. In fact one offspring from this pair was devoid of caries and another animal from a subsequent litter had 33 cavities at the end of the 14-week experimental period. These variations show the necessity of adequate distribution of animals from various parents within a given experimental series as has been pointed out earlier.[3] Variations between siblings of one litter from one pair of breeding stock are much less than for all the siblings of all litters from that pair.

Second generation offspring from No. 12 (No. 18 and 19) also show low susceptibility to dental caries. The amount of tooth damage obtained is similar to that in siblings of the parents. Thus it appears that susceptibility is influenced by inheritance. Matings made subsequent to these observations will further elucidate the effect of inbreeding and of crossing susceptible and resistant strains on the incidence and extent of tooth decay.

The offspring of the Michigan and Florida stocks show a lower susceptibility to dental caries as compared to the susceptible Wisconsin stock and approximate the more resistant Wisconsin stock in the degree of susceptibility.

† Purchased from the Hegener Research Supply Company, Box 224, Indian Beach, Sarasota, Florida.

‡ Obtained from Michigan State Board of Public Health.

Discussion. Hunt and co-workers[5] have studied the inheritance of susceptibility to dental caries in the white rat, and have obtained in a series of 12 generations, a marked increase in susceptibility by inbreeding susceptible strains. They could decrease the susceptibility of the resistant strains by similar means. McClure and Arnold[6] in a study on the influence of fluorides and iodoacetate on the incidence of caries in the white rat have pointed out a difference in caries susceptibility of offspring from different parent stock. Arnold[7] has also observed that a difference in caries susceptibility existed in hamsters, when offspring from different parents were compared. These observations indicate the importance of heredity as a factor in the production of experimental dental caries and also point out the necessity of recognizing this factor in designing properly controlled experiments, especially where animals are of heterogeneous stock.

Summary. A difference in susceptibility of different strains of cotton rats to dental caries has been observed and shown to be statistically significant. Preliminary results from second generation offspring indicate that their susceptibility is similar to that of the parent stock.

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[6] McClure, F. J., and Arnold, F. A., Jr., *J. Dental Res.*, 1941, **20**, 97.

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Effect of Cardiac Cycle Length upon Magnitude of Ventricular Gradient.

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The ventricular gradient of Wilson[1] may be defined as the net electrical effect of differences in time course of repolarization of different parts of the ventricular muscle as this effect is projected onto the frontal plane of the body. In the electrocardiogram it is measured by the mean manifest net area of the QRS-T group of deflections. In previous papers[2,3] it has been pointed out that the magnitude of the gradient varies inversely as the heart rate or directly as the average cardiac cycle length. The present report seeks to explain this relationship.

Three main procedures were used. In one, the string galvanometer recorded the action current derived from the apex and base of the excised turtle ventricle, in air. Apical negativity yielded an upward deflection. Records were obtained when the ventricle was driven at various rates, as shown by the cycle lengths in Table I. In a second set of experiments the apex was cooled, though, as the irregularity of the results shows, no attempt was made to keep the temperature constant. Table I also shows the Q-T interval for each cycle length, and the net area of QRS-T in units of about 30 microvolt-seconds. The method of measuring the areas has been published elsewhere.[4] Since the initial deflections were small, the larger part of the net QRS-T area is within the T wave, except when the cycles were short.

It may be observed that the net areas are

[1] Wilson, F. N., Macleod, A. G., and Barker, P. S., *Tr. A. Am. Physicians*, 1931, **46**, 29.

[2] Ashman, R., Ferguson, F. P., Gremillion, A. I., and Byer, E., *Am. J. Physiol.*, 1945, **143**, 453.

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