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SUMMARY TECHNICAL REPORT
for
OFFICE OF NAVAL RESEARCH

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AD No. 71064

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Report Prepared By: James H. Shaw Technical Report No. 3

Period of Contract: From 1 December 1952 To 1 December 1955

Period Covered by this Report: From 1 January 1954 To 31 December 1954

180-026 Contract N5 ori 07658

Principal Investigator James H. Shaw, Assistant Professor of Dental Medicine

Contractor President and Fellows of Harvard College, Cambridge 38, Massachusetts

Assistants Miss Ora Ashley, Technical Analyst

Dr. Aina M. Auskaps, Technical Assistant, during summer.

Title of Project: Studies on the Prevention of Tooth Decay

- Objective of Project:
- a. To determine the caries-susceptibility of genetically homogeneous strains of rats.
 - b. To investigate constitutional differences between caries-resistant and caries-susceptible strains of rats.

Plans for Future:

Immediate: The colonies of rats that have been developed for the caries-susceptibility trials will be maintained to supply animals for the studies on the constitutional differences that are underway. The breeding stock for each future generation of these colonies will be selected with the purpose of maintaining the modal caries-susceptibility of each strain and at the same time of reducing the variation in caries-susceptibility among the various representatives of each strain. The main emphasis in the genetic constitutional studies of the representatives of these strains is being shifted away from the inorganic analytical phases of tooth composition to studies on the organic components of the teeth and to studies of the nutritional efficiency of the strains and of the metabolic characteristics of the strains as defined by R. J. Williams.

Long Range: The slow progress that can be made in genetic constitutional evaluations in a small project suggests that only a few of the parameters mentioned above can be defined with any degree of exactness in a year. Hence we anticipate that any intensive characterization of the constitutional differences between these strains that are responsible for the varied caries-susceptibilities will take appreciably longer than the present contract year.

Reports and Publications during the current reporting period:

Auskaps, A. M., and Shaw, J. H.: Vital Staining of Calcifying Bone and Dentin with Trypan Blue. Accepted for publication in the Journal of Dental Research.

Shaw, J. H.: Comparative Studies on the Caries-Susceptibility of Ten Strains of the Common Laboratory Rat. Abstract submitted for presentation at the I. A. D. R. Annual Meeting in Chicago, March 1955, and for publication in the Journal of Dental Research.

Abstract of Results:

Since start of the Project: Beginning 1 December 1952 to
31 December 1954.

Representatives of ten strains of the common laboratory rat were maintained throughout successive reproductive cycles on a cariogenic purified diet (Shaw, J. H., J. D. Res., 26: 47, 1947). Six of these strains were obtained from the Wistar laboratories; one was obtained from the Holtzman breeding colony; the remaining three had been maintained in our laboratories for numerous generations. Their offspring were maintained on the same purified diet throughout their entire life span, including one or more reproductive cycles. Offspring in the second generation were tested for their caries-susceptibility by maintenance on three caries-producing diets: the above purified diet, the Hoppert-Webber-Canniff diet, and McClure's cooked cereal diet. These diets gave the same relative results for the caries-susceptibility of the strains, but uniformly the purified diet caused the greatest amount of tooth decay and the cooked cereal diet least with the Hoppert-Webber-Canniff diet intermediate.

The strains with the highest caries-susceptibility were the Harvard susceptible, and the Wistar mutant albino strains. The Wistar waltz-whirler, the Wistar chocolate and the Holtzman strains were moderately susceptible. The Wistar yellow red-eye, the Wistar yellow blue-eye, and the Wistar fawn were moderately resistant strains. The Long-Evans and Harvard resistant strains were the most caries-resistant of the ten strains. The most homogeneous results were obtained with the Harvard susceptible, the Harvard resistant and the Long-Evans strains which for several generations have been selected for particular characteristics of caries incidence. Within each remaining strain, there was a much higher degree of variability in dental caries experience.

During the Current Reporting Period: From 1 January 1954 to 31 December 1954

Sufficient rats in each of the above strains completed caries-susceptibility trials to make the group size in each strain sufficiently large to give a body of data that is suitable for statistical comparison.

A large portion of the time and funds during this contract year have been expended on studies to attempt to determine what constitutional differences determined the susceptibility or resistance of a strain of rodents to dental caries initiation and development. As yet, surveys of the chemical determination of the inorganic components of the teeth have not been suggestive of any differences between the several strains.

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