Determination of feasible methods for limiting the transfer of such diseases as plague and tularemia from wild rodents to man requires basic biological information obtained through intensive field study of rodents and their associated ectoparasites. The collection of such information was a primary objective of the Santa Fe Field Station which was established in July 1951 as a part of the plague investigative program of the Communicable Disease Center. The present report has been prepared to give general background information for more detailed papers on specific phases of the study. The background information consists of a concise, integrated view of the area, methods of study, and species of mammals investigated. For each species of mammal, observations are given on reproduction, local distribution, and general abundance of the most frequently collected species of fleas. Subjects expected to be presented in more detailed reports include: natural history of the most extensively studied species of rodents; seasonal host, and geographical distribution of ectoparasites; and susceptibility of rodent species to plague organisms. An excellent review of published studies on plague in wild rodents has been presented by Pollitzer (1952).

Several factors, considered desirable for a field study relative to rodent disease, were possessed by an area near Santa Fe in north central New Mexico. Important features of this area included 1) a recent (1950) case of human plague, 2) recent active rodent plague had been indicated by recovery of plague organisms from fleas from white-footed mice in 1951, 3) a relatively undisturbed area at the Municipal Airport for rodent life history studies, and 4) convenient access to Upper Sonoran, Transition, and Canadian Life Zones for comparative study of the associated mammal and ectoparasite fauna.

Methods

Mammal life history data, obtained primarily through observation of trapped live rodents were supplemented by field notes of observed tracks, middens, burrowing activity, food storage, study of carcasses, etc. Most live-trapped animals lived on the airport and were obtained by trapping at permanent marked locations on a once-a-week schedule. Live catch traps of three different types, described by Holdenried (1951), and snap traps were set at places most likely to catch animals, i.e., at burrow entrances for burrowing rodents and at openings in stick houses for the house-dwelling woodrats. Areas other than the airport were also repeatedly live-trapped for special studies. Diurnal species were usually released on day of capture but nocturnal species were left overnight in the field when minimum temperatures remained above freezing; in winter the trap lines were inspected between 8 and 11 p.m. All trapped animals were then brought to the laboratory and vacant traps were sprung. The following morning the captured mammals were examined and notes on age, sex, weight and other pertinent data recorded. Ectoparasites were removed as scheduled to secure representative samples. Live mammals were rarely anesthetized and ectoparasites were removed while alive. Fleas were obtained while the host was held over a pan with sides 3 inches high. Fleas usually dropped into the pan as the collector blew into the host's hair. Others were removed with forceps. Attached chiggers were obtained in pieces of skin scraped from infested areas. Collections of ectoparasites from live mammals were of a consistent degree of completeness to
provide reliable indication of seasonal changes in abundance. Following the removal of parasites, each mammal, if unmarked, was marked by a combination of clipped toes and was then returned to the location of its capture and released.

Animals held captive in traps for up to 18 hours away from their homes in the dry atmosphere and at variable temperatures were undoubtedly adversely affected. The degree of this disturbance was not measured, but limited hindrance was indicated by repeated recapturing of individuals over long periods. Evans and Holdenried (1943) studying the relation of ground squirrels (Citellus beechyi) to plague used successfully a similar recapturing procedure.

Mammal carcasses were obtained from areas other than the airport, through the use of break-back traps and shooting. Dead mammals, placed in cloth bags, were exposed to hydrocyanic acid for about 15 minutes until ectoparasites were killed. Dead ectoparasites were then removed from their hosts through brushing and the use of forceps and held in 2% saline solutions. Depending on the need of the program, parasites were identified and sent to the laboratory of the San Francisco Field Station for bacteriological tests for plague organisms, were preserved for further taxonomic study or were discarded. The mammal carcasses following identification, were examined for gross pathology and evidence of reproduction. Occasionally the food in trapped mammals' stomachs was examined and identified. For each mammal species studied, at least one and usually more conventional museum specimens consisting of skull and mounted skin were prepared. One or more specimens of each species were sent to museums for identification by specialists in the various mammal groups. These specimens will be deposited at the California Academy of Science and the Museum of Natural History of the University of Kansas.

Results

Routine identification of ectoparasites was continued from July 1951 to February 4, 1954. The 8,784 mammals examined (or re-examined) for ectoparasites in this period resulted in the collection of over 26,000 fleas representative of 51 species. Other collections from rodent nests and a bird added three additional species of fleas, for a total of 54 species presently known to occur in Santa Fe County.

By February 4, 1954, 4,900 individual mammals had been trapped by the Field Station staff. Over one-half (2,507) of the individuals were captured 12,981 times on the airport study area; the remainder taken in the 40,000 trap settings resulted in about 16,000 captures. Many of the species encountered were on or within a few miles of the geographic limits of their range and some were recorded for the Santa Fe area for the first time.

Summary

To add to basic knowledge of rodent-borne diseases, a Field Station at Santa Fe, New Mexico, has investigated mammals and their ectoparasites. Data, obtained primarily through repeated live-trapping in a semiarid area of the Upper Sonoran Life Zone, were supplemented with collections by break-back trapping in other locations which also included Transition and Canadian Life Zones.

From July 1951 to Feb. 4, 1954, a total of 8,784 mammals of 34 species were examined. Over 26,000 fleas of 54 species were collected. For each species of mammal, observations are given on reproduction, local distribution, and general abundance of the most frequently collected species of fleas.
RADEF AND RADIOBIOLOGY

Dean Dixon

Last year was my first encounter with the fields of Radiation Defense and Radiobiology. Ever since, my excess energies and time have been consumed learning and working with terms like transmutation, half value thickness, particle absorption, residual radiation and back scattering.

Chico is Region 3 Headquarters for California Disaster (C.D.) and Dr. Margery Anthony is the region's Radiological Service Director. Last fall and spring she taught a C.D. Radef Monitoring Course. This course included such things as fundamental atomic physics, bomb phenomenology, communications, calibration of detecting instruments, biological implications of radiations, and other related topics.

What was the purpose of such a course? Most people think of radiation defense as being a deterrent to atomic bomb attack, but this is not entirely true. As you probably know, F.G. & E. has just built one atomic powered electric plant in California and we will soon have more, along with atomic powered trains, airplanes, and maybe even cars. Well, for example, you know it is a physical law—or it was till sputnikes came along—that what goes up must come down, and as has happened in the past, airplanes don't always land in the place designated, in the case of accidents. Now with atomic planes we have an added danger in the case of accidents, over the present models, in that the atomic reactor would be an additional hazard to people, if it crashed in a populated area and its shielding was destroyed.

If such an accident happened, C.D. monitoring personnel would be called into the area. With their instruments they could determine the intensity of contamination and radio their findings to a control center. Then Radef would be in a position to advise local authorities if it was safe to go into the area or if people should be evacuated. Basically, this would be the modus operandi in event of an atomic attack.

This spring another C.D. Radef course is being offered at the college by Dr. Anthony under extension. Several science teachers in the county are taking the course for credit and about 20 townspeople are enrolled through the Adult Night School program.

This course is concerned with training people to operate a Civil Defense Mobile Radiology Lab that is stationed at Chico State.

If or when this nation is subjected to enemy attack involving atomic weapons, the resulting destruction and disorganization are likely to be so great that the majority of existing public health and similar laboratories will be unable to function. In order to lessen the risk of additional exposure of survivors to harmful amounts of radiation, especially internal exposure, it is essential to obtain information promptly on the levels of radiation in the air, water, soil and foods. Mobile laboratories have been developed which can be moved rapidly to places where they are needed.

These laboratories consist of a 7 foot BU 12 foot aluminum body which is 6' 4" high and mounted on a two ton truck chassis. They contain a variety
of radiological assay instruments and the necessary accessories.

To have qualified personnel to run these laboratories and do this type of investigation is of vital importance in case of atomic disaster. Last spring in Quincy, California, a freak weather condition caused the area to be slightly contaminated from an atomic cloud coming from the atomic test center in Nevada. A state mobile lab was sent to the Plumas County area and some 70 snow, air, soil and drinking water samples were run to see if ingestion of any of these samples could cause severe biological damage. All samples were well below maximum permissible levels.

A third course being offered this year at the college is Biology 190 AB Radiobiology. This course is geared to the person with more training in Biology. The text is Radioisotopes in Biology and Agriculture by C. L. Comar. The first semester we investigated areas of health, physics, biological effects of radiation to cells, auto-radiography, atomic physics and methods of using tracers. This spring the class is doing a series of isotope experiments with plants and animals with the idea of developing a manual for science teachers to be used in the high school.

Any way you look at it, there is a lot to learn about these fields of Radef and Radiobiology. Maybe in the near future, if Chico State gets a Reactor, the college will be offering more work in Radiobiology and then the college can turn out qualified radiobiologists; it is something to look for.
BIOCHEMICAL CHANGES INDUCED BY THIORACIL IN CUCUMBER MOSAIC VIRUS-INFECTED AND NON-INFECTED TOBACCO PLANTS

By Clark A. Porter and Leonard H. Weinstein

(Reprint: Contributions from Boyce Thompson Institute)

Cucumber mosaic virus-infected and non-infected tobacco plants were grown in nutrient solutions containing 0, 3, and 5 p.p.m. of thioracil, and their leaves were analyzed for certain biochemical constituents. Infected plants exhibited wilting, diffuse mottle, and veinal necrosis in secondary invaded leaves, and necrotic local lesions on inoculated leaves of the plants grown in thioracil. The severity of both the local and the veinal necrosis was increased by thioracil. Thioracil toxicity symptoms were manifested as interveinal chlorosis of leaves, as cupped, strapped, and torn leaf laminae, and as discolored and poorly developed secondary roots. Intervenial chlorosis was more severe in non-infected than in infected plants.

Virus infection of tobacco grown without thioracil induced a stimulation of host metabolism, as compared with noninfected plants, that was reflected by increased dry weight of leaf tissues and higher levels in leaves of alcohol-soluble amineamide-, and ammonia-nitrogen, ribonucleic acid and deoxyribonucleic acid-phosphorus, and malic and citric acids, while there was a higher level of soluble amino acids and amides. Active virus in infected plants subjected to 5 p.p.m. of thioracil was reduced to nearly one-tenth the concentration present in plants grown without thioracil.

The data indicate that thioracil induces a block in the synthesis of proteins; however, a block of the same magnitude did not occur in the synthesis of amino acids and amides. This effect apparently exists because of an aberration in nucleic acid metabolism resulting from the antimetabolic relationship of thioracil with uracil. It is suggested that the reduction of active virus in thioracil-treated plants is a consequence of this impaired synthetic mechanism.