vigor. The patients who had been unwilling to eat now ate everything on their trays and requested more. A part of the clinical improvement included a disappearance of the "indigestion," anorexia, sore tongue, pallor, and exhaustion, and a decrease in the amount of the stools. This occurred at about the time of the onset of remission. The remission itself was characterized by a reticulocytosis beginning on the third or fourth day and peaking around the sixth. As seen in Table 1, the reticulocytosis, in turn, was followed by an increase in the number of red blood cells and the hemoglobin. These patients showed a typical hematopoietic response following the administration of folic acid under conditions which make it certain that the folic acid produced the results.

Accordingly, we must state that these findings demonstrate clearly that folic acid produces beneficial effects in persons with tropical sprue in relapse. These and additional patients are being investigated to determine the long-time effects of folic acid on this disease. Some of them will receive a diet devoid of meat and meat products, and others will receive an antisprue diet.

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Food of Nymphs and Adults of *Neoschöngastia indica* (Hirst 1915)

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Medical research on tsutsugamushi fever or scrub typhus has been severely handicapped by the inability of investigators to culture mites of the family Trombiculidae. The disease is carried to men by the larvae of *Trombicula akamushi* and closely related species. The larval stage is the only parasitic instar of trombiculid mites. In order to culture these mites a satisfactory food must be provided for the nymphs and adults, which are free-living.

Ewing (*2*) discusses the attempts of previous workers to rear trombiculid mites. Engorged larvae have been reared to adults in a few cases but never in numbers and never consistently. Ewing (*1*) used feces of millipedes and springtails as food for nymphs and adults of *Eutrombicula alfreddugèsi*; Miyajima and Okumura (*3*) provided nymphs of *Trombicula akamushi* with pieces of melons and potatoes; while decomposing vegetable matter was used by Nagayo, *et al.* (*4*) for several species of *Trombicula*.

Nymphs and adults of *Neoschöngastia indica* were used in the present study on the food habits of trombiculid mites. The larvae of *N. indica* were common in the ears of a wild subspecies of *Rattus rattus* that was common on Guam in the jungles adjacent to the laboratories of U. S. Naval Medical Research Unit No. 2. The nymphs, adults, and unattached larvae were common in the nests and covered runways of the rats.

Live rats were supplied frequently by the Laboratory of Mammalogy. These were kept in cages for at least seven days prior to removal of the larvae of *N. indica* from their ears in order that a supply of engorged larvae might be assured. The larvae thus obtained were placed in culture bottles, which were wide-mouthed, low-form, glass-stoppered, weighing bottles of 25-cc. capacity, coated on the sides and bottom with a thick layer of plaster of Paris blackened by the addition of 5 per cent activated charcoal. These bottles were kept in an incubator in which a temperature of 32° C. was maintained. Five days after the engorged larvae were placed in the culture bottles, nymphs emerged. The bottles containing these nymphs and similar bottles to which nymphs and adults captured in the field had been added were used as cultures for testing the suitability of various foods for the free-living stages of *N. indica*. The usual number of nymphs or adults in a culture was about 30, but some contained only one while a few had as many as 100. Nymphs and adults remained active and apparently healthy in the culture bottles as long as the plaster was moist enough to produce droplets of condensed water on the inner side of the glass cover.

Pieces of potato, papaya, apple, and decaying wood; feces of springtails, millipedes, rats, and noddy terns; concentrates of soil containing nematodes, rotifers, protozoans, and various free-living mites; litter from the floor of the jungle; broth made from potatoes; dried serum; a nutrient solution containing amino acids, sugars, and vitamins; fungi; and live springtails and millipedes were tried singly or in various combinations as food for the cultures. One adult developed in one of 11 cultures of younger forms fed on concentrates of soil, and a second in one culture of 11 fed on litter from the jungle to which a live millipede had been added. The above results are similar to those achieved by previous workers.

Nymphs appeared to feed on many of the foods offered and even on the plaster itself. However, even

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though the gnathosoma was pressed against the substratum and the opisthosoma was expanded and contracted, it is doubtful whether the nymphs were successful in taking food. On one occasion a nymph was seen to engage an injured culture mate in such a way that it gave the appearance of attempting to eat the injured nymph. The claws of the anterior pair of legs were sunk into the dorsum of the injured one, and the gnathosoma of the attacker was brought as close to the back of the wounded nymph as the long setae on the back of the latter would permit. The injured nymph then moved while the other remained anchored. The opisthosoma of the retreating nymph was stretched to twice its length before the hold was broken and the injured nymph made good its retreat. This observation suggests that occasionally one nymph may eat another. Therefore, culture experiments, even though successful in producing adults from nymphs, cannot be used as indubitable proof of the suitability of a material offered as food unless many nymphs in a culture become adults.

While observing the behavior of a captured adult which appeared to be guarding her recently laid egg, a second adult was seen to drive the first away by beating it across the propodosoma with its club-like forelegs and then to suck the egg dry. This observation suggested that eggs might be suitable food. An ant's nest was excavated, and eggs were collected from the jaws of the nurses carrying them. Upon examination, the egg masses were found actually to consist of eggs and first-instar larvae. Both eggs and larvae were offered to adults, five of which were seen to feed on a first-instar larva. That these adults actually fed was substantiated by the following facts: (1) the chelicerae were inserted through the larval skin; (2) pumping action of the muscular pharynx was observed; (3) air bubbles occasionally appeared in the mouth, and thus the flow of fluid was visible as it passed into the mite; (4) the larva being devoured decreased in volume, and, consequently its integument became wrinkled; (5) the opisthosomas of the feeding adults became enlarged and distended.

Eggs and first-instar larvae of ants were then offered to nymphs, but no feeding was observed. Since the eggs and larvae appeared to be too large for the nymphs to manipulate, six kinds of smaller eggs were offered. Six unidentified, small (approximately 300 microns in diameter) spherical eggs found in an ant's nest were placed in a culture bottle containing eight nymphs. Twenty-four hours later all of the eggs were collapsed. Eggs of three species of mosquitoes (*Culex quinquefasciatus, Culex jepsoni,* and *Aëdes aegypti*) were obtained from the insectary of U. S. Naval Medical Research Unit No. 2. Naturally laid eggs and eggs dissected from gravid females were placed in culture bottles containing reared nymphs and in some bottles containing captured nymphs and adults. From 5 to 20 eggs were added to each culture every day. Uneaten eggs that had been placed in the bottles the previous day were removed. The nymphs and adults were frequently seen feeding on the eggs, and after 20 days adults appeared in all of the six cultures of reared nymphs fed on the eggs of mosquitoes. One culture of reared nymphs was fed eggs dissected from a species of flour beetle (*Tribolium* sp.), and eggs of *Drosophila* sp. were used as food for four cultures. The eggs of the beetles and flies were added to the cultures daily, the uneaten eggs remaining from the previous day being removed. Adults were seen in all these cultures after 20 days.

While no information is available on the food which serves *N. indica* in nature, it is reasonable to assume that eggs and early larval instars of the many small arthropods associated with it in the debris of rats' nests and covered runways comprise a significant part of, if not the entire diet. Certainly the eggs used in the present studies are sufficiently nutritious to produce active adults of healthy appearance.

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Period of Effective Weed Control by the Use of 2,4-Dichlorophenoxyacetic Acid

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Early reports (*1, 2, 3*) on the use of 2,4-dichlorophenoxyacetic acid (2,4-D) as a selective herbicide for killing weeds in lawns and other grassy areas have shown that such common pests as plantain (*Plantago lanceolata*), dandelion (*Taraxacum officinale*), Indian strawberry (*Duchesnea indica*), and others can be readily cleared out by spraying the infested area with a water mixture of this chemical. A number of years of testing are required, however, to evaluate fully a chemical treatment of this nature. After a lawn or pasture area is cleared of weeds, the presence of numerous weed seeds in the soil, as well as those that may be blown in from bordering areas, constitutes a continual threat of reinfestation. Of further concern may be the possible accumulative effect of the