infection rate in the South Pacific has averaged nearly 50 per cent. It seems established that, until new compounds are discovered which can act as casual prophylactics or can effect a true sterilization of the disease, the war in the Pacific will continue to be fought against two enemies, the Japanese and malaria-carrying mosquitoes. The fact that research on antimalarials is more than merely a war problem is indicated by the number of publications which have appeared on the possibility of the importation of malaria into the United States at the termination of hostilities. Species of mosquitoes capable of transmitting malaria are to be found throughout the nation and the return to civilian life of men bearing chronic malaria infections may possibly be followed by the establishment of new endemic foci in sections now free from the disease. Furthermore, as the strains of the parasite introduced will in general be foreign to this country, little or no existing immunity will be found thereto. Obviously, in the face of such possibilities, the search for new and improved antimalarials will require continuation in the postwar period.

ADVANCES IN THE INSTITUTE'S ANTIMALARIAL PROGRAM

Owing to the extreme urgency of the problem of finding improved antimalarials to replace quinine, a drug which is now practically unobtainable since the acquisition by the Japanese of the Dutch East Indies, the activities of this department have been largely concentrated on the synthesis of new drugs of possible antimalarial value. Because of wartime limitations, it is not permissible to describe these investigations. It can be stated, however, that the results obtained with certain new drugs as antimalarial agents are sufficiently encouraging to warrant further researches. A survey article on the advances in antimalarials has been published. Under a scheme promoted by the National Research Council, arrangements have been made for evaluating the antimalarial effectivity of new drugs. Furthermore, the cooperation of those fellowships engaged in research in organic chemistry at the institute has been enlisted, so that likely compounds prepared by them may also be tested if desired. Over eighty new drugs have been submitted for antimalarial appraisal, embracing substances related to quinine, quinacrine and pamaquine; in addition, many quinoline, pyridine and aromatic derivatives have been prepared and studied. In part, efforts have been directed toward possible ways of diminishing the toxicity of chemical structures recognized as possessing antimalarial potentialities. Facilities have also been provided for testing new drugs for possible activity against trypanosome infections.

Every resource is being employed to expand the institute's area of opportunity and aid to our country at war. In this résumé it is shown that results of value have been effected by tapping the constructive power of the research staff, whose members are constantly being given channels for personal assistance through the cooperative procedures of the institution and the close contacts maintained with governmental agencies.

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SPECIAL ARTICLES

STUDIES ON THE GROWTH OF RATS RAISED ON CHOCOLATE MILK[1]

AT the present time rather large quantities of chocolate products are included in the average American dietary. A considerable amount of the chocolate is consumed in chocolate milk or in products containing appreciable amounts of milk solids. In spite of the increasing utilization of chocolate in the diet, questions are still raised concerning its possible harmful effects. Mueller and Ritchie[2] found that rats fed mineralized whole milk containing 1 per cent. of cocoa grew as well as those receiving the mineralized milk alone. When fluid chocolate milk containing more than 1 per cent. of cocoa was fed *ad libitum* the rate of consumption decreased as the percentage of cocoa added increased. When cocoa was added to whole milk powder definite retardation of growth did not result until 4 per cent. of cocoa was used. The results reported in this paper as well as those given in later papers by Mueller and coworkers[3] have attracted considerable attention because deleterious effects were obtained with the higher levels of cocoa. It is, however, difficult to evaluate the results until consideration is given to the actual amount of cocoa used in commercial chocolate milks.

Since a uniform chocolate milk was being prepared daily by our Department of Dairy Industry[1] we were asked to study its nutritional value on animals. The

[1] Published with the approval of the Director of the Wisconsin Agricultural Experiment Station. We are indebted to Mr. Gideon Hadary for the continuous supply of these milks.

[2] W. S. Mueller and W. S. Ritchie, *Jour. Dairy Sci.*, 20: 359, 1937.

[3] W. S. Mueller, *Jour. Dairy Sci.*, 25: 221, 1942; L. D. Lipman and W. S. Mueller, *ibid.*, 24: 399, 1941; Faye Kinder, W. S. Mueller and Helen S. Mitchell, *ibid.*, 25: 401, 1942; W. S. Mueller and Marilyn R. Cooney, *ibid.*, 26: 951, 1943.

milk was made by using 86.3 parts of whole milk and 11.7 parts of a chocolate syrup having the following composition:

Glucose	18.0 per cent.
Sucrose	33.5 " "
Invert Syrup	11.0 " "
Water	28.2 " "
Cocoa	9.0 " "
Stabilizer	0.2 " "
Salt	0.1 " "

The final product, therefore, contained 1.05 per cent. of cocoa. Another chocolate milk was prepared in the same manner except that partially skimmed milk (1.5 per cent. fat) was used. Four groups of 21-day-old rats of the Sprague-Dawley strain, averaging 40 to 45 gm, were placed on experiment. One group received mineralized whole milk, a second mineralized whole chocolate milk, a third mineralized partially skimmed milk and a fourth mineralized partially skimmed chocolate milk. The average growth at the end of four weeks for each of these groups is given in Table 1.

TABLE 1

	No. of rats	Average weight in grams after four weeks on milk diets	
		Male	Female
Trial I			
Whole milk	12	172	141
Whole milk plus chocolate syrup	12	182	143
Partially skimmed milk	12	172	137
Partially skimmed milk plus chocolate syrup	12	173	148
Trial II			
Whole milk	6	164	126
Whole milk plus chocolate syrup	6	151	133

The data show that there is no inhibition of the growth of young rats when commercial chocolate milk containing 1 per cent. of cocoa is fed. It is interesting that in Trial I the growth obtained on chocolate milk diets was slightly better than on whole milk. However, in a second trial the males on whole milk grew a little better than those on the chocolate milk. None of the differences are significant. The animals on partially skimmed milk responded as well as those on whole milk. This was undoubtedly due to the fact that sufficient vitamin A was supplied even by the partially skimmed milk when it was consumed at such a high level. The fat supplied in the chocolate probably also aided in the utilization of galactose.

These rats as well as other groups were maintained on the above milks for 16 weeks without any significant difference in growth. When the rats were carried through reproduction normal young were produced in all cases but the mothers on chocolate milk had some difficulty in rearing their young. Further work is now under way to determine the exact cause of this difficulty.

Although man would never subsist on a diet containing only chocolate milk, these results appear to be of some significance since earlier work in our laboratory has shown that the growth response of rats on a mineralized milk is a critical measure of certain changes in the nutritive value of the milk.[4] While these results give no indication of reactions which may be encountered by individual human subjects, they do show that animals may be raised on a diet consisting solely of mineralized chocolate milk without any ill effect. It should also be pointed out that one per cent. of cocoa in liquid milk is equal to about 7 or 8 per cent. of cocoa on the dry basis.

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ANTIBODY RESPONSE IN MAN TO INJECTION OF THE SPECIFIC ANTIGEN OF TYPE V SHIGELLA PARADYSENTERIAE[1]

SEROLOGICALLY specific types of dysentery bacilli are frequently encountered in endemic and epidemic areas. The selection of suitable strains for use in vaccines is but one of the difficulties which arises in attempting to immunize human beings against bacillary dysentery. Furthermore, the inherent toxicity of the organisms themselves is reflected by serious local and general reactions which render the use of vaccines undesirable and often hazardous. It would seem desirable, therefore, to have at hand as a prophylactic agent a material of broad immunological specificity and devoid of many of the toxic elements of the cells themselves. With this in mind we have undertaken the isolation of the specific antigens of certain of the *Shigella paradysenteriae* and have injected human volunteers with one of these chemically purified materials.

Antigens from Gram-negative bacteria can be obtained by a variety of procedures. Thus Boivin and his collaborators[2] used trichloracetic acid for extracting the antigens from a number of different Gram-negative organisms. Topley *et al.*,[3] on the other hand,

[4] C. A. Elvehjem, E. B. Hart, H. C. Jackson and K. G. Weckel, *ibid.*, 17: 763, 1934.

[1] The work described in this paper was done under contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the Rockefeller Institute for Medical Research.

[2] (a) A. Boivin and L. Mesrobeanu, *Rev. Immunol.*, 1: 553, 1935; 2: 113, 1936; 3: 319, 1937. (b) L. Mesrobeanu, "Les antigènes glucido-lipidiques des bactéries (Etude chimique et biologique)," Paris, Libraires de L'Académie de Médecine, 1936.

[3] W. W. C. Topley, H. Raistrick, J. Wilson, M. Stacey, S. W. Challinor and R. O. J. Clark, *Lancet*, 1: 252, 1937.