radioactivity assimilated by the fetal lungs was as high as that assimilated by the liver, which may have been caused by direct contact of fetal lungs with amniotic fluid containing the radioactive FFA. The TG/PL ratio of radioactivity taken up by the viscera generally paralleled that on the maternal side, with the possible exception of the fetal heart, which exhibited a higher ratio than other viscera. After intra-fetal introduction the liver and the carcass assimilated a larger proportion of radioactivity perhaps by virtue of the direct contact with the FFA in the peritoneal cavity.

Discussion. The results indicate that the maternal circulation is not an important source of direct transfer of fetal FFA. Since the transfer of albumin has also been demonstrated to occur to a limited extent only(3,4), it may be inferred that whatever passage takes place, it is not by exchange of FFA between the maternal and fetal side but by a small seepage of FFA with the original carrier protein. As an additional tributary of FFA to the fetal circulation placental lipolysis may be considered. The FFA (or fatty esters) initially retained as TG or PL may be released on the fetal side after the cleavage of the ester bonds. Such a mode of transfer is compatible with the continuing, though small, rise in fetal radioactivity observed at periods when virtually no labeled FFA were present in the maternal circulation (Table II). It may also account for the reported changes in saturation induced in fetal fat by alteration of maternal dietary intake or for the passage of rare fatty acids when fat such as elaidin was fed to pregnant rats(10). Most of the fetal lipids seem to be derived then by independent synthesis and adequate mechanisms for this function are probably available(2,11). The contribution of preformed fatty acid molecules appears to be of minor importance to the fetus with the possible exception of essential fatty acids.

Summary. Direct placental transfer of albumin-bound, labeled palmitate, stearate or linoleate administered to albino rats was very small, whether introduced by intra-aortic, intra-amniotic or intra-fetal injection. Time-course experiments indicated a small indirect transfer of radioactivity initially assimilated by the tissues as TG or PL. The distribution of the assimilated FFA between tissue TG and PL was generally similar on fetal and maternal side.

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Effect of Protein Nutrition on Leukocyte Mobilization. (29264)

IRVING GRAY (With technical assistance of Sara Willard)
U. S. Army Medical Unit, Fort Detrick, Md.

The interaction between nutrition and resistance to infectious disease has been well established(1). While many reviews have summarized the current status of this problem(2), more specifically Dubos and Schaedler have demonstrated the effect of lysine deficiency on resistance to infectious disease(3). We(4) have related the lowered resistance to

infectious disease to the activity of the fixed macrophages of the reticuloendothelium system (RES). In view of the relationship between the circulating macrophages and those of the RES(5), and the fact that the former play at least an equal role in the response of an animal to invasion by microorganisms, this system has also been studied. This report concerns the ability of rats fed 2 different proteins to mobilize circulating leukocytes in response to a standardized irritant.

Materials and methods. The dietary regimen used in these studies has been reported (4). Essentially, it consists of placing weanling rats on a diet complete in all known requirements, except that the protein source is 20% gluten (20% protein). The protein source in the control diets is 26% casein. The animals are kept on the diet for 30 days. The effect of this diet on weight and appearance of the animals was the same as in the initial report(4). Control animals averaged 165 g; experimental, 80 g in weight. The rats used were white, females of the Sprague-Dawley strain, obtained from a commercial source.*

Two techniques were used to study the mobilization of leukocytes. One was essentially that of Rebuck(6), in which his "skin-window" method was adapted for use on rats. The animals were restrained on their backs on specially designed boards. The abdomen was clipped, then closely shaved with a very sharp blade. This usually brought about enough abrasion of the skin to cause migration of the leukocytes to the site. However, to insure sufficient leukocytic activity, a site approximately one inch square was additionally abraded with a Bard-Parker blade. A microscope slide coverslip was placed on the prepared area and fixed by means of a ring cut from ½" i.d. rubber tubing placed on it and held in place and to the skin, with adhesive tape. The coverslips were replaced each hour for 8 hours. When removed, they were stained in the usual manner with Wright-Giemsa(7). The coverslips were then mounted on slides and examined. All preparations were coded, examined blind, and the results graded as 0 to 4+, the latter being those slides that were the most populated with leukocytes. An arbitrary value of 0 to 40 was given for use in evaluating the results.

* Charles River Breeding Laboratories, Brookline, Mass.

TABLE I. Per Cent of Total Leukocytes on the Skin Window as Mononuclear Cells.

Exp.	Control	Gluten
1	28 (10)*	15 (10)*
2	20 (10)	20 (10)
3	17 (10)	9 (10)
4	25 (5)	8 (5)
Mean	23	13

* Indicates no. of animals used.

The second method used to study the mobilization of leukocytes was the response to an irritant injected into the peritoneum. The material injected was 12% sodium caseinate: 5 ml into the control animals and 3 ml into the gluten animals. After the selected time interval, the animals were anesthetized with ether, the abdomen opened, and the contents removed with a pipette. The exudates were added to 2 ml of heparinized saline, centrifuged, and the packed cells resuspended in 1 ml saline. Total leukocyte count was determined in the standard manner(7).

To check the viability of the leukocytes, the preparations were stained with 0.1% Eosin.

Results and discussion. Fig. 1 and Table I summarize the results obtained in the "skin-window" experiments. Two facts may be deduced from these data: (a) the gluten-fed animals do not sustain a response to a peripheral irritating stimulus to the same extent as those fed casein, even though the initial rate may be the same, and (b) the number of monocytes present in relation to total number of leukocytes is also reduced. When one considers that the total number of leukocytes is reduced about 30% below the casein control values, the 55% decrease in monocytes has even greater significance.

In Fig. 2 are summarized data pertaining to ability of the 2 groups of animals to respond to an irritant injected intraperitoneally. The results here are in accord with the previous part of this paper, but are even more striking as far as the total leukocyte count it concerned. It is evident that the control animals mobilize the circulating leukocytes

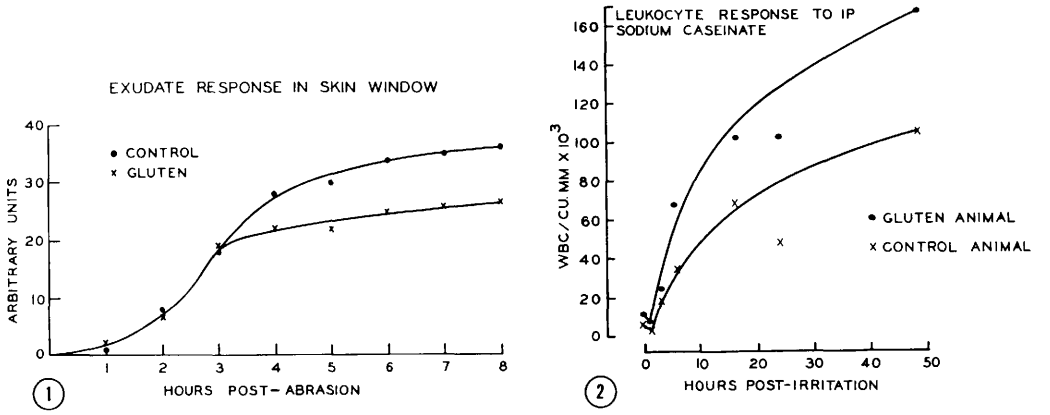

FIG. 1 and 2

faster and to a higher level than do the less resistant animals.

Finally, the viability of the leukocytes, as measured by uptake of Eosin by the dead cells, was the same in both groups of animals.

It is obvious that animals made less resistant to a bacterial challenge(4) by means of a gluten diet are unable to mobilize a leukocyte response of the same magnitude as that of control animals. Since the circulating monocytes are directly involved in phagocytosis(5), the total decrease in these cells could well contribute to the changed resistance. We reported(4) that the total number of circulating white blood cells was significantly decreased in the experimental animals as compared to controls. In the present experiments, the total response to the intraperitoneal irritant was likewise reduced. These two factors could also contribute to the reduced resistance of gluten-fed animals. As we had previously demonstrated the role of the fixed macrophages in resistance to a bacterial challenge, and the present data indicate that the circulating macrophages also play a role in resistance to infection, it is apparent that the overall phagocytic system in this model is critical in resistance to bacterial invasion. Similar conclusions have recently been reported by Smith *et al*(8) with respect to radiation and infection. This reemphasizes the important role of the phagocytic system as a main line of defense against bacterial invasion.

Summary. Rats made less resistant to anthrax by means of a gluten diet have been studied as to their ability to elicit an adequate phagocytic response. When followed by the Rebuck technique, the gluten-fed animals do not sustain a total leukocyte response as do the controls. In addition, the relative number of monocytes is reduced by more than 50%. When followed by the ability to mobilize leukocytes in response to an intraperitoneal irritant, the less resistant group responded with a decreased rate as well as decreased numbers of leukocytes.

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