(haemocytoblasts) 42.5%, myeloblasts 35.5%, premyelocytes 15%, myelocytes 0.5%, polymorphs 1.5%, lymphocytes 1.5%, monocytes 0.5%, basophils 1%, plasma cells 0.5%, normoblasts 1.5%. About 60% of the nucleated cells in the bone-marrow films showed the presence of peroxidase-positive granules. On Sept. 16 the white cells numbered 2,500 per c.mm., of which 85% gave positive peroxidase-stained granules. The differential count showed: haemocytoblasts 10%, myeloblasts 32%, premyelocytes 45%, myelocytes 3%, polymorphs 6%, lymphocytes 4%; two normoblasts were seen while counting 100 white cells.

Post-mortem examination on Sept. 17 revealed complete consolidation of the left lung, a few haemorrhages in the left parietal pleura and into the mesenteric fat, spleen slightly enlarged and soft, and bone marrow brownish pink in colour; no other macroscopic abnormalities. The previously described lesions of the skin of the limbs were still present but had become more purple, and those of the legs had lost the vesiculation in the centre.

Histological sections from the skin lesions showed infiltration of the corium with leucocytic cells surrounded by a zone of haemorrhage. The kidney, liver, and spleen contained a very few scattered foci of leucopoiesis. The lung showed the alveoli filled with fibrinous accumular exudate with little inflammatory reaction.

After the report on this case had been submitted for publication, a second case presenting similar haematological features was seen by one of us (B. L. D. V.).

Case II

A man 41 years old, who had been complaining of lassitude for two to three months and severe headache for the last fortnight, presented the following blood picture when first seen: haemoglobin, 34%; red cells, 1,640,000 per c.mm.; white cells, 10,200 per c.mm.—haemocytoblasts 16%, myeloblasts 42%, myelocytes 2%, polymorphs 14%, lymphocytes 25%, monocytes 1%. Except for marked pallor nothing abnormal could be detected on general examination: spleen and liver were not palpable, and there was no glandular enlargement. Sternal puncture showed a picture very similar to that of the peripheral blood, possibly through the marrow sample being heavily contaminated with peripheral blood. The primitive immature cells were almost identical with those observed in the previous case, and were correctly diagnosed only by means of the peroxidase stain.

White cell counts during the patient's stay in hospital showed variations between 6,800 and 18,600 per c.mm. He was given a large blood transfusion when his red cells reached the level of about 1,000,000 per c.mm., and was sent home, his general condition being much improved. When last seen his white cells had risen to a level of 50,000 per c.mm. with over 80% of very primitive mononuclear forms.

This case also, although not strictly comparable to the first because of the rise in white cells following the transfusion, when first seen in the aleukaemic phase presented a blood picture hardly distinguishable from that of lymphatic leukaemia without the aid of the peroxidase stain.

Conclusion

Both these cases are of interest in showing the "hiatus leukaemicus" of Naegeli, consisting of the presence in the peripheral blood of primitive cells and mature forms with few or no intermediate stages. The acuteness of the leukaemic process coupled with a very low white cell count as found in Case I is an uncommon feature. The bone marrow showed definite and marked leukaemic change, but other organs presented little leukaemic infiltration. The low white cell count may have been due either to the minimal leukaemic involvement throughout the body or to the destruction of the immature circulating cells by the spleen, itself not yet involved in the process.

It is worth noting that in both cases the peroxidase stain was essential for the correct classification of the immature cells, which might at first sight have been thought to belong to the lymphatic order.

We are indebted to Dr. J. H. Sheldon, honorary physician, and Dr. S. C. Dyke, pathologist to the Royal Hospital, Wolverhampton, for permission to publish these cases and for much helpful criticism.

S. M. Feinberg and others (*Ann. intern. Med.*, 1943, 18, 311), recording 8 cases of allergic reaction to injected liver extract, suggest that this type of allergy is not uncommon. Their tests indicated that it is neither a species specificity nor an organ specificity involving the usual protein antigen. They believe that the allergic response is to "a special fraction of an organ (liver) not bound with the ordinary protein fractions but associated with the anti-anaemia fraction."

THE DIETARY FACTOR IN REPRODUCTION AND LACTATION

BY

MARION B. RICHARDS, M.A., D.Sc.

(From the Rowett Research Institute, Aberdeen)

Any investigation into the causes of high infant mortality must take account of nutritional factors. Direct proof of the extent of their influence on human beings is hard to obtain, but by means of experiments on small animals, in which environment and diet are strictly controlled, it is possible to obtain valuable information regarding the effects of a deficient diet on breeding performance, and the possibilities of remedying the deficiencies by means of suitable supplements.

A recent breeding experiment on rats carried out at this Institute has given results which seem to be of considerable practical importance at the present time. This was a long-term experiment in which the females, mated at 100 days of age after being on their experimental diets from weaning, were carried through three successive matings. The object was to determine the effect on reproduction in rats of supplementing a poor human dietary by additions of inorganic calcium and vitamin B₁, given separately and in conjunction; to test the effect of dried yeast as a source of vitamin B₁ and other factors; and further to test the influence during the breeding period of an increased milk intake along with these supplements.

The basal diet was that employed in the growth tests on rats recently reported (*Journal*, 1943, 1, 161), and represents the average diet of households spending from 3s. to 7s. per head weekly on food. This diet contains milk equivalent to a weekly intake of 3 pints per person, and from the date of mating each group of rats was subdivided, half the animals, both male and female, receiving thereafter a doubled supply of milk.

Table I gives a brief summary of the results of the breeding test, combining the figures for three matings and rejecting animals which failed to produce three litters within six months. It is our practice to reduce all larger litters to 8 on the day after birth—a fact to be remembered in regard to the number of rats reared per litter.

TABLE I.—Showing Breeding Results for Three Consecutive Matings

Group	Dietary Supplements	Litters Born and Litters of 8 Reared	Aver. No. Born Alive per Litter	Aver. No. Born Dead per Litter	Aver. No. Reared per Litter Born	Aver. Weaning Wt. per Rat (Litters of 8) (g.)	Weights of Does	
							At First Mating (g.)	After Third Lactation* (g.)
IIA	—	24/4	6.9	0.8	5.4	33.6	185	228
II	Milk	30/14	8.8	0.5	6.3	39.1	186	255
IVA	Ca	27/13	8.6	0.3	6.9	35.1	202	239
IV	Ca + milk	21/14	9.2	0.5	7.4	40.5	196	273
IA	Aneurin	27/15	8.0	1.9	6.2	32.2	186	214
I	Aneurin + milk	27/14	8.7	0.4	6.8	38.7	185	243
IIIA	Ca + aneurin	33/17	7.9	0.6	6.5	36.5	193	258
III	Ca + aneurin + milk	27/18	9.9	0.4	7.1	41.9	186	268
VA	Ca + yeast	30/25	9.8	0.6	7.4	40.9	206	266
V	Ca + yeast + milk	33/23	9.8	0.8	7.0	45.8	209	302

* After rearing litters of 6 to 8.

Effect of Extra Milk

Comparison of the results for the various pair-groups shows at once the beneficial effects of the milk supplement. This is particularly evident in all groups in the weights of the young at weaning and in the weights of the does after lactation. The milk supplement has increased the average weight of each young rat in litters of 8 by approximately 5 to 5½ g., making an increase of 40 to 44 g. for the litter. At the same time the does, in spite of rearing this greater weight of young, have made a greater increase in their own weights. The milk groups show also in general a higher number of young born alive per litter, and a higher proportion of litters of 8 reared. This is especially marked in the basal group, in which the number of young per litter born alive is raised from 6.9 to 8.8 by

addition of milk, and the proportion of litters of 8 reared is raised from 1 in 6 to 7 in 15. In the groups receiving calcium and yeast the diet has already been so much improved by these additions that the further addition of milk shows its effect mainly in the weight of the young at weaning, and in the high weight and excellent condition of the does after lactation.

Additions of Calcium and Aneurin

Addition of calcium alone to the basal ration has had a pronounced effect in increasing the number of live young per litter and in raising the proportion of litters of 8 reared, but these increases are no better than those effected by the simple addition of milk to the basal ration, while the increase in the weaning weight of the young due to the calcium supplement is much less than that effected in any of the pair-groups by addition of milk.

Addition of aneurin alone is of doubtful value. There was a considerable improvement, it is true, in the number of live young per litter and in the proportion of litters of 8 reared; but, on the other hand, the percentage of stillborn was high (18.7), the average weaning weight of the young and the weight of the does after lactation were both less than on the basal ration, and the condition of the does was poor. Keeping in view these harmful effects, it would seem that caution must be exercised in the addition of vitamin B₁ to a poor diet. Such improvements as are effected by the aneurin addition can be more simply attained by a milk supplement, and the group receiving both aneurin and milk was no better than that receiving milk alone.

The addition of calcium as well as aneurin reduced the percentage of stillborn (cf. IA and IIIA), and increased both the weaning weights of the young and the weights of the does after lactation. The gradation seen in the weaning weights in Groups IIA, IVA, and IIIA—33.6, 35.1, and 36.5—is repeated in the corresponding groups with extra milk—39.1, 40.5, and 41.9.

Addition of Calcium and Yeast

Direct comparison of Group VA with Group IIA brings out very clearly the great improvement in the diet brought about by the addition of calcium and yeast. The number of live young per litter is increased from 6.9 to 9.8, the proportion of litters of 8 reared is raised from 1/6 to 5/6, while the average weaning weight per rat in litters of 8 is 7.3 g. more, representing an increase of over 58 g. for the whole litter. The addition of milk to the calcium and yeast group brings this increase per rat up to 12.2 g., making the weaning weight 45.8, which is approximately the average weight of a stock rat at weaning.

The groups receiving calcium and yeast were outstanding throughout the experiment. In their appearance and general performance, especially Group V, they were quite comparable with stock rats.

One of the most noteworthy points in the experiment was the striking difference in the condition of the does after lactation. In Groups IA and IIA some of the does were in such a limp and exhausted condition after rearing their litters that they had to be given a few days' rest before remating—a procedure which was unnecessary in the corresponding groups receiving the extra supply of milk. The differences in the condition of the does may be gauged by the differences in their average weights after rearing litters of 6 to 8 in the third mating. Thus in Group V the average weight of such does is 302 g., as compared with 228 g. and 214 g. in Groups IIA and IA.

The results indicate that the yeast supplement has made good certain deficiencies in the diet not already supplied by the calcium, milk, and aneurin, and that the simultaneous addition of calcium, yeast, and milk has converted a poor diet into one on which the breeding performance is on a par with that of stock rats.

Deaths during the Suckling Period

During these breeding tests it was noted that in a number of cases one or more rats in a litter died, without any apparent cause, within a few days of weaning age. These deaths occurred almost entirely in the groups receiving the unsupplemented basal ration, and in this respect the milk subgroup was no better than that without the extra milk. In Table II are given the number of deaths that occurred among the sucklings at

different periods, ignoring the first 24 hours after birth, when accidental deaths are apt to occur, especially with large litters.

TABLE II.—Deaths during Suckling Periods

Groups	Supplements	No. of Does	No. of Young		Deaths during Suckling			
			Born Alive	In Reduced Litters (after 24 Hrs.)				
					2-6 Days	7-11 Days	12-23 Days	Total
II and IIA	—	18	431	356	20	3	16	39
IV and IVA	Ca	16	425	354	8	3	0	11
I and IA	Aneurin	18	451	361	7	0	3	10
III and IIIA	Ca + aneurin	20	529	416	9	1	0	10
V and VA	Ca + yeast	21	615	458	4	0	0	4

Although it is not unusual to have deaths occurring in the first few days of the suckling period, it is to be noted that even at this stage they are appreciably fewer in the groups receiving supplements. Deaths in the later stages do not normally occur with healthy animals, and the high number occurring on the basal ration in the latter half of the suckling period is undoubtedly of significance. It will be seen that in the groups receiving Ca alone, Ca with aneurin, or Ca with yeast there was no death at all during this period. Further, in the yeast groups the total number of deaths is very small relatively to the large number of young reared, and there was no death after the first few days.

Conclusion

These records show clearly the importance of the diet in matters concerning breeding performance in animals in controlled environment, and indicate the large part it may possibly play in the problem of infant mortality in human beings. While it is disquieting to reflect that the basal diet used in these experiments is not that of the poorest classes in the community but is representative of the diet of large masses of our population, the fact that it may be radically improved, for experiments on animals, by the addition of such simple supplements as inorganic calcium, milk, and dried yeast gives ground for the hope that it may be similarly improved for purposes of human nutrition. Recent dietary surveys have indeed shown that the diet of pregnant and nursing women of this socio-economic group has been improved during the war by means of the milk priority scheme and by the introduction of national wheatmeal bread. Moreover, despite adverse housing conditions, restricted medical service, and an increase in the number of married women going out to work, the infant mortality rate in Scotland for 1942 fell to 69 per 1,000 live births, a figure equal to that for 1939, which was the lowest recorded up to that date; while in England and Wales the rate for 1942 was the lowest ever recorded. Our experimental results show the possibility of a connexion between these two sets of facts, and indicate how further improvements in the diet may be effected. At the same time they provide useful pointers for the post-war feeding of the starved populations in Europe.

METALLIC INTERNAL FIXATION OF FRACTURES IN AIR-CREW CASES

BY

N. VERE-HODGE, M.B., B.Chir., F.R.C.S.

Squadron Leader, R.A.F.V.R.

Internal fixation of fractures with metal plates and screws has been coming more and more into use for several years, with the result that an ever-increasing number of men are working with metal plates and screws in their limbs. Until recently the metals available showed a slight reaction within the body tissues, though not necessarily enough to interfere with their usefulness. Within the last ten years an alloy—vitallium—has been produced which is inactive in body tissues.

The discovery of vitallium has given further impetus to the use of metal internal splintage of fractures. During the present war a very large number of fractures have occurred