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

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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

in men of the younger age groups. It is vitally important to the war effort that they should be returned to duty as soon as possible and with the minimum functional disability. It is with this end in view that certain types of fractures are being treated with internal fixation by vitallium plates and screws. In the R.A.F. many air-crew fracture cases have been treated with vitallium plates and screws. After the stage of full rehabilitation has been reached the airman returns to his unit to resume flying. In consequence numerous air-crew members are now regularly flying with large metallic plates and screws retained in their limbs.

The purpose of the present inquiry is to make certain that these men are not a menace to the other members of their air-crew by upsetting the compass readings on account of their "personal" metal.

The Investigation

Vitallium is now most commonly used, when available, owing to its superior properties. However, when not available stainless steel is found to be the next best material. For the purpose of this investigation two sets of these materials were tested: (i) a 14-hole stainless-steel plate 7 in. long and 5 stainless screws $1\frac{1}{2}$ in. long, such as might be used for a fractured femur or a fractured tibia; (ii) a vitallium plate $5\frac{1}{2}$ in. long and 4 vitallium screws $1\frac{1}{2}$ in. long, such as might also be used for a fractured femur or tibia.

The two sets of metal were tested for magnetism in the following way: First, (i) and (ii) were tested for their effect on an aircraft compass: no effect was discernible. Secondly, attempts were made to magnetize each component of (i) and (ii) separately, stroking with a permanent magnet. (i) and (ii)

Photograph of vitallium and stainless-steel plates and screws.

were then tested for their effect on an aircraft compass, and again no deviation was discernible. Thirdly, the components of (i) and (ii) were treated by a high-power remagnetizing plant. After this treatment (i) and (ii) were retested for their effect on an aircraft compass. The position adopted in relation to the compass needle was with the nearest end of the component 6 in. distant from and level with the centre of the compass bowl, with the ends of the component under test at right angles to the axis of the compass needle. Three days were allowed for natural demagnetization. At the end of three days the results were:

		Compass Deviation*	
(a) Stainless steel plate		+2°	-2°
(b) Stainless steel screws, No. 1		nil	nil
" " " No. 2		+2°	-2°
" " " No. 3		nil	nil
" " " No. 4		nil	nil
" " " No. 5		+2°	-2°
(c) Vitallium plate		nil	nil
(d) Vitallium screws		nil	nil

* Second figure obtained with polarity reversed.

From these tests it is found that the stainless-steel plate, though difficult to magnetize, after being magnetized has an appreciable effect upon a compass, and it cannot be

demagnetized by ordinary methods such as mechanical vibration or striking with a hammer. Although two of the stainless-steel screws retained their magnetism for three days to the same extent as the plate, they are likely to lose it in a short time, as the other three screws did. The vitallium plate and screws could not be magnetized by these powerful methods.

To complete these tests several airmen with stainless-steel or vitallium plates and screws in their upper or lower extremities have been tested against an aircraft compass. In all cases there has been no deviation of the compass needle.

Conclusions

These tests show that vitallium plates and screws are entirely safe as regards magnetism when used for treatment of fractures in men who fly aircraft.

Stainless-steel plates and screws are magnetized only with the greatest difficulty, and then tend to lose their magnetism gradually. When handled by the usual surgical methods it is extremely unlikely that they would affect an aircraft compass.

As a result of the tests on the magnetic properties of these metals, surgeons should feel quite justified in leaving any vitallium or stainless steel in the limbs of their fracture cases, and there is no indication for removal of either of these metals before returning the men to full flying duties.

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Medical Memoranda

Incidence of Syphilis among Juvenile Defectives

The following is a record of the blood Wassermann reaction of juvenile patients admitted to the Fountain Hospital from the years 1938 to 1942 inclusive. All were mental defectives, mostly of the lowest grade.

Year	Admissions	Positive W.R.	Average Age
			yrs. mths.
1938	80	—	4 3
1939	175	2	7 7
1940	98	—	4 6
1941	45	2	4 9
1942	114	—	4 9
Total ..	512	4	5 6

These results are of interest because of the low incidence (0.78%) of syphilis that they reveal, and they provide some evidence on the question of the general incidence of syphilis. Many of these patients have parents with some degree of amentia, and it might be expected that a general increase in syphilis would particularly affect these members of the population and would be reflected in an increase of congenital syphilis in their children. However, the figures indicate that congenital syphilis is not now the important factor in the aetiology of low-grade amentia that it formerly was, for it seems that among older mental defectives a positive blood W.R. is much commoner than in this group.

Syphilis would therefore appear to be decreasing among the parents of mental defectives, although a possible alternative explanation of the results is that an increasing proportion of mothers may be seeking ante-natal examination and receiving successful treatment if syphilitic.

It is interesting to note that extremely inconsistent results have been obtained by different observers in this matter. Penrose (1933) gives a table of findings of positive W.R. in groups of defectives varying from 1.5 to 55%, the smallest percentages being in the largest groups. Other authorities seem to regard 10% as a fair average.

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