XXXIX. A MODIFICATION OF BASAL DIET FOR RAT FEEDING EXPERIMENTS.

By MURIEL BOND.

*From the Physiological Laboratory, London (Royal Free Hospital)
School of Medicine for Women.*

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CASEINOGEN, the usual protein constituent of a basal diet for rat feeding experiments, possesses several disadvantages. Owing to its natural association with milk fat it is difficult to render it free of fat-soluble *A*—if the purification be done by alcohol and ether extractions the cost of the material is greatly increased, and if the caseinogen is treated by the Drummond method [Coward and Drummond, 1921], careful supervision is required to ensure a proper oxygenation and a constant temperature. In addition it often seems impossible when using caseinogen to obtain a deficiency curve, although apparently no fat-soluble *A* is present in the diet. The rats continue to grow steadily and seem apparently healthy.

In view of these difficulties which were experienced while investigating the fat-soluble *A* content of certain foods, some rat feeding experiments were started, in which for the caseinogen dried egg white was substituted. Dried egg white, unlike caseinogen, contains very little associated fat and if it is an adequate protein when used in a percentage similar to that normally used for caseinogen, would be considerably cheaper.

The first series of experiments was done with a diet containing 30 % protein—instead of the usual 20 %—as analyses of egg white have shown it to be somewhat deficient in tyrosine.

When the diet was first used the dried egg white was crushed and the dry protein mixed with the other ingredients of the diet. It was found, however, that on this diet many of the rats developed diarrhoea and little or no growth was obtained. A diet was then tried in which the dried egg white was soaked overnight in tap water and the solution gently heated to coagulate the proteins. While heating the solution it was constantly stirred and the broken clot was then mixed with the other constituents. A fairly solid mass was thus obtained, which was readily taken by the rats and was satisfactorily digested¹.

The experiments were carried out on young healthy albino rats, weighing about 40–60 g. at the beginning of the experiments (see Fig. 1). Usually the

¹ Subsequently I read Bateman's paper [1916] on the digestibility of egg proteins and find that his results and mine are completely in accord.

young rats were fed on bread and milk for about a week previously and any animal not showing a decided gain in weight during that time was discarded. The rats were fed twice daily—usually at 9 a.m. and 3 p.m.—and were weighed twice a week. The amount of food given was so arranged that there was still a little left uneaten when a fresh quantity was due.

Each litter was divided into two groups. One group received diet *A* and the other group diet *B*.

	Diet A	Diet B
Soaked and cooked egg white	30 g.	30 g.
Salts (Hopkins' mixture) ...	5 g.	5 g.
Marmite	5 g.	5 g.
Strained lemon juice	5 cc.	5 cc.
Potato starch	40 g.	40 g.
Fat { butter	15 g.	—
{ hardened cotton seed oil	—	15 g.
Water to drink	<i>ad lib.</i>	<i>ad lib.</i>

The rats on the *B* diet showed a growth curve, which in a few weeks began to flatten out. These rats also frequently suffered from eye inflammations. The rats on the *A* diet grew well, appeared to be healthy and when they were mated reproduction was obtained (Fig. 1). In this series of experiments 20 rats were used.

Fig. 1. Litter of 6. Feeding extending over 8 weeks, *A* and *B* diets.

The results of feeding the lactating rat and her growing young on the egg white diet are not very conclusive. One litter has been successfully reared on this diet, but as a rule it was found that the young died about the 20th–30th day after birth, and the mother became ill unless the diet was changed to one of bread and milk as soon as the young rats began to move about the cage.

This is probably due to the large proportion of protein in the diet [Hartwell, 1921, 1922]. Hartwell has shown 30–40 % protein to be excessive during lactation, although the experiments described by her are somewhat different from those described here.

1. In the experiments described in this paper the diet used for the lactating rats always contained all the necessary food factors and had been given to the mother rats during growth and gestation.

2. The egg white used has been soaked and cooked, whereas in the cases quoted by Hartwell, the protein was used crushed, dry and uncooked. This condition of the egg white in itself frequently leads to diarrhoea and death in non-lactating and non-sucking rats.

3. The unhealthy symptoms were not observed as early as in her experiments—the young rats always having begun to move about the cage and get food for themselves before they began to show signs of weakness. The characteristic spasms and screaming fits observed by Hartwell were never noticed, but the young rats became less active, were cold and died after a period of coma. Weighing of the young rats was not carried out so that it is not possible to say when growth ceased.

A second series of experiments is now in progress, in which the rats are receiving a diet containing only 20 % egg white. This is a diet comparable to that normally used, but with the substitution of egg white for caseinogen. The growth of rats on the 20 % diet is being compared with that of rats on the 30 % diet and so far no signs of inadequacy can be detected among the rats on the lower protein diet. There has not yet been time to ascertain whether this 20 % diet is adequate for reproduction nor whether it is more satisfactory than the 30 % diet during lactation.

A point in favour of egg white as a source of protein seems to be the constancy with which, when this material is used, the characteristic flattening of the growth curve is obtained if the diet be deficient in fat soluble A—a constancy not always obtained when caseinogen is used.

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