

## LITERATURE

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# THE EFFECT OF A IODINATED CASEIN FRACTION ON THE MILK YIELD OF GOATS <sup>1)</sup>

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## SUMMARY

MØLLGAARD has advanced the idea that iodinated casein might contain two hormones, one being thyroxine, stimulating metabolism, and the other a factor only effecting an increase in milk yield. Experiments made by POULSEN with lactating goats seemed to confirm this view. Our experiments do not agree with these ideas. The effect of iodinated casein and the so-called thyroxine-free lactogenic factor (fraction B), isolated from hydrolysed iodinated casein, was investigated by experiments on a number of lactating goats. The effect on milk yields was favourable though somewhat variable. Also an increase of the butterfat yield was clearly noticeable where fraction B was administered. The increased milk yields declined rapidly as soon as the injections were discontinued. Live weight diminished during the experiments by about 10 percent on an average and heartrate and body temperature were noticeably increased.

The results obtained with fraction B were in no way more favourable than those obtained with iodinated casein.

## 1 INTRODUCTION

Amongst the hormones applied experimentally in livestock nutrition and in some countries also in dairy farming, the thyroid hormone thyroxine is to be mentioned in the first place. Administration to lactating animals usually takes place as iodinated casein and in doing so it can exert a very favourable influence on the milk yield as well as on the butterfat yield. A temporary increase of 20 percent and over in milk yield is no exception.

By administering iodinated casein, viz. thyroxine, metabolism is intensified, the increase of the milk and butterfat yield being one of the symptoms, as far as not inhibited by other factors. Other, less desirable consequences of the administration of iodinated casein are: an increased heartrate and higher body temperature, loss of weight and possibly some other symptoms indicative of hyperthyroidism. Besides, after the administration of iodinated casein is dis-

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continued the yield may drop to such an extent that the preceding increase is entirely or partially annihilated.

It is easily understood that, when weighing pros and cons, the appreciation of the suitability of iodinated casein for livestock nutrition will not be the same. This is also due to the fact that, though experiments usually show the same trend, results vary quantitatively when iodinated casein is administered. BLAXTER's (1949) and SIMONNET's (1950) surveys pay attention to this feature. In the Netherlands the application of iodinated casein in dairy farming is considered with some reservation. Nevertheless SCHUURMANS (1949), whose experiments with iodinated casein on lactating cows clearly showed an increased yield without the occurrence of accompanying less desirable symptoms, is of the opinion that administration of iodinated casein is not to be recommended for the time being. Experiments made by FRENS (1951) showed that with a moderate dose of iodinated casein favourable results can be reached, provided the dose be gradually reduced during a weaning period at the end of the experiment. Also BROUWER (1950) urges that caution is needed in this regard. Finally there are other reasons of an entirely different nature why the use of iodinated casein should not be stimulated in livestock feeding. An increased milk yield can only be maintained if higher rations are given simultaneously. The concentrates situation is not so satisfactory in the Netherlands that stimulation of the production by administering iodinated casein could be considered.

Conditions would, however, improve if the problem of yield increase could be disconnected from intensified metabolism. In Denmark experiments have been made to this effect. Partly based on experiments made by MANSFELD (1943) who is inclined to accept three other hormones in the thyroid gland side by side with thyroxine, MØLLGAARD developed the theory that stimulation of metabolism and increased milk yield are not effected by the same hormone. He presumes that in iodinated casein — the same as in the thyroid gland — different hormones occur, one of which would be responsible for the increase in yield, another one (thyroxine) stimulating metabolism. When the thyroxine is removed from iodinated casein, another fraction would be left behind which exerts a favourable influence on the milk yield without the occurrence of any less desirable other symptoms of either iodinated casein or thyroxine. In order to test the value of this theory POULSEN (1949) made a series of experiments on lactating goats. He investigated the effect of two fractions prepared from iodinated casein on the yield and the live weight. The results confirmed the theory of MØLLGAARD and they implied that administration in practice of one of these stimulants, though in a modified way, did not at all seem excluded in the future.

In order to come to a conclusive opinion we repeated some of these experiments in 1950.

## 2 METHODS

For a detailed description of the preparation of iodinated casein we refer to the circumstantial survey by REINEKE (1946) and to the original publication by POULSEN (1949). In segregating the thyroxine fraction A and the thyroxine-free fraction B from iodinated casein we followed the procedure as indicated by POULSEN. Fraction A is prepared by precipitating thyroxine from the hydrolysed iodinated casein as a barium salt. By bringing the pH-value to 5.0 by

means of hydrochloric acid and acetic acid fraction B is precipitated in the residual solution. It is washed out with water and subsequently dried and powdered.

The original intention was to test only the favourable influence of the B fraction as described by POULSEN. At the end of our experiments we did yet administer the original iodinated casein to a number of goats. POULSEN'S experience in administering the thyroxine containing fraction A had been so unfavourable that repeating was far from attractive.

In ascertaining their milk and butterfat yield, live weight and also their body temperature and heartrate, eight goats were subjected to administration of the B fraction, four to iodinated casein. The milk yield was weighed every day, the butterfat content was determined from the aggregate sample of one week according to GERBER, live weight, temperature and heart-rate being verified at regular intervals. The experiments have been made with the goats individually as soon as it became evident that each animal got over its peak of lactation. At the start 0.3 g of the B fraction, dissolved in an isotonic solution, was daily injected intra-muscularly; for some animals the daily dose was later increased to 0.5 g. The dose of iodinated casein was 2-3 g every day and it was administered orally. The experiments were carried on, varying from 2 to 5 weeks. The animals were constantly stabled and their daily rations consisted of grass and hay. Dependent on their yield and live weight concentrates were added, the amount of which was fixed once a week.

### 3 RESULTS

The results concerning yield and live weight are summarized in Table 1. The surplus yield during the experiments is expressed in percentages of the average yield recorded during the periods before and after the experiments. This method would not have been correct in case a clear and prolonged after-

Table 1. The effect of B fraction and of iodinated casein on the milk yield and live weight.

B fraction				
Number	Days × dose	Milk %	Fat %	Live weight %
1	21 × 0.3 g	+ 3	+31	-16
3	14 × 0.3 g	+16	+29	- 9
8	21 × 0.3 g	+20	+21	- 9
5 <sup>1)</sup>	21 × 0.3 g	- 2	+33	- 3
6 <sup>1)</sup>	21 × 0.3 g	-14	0	-15
9	7 × 0.2 - 14 × 0.3 - 7 × 0.1 g	+14	+15	- 4
10	21 × 0.3 - 7 × 0.2 - 7 × 0.1 g	+ 6	+14	- 1
1	21 × 0.5 - 7 × 0.3 - 7 × 0.1 g	+19	+61	- 8
4	21 × 0.5 - 7 × 0.3 - 7 × 0.1 g	+ 7	+35	-19
Iodinated casein				
2	14 × 2 - 14 × 3 g	- 3	+11	const.
9	14 × 2 - 14 × 3 g	+18	+10	"
3	14 × 2 - 14 × 3 g	+38	+26	- 5
8	14 × 3 g	+21	+22	+ 4

1) Showed stiffness after injection.

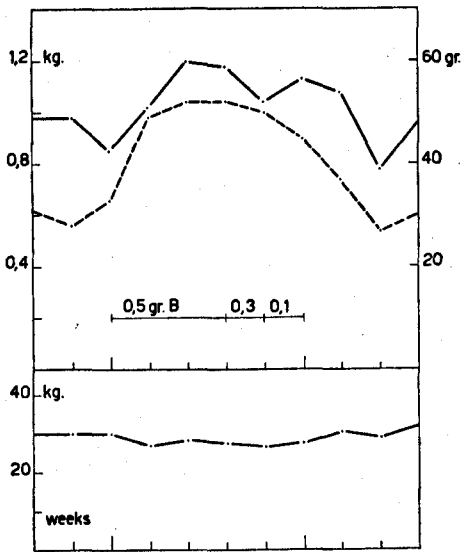


FIG. 1. GOAT 1.

Upper part: milk (—) and milkfat (- -).  
Lower part: live weight.

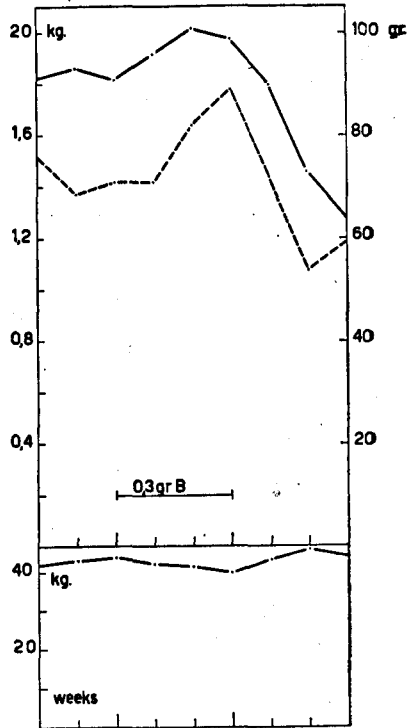


FIG. 2. GOAT 8.

Upper part: milk (—) and milkfat (- -).  
Lower part: live weight.

effect of the hormone had been noticeable. Since this only occurred in the case of goat 5, whose milk production increased for another 2 weeks after the termination of the experiment, this procedure does not give rise to any serious objections. The influence on the heartrate and body temperature are not mentioned separately. For barring one exception, the effect both of the B fraction and the iodinated casein was clearly noticeable; during the experiments the heartrate increased by 15% and the temperature by 0.2 to 0.8° C.

It is evident that the milk yield is perceptibly — though variably — affected. The less favourable results shown by the goats 5 and 6 may be linked with the fact that they suffered from stiffness after the injections. On an average the effect on the butterfat yield is more pronounced as is also frequently the case in experiments with iodinated casein. The extra milk or butterfat yield was not always due to increasing yields during the experiments but to a stabilization of the yield which showed a decline in the periods before and after.

In the post-experimental period a decline was usually clearly noticeable in the first week. After-effects of two weeks duration occurred in only one case. Graph 1 and 2 show the trend of the yields produced by goat 8 (tested for the first time) and goat 1 (tested for the second time).

The loss of weight varied between 1.5 and 5 kg. The percentage of loss of weight of the goats 9, 10, 1 and 4 is misleading because these animals had started to recover as soon as reduced doses were applied during the last

few weeks of the experiments. In the other cases the loss incurred during the experiments was readjusted in the post-experimental period.

The results obtained with doses of iodinated casein, considered moderate for goats, are in the aggregate not less favourable than those issuing from the B fraction. The assumption that this B fraction contains only a lactogenic factor, which merely stimulates the milk and butterfat yield, whereas iodinated casein also contains thyroxine whose less desirable secondary effect is stimulation of metabolism, manifesting itself in an increased heartrate and body temperature and a simultaneous decrease of body weight, is therefore in no way confirmed by our results.

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