LETTERS TO THE EDITORS

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Œstrogens in Grass and their Possible Effects on Milk Secretion

STUDIES of variations in the composition of cows' milk[1,2] have revealed a progressive decline in the non-fatty solids content during the winter months, followed by a substantial and immediate rise when the cows are turned out to grass in the spring. Also it is widely recognized that on 'going out to grass' cows often show an increase in milk yield, greater than the amount ascribable to the extra nutrients ingested.

Attempts to simulate these (galactopoietic) effects of spring grass on milk yield and composition by liberal supplements of carbohydrate, protein or carotene to the ordinary winter rations of cows gave no response, though the characteristic effects were shown when these cows were later given access to spring pasture[2]. It therefore seems reasonable to conclude that these effects are due to the presence in young, rapidly growing grass of a galactopoietic factor such as a hormone or vitamin.

In speculating upon the nature of this postulated galactopoietic factor, we were impressed by the findings of Bennetts and his collaborators[3,4], who observed, in sheep grazing on subterranean clover in Western Australia, histological changes in the reproductive organs of both sexes which pointed to the presence of an œstrogen in the pasture, a conclusion which was later strengthened by the extraction of œstrogen by chemical methods[5]. These findings, taken in conjunction with those of Folley and his co-workers[6,7], who showed that administration of œstrogens will increase the solids content of cows' milk (enrichment effect), indicated the possibility that part at least of the galactopoietic effects of spring grass at the time of maximum growth might be due to the presence of œstrogens. Such a theory would also account for milk yield increases, since the 'enrichment effect' is only one aspect of a general galactopoietic action exerted by œstrogens under suitable conditions[8]. We were thus led to examine the growing herbage of English dairy pastures for the presence of œstrogen.

Samples of herbage cut from a number of pastures during the period of active growth were extracted by a method developed by Mr. T. J. Robinson details of which were kindly made available by him in advance of publication. The method involves extraction with ethanol, followed by saponification and separation of the phenolic fraction. The extracts were tested for œstrogenic activity by the effect on the weight of the uteri of immature mice, six mice being used in each group. The extracts were dissolved for injection in arachis oil, and the dose given in six subcutaneous injections over three days, with autopsy eighteen hours after the last injection.

The results are noted in the accompanying table; the first series (Nos. 1–7) refers to tests of grasses cut at the early flowering stage in May 1948 at a time when, though plant growth was restricted by adverse weather conditions, cows grazing the pastures showed moderate increases in milk yield and non-fatty solids. The second series (Nos. 8–14) refers to herbage from a number of pastures at the second seasonal cutting on June 23, 1948, and to a hay which was a year old and was included for comparison. This herbage was in the pre-flowering stage. Extracts of the two grass samples in the first series (Nos. 2, 3, 4 and 5) gave significant uterine weight increases over the controls ($P < 0.05$), and the herbage undoubtedly contained œstrogen. The second series demonstrated œstrogen with certainty in the clover (No. 12) and probably in the grasses (Nos. 10 and 11), while the hay (No. 13) was negative.

Serial No.	Treatment	Mean uterine weight (mgm.)
	First series	
1	None	7.8 ± 0.8
2	Grass No. 1: Extract equiv. to 0·75 gm. dry matter	14.2 ± 1.1
3	,, ,, ,, 1·50 ,, ,, ,,	24.5 ± 2.4
4	Grass No. 2: Extract equiv. to 0·75 gm. dry matter	19.6 ± 1.7
5	,, ,, ,, 1·50 ,, ,, ,,	20.0 ± 1.2
6	0·03 μgm. α-œstradiol	23.0 ± 1.8
7	0·06 μgm. α-œstradiol	29.3 ± 3.0
	Second series	
8	None	5.3 ± 0.4
9	Arachis oil	6.4 ± 0.5
10	Grass No. 3: Extract equiv. to 0·75 gm. dry matter	8.8 ± 0.9
11	Grass No. 4: Extract equiv. to 0·75 gm. dry matter	9.9 ± 0.8
12	Clover ,, ,, ,, 0·75 ,, ,, ,,	15.1 ± 1.0
13	Hay ,, ,, ,, 0·75 ,, ,, ,,	6.3 ± 0.8
14	0·03 μgm. α-œstradiol	17.4 ± 1.5

These preliminary results are in harmony with the theory that the galactopoietic effects of spring grass in lactating cows may be due to the presence of œstrogen, and justify further work, which is planned, to examine various aspects of the theory in greater detail.

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Atypical Growth, Abnormal Mitosis, Polyploidy and Chromosome Fragmentation Induced by Hexachlorocyclohexane

THE best insecticides and fungicides will be those which kill the plant parasites without affecting the plant organism. In fact, they all affect the host plant more or less in various ways and degrees[1–4]. A series of fungicides and insecticides may have very similar effects on the plant organisms. Ethylmercury-chloride (CH_3CH_2HgCl), which is the active substance (2 per cent) of the fungicide 'Granosan', induces atypical growth, abnormal mitosis and polyploidy[3,4], reminding one of the effect of colchicine