EFFECTS OF SUPPLEMENTARY FEEDING ON REPRODUCTIVE FUNCTIONS OF SMALL RUMINANTS

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By

TOTTI TJIPTOSUMIRAT
(National Atomic Energy Agency, Indonesia)

Department of Biochemistry, Microbiology and Nutrition
University of New England
Armidale, NSW 2351
Australia

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SUMMARY

Animal nutrition and reproduction are two major components that are interrelated. To increase animal production, manipulations of those components should be emphasised. Many earlier findings have indicated that nutrition could alter reproductive functions by changing the body metabolic status or by increasing body reserves status of the animal. These two effects of nutrition are known as the 'dynamic' and 'static' effects. Increased animal production, with emphasis on animal nutrition, is reviewed (Chapter 2) in several stages of the animal's life (ie. cyclic or oestrous, pregnant, lactating and anoestrous). Also the manipulation of the reproductive system by the manipulation of reproductive hormones is discussed in relation to increased productivity. The use of several exogenous synthetic reproductive hormones indicate that there are possibilities for improving some reproductive traits both with and without any concern with the nutritional status of the animal. When on animal is in the stage above critical level (ie. above maintenance) and the availability of feed is not a problem, improvement in productivity may be possible, whilst additional attention to nutrition is necessary for improvement when feed is inadequate.

In this thesis a series of experiments is reported and most of these experiments were carried out in the field, stressing the effects of protein supplementation. The experiment in Chapter 3 utilised cycling ewes. The aim of this experiment was to monitor by observing the number of corpora lutea, whether cottonseed pellets (CSP; 40% bypass protein) supplementation for the period of two oestrous cycles would alter ovulation rate. Animals were grazed on improved pasture on a rotational basis with initial pasture availability of 1.45 tonnes DM/ha. Results from this investigation indicated that CSP supplementation did not perturb ovulation rate during the supplementation period and no residual effects were found on ovulation rate after supplementation cessation. In this experiment there was an indication that energy supplementation is also required to alter ovulation rate, besides additional protein, since liveweights of all experimental ewes were not significantly different.

The next experiment, Chapter 4, utilised lactating ewes, rearing either single or multiple litters out of the breeding season. The objective of this investigation was to assess whether protein supplementation of anoestrous ewes could influence the onset of oestrus; and to assess this, changes in the sensitivity of the pituitary gland to exogenous gonadotrophin releasing hormones (GnRH) were observed. The sensitivity of the pituitary

to exogenous GnRH was determined by measuring the level of plasma luteinizing hormone released from the pituitary gland. Animals were grazed on improved pasture on a rotational basis with initial pasture availability of 1.5 tonnes DM/ha. Oaten chaff (OC) was provided as an additional basal diet to these ewes. Urea supplementation, as the source of non-protein nitrogen, was compared with CSP supplementation, as the source of bypass protein. Results from this investigation showed that neither onset of oestrus nor ovarian activities changed due to supplementation. However, pituitary sensitivity to exogenous GnRH of experimental ewes fed with OC+urea showed greater response as compared to the other two treatment groups. However, this change was not followed by more ewes ovulating and showing oestrus in the next observation as indicated by no significant difference in the ovulation rate nor in the proportion of ewes showing oestrus compared to other treatment groups.

In Chapter 5, two experiments were conducted. The first experiment, as a laboratory trial, aimed to identify an appropriate mixture of supplements using agricultural by-products located in Central Java, Indonesia. From this experiment a mixture of urea-multinutrient-molasses block (UMMB) and ground soybean (GS) supplemented to Ettawa crossbred (ECB) goats significantly stimulated rumen microbial growth and rumen ammonia. Therefore, this supplement was used in the second experiment, a field trial. The latter investigation here aimed to determine a strategic supplementation *pre* and *post partum* of pregnant goats fed cut-and-carry grass/forages/shrubs as basal diets which would improve their reproductive performance. Supplementation feeding commencing at day 120 pre parturition and ceased on 40 days after parturition was the best system increasing reproductive performance of ECB goats by increasing kid birth weight and reducing the mortality percentage. However, this UMMB and GS supplementation did not stimulate ovarian activity *post partum* of ECB goats.

Most of the supplement feeding systems in this series of experiments were focusing on the effects of protein supplementation, either by bypass protein or via the stimulation of microbial growth. The maintenance of energy was assumed to be fulfilled from utilisation of basal diets fed to the animal during the experimental period. Environmental factors were beyond control as experimental treatments, and so experiments in Chapters 3 and 4 gave results contrary to those of previous studies, as discussed in Chapter 2.