FARM ANIMAL PROFILES

These assays are performed on a group of animals *(six)* and are used in the flock and herd situations. They have two prime functions :-

1. **MONITORING**
2. **DIAGNOSIS**

At no stage are the tests involved intended to constitute a definitive biochemical analysis to produce a specific diagnosis and it is hoped that the results will confirm the predictions of the veterinarian. Monitoring and diagnosis are not mutually exclusive but the groups chosen for testing are different. For monitoring six normal animals are required while for diagnosis six abnormal animals are chosen.

Prior to any profile being considered a detailed history of the group is necessary. Profiles are appropriately thought of as adjuncts to conventional considerations of feeding systems, feed stuffs, herd/flock records, management practices and clinical conditions.

MONITORING

INPUTS to the herd or flock

(i) Feeding and food analysis for the group and the individuals tested.
(ii) Housing and animal comfort.
(iii) Management including routine antelminthic and prophylactic measures.

PRODUCTION

(i) ***Dairy Cattle***

Individual

(a) Yield
(b) Age
(c) Stage of Lactation
(d) Condition Score

Group

(e) Yield Actual and predicted
(f) Milk Quality

(ii) ***Beef Cattle and Sheep***

a) Stage of Lactation
b) Stage of Gestation
c) Number of Foetuses

(iii) ***Young Stock***

a) Growth Rate of Stock

DIAGNOSIS

i. Previous losses of production
ii. Previous disease patterns
iii. Current patterns and incidence of abnormality

For routine monitoring of Dairy Cows it has been established that the groups to be tested are cows which have been calved four to eight weeks and those which are dry. The former group are still approaching peak lactation and can be considered as reacting to the diet and management they are receiving and as such should demonstrate any shortcomings in their blood biochemistry and rate of condition loss. Also corrections at this time will have effects throughout the complete lactation. Post peak cows, by definition, have adapted and stabilised and will show little remarkable in their blood pictures though consideration of their yield regression should give pointers to their level of feeding.

Dry cows can be checked for minerals and trace elements *(see below)* and also for body condition.
Cattle take two to three weeks to adjust to new rations and meaningful results can only be obtained after such time has elapsed. Optimum testing would therefore be carried out :

i. In Autumn after housing and the full winter ration is being fed
ii. Mid/Late Winter as a check on feeding adequacy
iii. Early to mid grazing season

If herds are being sampled regularly they should be sampled at the same time of day but of more importance at the same time relative to milking and feeding. It may be thought that the components of the tests are related to specific

aspects of the animals' biochemical make-up but there are many interrelationships which must be appreciated before decisions can be made on the results obtained. Diagnostically the tests are likely to be more useful when greater than acceptable deviations from normality have
occurred.

REASONS FOR SAMPLING

Dairy Cattle
Poor yields both in quantity and quality, infertility, poor cow condition, ketosis, milk fever, hypomagnesemia, fatty liver syndrome.

Beef Cows
Inadequate yields, infertility, poor cow condition, hypomagnesemia.

Cattle Followers and Calves
Infertility in heifers, poor growth rates, still births and goitre, white muscle disease, calfhood diseases and increased mortality.

Sheep
Low fecundity, toor ewe condition, twin lamb disease, hypocalcaemia, hypomagnesemia.

Lambs
Inadequate birth weights, poor growth rates, pine; sway back, white muscle disease, increased mortality.

COMPONENTS OF THE PROFILES

Energy Status

Beta Hydroxy Butyrate BHB
Being formed when fat is mobilised for energy, the level of BHB, with other ketone bodies, increases with underfeeding The level is closely related to energy status when there is a high demand for glucose, i.e. during late pregnancy and lactation. BHB does not increase with stress.

Non esterified Free Fatty Acids NEFFA
Long chain fatty acids also released when fat is hydrolysed as a response to underfeeding. The level is a useful indicator of energy status but this level is subject to considerable variation both diurnally and with feeding. Levels also increase rapidly with stress and excitement. NEFFA increases markedly in late pregnancy and early lactation, before BHB, and when Fatty Liver Syndrome is present.

Protein Status
Protein digestion in the ruminant is a two stage process.

Rumen Degradable Protein RDP
RDP is microbially degraded to ammonia which is then taken up by another group of microorganisms to produce microbial protein which is digested on reaching the small intestine. The rate of ammonia uptake is energy dependent.

Undegradable Protein UDP
UPD passes through the rumen and is digested in the small intestine.

Urea *(Blood Urea Nitrogen)* ***(BUN)***
Plasma Urea levels are derived mainly from ammonia produced in the rumen. There are three main factors which can cause an increase in urea.

i. A gross increase in protein intake
ii. A relative increase in RDP
iii. A decrease in energy which results in less free Ammonia being taken up by the microorganisms in the rumen

It is obvious that there is no simple correlation between urea levels and the dietary protein status. Swedish workers have produced promising results by correlating dietary sufficiency in carbohydrate and protein with estimations of acetone and urea in milk in early and mid lactation cows. *Albumin* This is synthesized in the liver but does not constitute a protein store. Blood levels reflect long term protein and UDP uptake but also long term energy status. Low levels of milk protein *(below 3.1 %)* also indicate inadequate intake of energy and UDP. Low levels of Albumin can be due to :-

i. Inadequate protein intake
ii. Recently corrected protein intake. Urea responds rapidly but albumin response is a slower process
iii. Inadequate energy intake resulting in depressed uptake of ammonia in the rumen
iv. Chronic liver damage as in Fascioliasis and impairment of liver activity as seen in fatty liver syndrome

v Chronic intestinal parasitism as seen in young stock

Haemoglobin and PCV
These are both useful indicators of protein status. They are dependent on synthesis and therefore have a lag period before recovery takes place following diet corrections.

Minerals
Calcium,
Magnesium,
Phosphorus.
With well constructed diets there should be a minimal problem due to deficiencies of these minerals. Problems do occur mainly when animals are outside on grass in the Spring and Autumn. Interference with the uptake of Magnesium is well known on high Potash swards. High incidences of Milk Fever will occur when dry cows receive only Autumn grass. It is well supplied with Calcium but low in Magnesium. Fed exclusively on the same pasture which is also inadequate for energy, hypomagnesemia will also occur in suckler cows. Cold weather constitutes the most important stress factor and in sheep the sudden deprivation of food can precipitate both hypomagnesaemia and hypocalcaemia. Mineral profiles are appropriate to single, affected animals for confirmation of the clinical entity and other members of the group can then be tested.

Trace Elements + Vitamins
Cobalt/B12,
Copper,
GSH-Px/Selenium,
T4/Iodine.
These elements and vitamins are well supplied by concentrate rations and should therefore be estimated when animals are receiving none. This applies to dry cows, ewes up to mid pregnancy and to growing animals on grass. These are the times when trace elements are most vital - during the growth and development of the foetus and the growth of young stock. It is also the most beneficial and cost effective time to correct any deficiencies. Blood results are used in conjunction with previous or present clinical conditions. Supplementation with copper without estimation runs the very real risk of Copper poisoning.

Apart from well known syndromes deficiencies of these trace elements and vitamins can lead to increased incidence and seriousness of commonly occurring diseases in young stock.

The blood levels attained are influenced by the absolute ability of particular foodstuffs, both concentrate and forage, to supply them and this can further be markedly influenced by geographical location *(soil type)* and grassland management. Knowledge of such factors is of paramount importance.

OTHER ENZYMES

Glutamate Dehydrogenase GLDH

Gamma Glutamyl Transferase γGT
In ruminants GLDH is the enzyme of choice as an indicator of hepatic cell damage.
γGT occurs at high levels in the cell membranes of hepatocytes and bile duct cells and raised serum levels occur with cholestasis.
GLDH levels are raised in the early parenchymatous stages of Fasciola hepatica while γGT is raised in the chronic stages involving fibrosis of the bile ducts.

ANTIBODIES

Infectious Bovine Rhinotracheitis *(IBR)*

Leptospira hardjo
Infections by both these agents can cause dramatic falls in milk yield. Other characteristic clinical signs are normally present but it is prudent to include both infectious and nutritional causes as a possibility when investigating such a downturn in the economy of a dairy farmer.

Various other serological tests may be included in herd profiles, particularly BVD antibody testing and antigen detection of seronegative animals. Heparin bloods are required for this.

Further advice on nutrition and general feeding and management of cattle is available from the laboratory via THE COW CARE SERVICE which is administered by Dynamic Nutrition Services in association with this Laboratory.