Preventive Medicine For Cattle:

A Report on a Symposium held by the British Cattle Veterinary Association, April, 1979.

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The third annual conference under this general theme was held by the British Cattle Veterinary Association at the University of Nottingham School of Agriculture, Sutton Bonington. Items were included under various subjects such as mastitis control, oestrous control, calf management and disease, computer utilisation, minerals, beef preventive medicine and parasites. About one hundred and thirty veterinary surgeons attended each day and they were augmented by about fifty farmers on the second day.

Robin Pepper (Lewes) chairing the first day said that despite the vast knowledge on the subject of mastitis, the price of cull cows was more effective nationally in control than anything undertaken by practitioners. **Keith Pugh** (Glaxovet) introduced a tape/slide presentation for farmers simply entitled "Mastitis". It dealt with mastitis, its causes and described methods for detection particularly in the early form. At present there were as many cases of mastitis as cows in the national herd. Sub-clinical attacks might never become clinical cases, but affected about half the nation's cows. Chronic mastitis in cows represented a permanent source of infection and such animals should be culled. Dry cows should be looked at daily. Hygiene was very important with calving boxes disinfected and fresh bedding introduced; chaps and sores should be treated. All clinical cases of mastitis needed treatment with the full course of antibiotic. Dry cow therapy helped control by reducing sub-clinical infection and protecting the udder in the dry period. Teat dipping should also be practiced.

"A Method of Milking Machine Cluster Pasteurisation" was described by **Philip Box** (Glaxo-Allenburys Research). During milking, infection from one teat to that of another cow could take place. Methods of prevention were difficult as they lengthened the routine unacceptably, dipping the inside of teat liners did not remove all contamination and teat dipping after milking helped stop spread after milking but not before. In an experimental herd a system was devised to allow teat cluster flushing in a herringbone parlour. This involved flushing out the teat cluster with water at 85°c for five seconds. Deliberate contamination of the clusters with cultures of *Staphylococcos aureus, Streptococcus uberis, E. coli* and *Strep agalactiae,* produced cultures in 8 of 64 swabs after 5 seconds flushing and no cultures after 10 seconds flushing. The time required for altering switches and a 5 second flush was 10 seconds but if the milk was to be rejected there was no extra time involved. For a herd in 1974 it cost £4-£6 (8-12 dollars) per week for 100 cows and added less than 17 minutes to milking time.

The temperature of the water was critical and so it required either a powerful heater and small self filling reservoir, or a large insulated reservoir which was not self filling and a small heater. Before it was really a commercial proposition the system required an automatic device to dispense 1 litre of water, and valve arrangements to allow flushing and milk discharge to occur simultaneously.

Mastitis due to environmental organisms still causes much debate and so the paper by **Trevor Jones** (VI Centre, Sutton Bonington) on "A Herd *E. coli* Mastitis Problem" provided fresh information on the subject. Most *E. coli* found in mastitis showed little evidence of antibotic resistance suggesting they originated from an environment not exposed to antibiotics e.g. alimentary tract of cows, in addition the majority of isolates could not be serotyped. Environmental organism mastitis was often a reflection of general bad hygiene or that factors which predisposed cows to mastitis were involved. Experimentally, cows with a low milk cell count developed more acute mastitis than those with a high cell count. However, this did not mean that they were necessarily more susceptible to infection.

An outbreak of disease was described in a herd of 33 cows with ample straw bedding and cleaned twice daily. Odd cases of mastitis occured in 1977 and investigations commenced in 1978. Quarter samples from each cow showed *E. coli* 09R infection resistant to many antibiotics in two cows fitted with teat cannulae. Following these isolations, 6 new cases of *E. coli* occurred over the next 10 weeks. The milking machine was tested and found to have serious vacuum fluctuations, erratic pulsations and other faults. Correction of the problems took some weeks. An extensive clean-up of the premises was undertaken but the same *E. coli* was isolated from the bulk milk the day after clean up. This redirected attention to the milking machine which was washed by hand. It seemed that air trapped in the large claws prevented their exposure to normal disinfection and the claws were not opened and brushed out properly at each washing *E. coli* 09R was isolated in almost pure culture from the water remaining after washing. The machine was then extensively cleaned and no further cases had resulted. It was felt the case had to be put into perspective in that several features were unique. However, in mastitis cases of *E. coli* showing antibiotic resistance, it might be worth investigating to see if there are persistent cases of *E. coli* mastitis and an infected milking machine.

"Mastitis control - a practical approach" was discussed by **David Thornton** (Arlesford). He suggested that mastitis was an interaction between the cow, micro-organisms and environment. There was at present a high usage of antibiotics and only about 16% of farms kept clinical records. Cell counts of clients' herds could be obtained from the MMB for £12.00 ($24.00) per practice per annum. He found it incomprehensible that only 77 out of about 900 agricultural practices made use of the service. The use of the MAFF Mastitis check list was of help. The first at the convenience of the stockman and the practitioner. This should involve going through the check list and discussing routine etc. The second visit should be at an afternoon milking under the pretext of looking at the cows' teat ends, but it also gave the opportunity to check the milking routine. This must be done unobtrusively and without disrupting the milker's work.

The appearance of the cows' udders and teat ends should be noted. Also how long animals were milked. In Mr. Thornton's opinion, automatic teat cluster removal worked well. Once all the information had been obtained a written report should be produced. If changes in milking routine were to be suggested it was important to tread carefully so that the milking time was not increased. Thus the introduction of automatic vacuum gates will allow the time necessary for teat dipping. Bacteriology undertaken at the practice was of use in providing quick results and also was profitable.

"Progress in Control of Mastitis" was the final talk on mastitis and was given by **James Booth** (MMB). Internationally it seemed that 11 out of 20 countries were undertaking measures based on the five point NIRD/CVL programme. Others were undertaking a system with more emphasis on hygiene and milking and less on routine use of antibiotics. However, only a few countries monitored the effectiveness of control measures, although several methods were now being used, such as adoption of control measures, clinical mastitis records, infection level surveys and cell count surveys. Of 20 countries asked about the improvement in mastitis over recent years two showed definite progress, 11 showed some improvement, four had no improvement and in 3 no records were available.

In England and Wales the Mastitis Awareness Campaign was launched in

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1972 and obtained a high degree of uniformity of advice. There has been increased uptake of control measures e.g. 49% of herds practice teat dipping compared with 17% in 1972, dry cow therapy was used in all cows in 58% of herds and milking machine testing was undertaken in 30% of herds rather than 16%. In the 1960's 50% of the herd were infected with mastitis compared with 32% in 1976/1977 national cell counts have been monitored since 1971 when it was 571,000 cells/ml. By 1977 it had reduced to 468,000 cells/ml but there had been a subsequent increase. In the national figures there was considerable regional variation with Southern England and Wales having higher counts and the North of England lowest counts. This was partly due to differences in the average number of lactations.

The session on oestrous control began with a film "The Clockwork Cow" presented by **Peter Dawson** (CEVA). He described the use of a progesterone impregnated intra-vaginal device, which also contained a capsule of oestradiol benzoate. The latter on absorption through the vaginal wall was converted into oestradiol 17B and caused premature regression of the corpus luteum or the blocking of its formation. Besides being used for control of oestrus, the device could be used for non detected oestrus caused by anoestrus, non seen oestrus, and suboestrus. **Mrs. Bridget Drew** then described "Management Factors in Oestrous Cycle Control". She quoted that all too often standards were too low to fulfil the expectation of farmers with sophisticated drugs. Most nutrition of dairy heifers and suckler cows was to maximize growth in the summer period and then limited growth in winter. It was during this period that most cattle were mated. Changes of diet also caused problems.

In one study, farmers divided their heifers into two groups, one had the normal herd ration the other received the same ration but with 4 lbs of barley. The supplemented cattle had an extra 20 MJ of ME and this diet represented sufficient for maintenance and 0.7 kg liveweight gain. The conception rates of the heifers were 50% in the controls and 68.9% in the supplemented group. A study of cows at turnout to grass showed 26% to be non cycling. The conception rates tended to be higher in cycling than non cycling cattle. Oestrous control could have an effect on calving to conception interval but it was found that conception rate was lower in those calved in less than 60 days. It was found that condition score at service did not seem to influence conception rate following oestrous synchronisation, but changes in condition score did have an influence. Stress also appeared to be important. The number of inseminators used affected conception rates and ideally no more than 30 should be inseminated by one man. Where this was not possible the inseminators should have a rest. In addition blood albumin levels appeared to be a good indicator of fertility. Mrs. Drew concluded by suggesting that all methods of synchronisation of oestrus were an aid to herd management, but not a substitute, for sound management.

The second day was concerned with calf management and disease and was attended by about fifty farmers and began with **Professor Fred Bell** (RVC) describing experimental work which was applicable to the clinical situation of calves. His talk was entitled "The Influence of Various Substrates Affecting Abomasal Emptying and Secretion". The abomasum consisted of two main parts the body or fundus and the pyloric antrum which acted as a pumping organ. The abomasal functions fell into motility, secretion, digestion and absorption. The proximal duodenum had a pH of 2 and then gradually rose so that by the jejunum it is 7 to 8.5. The activity of the abomasum can be studied by cannulation and perfusing the duodenum with various compounds, electrodes were also introduced to record myographic activity. In general alkaline perfusates caused muscular activity and abomasal emptying, whereas acids inhibited activity. The best stimulation was by isotonic sodium bicarbonate or sodium chloride solutions, and was due to osmoreceptors. This stimulation could be stopped by vagal section.

Acid effect on the abomasum appeared to be hormonal in origin. Thus acids increased the quantities of secretin, motilin, and pancreatic glucagon. The injection of pentagastrin (a synthetic analogue of gastrin) stopped abomasal activity. In milk itself whey protein and lactose had little effect whereas fat caused inhibition due to enterogastral hormonal output. In addition soya bean found in most milk replacers inhibited. Milk sometimes entered the reticulorumen in the calf where it could remain for up to 3 days. Often there was no digestion but it might undergo fermentation. In *Trichostrongylus colubriformis* in the duodenum there was complete anorexia in 12-15 days and abomasal pH increased. This resulted in a marked increase of abomasal activity possibly due to toxin production or stomach enzymes. Similar events could occur with some ostertagia infections. Another syndrome occurred with a gas cap in the abomasum due to sucking in air. The air prevented fluid passing from the body to the pylorus, the gas later entered the intestines producing flatus. A greedy calf can guzzle milk quickly and this led to a marked rise in aortic blood pressure, increased heart rate, cerebral ischaemia and convulsions.

Talking in a light vein **John Byron** (British Denkavit) described "Mismanagement of the Milk Replacer - the cause of the Problem". He suggested that 90% of calf problems were due to mismanagement and that 90% of the milk replacers sold contained 60% dried skim milk. Most replacers have a high energy milk fat and low energy ones were now disappearing. Milk replacers are used rather than cow's milk for economy and convenience. A milk replacer depended on formulation, raw materials available, clotting ability, consistency, mixing ability, shelf life and additions. He went on to describe the raw material choice of milk replacers. The stockman's preparation of the milk replacers was important and powder should be weighed out. It should be mixed properly and fed at the temperature recommended by the manufacturer. He suggested that if a calf did not finish up its milk quickly it was being overfed and the quantity should be cut back. The golden rule was if in doubt feed less. The bucket for the calves should be raised off the ground. In addition the loss of hair which occurred around the muzzle was due to milk being fed at too low a temperature.

"Calf Disease Prevention by Feeding Management" was discussed by **Dr. Nick Steenkamer** (Denkavit, Holland). He said that he had recently given a paper at the European Conference on the Protection of Farm Animals and it seemed that people would press that calves were not kept in single pens and veal calves should receive roughage. The number of feeds for a calf was important and the same number should be given each day including the weekends, in addition the regularity of feeding times was important. Veterinary surgeons often corrected poor management by drugs and injections possibly because of a lack of time or interest in calf rearing. Often it took several hours to find out the cause of the problem. Urine drinking calves in a group should be muzzled between feeds. Otherwise quite often urine drinkers failed to gain weight. Teat feeding was of use for certain breeds. Other problems were disorientated calf after travelling, continuous scours, constipation and bloat.

Often in Holland there was routine antibiotic therapy for the first 4-7 days after entry to the unit. This also appeared to help reduce navel infections and calf diptheria. Vitamin A also appeared to reduce the amount of coughing and scour, however vaccination appeared to be of little value. It should be remembered that the calf on milk substitute might often require water. When a litre of water was presented to the calves between feeds then about 95% would drink, Dr. Steenkamer considered it important to keep the calves warm and if there was no heating the pens should be covered.

Following lunch, a visit was made to the estate of **William Bentley** at Woodhouse Eaves. There we looked at the method of rearing the heifer calves for the 300 plus herd of Friesian cows and 200 heifers. The calves were housed in individual pens with mechanical ventilation. The cows were housed in a large covered yard with straw and a mechanized feeding system. On returning to Sutton Bonington, **Dr. Harry Postema** (Denkavit, Holland) described "Diseases of Intensive Calf Rearing and Problems of Therapy". He surveyed the post mortem examinations undertaken during 1978 and found that most mortality was due to enteric conditions and only small numbers had respiratory disease, 50% of mortality was in the first month, 15% in the second, and 10% in the third but it was surprising that about 25% occurred between 3-6 months. The proportion of deaths due to respiratory disease was higher in those over 3 months than in the younger age groups.

Navel infection was best prevented by antiseptic application at birth, prophylactic antibiotics also helped at the receiving farm. Colisepticemia usually occurred about 3 days after arrival and could be treated with bicarbonate infusion and antibiotics. *Salmonella dublin* infection often resulted in respiratory as well as alimentary signs whereas with *S. typhimurium* most signs were alimentary. The most common viral infections were parainfluenza III, bovine viral diarrhoea and infectious bovine rhino-tracheitis, secondary bacterial infection with *Pasteurella haemolytica* or *P. multocida* occurred. Alimentary hyperkeratosis was seen as clay like faeces, in such cases feeding by teat often helped, otherwise the calf had to be taken off milk feeding and turned out to grass. Toxicity with furazolidone took on two forms, acute with nervous signs due to overdosage and a chronic haemorrhagic form which often occurred sometime following the therapy.

"The Role of Acidified Milk Replacers" was described by **Dr. Nick Steenkamer.** They were devised as a method of reducing labour and the first acid used was formic acid because it was cheap. Subsequently mixtures of organic acids were used. At a pH of 4.2 to 4.3 multiplication of gram negative bacteria was inhibited. The advantages of acidified milk replacers were that it was convenient and required less labor, they inhibited multiplication of *E. coli* and so there was less scour, and the calves were in

better condition at weaning. The disadvantages were that often because less feeding was required this resulted in fewer observations and a higher mortality, the amount of concentrate consumed was less, there was a greater check at weaning and the amount of milk powder consumed tended to increase. The increased powder consumption could however be overcome by either using a cheap calf milk or making the mixture less palatable.

Keith Smith (Bridgwater) then brought the session on Calf Management and Disease to a close with a talk on "Calf Rearing Today". He described the different export requirements for the three main countries to which Britain exported namely Holland, France and Denmark, and made the comment that there was tighter control over the movements of export calves than those transported around Great Britain. Much of the success of calf rearing depended on the accommodation. A well drained floor was required, and single crates of adequate size with solid sides, good all round inspection facilities and front designed for handling. Calves should have individual buckets and there should be a good working space. The animals required heat for the first ten days after entry especially if housed on slats. The maximum in any air space was forty, there should be an all-in-all-out policy, ventilation and lighting also needed to be of high standard.

The merits of both group and single penning were discussed but Mr. Smith considered that the latter was preferable particularly from the spread of disease viewpoint. Mention was also made of otitis which consisted of two forms, discharging and non-discharging. The discharging form had foul smelling pus in the ears, droopy ears and normally responded to intra mammary antibiotic application. The non-discharging type showed head tilt, inco-ordination and on X-ray there was often tympanic bulla involvement. This type was treated with antibiotics and puncture of the tympanic membrane. The cause was unknown but thought to possibly be an ascending infection of the eustachian tube.

The annual dinner of the BCVA provided a fitting setting for the presentation of the first Peter Bridge Award. The award was for the best paper presented at a BCVA meeting and was in memory of Peter Bridge who had been treasurer of the BCVA for over eight years. The prize was won by Bill Grimshaw (Glasgow University) and we were fortunate enough to have David Bridge, Peter's son, to present the award. The after dinner speakers were both a great success with Ted Moult telling us how he entered show business and forgetting to tell us about the Common Market and then Mike Stockman confirmed that the existence of the BCVA was known to those at 7 Mansfield Street.

The BCVA conferences are always overflowing with information of one sort or another. As such they are only attended by those fit and with stamina and I think many go back to practice for a rest. This one was no exception and at about ten in the evening, following the dinner, many settled down to a seminar on "A Mini-Computer Based Practice Accountancy and Information System". This was presented by **John Hartnell** (Sprint Computers) and **Andrew Stephens** (Reading University). Although the use of computers in veterinary practices had been much discussed, few computers had actually appeared in veterinary offices. The two main reasons for this were that there was little understanding by the computer industry of the needs of veterinary practices and secondly, there had been little appreciation by the veterinary profession of the potential benefits in using a computer. In consequence the veterinary profession had not known what to ask for and the computer industry had not known what to offer. Computers were used by the Danish veterinary profession but it was thought the system would not work so well in Britain. A computer should first enable one to carry on doing what a practice was already doing or to enable one to do something more. Programmes becoming available included those which handle internal practice matters and provide management information and programmes which enabled veterinary surgeons to develop their preventative medicine and advisory services, such programmes might include client accounting, purchases accounting, nominal ledger accounting, client information and statistics, veterinary surgeon analysis and work analysis and VAT accounting.

The final day was chaired by the newly installed president of the BCVA, **Bill Harrison** (Castle Cary). **Dr. David Weaver** (Glasgow Veterinary School) was the first speaker and he introduced a discussion on the Prevention of Laminitis. Chronic laminitis could be an important contributory factor in other types of lameness including solar ulceration, white line separation and abscessation and solar bruising and penetration, as well as foot overgrowth. In three herds reduction in the condition had occurred due to no rapid charges around calving, a reduction in rate of concentrate feeding after calving so that peak yield was at about 6 weeks, immediate and adequate forage access and bulk after concentrate feeding, in some cases inclusion of some sodium bicarbonate in the home mix, provision of free access to salt to increase salival flow and hence pH buffer, provision of grass cubes or lucerne nuts in rations to buffer, rumen pH, feeding concentrates, in several feeds to freshly calved cows, or change to complete feeding of the ration, down calving heifers should enter concentrate yards in order to become accustomed to them several weeks beforehand, and plenty of exercise for stock in the prepartum month and immediate post-partum period.

Andrew Stephens (Reading University) continued the topic of computers with a talk entitled "Practice Data Management Using Small Computers". He considered that instead of thinking about computers and programmes, one should think of information systems and these include people. The philosophy behind what one was trying to do was that people wanted to collect and use information. A small computer was like a small child with all potential and amoral. The way it turned out depended on the intrinsic capabilities, the quality of programming and the opportunity to express its potential. It could be used for accounts and business information, health and production records, aids to ration calculation, efficacy of treatments, clinical and animal statistics and information retrieval. Data were any record of events. Information was data selected, sorted, summarised to transform it into a useful guide for specific purposes. The same data could be used to provide different information and one man's data was another man's information. The control of information enabled one to take a positive role rather than merely responding.

In manual systems input data was summarised as a structure to aid analysis rather than to simplify data collection. In small computer systems it was possible to separate functions, such as data collection, data control, data storage, data analysis and information presentation. Often practitioners were too busy to make proper use of information. They had to make time and thereby obtain more income from services and less from drugs and therapy and also from MAFF. In addition the veterinary surgeon must co-operate with other advisers rather than form "armed enclaves".

"Preventive Medicine in Beef Herds" was described by **Angus Carmichael** (Horncastle). In his practice a lot of disease prevention was undertaken but not a lot of preventive medicine. In the practice there were six concerned with general practice, one worked in the laboratory and two were undertaking embryo transfer. There were 120 beef herds with an average herd of 40 with size range of 16-150 and 30 dairy herds, and the practice had over 1,000 cattle calls in the first three months of the year. When undertaking preventive medicine a check list was used. Mr. Carmichael then went on to discuss the case history of a beef herd with a suckler herd and rearing dairy-bred calves. Four groups of 40 calves were bought at intervals between August and November and large numbers of treatments for Salmonella and pneumonia occurred in the last three groups. It was found disease occurred at a time of high starling levels but was more probably the result of weather changes and overcrowding. The suckler herd was housed in a large building and had also several problems. This resulted in veterinary drugs and expenses averaging £8.00 ($16.00) per cow rather than £3.00 - £4.00 ($6.00 - 8.00) average obtained from national records.

Dr. Jeanne Piere Willemart (Distrivet, Paris) described work on "Trace Element Deficiencies in Cattle - their treatment and prevention". Although trace element deficiencies were recorded by the Greeks it was not until 1924 that work started to determine their cause. The deficiencies depend on management and agronomy techniques. Copper deficency was seen as a discolouration of the integument, rapid breathing, Congestion of udder, fractures and refractory diarrhoea, cobalt problems results in cachexia, anaemia, pica, lack of appetite and digestive disturbances. Zinc deficiency resulted in alopecia and poor healing of wounds. Manganese problems result in a straightening of the tibio-tarsal joint as well as reproductive disorders and an abnormal gait. A lack of selenium was seen as locaomotory disturbances and respiratory system difficulties heart rate increased and there was often diarrhoea. Iron deficiency could result in anaemia.

Copper deficiency was often related to the presence of other minerals such as molybdenum, sulphate, iron and calcium. It appeared the zinc deficiency threshold was higher when grazing, but high calcium and phosphorus intakes increased deficiency. Manganese was also influenced by deficiencies of copper selenium and iron. Selenium and the association of Vitamin E was well known, but it was suggested that cobalt deficiency and excess sulphate had an effect. Molybdenum had interactions with copper,

sulphate, and potassium.

The conference ended with a session on Parasites. **Les Lloyd-Evans** (Smith Kline) introduced a film entitled "The Cattleman's Guide to the Modern Wormer"--which contained excellent sequences about various cattle parasites but also seemed to be very repetitive in its references to a certain anthelmintic. Mr. Lloyd-Evans said the drug in question, albendazole, had now undergone its first year of marketing in the British Isles with good results. "The Implications of Clinical and Sub-Clinical Parasitism in Ruminants" was discussed by **Professor Lawson Soulsby.** He suggested that the changes caused by parasites in different species were virtually the same, partly because a parasitised tissue could only respond in a given number of ways. The effects of parasites on production depended on how the effect was measured. The more time the method of measurement the more clear the effect of parasitism and so even minor parasitic burdens might be important.

One effect of worms was on the intestinal tract and affected the replication of epithelial cells. The cells were produced at a given rate and underwent maturation. Following parasitism the cells remain in an undifferentiated state and the integrity of the epithelial surface was lost. Instead of the normal lining of the abomasum, type 2 oestertagiasis resulted in the damaged mucosa and the production of cubiodal type cells. These were unspecialised and so did not produce pepsinogen and hydrochloric acid. This resulted in three main factors occurring (a) one elevated abomasal pH which resulted in pepsinogen not being activated (b) reduced pepsinogen output (c) protein leakage resulting in elevated plasma pepsinogen levels and hypoalbuminaemia. Gastro-intestinal trichostrongylosis caused stunted skeletal growth due to low calcium/phosphorus uptake caused by inadequate transport of the minerals from the gut lumen into the body. There also seemed to be an effect on the utilization of feed transported the gut into the body due to reduced efficiency of absorption Thus 8.6 kg of a feed produced 1 kg body weight gain in control animals whereas 15 kg was required in parasitised animals. This had lead to the American investigations on the effect of sub-clinical parasitism in adult cows on milk yield.

"Current Thoughts on the Diagnosis of Parasitism in Ruminants" was the subject dealt with by **Professor Jimmy Armour.** In diagnosis of bovine ostertagiasis he considered there were several factors to be considered. Firstly the clinical signs were important in that the season when disease occurred was relatively constant. There were two difference times i.e. the first four to five weeks after turnout or from July to the end of the grazing season. Ostertagia type 2 occurred usually March to May. The grazing history was important as disease was normally on permanent pasture and there was usually grazing by cattle the previous year. Often there was over grazing. In addition age was important but with ostertagia there was no specific age immunity and so adult animals not previously exposed could develop parasitic signs.

Aids to diagnosis included faecal egg counts, pasture larval counts and plasma pepsinogen. Faecal egg counts were a good guide to infection in susceptible animals i.e. 1000 epg suggested severe infection and usually under 500 epg there were no signs. However, it had to be realized that although the values were indicative in a first year grazing season, egg levels tended to be lower in second and subsequent grazing season. Pasture larval counts over 1000 larvae/kg were usually associated with disease and levels of 200 - 300 larvae/kg caused loss of weight. Plasma pepsinogen levels showed elevation in ostertagia but this aid should not be used without taking into account the presenting clinical signs. Professor Armour then described a two-year study where it appeared that land grazed one year and not the succeeding year had a larval count during the second half of the grazing season.

The session was rounded off by **Frank Clegg** discussing "Pepsinogen Results obtained by the VI Service". The VI service had been able to apply the pepsinogen test on recognised cases of ostertagiasis and to investigate field outbreaks with details of grazing histories. The value of the test was described under four headings, evidence from experimental infectious was reviewed. Evidence was also obtained from naturally occurring outbreaks, and thirdly the test had been used to correlate other criteria for the diagnosis of ostertagiasis, but there were often difficulties of diagnosis and imprecise histories. Finally evidence could be obtained from the use of pepsinogen estimations during the course of grazing or drug trials.

At Sutton Bonington cow and calves had been studied grazing normally infested pastures. In calves there was a significant increase in values from June to September and then a fall thereafter Values in cows were higher than in calves, this might have been due to age, other factors or greater larval intake by the adults. A study of pepsinogen levels in cases of suspected adult disease had been made. It was suggested that regular pepsinogen values from animals on normally infested pastures might be of use in view of the current interest in possible increased yields of dairy cows due to anthelmintic treatment. The forecasting of parasite gastro-enteritis levels in cattle would become important and pepsinogen levels could be used to check the accuracy of previous forecasts. Pepsinogen levels might be used to increase knowledge in epidemiology of ostertagiasis and could demonstrate breakdowns in worm control systems. Mr. Clegg concluded by suggesting that the pepsinogen test would have an important role in the control of parasitic gastro-enteritis of cattle in the future. There then followed, as throughout the rest of the conference, a lively discussion.