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The veterinary relevance of farm animal ethology

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The world expects veterinary knowledge to encompass all aspects of the lives of animals. These include their management and welfare, not just their diseases. Modern research into behaviour is relevant to practical veterinary work, such as animal handling and disease diagnosis, and also to general management and welfare. Hence, all veterinary courses should include instruction in behaviour and those involved in veterinary work should be aware of new developments in the subject.

THE concept of the veterinarian as someone who knows only how to cure animal disease is now seen as being too narrow and out of date. The role of the profession is changing and in several areas the idea of what constitutes veterinary work is broadening. It is becoming more and more apparent that animal medicine should involve an understanding of whole management systems for both farm and companion animals, an appreciation of how aspects of the life of an individual predispose it to disease, and the careful use of measures for preventing disease and generally improving welfare. Some of these measures necessitate the use of drugs and antibiotics but many are inextricably linked with building design, the management of the life of the animal and stockmanship.

In order to be able to adopt this wide approach to veterinary medicine some knowledge of a number of different disciplines of animal biology is necessary. Ethology, the investigation of biological mechanisms by observation and detailed description of behaviour, is one of those disciplines. Behavioural observation has always been an important part of veterinary work but the study of animal behaviour has become very much more precise and rigorous in recent years. Hence, while there is behavioural work which is intelligible to everybody, certain of the concepts require careful explanation if they are to be understood. Some of the ways in which behavioural studies are relevant to veterinary practice and research are outlined here.

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Professor Broom, who is Colleen Macleod Professor of Animal Welfare at the University of Cambridge and is president of the Society for Veterinary Ethology, gave this lecture at the congress of the Association of Veterinary Teachers and Research Workers in Scarborough in April 1987

Behavioural observation and animal handling

Every veterinary practitioner learns how to assess the state of an animal by observing its behaviour and how to use appropriate methods for handling that individual. Those who are good at responding to information derived from such observation can calm the animal, facilitate examination, protect themselves and impress both the animal and its owner. Some general guidance on the procedures to use can be gained from books, such as that by Fowler (1978), but practical experience and advice from someone who knows what to look for are necessary. Those who teach animal handling courses usually know a great deal about behaviour but experimental studies can sometimes be used to test theories, arrived at empirically, about what procedures are the best ones to use.

An experimental behavioural study which has helped in the handling of farm animals is that of Grandin (1983). Observation of the behaviour of cattle, sheep and pigs which were being moved from place to place on farms or at lairage showed that the animals were reluctant to pass areas of dark shadow or sharp contrast, such as that produced by bright light shining through bars. They were also more difficult to drive along races with right angled bends in them, or those with long straight sections, than along those with gradual bends. As a result of these observations, Grandin was able to design curved races with solid sides which made the stockman's job easier and improved the welfare of the animals.

Behaviour problems

Behaviour which leads to difficulties for owners and other animals is quite frequently reported to veterinary practitioners by the owners of pets and is also a major problem in certain circumstances on farms. The general public seek veterinary advice when their dog is aggressive or when it does not control its urination, defecation or ingestion behaviour as the owner requires. The practitioner may wish to pass on many of such cases to a specialist consultant but some know-

ledge of behaviour and its development is necessary if any constructive advice is to be given. Studies of the social behaviour of dogs have helped us to understand dog-human relationships and to solve problems where dogs become dangerous because they find that they are able to dominate people. Much more research is needed on how to avoid these problems by improving procedures used during the development of the individual and on how to solve the problems when they have arisen. Studies such as these and others on pet welfare, the beneficial effects of pets on people, human behaviour in relation to pets and behaviour in relation to zoonoses and pet mortality are the subjects of work planned by our recently formed Cambridge Companion Animal Research Group.

Behavioural problems of farm animals include tail biting by pigs, feather pecking by chickens and various stereotyped behaviours mentioned later. Such behaviours are sometimes referred to as vices but this term is inappropriate because it implies that the principal blame for the occurrence of the behaviour lies with the animal. Since research indicates that such behaviour is a consequence of certain conditions which have been imposed on the animal and is almost completely absent in good conditions, the word 'vice' should not be used. The problem of feather pecking has been investigated experimentally and has been found to be increased in frequency by bright light, larger group size, disturbance and caging (Hughes and Duncan 1972). It is also affected by crowding, dietary and hormonal factors but seldom reaches the damage threshold except in behaviourally impoverished environments (Hughes 1982).

Behaviour and disease transmission

The behaviour of hosts and of vectors is often of crucial importance in the transmission of diseases and parasites. The sheep tick increases its chances of finding a sheep by climbing to the top of vegetation and then transfers to objects which are, ideally for the tick, moving, warm and woolly (Lees 1948, Lees and Milne 1951). Behavioural studies have now been carried out on many other parasites, for example, flatworm miracidia (Saladin 1979), but among the most interesting are those who hijack their intermediate host and change its behaviour so that transfer to the final host is more likely (Holmes and Bethel 1972, Crowden and Broom 1980).

A disease whose transmission has caused much concern in recent years is bovine tuberculosis. Work by P. F. J. Benham has provided information about the extent of contact between cattle and badgers or badger products (Benham 1985, Benham and Broom, unpublished data). The transmission of *Mycobacterium bovis* from badger to cow could theoretically occur by close contact in a field. Prolonged observation of badgers and cattle at night, however, showed that badgers strongly avoided cattle, even when they were confined together in a 0·5 ha enclosure. Since cattle could inhale *M bovis* from the faeces or urine of infected badgers, experiments were conducted to investigate the responses of cattle to these products. Both in winter housing and in fields almost all cattle showed very strong avoidance of badger products but 1 per cent of cattle were less selective and would graze close to badger products.

Clearly it would be of interest to find out whether these unselective grazers were more likely to contract tuberculosis. In addition, contact with badger products could be minimised by managing cattle so that they were not spread out but concentrated in small areas of the available badger foraging area so that badgers could easily avoid them and not contaminate the area used by cattle. Cattle were observed to rub their heads on earth around badger sett entrances where badger droppings can be present so Benham recommends that sett entrances in fields used by cattle should be fenced off. Studies of cattle food troughs in fields visited by badgers showed that badgers would take food from these but that certain sorts of trough could be badger-proof. It is in the interest of farmers to use such troughs and to keep badgers out of buildings. It is clear from this work that small changes in farm management methods could minimise the risk of bovine tuberculosis transmission without much cost and without killing badgers.

Another example of a behavioural study which is helping to minimise cattle disease transmission is that of Hillerton and collaborators on the role of flies in the transmission of summer mastitis in cattle (Hillerton and others 1983, 1984, 1985, Harris and others 1987). The fly *Hydrotaea irritans* had been implicated in the transmission of the disease. It does not bite the cow but observations of its behaviour confirmed that it visits the udder region much more than do most flies and is found on cows at certain times of day and during certain periods of the year. Caught flies were found to carry *Corynebacterium pyogenes*, *Peptococcus indolicus* and *Streptococcus dysgalactiae* which are involved in the pathological effects on the teats. Cattle show ear flicks and other behavioural responses which are positively correlated with fly numbers. The occurrence of the disease can be reduced substantially by managing the cattle so that contact with the flies is minimised and by the use of ear tags containing synthetic pyrethroids.

Behaviour as a sign in diagnosis

The observation of behaviour is an integral part of veterinary diagnosis. Horses or cattle with persistent abdominal pain may lie down and rise again repeatedly, adopt an unusual stance, or stand pushing their heads against a wall (Fraser 1980). Lame animals adopt characteristic postures according to the location of the lesion or inflammation and sheep with severe foot rot adopt a kneeling posture in order to graze. Many neurological disorders result in anomalous movement. For example, gait deficits are a sign of a brain stem tumour, and cerebellar hypoplasia leads to lack of limb coordination, a widened basal stance and overshooting of the target in movement (Palmer 1976, Oliver and Lorenz 1983).

These and many other signs require a skill in recognising abnormalities of behaviour which depends upon a knowledge of normal behaviour. A more extensive documentation of such knowledge of behaviour is desirable and there is now scope for modern techniques of behavioural measurement to be brought into veterinary diagnosis in order that quantitative studies of behaviour can be used in identifying signs. The stop watch and the video camera may gradually become standard parts of veterinary diagnostic equipment.

Behavioural studies used to improve animal management

Behavioural observation is of paramount importance in certain aspects of farm animal husbandry. The detection of oestrus in cattle and pigs depends upon observation by the stockman. Ethological studies such as those of Esslemont and others (1980) and Signoret and du Mesnil du Buisson (1961) have clarified the problems of detecting oestrus. Veterinary surgeons are expected to be knowledgeable about the general management of animals, methods of training them and how to reduce stress-mediated disease so they must use information based on behavioural research.

Interaction between mothers and offspring

The study of interactions between mother mammals and their offspring is an example of a research area which has now been applied extensively to farm animal management (Broom 1981). Some sheep breeds, notably Merinos, are less profitable than they should be because of high lamb mortality. If lambs become weak and die then this is a welfare problem as well as an economic problem and the same research can solve both. Behavioural studies have shown where ewes lamb

(Arnold and Morgan 1975), how ewes recognise lambs (Alexander and Shillito 1977), how lambs recognise ewes (Alexander 1977) and the importance of experience in the occurrence of maternal care (Alexander and others 1983).

The problem of dairy calves which do not get enough colostrum has been investigated by observing cows and their calves during the first six hours after parturition. Factors leading to a failure of calves to suck included difficult calvings, rejection by the mother, inability to find the teat and calf stealing in a group situation (Edwards 1982, 1983, Edwards and Broom 1979, 1982). The most important reason why calves failed to suck was that the calf initially searched for the teat at belly level so it frequently failed to find the teats of older cows with pendulous udders and sometimes fat, low slung teats were difficult for it to grasp. Hence, calves of cows with such udders and teats had low colostrum levels at 48 hours old (Edwards and others 1982). The problem could be solved if a stockman put the calf on to the teat within a short period after birth. The behavioural factors leading to low levels of colostrum absorption in calves and in piglets are summarised by Broom (1983b).

Other behavioural studies would improve our understanding of how it is that certain calves scour or get respiratory disease. Are the most susceptible calves those which show certain licking or eating behaviours, or those which are inactive, or those which show other abnormal behaviour? How useful is behaviour as a predictor of likely disease problems? More research is needed in this area.

Behaviour as an indicator of welfare

The welfare of an individual is its state as regards its attempts to cope with its environment (Broom 1986b). Since animals use behavioural and physiological methods in their attempts to cope with difficult conditions, measurement of the relevant behaviours can allow the identification of how good or poor their welfare is. Many different sorts of behaviour indicate that welfare is poor because the animal is diseased, because it is failing to cope or because it is having difficulty in coping. As mentioned earlier, the recognition of abnormal behaviour (Wiepkema and others 1983) involves an understanding of what constitutes normal behaviour. The interpretation of behavioural indicators of poor welfare often necessitates an appreciation of motivational mechanisms and the role of behaviour in the general regulation of animals' lives.

Many welfare problems arise because of deliberate abuse of animals, or neglect. Some modern farming systems, however, result in poor welfare even when the quality of management is very high. Close confinement of dry sows in stalls or tethers is an example of such a system. Behavioural and physiological indicators show that, although there is much individual variation in sow responses to these conditions, a high proportion of the sows show signs of poor welfare. Stereotyped behaviour (Broom 1983a) is widespread in closely confined animals and one group of stall-housed sows showed activities such as barbiting, drinker-pressing and sham chewing for 7 to 24 per cent of the day period (Broom and Potter 1984). In a study of tethered sows the mean time spent in such behaviour was more than 50 per cent and some individuals spent over 75 per cent (Cronin and Wiepkema 1984). Stereotyped behaviour is seldom shown by group-housed sows. Another behavioural abnormality of confined sows is lack of responsiveness to environmental events other than food provision. In a comparative study, stall-housed sows were much less responsive to two different stimuli than were group-housed sows (Broom 1986a). It is possible that the animals show these behavioural changes because they are linked to the use of analgesic peptides in the brain (Cronin and others 1985).

Conclusion

In addition to areas exemplified above, behavioural studies have been important in helping us to understand biological processes. Work on the evolutionary origins of behaviour clarifies questions about why certain behaviours occur and may, on occasion, make it easier to modify that behaviour by appropriate training. Studies of the role of behaviour in the various functional systems in animals (Broom 1981), for example, in temperature regulation or feeding, are inextricably linked with physiological and anatomical studies in providing an understanding of how animals live. Veterinary ethology has developed to a point where no one involved in veterinary medicine can afford not to know something about it. Veterinary students need to know about modern behavioural concepts and methodology and every veterinary course should include instruction in these principles.

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