79. Broom, D.M. 1987. General conclusions. *Welfare aspects of housing systems for veal calves and fattening bulls* ed. M.C. Schlichting and D. Smidt. 161-166. Luxembourg : Commission of the European Communities (EUR 1077 EN).

GENERAL CONCLUSIONS

Broom, D.M. (U.K.)

Welfare concepts:

The welfare of an individual is its state with respect to its attempts to cope with its environment (Broom, 1986). For a given set of conditions there are three possibilities when an individual is attempting to cope with them. The first is where the various homeostatic mechanisms, including those regulating energy availability, allow the individual to cope easily with little expenditure of time and resources. Here there is no welfare problem. The second is where the individual cannot cope and it dies, or does not grow, or cannot reproduce. Here its welfare is poor. The third situation is where the individual is able to cope but only with difficulty, involving spending much time and resources in doing so. Here again its welfare is poor but a moral decision must be taken about how poor the welfare must be before it is considered unacceptable.

When changes in husbandry methods are made in order to improve welfare there will often be an improvement in production. It is the production of certain individuals which is improved, sometimes only those individuals in a system which, were previously prevented from performing well. The beneficial effects of welfare improvement on production are obvious for milking cows but they also exist for calf and bull systems. It must be accepted, however, that some changes which improve welfare have a cost, usually because fewer animals can be housed or because more labour is needed. When such changes occur it is necessary to safeguard the livelihood of the farmer. Will the public pay the extra costs and is legislation needed to bring about the changes? As pointed out by Smidt in his introduction to this Seminar, ideally legislative action should be world-wide or European Community-wide.

There are various indicators of animal welfare (Smidt, 1983) and each of these indicators is a measurement made on an individual animal. The principal kinds of indicators are survival, growth, reproductive ability, abnormalities of behaviour, abnormalities of physiology of body and brain, increased disease incidence and increased susceptibility to disease. There is much individual variation in the methods used to cope with adversity, for example one individual might fail to grow whilst others might show abnormal behaviour or physiology. Here any one indicator can show that welfare is poor and absence of one indicator of poor welfare does not mean that welfare is good.

Some points from papers in this seminar.

The considerable variation in veal consumption and in the production systems used in the various European Community countries was emphasised by Susmel. For example, many suckler calves are reared for veal in France, whilst Italy imports one million calves each year for crate rearing. Despite the variation in systems, 7 million (of the 23 million calves) reared for veal in the Community each year are housed in individual crates. Veal forms about 11% of the total meat production from cattle but its importance varies greatly from one country to another. The ratio of veal calves to bulls is 15:1 in France, which produces 45% of EEC veal, whilst the ratio of beef animals to veal calves is 3.5:1 in Germany and 21:1 in the United Kingdom. The diversity of systems for production in the European Community was also emphasised by Langholz who reviewed beef production. Feeding sys-

tems, the use of indoor housing or outdoor management, and the age at slaughter varied considerably. In Germany 98% of beef comes from bulls but in the United Kingdom 92% comes from steers.

The problems associated with different aspects of calf husbandry were emphasised by van Putten. An inadequate supply of colostrum, with the consequent health risks,and mixed with other calves at market or during transport, cause problems before the veal unit is reached. Variables which are of importance for calf welfare include the amount of space available for movement, the use of wooden slats or concrete or deep straw underfoot, the effects of ingesting straw, the presence or absence of other calves in the pen, teat or bucket feeding, and stockmanship. The effects on welfare of having sufficient space for the calf to turn around are all beneficial. Group-housing systems reduce abnormal behaviour shown in crates but inter-sucking can be a problem. Trials using automatic feeders have been quite successful although weight gain may be rather variable. Daelemans reported on housing systems for bulls and explained that slatted floors are widespread and much straw is needed if the animals are not to be dirty. In discussion of this point, Ladewig questioned the importance of dirtiness to welfare. While the net effect of straw on welfare is probably beneficial, as pointed out by Harte the effects of dirt on the value of the animals at market or at slaughter is important. Another problem with older fattening bulls is mounting, with consequent injury, but bars over pens may reduce mounting. The use of cubicles and a walking area for fattening bulls seemed to work well.

Amongst the behavioural problems for veal calves which Signoret and Le Neindre described are those which result from maternal and social deprivation. Advantages to calves of continuing contact with the mother and of feeding from a teat were reported. There are behavioural differences among calves of different breeds which should be considered when assessing systems. The widespread occurrence of abomasal ulcers in calves was reported by Welchman. He distinguished small lesions from large, chronic ulcers. Small lesions are more frequent if the calf is reared on straw or woodshavings but their incidence could not be related to growth rate or any clinical effect. No suckler calves had been studied and, as van Putten pointed out, it is possible that there is some adverse effect which has not yet been measured. Ödberg commented that the lesions might be indicators of coping problems. The great variability amongst veal calf units in the incidence of abomasal lesions and of disease was described in the paper by van der Mei. Clearly stockmanship is important and could exacerbate or help to compensate for inadequacies of a system. In a study of calves in crates and calves which were bucket fed and group-housed on slats, there was no overall difference in disease incidence but some diseases were more frequent in the group-housed calves. Since Webster et al. (pers.comm.) have found less disease in an automatic feeder group-housing system it seems that the poorer group-housing systems may be worse than crates in disease incidence whilst the better group-housing systems may be good in this respect.

Fattening bulls are often kept in crates when they are calves and Wierenga reported that many of them develop tongue-rolling behaviour. This behaviour was shown by one third of fattening bulls and it occurred several times per hour by the age of three months. There was variation amongst groups of calves in the incidence of tongue rolling. Another behavioural problem was inter-sucking, especially in bucket-fed calves, but this was

lower if the calves were teat fed or tied up during feeding and was confined to the first two months of life. Schlichting mentioned that those calves which suck other calves grow less well than others. A third behaviour problem with fattening bulls was the abnormal standing and lying behaviour first reported by Andreae and collaborators (Unshelm et al., 1979, Andreae et al., 1982). Wierenga found that 50% of bulls showed these abnormalities by the age of 15 months and referred to the work of Dämmrich reporting cartilage damage, following fast growth, with consequent pain when standing or lying. In a study by Graf (1984), no such problems were found if bulls were kept on deep straw with a space allowance of 4.2 m^2 but there were problems on slatted floors with 3 m^2 per animal. In discussion of these systems Borghese pointed out the extra cost of straw for many producers. Ladewig reported on recent work on heifers by Müller, following that of Andreae, in which abnormal lying was found only on slatted floors, the abnormalities were seen from the first on slats and much more investigatory behaviour was shown before lying on slatted floors. The question of how important such behavioural problems are for the animal was being studied by Ladewig who had found that plasma cortisol levels were increased for 10 - 20 minutes after lying on slatted floors. Another problem on slatted floors, reported by Bisgaard Madsen was tail tip inflammation (or necrosis). This condition resulted in death in 10% of fattening bulls and enforced delay before slaughter was necessary in many animals. It must have an adverse effect on welfare. Tail tip inflammation was worse at high temperatures (>20°) and at high stocking densities. In discussion of alternative systems for rearing fattening bulls, and indeed calves, Zeeb made the point that compromises between existing systems and those ideal for welfare are necessary. Many such compromise systems already exist but require some development so that they will be commercially viable.

The difficult question of how to bring about change which improves welfare was discussed by Baker. He advocated the use of codes of practice, as used in the United Kingdom, pointing out that the European Community had, so far, been very slow to pass legislation. He referred to many details of welfare problems in housing systems and also to mutilations, such as castration and tail docking, and emergency problems such as fire in stock units. His points about public attitudes were reiterated by Beukema who emphasised differences between countries in the likely effects of restrictive legislation. Beukema stated the need for development of work on welfare in relation to economics and described the Dutch consultative committee on welfare which includes representatives of government, producers and welfare organisations. In discussion about these papers van Putten reminded those present that the need for regulations concerning intensive calf husbandry had been discussed in the European Community for more than five years. He asked what had been done about this and there was general concern amongst those attending the Seminar on this point.

Veal Calves: The Main Welfare Problems:

The question of when welfare is poor for veal calves has been addressed at this meeting, at previous CEC-sponsored meetings and in various other scientific papers. The major welfare problems are for veal calves kept in crates and fed a milk replacer diet. Past papers by Kiley-Worthington (1977) and van Putten and Elshof (1982) and recent studies by de Wild (pers.comm.) Webster et al. (1985) and Wierenga (this volume) emphasise the high levels of stereotyped and other abnormal behaviours. These in-

clude tongue rolling, excessive licking and sucking of objects,excessive licking of the pelage (often accompanied by the formation of hair balls in the gut) and prolonged periods of inactivity. For example, Webster et al. (1985) found that "purposeless oral activity" occupied a mean of 15% of the time in crate-housed calves but only 2 - 3% in group-housed calves. At two weeks of age, crate-housed calves stood inactive for 34% of the time whilst for group-housed calves the figure was 19%. There is no doubt that the tongue rolling etc. must be regarded as abnormal and an indicator that welfare is poor. Behavioural problems are reduced if more social contact is possible either through bars, or better still, by group-housing (Broom, 1982). Other abnormalities of crate-rearing include the feeding to a polygastric animal up to 25 weeks of age of food which is inadequate in iron and roughage. Observations of lying in calves indicate that a width of 90 cm is needed for the adoptation of the normal sleeping posture and the difficulty with which calves walk after crate-rearing is readily apparent when they are taken to slaughter.

A major welfare problem for calves kept in groups is intersucking. This behaviour is sometimes frequent if the calves are bucket fed but is absent or a minor problem if calves are fed from teats supplied from a teat bucket, a reservoir or an automatic feeding system. Disease incidence is worse on some group-housing systems but better on other group-housing systems, especially those involving the use of automatic feeders.

A consideration of the welfare of veal calves leads to recommendations for diet to be changed so as to include roughage and iron, space allowance to be increased, and group-housing to replace individual housing so that social companions are available and more exercise is possible. Other aspects of husbandry which lead to welfare problems and where change is possible are in exposure when very young to transport, for example from France to Italy, and to markets, for example in the United Kingdom.

Fattening Bulls: The Main Welfare Problems:

Since fattening bulls are often confined in crates when young, the problems which obtain for them are, with the exception of those due to the milk replacer diet, initially similar to those of veal calves. The behavioural abnormalities reported by Wierenga are similar to those reported by Graf et al. (1976) and Riese et al. (1977) and stem from confinement and social deprivation. When older, the major questions about the welfare of housed fattening bulls concern space allowance and flooring. The widespread use of slatted floors leads to problems of behaviour, limb anatomy, certain forms of lameness and other pathological conditions such as tail tip inflammation. High density and poor design of pens exacerbate these problems. A consideration of the welfare of fattening bulls leads to recommendations for group housing when young, an improvement in flooring so that poor slatted floors are not used, an increase in the minimum space allowances now used and an improvement in the design of some pens.

Public Attitudes to Veal and Beef Production:

The decline in veal consumption in some countries, especially the United Kingdom is probably due to the cost of veal in relation to that of other meat and to dislike of veal production systems. Many people will not eat white veal because they do not like the production system and it is likely that the numbers of people with this attitude will increase. The cost of veal production is high relative to that of beef so total meat production would be increased if more calves were used for beef rather

than veal production. This is an over-simplification of the situation but the trend is likely to be towards more demand for beef relative to that for veal. The decline in the demand for white veal is likely to be much faster because of public awareness of the welfare of the animals in this production system. In addition to these changes in consumer demand, public pressure for improvements in calf and fattening bull welfare is increasing rapidly. Changes in the agriculture industry will be less painful if they are initiated early and brought about gradually rather than precipitantly.

Needs for Future Work:

If welfare is to be improved it is important that there should be work on group-housing systems for calves, better flooring for fattening bulls and the best stocking rates and pen designs for beef bulls. Research on systems which are alternatives to veal calf crates and fattening bull housing systems is urgent and should include compromises between present systems and those alternatives which are too expensive. Some extra production costs are likely and economic aspects must be included in the research. Although some welfare indicators are already available and can be used, further research is important so that systems can be more easily and efficiently compared. In all of this research it is most desirable that there should be increased possibilities for international collaboration.

Discussion about alternative systems and the best ways to bring about change, both national and Community-wide should involve government officials, scientists, producers and representatives of welfare groups. Some legislation is likely to be necessary but codes of practice can back up this legislation. Community-wide action is most desirable but in some areas, action by one country at a time is quite possible.

REFRERENCES

Andreae, U. and Smidt, D. 1982. Behavioural alterations in young cattle on slatted floors. In "Disturbed Behaviour in Farm Animals" (Ed. W. Bessei). Hohenheimer Arbeiten, 121, 51-60 (Eugen Ulmer,Stuttgart).

Broom, D.M. 1982. Husbandry methods leading to inadequate social and maternal behaviours in cattle. In "Disturbed Behaviour in Farm Animals" (Ed.W. Bessei), Hohenheimer Arbeiten, 121, 42-50 (Eugen Ulmer, Stuttg.).

Broom, D.M. 1986. Indicators of poor welfare. Br. Vet. J., 142, (in press).

Graf, B.P. 1984. Der Einfluß unterschiedlicher Laufstallsysteme auf Verhaltensmerkmale von Mastochsen. Doktor-Dissertation der Eidgenössischen Technischen Hochschule, Zürich.

Graf,B.P., Wegmann, R. and Rist, M. 1976. Das Verhalten von Mastkälbern bei verschiedenen Haltungsformen. Schweiz. Landw. Mh., 54, 333-355.

Kiley-Worthington, M. 1977. "Behavioural Problems of Farm Animals" p. 28. (Oriel Press,Stocksfield).

van Putten, G. and Elshof, W.J. 1982. Inharmonious behaviour of veal calves. In "Disturbed Behaviour in Farm Animals" (Ed. W. Bessei), Hohenheimer Arbeiten, 121, 61-71 (Eugen Ulmer, Stuttgart).

Riese, G., Klee,G. and Sambraus, H.H. 1977. Das Verhalten von Kälbern in verschiedenen Haltungsformen. Dtsch.tierärztl. Wschr. 84, 388-394.

Smidt, D. 1983 (Ed.) "Indicators Relevant to Farm Animal Welfare" Curr.Top. Vet. Med. Anim. Sci. 23 (Martinus Nijhoff,The Hague).

Unshelm, J., Andreae, U. and Smidt, D. 1979. Zur Variabilität der Cortisol-

Konzentration bei verhaltensphysiologischen Untersuchungen an Mastbullen. Tierhaltung. KTBL 240, 85-90.
Webster, A.J.F., Saville, C., Church, B.M., Gnanasakthy, A. and Moss, R. 1985. The effect of different rearing systems on the development of calf behaviour. Br. Vet. J. 141, 249-264.