UK CALF TRANSPORT AND VEAL REARING

A report for Compassion in World Farming
by Dr Claire Weeks, BSc, PhD

March 2007

CIWF
advancing farm animal welfare
www.ciwf.org
registered charity number 1095050

Executive summary

This report considers the welfare of male Holstein-Friesian calves, although other types of calf such as beef-cross heifers may also be exported and reared for veal or beef.

Approximately 570,000 male Holstein-Friesian calves are born in the UK per annum. In recent years, movement restrictions for the control of TB have resulted in some 150,000 such calves being culled shortly after birth, and numbers could remain at similar levels.

Recent levels of calf exports (principally to the Netherlands for veal production) are about 2,000 per week (100,000 per year). Expert estimates indicate that this figure is unlikely to exceed 4,000 per week (200,000 per year) in the short to medium term. The relative economics of beef and veal production on the European continent and in the UK, as well as politics and public concern for calf welfare are likely to influence these calf trade figures.

Scientific evidence indicates that *young calves are not well adapted to cope with transport. Their immune systems are not fully developed and they are not able to control their body temperature well, thus they are susceptible to both heat and cold stress.*

Weight loss following transit is indicative of exposure to a variety of stressors and is greater for longer journeys or greater stress, including cold or heat stress and exposure to vibration and acceleration. Therefore transport should be avoided where possible, particularly as morbidity and mortality following transport can be high.

UK legislation differs from EU legislation in three aspects:

1. it specifies higher minimum amounts of dietary fibre for young calves
2. the space allowances are more generous for older calves
3. bedding has to be provided – fully slatted floors are not permitted.

There is strong scientific evidence that dry bedding is necessary for calves raised indoors and that fully slatted floors are incompatible with good calf welfare. Increased space allowances are generally associated with more normal behaviour and improved health. Thus the UK legislation offers notably higher potential for improved calf welfare over the minimum EU specifications.

Table of contents

Introduction

This report embraces aspects of the welfare of male dairy-type (Holstein-Friesian) calves, which essentially are by-products of milk production. These calves have three possible destinies: to be killed soon after birth, to be reared for veal or to be reared for beef.

Section 1 considers these outcomes in predicting the likely numbers for export to continental Europe. Section 2 reviews scientific knowledge on the welfare of transported calves. Finally the impact on calf welfare of differences in legislation between the UK and Europe is considered in Section 3.

1. An estimate of the number of calves that could eventually be involved in the live export trade from the UK

1.1 Numbers of male dairy calves

The statistics available are not classified at this level, thus estimates need to be made from other figures. Having declined in recent years, the number of dairy cows in the UK has stabilised at approximately 2.07 million in the 2006 June census (Defra, 2007a).

Average dairy herd annual culling rate in England was 24% in a 1997 study by Esselmont and Kossaibati. With a possible mortality rate of replacement heifers of 10% and assuming an equal male: female birth ratio, up to 70% of inseminations would therefore need to be to dairy-type bulls to ensure herd replacements. In practice, however, 50-60% of inseminations are generally to dairy bulls and 40-50% to beef bulls.

In the current economic climate, herd replacements may be obtained from dairy farms going out of business. There has been limited uptake of sexed semen, which gives a high proportion of females, but at a high cost.

There is also a drive by the English Beef and Lamb Executive (Eblex, 2006a) and others within the industry to encourage dairy farmers to use beef-type bulls and dairy bulls that produce offspring more suited to beef production. The Defra-funded Eblex Beef Better Returns Programme is a three-year project focusing on knowledge transfer and training for English beef producers. It was launched at Beef Expo on 2 June 2006. An example leaflet, *Beef Action for Profit 3. Better returns from Dairy-bred bulls*, is available from Eblex or via their website (www.eblex.org.uk). Among the suggestions for improved performance is to rear calves bred by better-conformed dairy sires or beef bulls with high Estimated Breeding Values (EBVs) for growth and carcase yield where possible.

Overall, approximately 25% of calves born are dairy type male calves. A recent report by ADAS (2006) estimates actual numbers to be 570,000. Assuming a mortality in young calves of up to 5% (7% perinatal mortality in a US study of Holsteins by Johanson and Berger, 2003 and Defra (1999) estimates of up to 6% calf mortality), theoretically over half a million calves could be available for export for veal production.

1.2 European supply and demand

The number of dairy cows is declining in the EU: a 2.3% decline from 2003-2004 (EU-15) was followed by a 1.8% reduction in 2004-2005 (EU-25). These were accompanied by reductions of calf numbers by 4.3% and 0.5% respectively. Although also reducing, the UK cow numbers have not fallen as much as in other parts of the EU-15; between 1984-2004, the UK numbers were just over 11% of the total (Eurostat 2006).

Calves therefore are now in relatively short supply in Europe, with record prices being recently paid for them (Eblex 2006b). The Milk Development Council noted a rise in average UK-born Holstein-Friesian calf prices from £12 per head in July to £25 in August 2006. This is almost certainly driven by European demand and is likely to reduce the economic viability of UK beef and veal production systems.

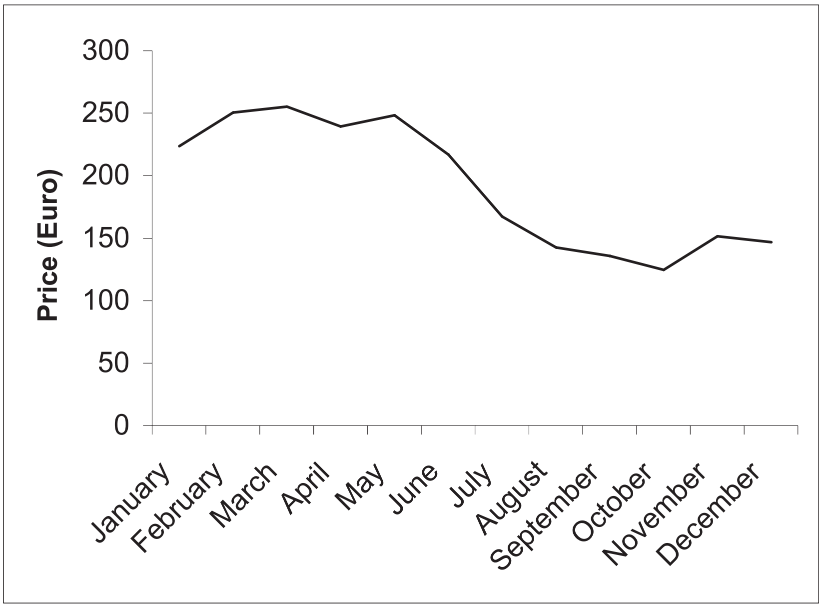
Costings by ADAS (2006) indicated gross margins of about £68 for white veal production from Holstein-Friesian male calves in the UK and losses of about £60 for rosé veal production for calves costing £25. Margins on cereal beef were estimated at about £126 for animals with a P+ conformation and 2, 3 or 4L fatness. Calf prices in February 2007 were approximately £21 per head for Holstein-Friesian males sold at market (source: Defra). However the current global shortage of milk powder has increased prices, which reduces margins, especially for white veal production.

The online meat trade journal (meatinfo.co.uk, 16 June 2006) noted that shortly after resumption of trade with the UK, European finished veal calf prices declined by 9% to €563 a head by the end of May, having peaked at €619 a head in the week ending 23 March. The peak was attributed to a short term rise in demand for veal as consumers abandoned poultry in the wake of avian influenza in Italy. Since the end of March 2006 veal calf prices have fallen in all member states.

Figure 1 (overleaf) shows the reducing trend in average prices paid in the Netherlands in 2006 for young calves destined for veal production. The Netherlands, northern Belgium, Austria, France, Portugal and Spain have decoupled the calf slaughter premium of €50 which is still payable for calves slaughtered between the ages of 1 and 7 months (calves aged 5-6 months should be under 160kg). Thus producers of veal in those countries receive the subsidy, whereas the UK adopted the single farm payment scheme (SFP) and so UK veal producers no longer receive this subsidy. Modulation will reduce this premium by 5% per annum until 2012, when decoupled subsidies are due to cease under current EU regulations. The calf slaughter premium enables producers in these six countries to pay more for young calves and still maintain a reasonable margin.

Figure 1 (overleaf) shows, however, that the availability of UK calves has actually reduced the price that Dutch producers have had to pay for calves, potentially increasing their margin for veal production.

Figure 1**:** Mean prices (€/head) for young Holstein-Friesian calves in the Netherlands during 2006 (source: LEI)



Note: Prices have been calculated for 45kg calves plus commission/delivery of €30/head (see http://www.lei.wur.nl/UK/statistics/Agricultural+prices/).

The total number of cattle in the EU-25 has declined in recent years, with a smaller reduction from 2004-05 of 0.7% to an estimated 85.8 million (Eurostat 2006). The price of cattle has risen correspondingly. Eurostat also collects figures for slaughter calves, but does not distinguish between very young 'bobby' calf and veal calf slaughter. The UK figures are more likely to be mainly the former, whereas continental European countries, the latter. ***Table 1*** (below) shows the figures for the UK and countries that import calves from the UK; however these figures pre-date the resumption of UK calf exports in May 2006.

Table 1**:** Calves for slaughter (1000 head)

	Belgium	**France**	**Italy**	**Netherlands**	**UK**
2003	163	633	413p	748	54
2004	156	646	445	775	50
2005	176	639	500	813	71
%05/04	13.0	-1.2	12.4	4.9	43.2

p=provisional **Source: Eurostat 2006**

Consumption of veal is increasing in large markets such as France, where an increase of 2.2% was recorded in 2005 to 4.3 kg/head (Eblex 2006c).

1.3 Outlets for UK dairy male calves

1. Postnatal slaughter

Neonatal calves are still being culled on dairy farms (personal communications from several industry sources, Sept 2006). It appears to be difficult to put a figure on these numbers, as the records may be incomplete. There is also an intermittent trade in bobby calves where the calves are slaughtered at an abattoir and the meat is used for human or animal consumption. This trade depends on calf prices and demand for bobby veal. ***Table 1*** indicates the number of young calves slaughtered in the UK was about 71,000 in 2005. ADAS (2006) estimated that, before the lifting of the export ban in May 2006, between 250,000 and 350,000 calves per annum (44 – 61%) were culled soon after birth. ADAS notes that approximately half were on holdings with TB restrictions and conclude that such cullings (around 150,000 per annum) are likely to continue. The reason why culling may be necessary is that many dairy farmers sell most of their calves shortly after birth. If any cattle on the farm react to the TB test they are not allowed to sell calves or any other stock for several months (until there are no positive reactors in the herd in two successive tests) and may not have the accommodation in which to keep them, thus they are often culled. However Defra may licence individual animals that have tested negative for TB to be moved to approved finishing units (Defra, 2006a).

2. Veal production

UK veal production is currently very low, although FAWC estimated in 1997 that up to 20,000 head per year could be reared. ADAS (2006) note the UK production of white veal was 1,000 calves per annum, that this figure was reducing and that the system is used primarily for continental cross females rather than Holstein-Friesian males. Rosé veal production is also very low – estimated at under 1,000 per year. Most UK calves destined for veal production are now exported to be reared on the continent, principally the Netherlands as shown in ***Table 2*** (below).

***Table 2*:** Live exports of cattle (calves) from the UK in 2006

Destination	Number	% of total
Netherlands	42,547	55.8
Belgium	16,318	21.4
Spain	9,055	11.9
France	5,139	6.7
Italy	1,985	2.6
Other EU	1,196	1.6
Total	**72,240**	**100.0**

Source: BCMS (Eblex 2007)
Note: Almost 95% of cattle exports are calves and 88% of exports are male dairy breeds.

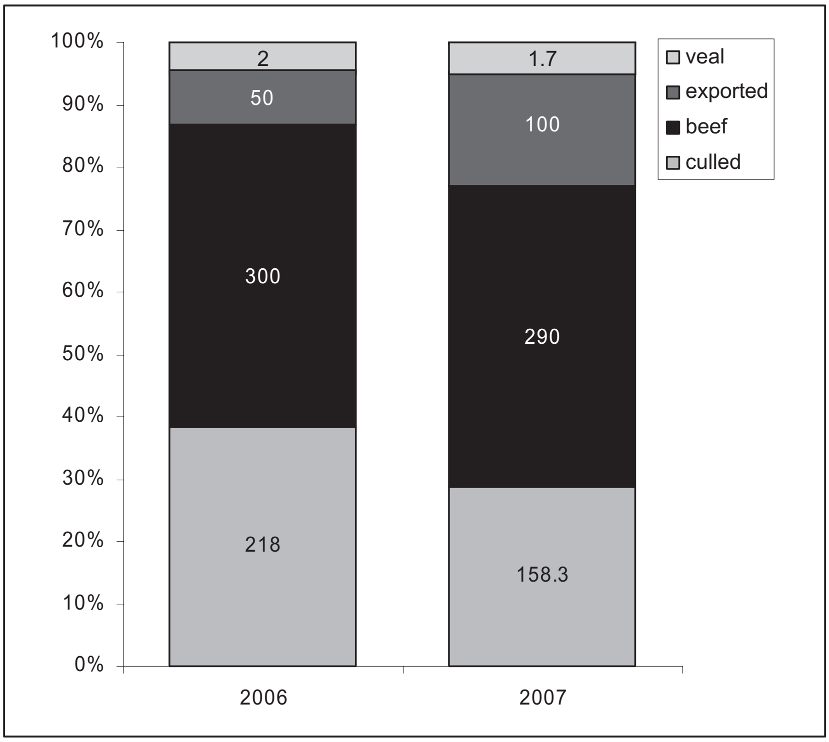
The barrier to UK veal calf production appears to be low market demand for UK veal, rather than the higher UK standards. It is unlikely that UK veal production will increase sufficiently to have an impact on the numbers of surplus male calves, despite marketing initiatives and feasibility studies (e.g. Hallings-Pott, 2006). Indeed the union representing the UK's farming industry, the National Farmers Union (NFU), states: "In an ideal world, the calves would be reared and slaughtered for veal in the UK and the meat then exported. But whilst that remains the NFU's long-term objective, a combination of the costs and expertise required to set up specialised veal calf rearing units from scratch in this country and the preference of continental consumers for 'home-reared' veal means that this is not a realistic prospect in the short or medium term" (NFU 2006). ADAS (2006) figures support the unprofitability of UK-produced veal, suggesting net margins of only £0.25 for male dairy calves in white veal production.

Nonetheless the Netherlands is a major producer of veal, 90% of which is exported to neighbouring countries. Thus, the UK could potentially develop a similar export market for veal using its own calves rather than exporting them to the Netherlands. This theoretical scenario would be possible only if UK producers could compete on an economically-level playing field. As explained above (**Section 1.2**), Dutch veal producers still receive a slaughter subsidy on veal calves and they have access to comparatively low priced milk substitute. Having weighed the options and uses of Holstein-Friesian calves ADAS (2006) concluded the demand from the Continent (particularly the Netherlands) for this type of calf and the prices being realised, are likely to "limit their use in UK-based cattle production systems."

3. Beef production

The demand for beef remains buoyant as the UK is only 79% self-sufficient (Eblex, 2007) and our beef exports have resumed. Thus a substantial number of Holstein-Friesian type calves are currently being reared for beef. These may be traded through integrated organisations such as Blade SW, which can also export calves. The flexibility of such organisations in an ever-changing economic climate means that numbers are again difficult to estimate. Despite a preference for beef crosses, it is estimated that over 300,000 Holstein-Friesian type male calves per annum have been reared for beef in the UK in recent years. Given the demand from Europe, a substantial proportion of these calves could be exported. It is likely that recent increases in world cereal prices (FAO, 2006) could decrease the profitability of intensive beef production enterprises, which could drive calf prices down. ***Figure 2*** (below) summarises these outlets for male dairy calves.

***Figure 2*:** Estimated proportion of UK born male Holstein-Friesian calves culled postnatally, reared for beef, exported for veal and beef production in the EU and reared for veal in the UK in 2006 and 2007 (projected).



Note: Data points are thousands of head.

1.4 Conclusion

Since the export trade resumed in May 2006, over 72,000 calves have been exported from the UK to the end of 2006, with a sharp increase during the final quarter of the year (source: British Cattle Movement Service). Of these, 88% were male dairy breeds (thus over 50 thousand Holstein-Friesians). These figures suggest the trade is currently equivalent to at least 100,000 calves per annum. A spokesperson for the farming industry on BBC Radio 4's *Food Programme* (1 October 2006) indicated that the export aim was 300,000 calves and this is feasible. The strong domestic demand for calves for UK beef production appears to be at least equalled by the demand from Europe for veal (or beef) production. Owing to subsidies and support schemes many European producers are able to pay more for calves than UK producers.

A realistic estimate is a doubling of numbers in the short term to about 200,000 head per year. ADAS (2006) also estimated potential export numbers to be at this level – approximately 4,000 per week. Depending on the political and economic climate, numbers could rise to approximately 300,000 during the next decade. However it is unlikely that numbers will rise to former levels, which in 1995, the year before the ban on calf exports, amounted to 426,000 calves; in part because of the continuing decline in the UK and European cattle population. *The actual numbers will depend on European calf numbers, calf prices and relative demand for beef and veal throughout the EU. Politics could also play a part, as UK calf exports were in decline during the 1990s following mass protests, before the subsequent ban owing to BSE. Indeed, to quote the ADAS (2006) study: "The export of live calves is an emotive subject and there is public demand for a solution that does not involve either slaughtering very young bull calves or shipping the live animals to other countries".*

2. A review of calf transport

Currently, calves may be exported from the UK only from one or more farms or from a single approved assembly centre, not from a general market. Where calves are picked up from multiple farms, journey time commences from the loading of the first calf.

Calves may then be transported for no longer than nine hours before there must be a rest period of at least one hour during which liquid and feed if necessary should be offered. They may then be transported for up to a further nine hours. Defra (2007) has summarised the requirements of the new Council Regulation (EC) 1/2005 that came into force on 5 January 2007.

The scientific literature concerning the transport of calves was reviewed by Trunkfield and Broom in 1990 and Knowles in 1995. This section reviews additional and recent literature relating particularly to young calves (up to approximately one month old).

A particularly relevant study was conducted by Knowles *et al* (1999), who examined the effects of transporting young calves (under four weeks of age) on a road journey of 19 hours, which is the maximum time that calves can be transported under current EU legislation before being unloaded and given food, liquid and 24-hours rest. Two journeys, each with three groups of 15 calves were undertaken in summer and in winter. The mean temperature on the lorry in summer was 15.0°C and in winter was 2.3°C. Each journey included a one-hour break on the lorry in which the three groups of calves were given one of a glucose/electrolyte solution, water, or nothing at all. Control groups of 15 calves remained on farm and were fed normally.

Immediately post transport, all the groups of transported calves showed a significant decrease in bodyweight that averaged 1.4kg in summer and 2.0kg in winter. The calves recovered to their pre-transport weight within eight hours in summer and 16 hours in winter. However it took them 48 hours in summer and 72 hours in winter to 'catch up' with the liveweight of the untransported control calves. There was a diurnal variation in rectal temperature in all groups of calves, but calves transported in winter and given cold water showed the greatest drop to 37.4°C, which was significantly less than the unfed calves and controls on farm which averaged 38.0°C and 38.3°C respectively. Calves in winter took longer to return to pre-transport values of rectal temperature.

The authors concluded that mid-journey feeding was of minimal benefit and would be likely to be too stressful in commercial practice. They reached the same conclusion in a similar previous study in which calves were transported for 24 hours (Knowles *et al*, 1997). Feeding electrolytes reduced the extent of dehydration, as measured by changes in plasma total protein and albumin concentrations. Most of the variables which changed during the journey had recovered in line with the values in the control animals within 24 hours of the end of the journey, but the calves' liveweight and creatine kinase activity took up to seven days to stabilise. The study (Knowles *et al*, 1999) highlighted the problem that young calves have in maintaining body temperature during transport, especially during colder weather.

This conclusion is supported by more recent experimental work by Elmer and Reinhold (2003) who exposed healthy young calves aged 3-6 weeks to either cold (5°C) [n=12] or hot (35°C) [n=11] air temperatures for just four hours. They noted that at 5°C calves had airway constriction, pulmonary hypertension and developed hypoxemia and hypercapnia (i.e. abnormally low levels of oxygen and high levels of carbon dioxide in the blood), but managed to maintain body temperature. In hot conditions, the calves panted and their body temperature increased continuously, which would have lead to collapse from heat stress. The authors concluded that: “Young calves up to the age of six weeks were not able to tolerate acute changes in ambient temperature”. Such temperature changes are likely to occur during long journeys. It should of course be noted that young calves on full feed and with bedding are thermally comfortable only between 13°C and 26°C (Hemsworth *et al*, 1995) and when not on feed have much higher lower critical temperatures so that they tolerate cold even less well.

Further evidence that young calves cannot readily accommodate transportation stress or regulate their body temperature well is given by Schrama *et al* (1996) who found in experimental calorimetry work that calves which were transported at five days of age had increased heat production for three days post transport that was not correlated with activity levels. They also found that calves were not in a steady-state regarding their energy metabolism.

There is recent evidence (Steinhardt and Thielscher, 2005a) that dairy calves reared on the bucket as opposed to being suckled by their dam, respond differently to transport for one hour during the first three weeks of life. The authors state that: "When the vehicle was stationery before transport, at unloading and at [*blood*] sampling, heart rate was raised significantly in TK [*bucket reared*] and older SK [*sucked calves*]". They concluded that: "Physiological variables of young calves whose regulatory capacity is small compared to older calves, were significantly influenced by husbandry system already within the first three weeks of postnatal life and that caused different reactions in calves of different breeds at specific periods of a transport process." The breeds in this study were the German Red Pied or Black Pied breeds, which are not found in the UK. Nonetheless, it is possible that UK dairy calves fed on the bucket (a principal method) could be less resilient to transport. Similar work by the same authors (Steinhardt and Thielscher, 2005b) found suckled calves with low blood haemoglobin levels had significantly elevated heart rates and noradrenalin levels during transport and grew less well subsequently, compared with peers having normal levels of haemoglobin. They also found that these calves' reactivity increased with age. The European veal industry prefers calves with low haemoglobin status and aims to preserve levels at the low end of the range that is considered normal. Calves are born with varying levels of blood haemoglobin and clearly those with lower levels are more likely to have their welfare compromised during periods of stress, including transportation.

All calves, however, experience physiological changes during transport. Apart from the work of Knowles *et al* (1997, 1999) other recent studies include Thielscher and Steinhardt (2004) who noted elevated heart rates and reduced noradrenalin levels together with weight loss in suckler calves transported for short periods (under one hour) at all ages and significantly increased levels of adrenaline in younger calves (9-14 days old).

In a previous study, these authors also found differences in several measures of physiological responses to transport by suckler calves and dairy calves aged 1-3 weeks and all calves showed increases in body temperature, heart rate and plasma cortisol concentration accompanied by weight loss (Steinhardt and Thielscher, 1999).

Grigor *et al* (2000) also found increased plasma cortisol concentration in young calves transported for two subsequent nine-hour periods with either one-hour or 22-hour lairage rest mid journey, compared with non-transported control calves. They found no differences in their measures of calf welfare between short and long lairage, nor between space allowances of 0.375 or 0.475 m^2/calf, but found some evidence that the health of the calves was reduced post-transport.

Todd *et al* (2000), however, found that calves aged between five and 10 days old would lie during a 12-hour journey if space allowances were high (0.4m^2/calf) and also maintained plasma glucose levels and lost less weight than those transported for three or 12 hours at 0.2 m^2/calf, which averaged approximately 1kg loss. Calves transported for 12 hours at low space allowances showed steady and significant increase of creatine phosphokinase (CPK) until the end of transport when levels declined towards normal.

The lactate levels in this group of calves increased to significantly higher levels than all other groups at one hour post transport. The authors suggested the changes in blood metabolites were due mainly to calves transported at high stocking rates using their muscles to brace against lorry movements during transport and also noted that high levels of CPK are associated with bruising.

The frequent finding of weight loss following transport is thought to result from food and water deprivation, as well as faecal and urinary losses, that combine to produce dehydration and hypoglycaemia, both of which increase with journey time (Mormede *et al*, 1982). However as the work of Knowles *et al* (1997,1999) has shown, the solution is not to feed calves during transit but rather to minimise or avoid journeys.

Among the transport stressors is vertical vibration, which was examined in an experiment simulating some of the vibrations that might be experienced by calves during transport (Van de Water *et al*, 2003). Of the range of vibration frequencies (2, 4, 8 and 12Hz) and root mean square acceleration magnitudes at 1 or 3ms^{-2} to which they exposed calves averaging 22 days old for 2 hours, the most stressful was found to be 2Hz at the faster acceleration, which was also more stressful at the other frequencies than slower acceleration (1ms^{-2}). Stress was measured using heart rate, saliva cortisol and behaviour as well as body temperature. Most transporters have a fundamental vibrational frequency in the range 1–2Hz with secondary peaks at about 10Hz and lateral vibrations in the chassis at 12–18Hz.

A serious concern for the welfare of calves during transport is the loading and unloading process (Hemsworth *et al*, 1995) which may be the most stressful part of the transport process (Trunkfield and Broom, 1990; Kent and Ewbank, 1986; Fell and Shutt, 1986).

Bremner *et al* (1992) observed calves being unloaded from multi-deck transporters at an abattoir in New Zealand. The proportion that fell down the ramp or slid on their chest, side or haunches increased from a mean of 8% with a comparatively shallow ramp angle of 4.2° to an average of 80% on steep inclines of 18.6°. The authors concluded that bruising was likely to occur during loading and unloading.

McCausland *et al* (1977) found that half of the 16.4 thousand calves they surveyed in New Zealand had bruised stifles with the injuries probably occurring during transport. Clearly with sympathetic handling and well-designed transporters such levels of injury need not occur and it would be informative for current levels of impacts and injury to be surveyed in Europe. Ramp angles are similar in European trucks to those in New Zealand. A small survey in the UK found that no cattle slipped when unloaded on level or gentle uphill slopes (0 to -5°) but 30% of recorded slips were associated with ramp angles exceeding 13° (Inman and Bevan, 2001).

The implications for calf welfare of assembling calves from several farms do not appear to have been studied scientifically. There are measures in place to reduce the health risks (Defra, 2007) including the specification that young calves may come only from the place of birth (not via other farms or markets). Both health and other aspects of welfare should be covered by the requirement that calves are fit to travel and are inspected by local veterinary inspectors prior to transport. The regulations should result in less stress to calves and potentially fewer health problems than previously when they were permitted to be exported from general auction markets.

2.1 Conclusion

Recent evidence supports previous work (reviewed by Knowles in 1995) that young calves are not well adapted to cope with transport. Their immune system is not fully developed and they are not able to control their body temperature well, thus they are susceptible to both heat and cold stress. Weight loss following transit is indicative of exposure to a variety of stressors and is greater for longer journeys or greater stress, including cold or heat stress and exposure to vibration and acceleration. Therefore transport should be avoided where possible, particularly as morbidity and mortality following transport can be high (Knowles, 1995). There remains a need for new studies in Europe of mortality and morbidity in young calves following transport. Those calves with low immunoglobulin status and/or low haemoglobin levels appear to be at greater risk of poor welfare during and after transport.

To reduce the welfare problems of calves during transport, the literature indicates that they should be handled particularly carefully during loading and unloading and not have to move up or down sloping ramps (particularly those with angles steeper than 4°). Additionally they should have sufficient space (at least 0.4m^2/calf) to be able to lie down on comfortable bedding when travelling; and be kept at thermally comfortable temperatures, which are likely to be in the range 15-26°C. Journey time should be kept as short as possible to limit weight loss and dehydration, as well as other metabolic changes, which tend to increase with the length of the journey. Drivers should avoid exposing calves to accelerations (including braking and cornering) so that animals which are standing do not have continually to brace themselves nor be at risk of collisions or falls leading to bruising.

3. The impact on calf welfare of the differing legislative requirements applicable to UK and continental EU veal rearing systems

The European Food Safety Authority (EFSA) notes in its recent (2006) report, the importance for calf welfare of housing (space and pen design, flooring and bedding material, temperature, ventilation and air hygiene), feeding (liquid feed, concentrates, roughage) and management (grouping, weaning, human-animal relations).

The relevant UK legislation is *in Schedule 4 to the Welfare of Farmed Animals (England) Regulations 2000 and similar legislation made in other parts of the UK. The EU legislation is Council Directive 91/629 laying down minimum standards for the protection of calves as amended by Council Directive 97/2 and Commission Decision 97/182.*

UK legislation differs from the EU Directive in three aspects (see also ***Table 2***):

1. it specifies higher minimum amounts of dietary fibre for young calves
2. the space allowances are more generous for older calves
3. bedding has to be provided – fully slatted floors are not permitted

The small quantity of veal currently being produced in the UK is predominantly to higher standards than the legislative minimum. Nonetheless there is evidence that the UK standards provide significant improvements for calf welfare in comparison with the EU standards.

3.1 Dietary fibre

The EU's Scientific Veterinary Committee (SVC) 1995 report highlighted a number of welfare problems associated with lack of fibre in the diet of veal calves. These include: behavioural abnormalities (such as tongue rolling, tongue playing and compulsive biting/sucking of substrates) and formation of hairballs in the rumen.

Recent experiments have shown that between 70-80% of veal calves fed solely on milk (replacer) have hairballs (Chain Management of Veal Calf Welfare, 2000; Cozzi *et al*., 2002).

Scientific evidence has shown reductions in welfare problems and benefits from feeding fibre to veal calves (reviewed by SVC, 1995 & EFSA, 2006). Thus EU legislation specifies that calves over two weeks old should be provided daily with some fibrous feed which should increase from 50g to a minimum of 250g from the beginning to the end of the fattening period. The UK legislation specifies more generous minimum starting allowances of 100g at two weeks of age but increasing in line with the growth of the calf to a minimum of 250g per day at 20 weeks old, which is then in line with EU recommendations.

According to EFSA's 2006 report: "The main types of solid feed given to veal calves differ somewhat between the veal producing countries in Europe. In France and Italy, solid feeds for veal calves usually consist of chopped straw or pelleted dry feed consisting of both fibrous (e.g. straw) and concentrate-like (e.g. cereal) materials. In the Netherlands, maize silage is a popular roughage source for white veal calves, provided that the iron content is not too high (an upper limit of 110-120pp/kg dry matter is generally imposed). Maize silage is usually fed in relatively high amounts, with maximum daily amounts of up to 1.5kg (500g dry matter) per calf per day. Other feeds used in the veal industry include chopped straw and rolled barley."

Thus in some cases the dietary fibre routinely provided even in white veal production on the Continent may be in excess of legislative minima.

There is a complex relationship between the quality and quantity of liquid feed (milk) and dietary fibre which affect the welfare of veal calves in different ways (reviewed by EFSA, 2006). In brief, provision of certain types of fibre has been shown to increase the incidence of abomasal ulcers in veal calves fed milk replacer. Thus large-scale multifactorial trials have been undertaken with the aim of determining optimum types and amounts of fibre in feed to promote normal oral behaviour and minimise the incidence of ulcers and hairballs (Chain Management of Veal Calf Welfare, 2000; Cozzi *et al*., 2002; Mattiello *et al*., 2002). These and other studies have found that the addition to the diet of hay and straw in any form or quantity significantly reduced the level of abnormal oral behaviours and at the same time also increased levels of rumination compared with veal calves offered milk replacer only. They were more effective in improving these aspects of calf welfare than other types of roughage with lower levels of fibrous material. Dietary fibre was also effective in substantially reducing the incidence of hairballs to below 30% and in some cases to none.

Further work is needed on the composition and balance of veal calf dietary fibre to optimise gut health and promote more normal oral behaviour and rumination.

The UK's more generous allowance for young calves appears to have been primarily based on evidence from the 1995 SVC report which stated that every calf should be fed a daily source of long fibre [*long being defined as >10mm*] supplemented with a fermentable material such as starch to maintain the microbial flora of the gut. It went on to recommend: “They should receive a minimum of 100g of roughage a day from two to 15 weeks of age, increasing to 250g per day from 15 to 26 weeks of age, but it would be better if these amounts were doubled.”

The recent evidence (EFSA, 2006) indicates that the composition and balance of the fibre is as important as quantity, so it is as yet unclear how much of an advantage the extra 50g per day afforded to young calves by UK legislation confers. Thus, there is a need for further studies to establish qualitative as well as quantitative recommendations for fibre provision.

3.2 Space allowance

Calves that weigh 150kg or more have markedly greater space allowances under UK law than those kept in the rest of the EU (see ***Table 3*** below).

Table 3: Comparison of space allowances for calves in UK and EU legislation

UK standards		**EU standards (from 31/12/06)**	
Calf weight (kg)	**Space allowance (m^2)**	**Calf weight (kg)**	**Space allowance (m^2)**
Under 150kg	1.5	Under 150kg	1.5
150 to 200kg	2.0	150 to 220kg	1.7
200kg or more	3.0	220kg or more	1.8

Note: EU standards apply from 31 December 2006 for all systems and from 1 January 1998 for newly-built systems.

The SVC (1995) report cited evidence that exercise is necessary for normal bone and muscle development, and recommended a minimum space allowance per calf of 10% more than the length of the calf from the tip of its nose to the caudal edge of the tuber ischii (or pin bone) and suggested that calves be kept in groups of at least four to allow more space for exercise.

The more recent EFSA report (2006) gives a risk assessment of factors influencing calf welfare noting that: “The hazard of insufficient floor space is considered very serious” (page 7). This report defines (page 125) insufficient space allowance as “not enough space in order to fulfil the animal behavioural needs, such as resting postures, locomotion and social interactions.”

It also states that: “Calves require space to perform activities such as resting, feeding, exploring, interacting and escaping from perceived danger.”

Recent studies have confirmed that the space available can affect both behavioural and physiological traits and productive performances of cattle (EFSA, 2006). However, little research has been done to directly compare behavioural and physiological indicators of welfare in calves reared in pens of various space allowances, as most work with veal calves has compared single pens with group pens.

Veal calves are likely to behave similarly to dairy calves, which have been observed to play more in pens with greater space allowance (Jensen *et al*., 1998; Jensen and Kyhn, 2000). Sufficient space is also needed to reduce the contamination of calves with potential pathogens acquired through contact. Thus the more generous space allowances given by UK legislation are likely to improve calf welfare, although other interacting factors such as pen design and flooring need to be taken into consideration.

3.3 Bedding and slatted floors

The influence of bedding and slatted floors on calf welfare was reviewed by SVC (1995). Key points for which scientific evidence was cited include:

- calves have difficulty lying down and standing up on slippery floors (as is likely to happen on fully slatted floors)
- this difficulty in changing posture reduces the frequency of bouts of lying, especially in older calves (over 150kg)
- veal calves on concrete slatted floors may show reduced locomotion and more cross-sucking behaviour
- young calves kept on slatted floors may develop skin lesions on their legs
- hard and slippery floors can cause lameness, claw and other leg disorders
- the provision of fibre in the diet may decrease the slipperiness of slatted floors
- slatted floors predispose calves to tail injuries caused by other calves standing on them when lying
- provided that the material (e.g. straw) is kept clean and dry, calves kept with bedding are cleaner
- dry (straw) bedding provides considerably better insulation than for example concrete slats and this is likely to be particularly important for the welfare of younger calves in cooler weather

Among the conclusions of the SVC (1995) report was this:

"18. Appropriate bedding, for example straw is recommended. Bedding must be changed at appropriate intervals and every calf should have access to a dry lying area. Slatted floors must not be slippery and must not be a cause of tail tip necrosis."

There has been little relevant recent research on flooring in veal calves, however SCAHAW (2001) notes that for cattle in general the type of floor surface not only affects the movements of getting up and lying down, lying and resting behaviour of the fattening animals, but concerns have been expressed about their effects on animal welfare. The report also indicates that: "When cattle can choose between different floor types, they prefer deep litter to slatted floors, especially for resting."

The Five Freedoms (see FAWC, 2006) are a widely-accepted checklist for good animal welfare that underpins Codes of Recommendation and some UK Animal Welfare Legislation. Systems that provide only slatted floors are likely to be unable to provide these freedoms. For example:

'Freedom from Discomfort – by providing an appropriate environment including shelter and a comfortable resting area.'

Slatted floors are physically uncomfortable and often thermally uncomfortable as well. It should be noted that calves may spend up to 80% of their day lying, so it is essential for good welfare that they can do this in comfort.

'Freedom from Pain, Injury or Disease - by prevention or rapid diagnosis and treatment.'

Calves whose tails are trodden on when lying on slatted floors will suffer injury and prolonged pain. They may also develop leg disorders and injuries from slipping on floors.

'Freedom to Express Normal Behaviour - by providing sufficient space, proper facilities and company of the animal's own kind.'

Calves show abnormal lying behaviour on slats and may also move around and play less, especially if the slats are slippery.

UK legislation, by specifying a bedding area and not permitting fully slatted floors, is likely therefore to very considerably improve the welfare of calves in comparison with the EU legislation.

3.4 Conclusion

There is scientific evidence and consensus of opinion among experts to support the higher standards of UK legislation that were made with the aim of improving calf welfare over and above those laid down in EU legislation. The most important of these is the specification of bedding, for which there is considerable scientific evidence of markedly improved calf welfare. It is impossible for fully slatted floors to provide all 'Five Freedoms' and to be compatible with good calf welfare. There is evidence that increased space allowances are beneficial for calf welfare.

Reference

ADAS (2006) *Use of purebred Holstein/Friesian male calves born in the United Kingdom*. Prepared for Livestock Products Division, Defra. August 2006.

Bremner, K.J., Matthews, L.R., Brears, D. and Painting, A.M. (1992) Behaviour and welfare of calves during transportation: unloading. *New Zealand Animal Production Science*, 52, 13-75.

Chain Management of Veal Calf Welfare, 2000. Final Report EU-project contract number FAIR 3 PL96-2049, 170 pp.

Cozzi, G., Gottardo, F., Mattiello, S., Canali, E., Scanziani, E., Verga M., Andrighetto, I., 2002. The Provision of Solid Feeds to Veal Calves: I. Growth Performance, Forestomach Development, and Carcass and Meat Quality. *Journal of Animal Science,* 80: 357-366.

Defra (1999) *Improving calf survival*. MAFF publications, Admail 6000, London SW1A 2XX
Defra (2006a) Dealing with bovine TB in your herd. October 2006. Online pdf document accessed March 2007, http://www.defra.gov.uk/animalh/tb/pdf/tbinyh.pdf.
Defra (2006b) Overview of the implementation CAP reform (first and second wave of the reform) http://www.defra.gov.uk/farm/capreform/mstates/pdf/MSoptionsplus2ndwave.pdf (accessed 28.11.06).
Defra (2007a) Joint announcement by the agricultural departments of the United Kingdom AGRICULTURAL AND HORTICULTURAL SURVEY: JUNE 2006 UNITED KINGDOM Stats 05/07 18th January 2007 http://statistics.defra.gov.uk/esg/statnot/june_uk.pdf (accessed 01.03.07).
Defra (2007) Exporter guide on export of cattle (31.01.2007) http://www.defra.gov.uk/animalh/int-trde/bovineexports/pdf/cattle_guide.pdf.

Eblex (2006a) Information on the Beef Better Returns Programme from http://www.eblex.org.uk/betterReturns/beef/ (accessed 28.11.06) or EBLEX Graphic House, Ferrars Road, Huntingdon, Cambs PE29 3EE. Tel: 0870 242 1394.
Eblex (2006b) Export bulletin 06-07.
Eblex (2006c) Export bulletin 06-08.
Eblex (2007) Eblex update February 2007.

EFSA (2006) Scientific Report on *The risks of poor welfare in intensive calf farming systems*. An update of the Scientific Veterinary Committee Report on the Welfare of Calves. Adopted by written procedure on the 24 of May 2006 EFSA-Q-2005-014, 14 pp.

Elmer, S. and Reinhold, P. (2003) Consequences of changing ambient temperatures in calves - Part 1: Immediate reactions of the respiratory system, the circulation system, metabolism and thermal regulation. *Deutsche Tierarztliche Wochenschrift*, 109, 182.

Esslemont, RJ and MA Kossaibati (1997) Culling in 50 dairy herds in England. *Veterinary Record*, 140, 36-39.

Eurostat (2006) Eurostat survey of EU cattle populations in December 2005 and production forecast for 2006.

FAO (2006) <http://www.fao.org/docrep/009/J8104e/j8104e03.htm> (accessed 2.12.06).

FAWC (1997) Report on the Welfare of Dairy Cattle. Farm Animal Welfare Council, FAWC Secretariat, 1A Page Street, London, SW1P 4PQ http://www.fawc.org.uk/reports/dairycow/dcowrtoc.htm.

FAWC (2006) Website giving details of the **Five Freedoms** (accessed 01.12.06). http://www.fawc.org.uk/freedoms.htm.

Fell, L.R. and Shutt, D.A. (1986) Adrenocortical response of calves to transport stress as measured by salivary cortisol. *Canadian Journal of Animal Science*, 66, 637-641.

Grigor, P.N., Cockram, M.S., Steele, W.B., Le Seuer, C.J., Forsyth, R.E., Guthrie, J.A., Johnson, A.K., Sandilands, V., Reid, H.W., Sinclair, C. and Brown, H.K. (2000) Effects of space allowance during transport and duration of mid-journey lairage period on the physiological, behavioural and immunological responses of young calves during and after transport. *Animal Science*, 73, 341-360.

Hallings-Pott, C (2006) Farming for the future in the Southeast of England, Case Study 'On the Menu' p10 http://www.go-se.gov.uk/gose/docs/169206/farmingForTheFuture.pdf. (accessed 01.12.06). Defra Government Office for the Southeast, Guildford, Surrey.

Hemsworth, P.H., Barnett, J.L., Beveridge. L. and Matthews, L.R. (1995) The welfare of extensively managed cattle: a review. *Applied Animal Behaviour Science*, 42, 161-182.

Inman, C. and Bevan, A. (2001) The transport and unloading of cattle at livestock markets. Unpublished undergraduate veterinary project report of a survey of 99 vehicles at four markets. University of Bristol.

Jensen M. B., Vestergaard K. S. and Krohn C. C. (1998) Play behaviour in domestic calves kept in pens: the effect of social contact and space allowance. *Applied Animal Behaviour Science,* 56, 97-108.

Jensen, M.B. and Kyhn, R. (2000) Play behaviour in group-housed dairy calves, the effect of space allowance, *Applied Animal Behaviour Science, 67, 35-46.*

Johanson, J. M. and Berger P. J. (2003) Birth weight as a predictor of calving ease and perinatal mortality in Holstein cattle. *Journal of Dairy Science*, 86, 3745-3755.

Kent, J.E. and Ewbank, R. (1986) The effect of road transportation on the blood constituents and behaviour of calves. II. One to three weeks old. *British Veterinary Journal*, 142, 131-140.

Knowles, T.G. (1995) A review of post transport mortality among younger calves. *Veterinary Record,* 137, 406-407.

Knowles T.G., Warriss, P.D., Brown, S.N, Edwards, J.E., Watkins, P.E and Phillips, A.J. (1997) Effect on calves less than one month old of feeding or not feeding them during road transport of up to 24 hours. *Veterinary Record,* 140, 116-124.

Knowles T.G., Brown, S.N, Edwards, J.E., Phillips, A.J. and Warriss, P.D. (1999) Effect on young calves of a one-hour feeding stop during a 19-hour journey. *Veterinary Record,* 144, 687-692.

Mattiello, S., Canali, E., Ferrante, V., Caniatti, M., Gottardo, F., Cozzi, G., Andrighetto, I., Verga, M. (2002). The provision of solid feeds to veal calves: II. Behavior, Physiology, and abomasal damage. *Journal of Animal Science*, 80: 367-375.

McCausland, I.P., Austin, D.F. and Dougherty, R. (1977) Stifle bruising in bobby calves. *New Zealand Veterinary Journal*, 25, 21-72.

Mormede, P., Soisson, J., Bluthe, R., Raoult, J., Legart, T, G., Levieux, D. and Dantzer, R. (1982) Effect of transportation on blood serum composition, disease incidence and production traits in young calves. Influence of the journey duration. *Annals of Veterinary Research*, 13, 369-384.

NFU (2006) *Calf exports – your questions answered*.

SCAHAW (2001) *The welfare of Cattle kept for beef production*. Directorate General Health and Consumer Protection, Directorate C - Scientific Health Opinions, Unit C2- Management of scientific committees. Scientific Committee on Animal Health and Animal Welfare. Adopted on 25 April 2001, 150pp.

Schrama, J.W., Heetkamp, M.J.W., Verstegen, M.W.A. Schouten, W.G.P., van der Veen, F. and Helmond, F.A. (1996) Responses of young calves, on two levels of feeding, to transportation. *Animal Science*, 63, 79-89.

Steinhardt, M. and Thielscher, H. H. (1999) Maturity of suckler calves and dairy calves at the second and third week of postnatal age and forms of reaction of the animals to transport by road. *Landbauforschung Volkenrode*, 49, 70-89.

Steinhardt, M. and Thielscher, H. H. (2005a) Transport stress in young calves. Effects of animal breed and husbandry system on heart rate, haematological values, blood lactate and acid-base balance. *Tierarztliche Praxis Ausgabe Grosstiere Nutztiere*, 33 (1), 28-36.

Steinhardt, M. and Thielscher, H. H. (2005b) The effect of haemoglobin content of blood on reactions of suckler calves exposed to short haul road transport and temporary separation from herd mates. *Tierarztliche Umschau* 60 (7), 356.

SVC (1995) *Report on the Welfare of Calves*. Scientific Veterinary Committee, Animal Welfare Section. Directorate Generale for Agriculture, VI/BII.2. Adopted 9 Nov. 1995, 120pp.

Thielscher, H. H. and Steinhardt, M. (2004) Physiological reactions of suckler calves from a cow-calf operation exposed to transport and temporary separation from herd mates in winter stalling. *Berliner und Munchener Tierarztliche Wochenschrift*, 117 (3-4), 88-96.

Todd, S.E., Mellor, D.J., Stafford, K.J., Gregory, N.G., Bruce, R.A. and Ward, R.N. (2000) Effects of food withdrawal and transport on 5 - 10-day old calves. *Research in Veterinary Science*, 68, 125-134.

Trunkfield, H.R. and Broom, D.M. (1990) The welfare of calves during handling and transport. *Applied Animal Behaviour Science*, 28, 135-l 52.

Van de Water, G., Heylen, T., Swinnen, K. and Geers, R. (2003) The impact of vertical vibrations on the welfare of calves. *Deutsche Tierarztliche Wochenschrift*, 110, 111-114.

CIWF
advancing
farm animal welfare

www.ciwf.org
registered charity number 1095050

Compassion in World Farming
Second Floor, River Court
Mill Lane, Godalming, Surrey, GU7 1EZ
Tel: +44 (0)1483 521 950 Fax: +44 (0)1483 861 639
Email: **richard@ciwf.co.uk** Website: **www.ciwf.org**