MODERN BREEDING TECHNOLOGIES AND THE WELFARE OF FARM ANIMALS

A COMPASSION IN WORLD FARMING TRUST

report by

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Foreword

MODERN FARMING: MAKING THE CRUELTY VISIBLE

Professor The Revd Dr Andrew Linzey

Most people who eat meat believe that it is justifiable to kill animals for food as long as they live natural lives and are treated and killed humanely. However, as this Report shows, most farm animals do <u>not</u> live natural lives and are <u>not</u> treated humanely.

The reason is everywhere evident in the Report. Farm animals have become economic machines exploited by an increasingly powerful biotechnology industry intent on maximising profitability. Farmers find themselves increasingly pressurised to conform their farming practice to the latest technologies in order to maintain their own profitability.

Scientists – to their shame – have led the way in this process by allowing their scientific ingenuity and skill to be harnessed to the commercialisation of animal farming. There is nothing more frightening in this Report than the comment of Professor Peter Street who maintains that modern breeding technologies, particularly embryo transfer, enable scientists to "... design the whole carcase, if you like, from embryo to plate to meet a particular market niche." (Page 17).

Government and its various 'welfare' committees (usually comprising both practitioners and profiteers from animal industrialisation) have invariably acquiesced in this process failing – again and again – to address fundamental ethical questions.

In the light of all this, one might be tempted to despair of the possibility of bringing about fundamental changes in the direction of animal welfare. But there are many reasons for hope, three in particular.

First, the growth of factory farming over the last 40 or more years – a process that itself once looked invincible and inexorable – has produced a strong counter-reaction. Although it is true that many ugly elements of intensification remain – most notably in hen battery production – most informed opinion has moved decisively against these systems of intensive farming.

Second, fuelled in part by this reaction, we have begun to witness over the last 20 years a significant change in public perception of the moral status of animals. The idea that animals are machines, things, commodities, resources, simply here for our use is giving way, slowly but surely, to another: that animals are sentient beings with their own intrinsic value, dignity and rights.

Third, the truth is that modern breeding technologies owe their success to public ignorance: most people simply do not know about artificial insemination, cloning, or embryo transfer – still less about the suffering to the animals involved. The industry must hope that they remain ignorant: after all, so much happens behind closed doors.

The task of Compassion in World Farming is to go on speaking the truth: to expose – as this document does in a commendably cool and calm way – the suffering and harm done to farm animals by modern breeding technologies. The cruelty which is currently invisible must be made visible – for all to see.

For myself I have little doubt that – for all their apparent sophistication and success – technologies that cause suffering to sentient creatures are morally doomed. Although knowledge is a variable thing, it is impossible to depend upon ignorance for ever. There is a mismatch between public conscience and technological practice that cannot last for ever.

If this sounds a little optimistic, it is vital to appreciate that our present scientific and technological abilities are the slaves – in this area at least – of a single perception: profitability at almost any cost. But perceptions can and do change. The very same people who have used their ingenuity and technical skills to create animal machines are also the very same people who could, given different circumstances, use their fantastic expertise to create genuinely welfare friendly systems of animal agriculture.

In short: It is not expecting too much that those who have used their expertise in response to commercial pressure might one day use this very same expertise in the service of a less morally repugnant system of animal agriculture.

Meanwhile, those who still want to eat meat and let the animals have natural, happy lives, will find the following pages nothing less than morally shocking.

Oxford
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Professor The Revd Dr Andrew Linzey holds the world's first academic post in the ethical and theological aspects of animal welfare – the IFAW Senior Research Fellowship at Mansfield College, Oxford. He is also Special Professor of Theology in the University of Nottingham.

1. Introduction

Compassion in World Farming Trust believes that serious ethical issues are raised by a number of both existing and emerging technologies used in the breeding of farm animals.

Increasingly, both the government and the public have become aware of the adverse welfare implications of intensive animal husbandry systems such as the battery cage for egg laying hens. Indeed, the government has legislated to prohibit the use of two of the most damaging rearing systems, the veal crate and sow stalls.

Much less attention has, however, been paid to the ways in which modern methods of breeding are threatening farm animal health and welfare. Compassion in World Farming Trust believes that these breeding methods merit just as much attention as rearing systems, and this report seeks to expose the serious shortcomings of current breeding practices.

2. Selective breeding

Selective breeding is often regarded as a wholly benign process. The argument tends to be: we have been doing this for centuries and it has led to few problems. Sadly, this is not the case. Over the last twenty years selective breeding has imposed considerable physiological stress, injury and pain on farm animals.

Broom [(1)] has emphasised that the considerable increase in the efficiency of animal production over recent decades (resulting from, amongst other factors, selective breeding) "has sometimes resulted in severe problems for animals. Where such problems exist, the practices which lead to them would be judged as morally wrong by the majority of the general public". The 1995 Report of the Banner Committee (on the ethical implications of the emerging technologies in the breeding of farm animals) stressed that selective breeding "can have highly objectionable side effects as regards animal welfare". [(2)]

The main aim of selective breeding is to enhance productivity, for example, by developing faster growth and larger animals. The dangers inherent in this process can be illustrated by an examination of a broad range of farm animals.

2.1 Broiler chickens:

As a result of selective breeding (and artificially rich diets) the modern broiler commonly reaches its slaughter weight in just 42 days. This is twice as fast as 30 years ago.

2.1.1 Leg problems:

The result of this rapid growth is that the birds' legs cannot support their massive bodies. What grows quickly is the muscle, which is the meat that is eaten, but the legs do not keep pace with the rest of the body and cannot properly support its weight. This means that for the last 10 to 15 days of the chickens' lives there are severe abnormalities of bone development which are known to be painful and crippling.[(3)]

The widespread incidence of leg problems has been well documented. In 1992, the Farm Animal Welfare Council (FAWC) produced a Report on the Welfare of Broiler Chickens. [(4)] FAWC's Working Group found leg problems of varying degrees of severity on nearly every farm they visited. The Report states that in the worst cases birds were only able to move with great difficulty, using their wings to balance. Such birds, adds the Report, were obviously distressed and had problems in reaching food and water.

FAWC concluded that the current level of leg problems is unacceptable. They stressed that in the most severe cases producers may be in breach of the Agriculture (Miscellaneous Provisions) Act 1968 by causing unnecessary pain or distress.

Leg problems that arise in chickens selected for rapid growth include tibial dyschondroplasia (malformation of the leg bone) and femoral head necrosis (septic arthritis of the hip joint). [1]

A recent study by Kestin *et al* has described a method for measuring leg problems by assessing the walking ability of broilers. [5] It found that 90% of intensively reared broilers had a detectable abnormality in their gait. In 26% their welfare was compromised as a result of their leg weakness – the authors emphasise that there is likely to be chronic pain and discomfort for these birds. If these results are representative of the UK broiler flock as a whole (and there is no reason to think that they are not) it means that some 150 million birds are suffering from chronic pain and discomfort each year.

Four per cent of the broilers in the study were affected to the point where they could only walk with difficulty; this would amount to some 24 million birds a year nationally. Two per cent (some 12 million a year nationally) were incapable of sustained walking and could only move with the help of their wings or by crawling on their shanks. The authors point out that the figures of 4% and 2% may well underestimate the number of birds with severe gait deformity because some may have died or been culled before the study was undertaken.

Kestin emphasises that the immobility associated with leg weakness impinges on four of the “five freedoms” elaborated by the Farm Animal Welfare Council. He adds that these disabled birds “may be less able to compete for living resources and could suffer injury, malnutrition and dehydration”.

Kestin’s results suggest that genetic factors make a major contribution to leg problems.

Referring to the chronic pain experienced by many broilers, Professor John Webster (Head of Bristol University’s Veterinary School) [6] has said “given that poultry meat consumption in the UK exceeds one million tonnes per annum, this must constitute, in both magnitude and severity, the single most severe, systematic example of man’s inhumanity to another sentient animal”.

2.1.2 Heart disease:

Broilers are also growing too fast for their heart and lungs. Their very rapid growth puts an enormous strain on the cardiovascular system. Many birds develop congestive heart failure which causes ascites, a pooling of body fluids in the abdomen. [3] The Agricultural and Food Research Council has estimated that ascites kills 1% of broilers – that is some 6 million each year.

Birds with heart and leg problems will sit down for long periods and are thus likely to get breast blisters or hock burns if the litter is damp from accumulated excrement. Worse, broilers that cannot stand up due to leg weakness “may be trampled and killed by the many other birds which are all around them”. [1]

Referring to broilers, Webster has said:

"It is absolutely not right that animals in the first weeks of their life should be experiencing heart disease; it is absolutely not right that animals in the first weeks of their life should be crippled as a consequence of their breeding". [3]

2.2 Pigs:

Selective breeding has been used to develop pigs with faster than ever growth rates and quicker, heavier muscle development. This has led to similar problems to those affecting broiler chickens. Pigs' legs are simply unable to keep pace with the growth rate in the rest of their bodies. As a result, pigs are suffering from painful joint and leg problems.

Professor Donald Broom (Colleen Macleod Professor of Animal Welfare at Cambridge University's Department of Clinical Veterinary Medicine) has said that these problems are increasing in incidence. He adds that rearing animals so that their bodies are growing too fast for their legs "is rather like a child who is nine years old in weight having to stand on the legs of, say, a five year old". [7]

Like broilers, pigs are growing too fast not only for their legs but also for their heart and lungs. As a result of selective breeding, strains are placed on pigs because their muscles have grown out of proportion to their blood-vessels and heart. Professor Broom has stated that during transport pigs can "have substantial problems because their muscles have grown faster than their blood-vessels have ... they can be physiologically affected by not being able to get enough oxygen into their muscles, and so even a young animal can have a heart attack and even die". [7]

Dämmrich [8] has pointed out that modern breeds of pigs are more susceptible to heart strain because the heart is smaller in relation to overall body weight. The heart constitutes 0.38% of the body weight in a wild boar but only 0.21% in a modern Landrace.

For years pigs have been selectively bred for leanness and big chunky-looking muscles. The halothane gene has become prevalent during this process. This gene contributes to leanness but is also associated with extreme sensitivity to stress and can lead to sudden death from weakness of the heart. This problem is now being addressed by some, but not all, breeding companies.

2.3 Turkeys:

Years of selective breeding have resulted in significant changes to the physiology and anatomy of commercial turkeys.

2.3.1 Leg and hip problems:

Dr Colin Whitehead has explained that much of a turkey's weight is transmitted through a cartilage pad in the hip joint, called the antitrochanter. Turkeys have been bred to have as much meat on them as possible, particularly breast meat. The resultant very heavy weight of the turkey's upper body can lead to "very considerable pressures building up in this antitrochanter and this can result in the structure breaking down and lead to degeneration of the cartilage of the hip joint". [9] This condition has been found in all types of commercial turkeys, but is particularly prevalent in breeding males, where Dr Whitehead's team found up to 70% of the birds to be affected.

Duncan *et al* [10] carried out a study to examine the degree to which degenerative hip disorders result in pain in adult male turkeys. One group of birds was injected with an anti-inflammatory, pain-relieving steroid in week 1 and with control injections of saline in week 3. A second group received saline in week 1 and the steroid in week 3.

The turkeys treated with pain-reducing steroids spent more time standing, walking and drinking than the control birds. The steroid-treated birds also showed speedier movement in a sexual activity test and attempted to mount the females more often. The assumption was that the activities of the control birds were more inhibited by the degree of pain and discomfort they experienced.

The authors concluded that “degenerative hip disorders in adult male turkeys result in a state of chronic pain which inhibits spontaneous activity and sexual activity”. It should be noted that post mortem examination revealed all the turkeys to have been suffering from extensive joint degeneration.

2.3.2 Inability to mate:

In addition to leading to painful hip joint problems, selective breeding has produced turkeys whose body shape makes it impossible for their reproductive organs to come into contact. As indicated above, turkeys have been selected for huge, meaty and profitable breasts, which make mounting impossible. As a result, all reproduction depends on artificial insemination.

Broom [1] points out that where male turkeys attempt to mate, injuries to the females may arise. He adds that “most of those not concerned directly in the animal production industry find it unreasonable that almost all members of a widely used breeding line are unable to perform a normal biological function like mating”.

The Banner Committee report stated that “the breeding of birds who are physically incapable of engaging in behaviour which is natural to them is fundamentally objectionable”.

2.4 Beef cattle:

As with pigs and broiler chickens, selection for rapid growth (together with a high level of feeding) causes leg problems in beef cattle. [1]

The detrimental impact that selective breeding can have on animal health is vividly illustrated by the selection of Belgian Blue cattle for double muscling. This leads to larger, heavier muscles particularly in the hind quarters and is also associated with a shrinking of the pelvic dimensions.

As a result, cows often carry calves which are too large for natural birth, i.e. through the pelvic canal. This leads to “the frequent or inevitable use of caesarean section” [11] with some cows undergoing a succession of caesareans during their lifetime.

Redfern [12] has said that clinically this is not justified “because the repeated opening of the cow will lead to surgical problems” and wound problems because in subsequent caesareans scar tissue rather than normal tissue is being opened and consequently the healing problems are much greater.

Webster [3] has emphasised that caesareans raise questions “of recovery from the fairly radical surgery of the abdominal cavity, and also the high probability of getting adhesions within the abdominal cavity following repeated surgery. And by analogy with humans, abdominal adhesions are very painful indeed".

2.5 Egg-laying hens:

The modern hen has been bred to produce some 300 eggs a year rather than the dozen eggs laid annually by jungle fowl, the ancestors of today's birds. Laying eggs in such huge numbers puts a very considerable strain on the hen's calcium reserves.

This calcium depletion is associated with progressive loss of structural bone throughout the laying period with some 70% of hens eventually suffering from osteoporosis. Osteoporotic birds are more vulnerable to bone fractures and breakages. Osteoporosis results not just from selecting for a high level of egg production but also from hens being in lay for a prolonged period with no natural break, and in particular from the lack of movement imposed on the birds by the battery cage.

2.6 Ethical implications of selective breeding:

Compassion in World Farming Trust believes that it is ethically unjustifiable to use breeding methods which are known to lead to a significant proportion of the animals suffering from painful leg or joint problems or from heart disease or other health problems. Increased productivity should not be achieved at the cost of widespread injury, disease and pain for the animals involved. Selective breeding which has an adverse impact on the health of the animals and almost inevitably causes suffering is indefensible on moral and welfare grounds.

3. Artificial insemination

Selective breeding has imposed considerable stress, injury and pain on farm animals, in terms of the unnatural traits which have been produced in the animals concerned.

More recently, artificial insemination and embryo transfer have developed, to 'facilitate' the process of selective breeding. In addition to the negative effects on farm animal welfare which selective breeding produces *per se,* the techniques frequently used to achieve artificial insemination and embryo transfer are themselves far from benign.

3.1 Cattle:

Artificial insemination (AI) developed rapidly in cattle in the 1950s, when bull sperm was successfully stored by freezing techniques. This allowed 2-4 ejaculations per week from a bull to be available to inseminate at least 2,000 cows. In Europe 90% of dairy cows are now impregnated by AI.

AI has therefore become the norm in the dairy business and its use in other species is also on the increase. Nearly all commercially reared breeding turkeys are now subject to the AI regime and its use in pigs is increasing, being currently 12-15% in Britain but up to 70-80% in some EU countries.

However, just because a technique has become widespread, does not mean that it is morally acceptable or welfare-friendly.

Breeding bulls kept for AI usually live in isolation. Their natural ruminant feeding patterns are disrupted as they are kept indoors and fed cereal concentrates and hay.

The procedure of obtaining sperm also subjects the bull to what humans might call indignity, but which to the bull is more likely frustration. "Current recommendations for preparation of dairy bulls are one false mount, two minutes of restraint and two additional false mounts before ejaculation". [(13)] A "teaser" animal is used – often another male. Its well-being must surely also be compromised in this repetitive scenario.

Cows are inseminated via the insertion of "straws" up the vagina and through the cervix. This should take place when the cow is in oestrus and the cervix is therefore open and receptive.

The procedure is controlled by putting one hand up the cow's rectum and manipulating the cervix to help insertion of the insemination "gun".

The procedure may not be painful, but it will almost certainly involve discomfort in itself, plus the discomfort of the restraint necessary to carry it out.

3.2 Pigs:

Breeding boars are made to mount a dummy sow and a gloved hand beneath masturbates the animal into a bottle. Semen is collected from such boars twice a week.

The sow is restrained fairly easily if she is in oestrus as a firm hand on her back will still her. The semen is inserted by a catheter into the vagina. Industry literature warns: "Catheters inserted at the incorrect angle, i.e. downwards, may enter the bladder". [(14)] The whole procedure takes several minutes, often longer in gilts.

Again it takes no stretch of the imagination to be fairly certain that the procedure may cause at least some discomfort, particularly to gilts.

3.3 Sheep:

In sheep, AI via the cervical route has acknowledged welfare problems because of the anatomy of the ovine cervix. The option is to perform a laparoscopy. As laparoscopy involves surgery, sedation and a local anaesthetic and therefore the services of a veterinary surgeon, it is more expensive for farmers. The Sheep Veterinary Society has recently considered the danger of untrained personnel carrying out trans-cervical AI in sheep. Currently about 17,000 AI procedures are carried out on sheep annually in the UK. The Executive Committee of the Sheep Veterinary Society has set up a working group to examine the ethical aspects of both artificial insemination and embryo transfer.

3.4 Turkeys:

As the modern turkey has been bred for massive muscle (meat) development, normal sexual activity has become impossible – the birds are simply too heavy. Now male breeding turkeys are "milked" two or three times a week so that the females can be artificially inseminated.

The "milker" holds the male turkey on a stool and presses two or three times on the abdomen beneath the vent causing semen to be released from the phallus. ADAS recommends "Excessive force should not be used". [(15)] Feeding and watering activities are stopped for 4-6 hours before semen collection.

Research shows that semen collection may be painful for the birds as it results in "the formation of primary haemorrhages throughout the proctodeum and urodeum". [16]

Females are subject to photo stimulation at around 22 weeks of age. This stimulates hormone release and follicle development. About 10 days after photo stimulation the membrane covering the entrance to the oviduct disappears and the opening to the oviduct can be entered. The insemination tube is inserted 2-3 cm into the oviduct and sperm released. Turkey hens are often inseminated three times in one week and not less than once in 10 days. [17]

4. Embryo transfer

Embryo transfer (ET) is the technology whereby a donor animal is fertilised and her embryo(s) removed to be implanted or transferred to a recipient animal (surrogate mother).

ET has been carried out for many years and up to the mid-1970s was usually surgical. This often led to the formation of scar tissue in the reproductive tract.

Most cattle embryo transfers are now non-surgical and take place via the vagina-cervix-uterus route. Although non-surgical methods for sheep are being developed, the vast majority of sheep, goat and deer transfers are surgical. In pigs it is particularly difficult to develop a non-surgical technique due to the physiology of the reproductive tract.

4.1 Cattle:

The aim of ET is generally to improve the overall quality of the breed/herd by taking embryos from high quality donors on a regular basis and growing them to term in recipient animals of poorer quality. "Superior" cows are inseminated with suitable bull sperm and each cow can (through transfer of her embryos to recipient cows) produce in her lifetime far more "superior" offspring than she would have done if left to produce the normal one calf per year.

To maximise the reproductive potential of "superior" cows, they are usually subjected to hormone treatment to induce super-ovulation. Treatment varies but often the oestrus cycle itself is shortened and the cow is stimulated to produce many more ova than she would normally. This is achieved through a series of prostaglandin and follicle stimulating hormone injections. Sometimes up to 10 injections may be given. As a result "some super-ovulated cows have radically altered hormone concentrations". [18]

Now a new technique using ultrasound to pierce the follicles is being developed. This could lead to cows having eggs collected on a weekly basis. Researchers in Canada say the aim of the new technology is to "aspirate eggs daily from top donor cows for in vitro fertilisation". [19]

Super-ovulation may result in 10 ova being ovulated in the cow. Insemination takes place twice: 12 hours after oestrus starts and 12 hours later. "Since donors are bred two or more times, chances of contamination of the uterus are increased", points out one expert. [18]

A week after insemination the embryos are recovered by so-called "flushing". A flexible rubber tube made rigid with a metal stilette is passed through the cervix into the uterus.

A balloon two inches from the end is inflated to fit inside the uterus and stop fluid escaping. Fluid is passed through the tube swelling the uterus to twice its usual diameter and thus dislodging the embryos trapped in the folds of the uterine lining. “Sometimes several attempts are required to dislodge them”. [18]

The industry is quick to say that ET is no more hazardous or unpleasant for the cow than AI. But flushing alone can bring problems. If the catheter goes inside the uterine horn it draws blood. If the balloon is inflated too quickly, the lining of the womb can be ruptured.

Of course the whole procedure is potentially painful as it takes place a week after oestrus, by which time the cervix is closed and difficult to penetrate.

“About 50 to 100 recovery attempts are required to learn to deal with the various situations that arise ... very rarely a donor can be damaged permanently”, George Seidel points out. [18] So this is a technique which requires great skill, the learning of which may cause considerable suffering to the cows involved.

Another method of obtaining eggs is to extract them from the ovaries of slaughtered heifers. They are then fertilised in vitro. This method is already being commercialised in Scotland by Scottish Beef Developments, an offshoot of Animal Biotechnology Cambridge.

More recently Dr Bob Stubbings of Guelph University has developed a technique for removing one ovary from newborn female calves, and even eggs from calf foetuses. [20] A rich supply of eggs is then available. The health and welfare implications of this procedure for the calf (and in the case of foetal removal, the mother as well) are horrendous.

Implantation or transfer of the embryos used to be performed surgically in cows with use of a general anaesthetic and an incision made between udder and navel. If surgery is used today an incision is usually made in the flank and a puncture made in the uterine wall to insert the embryo. In current UK practice the cow remains conscious and upright as general anaesthesia has been dropped in preference to epidural anaesthesia. (In the US, we understand anaesthesia of any kind is rarely used).

Most bovine ET in the UK is now non-surgical and the embryo(s) are implanted into the uterus via the vaginal route. However, although AI takes place when the cow is in oestrus and the cervix relaxed, implantation of embryos takes place a week later as recipient cows have their oestrus cycles synchronised with donor cows. The cervix is now closed. As one expert puts it “Passing equipment through the cervix at this time is much more difficult ... furthermore, it is more likely to lead to uterine infection”. [18]

In AI, sperm is placed in the uterus, but in ET the embryo has to be placed into the uterine horn on the side where ovulation has recently occurred, so it is a much more exact procedure.

Mr J Lucke, Chairman of the Royal College of Veterinary Surgeons’ working party on ET, says “the risks of pain, suffering and long term harmful effects are that much greater in ET than AI ...”. [21]

The fact that the government has required the use of an epidural anaesthetic for embryo collection and transfer in cows (The Veterinary Surgery (Epidural Anaesthesia) Order 1992), is a recognition of the potential for pain involved in this technology.

However, the new Regulations themselves are flawed, as they allow epidural anaesthesia to be administered by non-veterinary surgeons, i.e. those who have undertaken a short training course.

It is well known that badly administered epidural anaesthesia can result in paralysis. Presumably that is why the team veterinary surgeon is ultimately responsible for the animals' health.

4.2 Sheep, Goats and Deer:

With increasing use of AI and ET in non-bovines, the risks to the animals increase. With sheep, goats and deer both removal and implantation of embryos are surgical. Surgery, by its very nature, is potentially harmful and painful. ET necessarily subjects an increasing number of sheep, goats and deer to an unacceptable level of stress and the risk of short or long term harm.

Sheep are by nature seasonal breeders. But now "superior" ewes are super-ovulated with hormones every 2-3 months. The hormones are given by hormonal sponges inserted in the vagina and by injection. Implantation of embryos is usually done by a laparoscopy – an endoscope is inserted through an incision in the abdominal wall under a general anaesthetic.

Even the veterinary profession is worried about the increase in sheep ET and lack of any regulation of the procedure. Former BVA President Francis Anthony says some operations are being done by "cowboys" who "are giving the whole thing a bad name" (The Independent, 1991).

Farmed deer are also increasingly subject to ET with donor hinds being given repeated hormone injections to stimulate super-ovulation. Subjecting these nervous, semi-wild creatures to the stresses of regular injections and surgery carries with it obvious risk of long-term harm.

4.3 Welfare and ethical implications of AI and ET:

Besides being used for breed improvement, ET can also be used – for example – to place beef (or three-quarters beef) breed embryos into dairy cows. This means the cows will give birth to more profitable calves, as the male calves of the dairy herd are not suited to quality beef production. (Females may of course be reared as herd replacements).

However, producing heavily-muscled beef calves from slim dairy cows may result in a more painful and prolonged birth as the beef calf is larger than the cow's own calf would have been.

Former British Veterinary Association President Francis Anthony says "Our members are seeing an increasing number of bad calvings and are having to carry out more caesareans. It's a real welfare problem and we're having to pick up the bits". (22)

ET also aims to increase profits by sometimes inserting two embryos into the recipient cow so that she will bear twins. But it is acknowledged that carrying twins places a greater physiological burden on the cow, increases her chances of non-infective abortion and post-calving problems. The twins themselves may be smaller/weaker and more vulnerable to infection.

A recent survey of 9,900 calvings, showed that 16.5% of twin calves died within 2 days of calving compared to 6.20% of singletons. 12.9% of twin calves were stillborn compared to 4.09% singletons. The cow retained her foetal membranes in 19.4% of twin calvings but only 3.27% of single calvings (23), making uterine infection more likely.

ET is a highly skilled procedure and the administration of epidural anaesthesia even more so. In the UK, non-veterinary operators are now able to carry out both these procedures. Yet one authority reckons "It takes one to two years to train an embryo transfer technician to reach full potential". [18] Even in the most skilful hands ET is a procedure which can cause suffering – in insufficiently qualified personnel the risk of harm and suffering is obviously increased.

Both AI and ET have a much-vaunted aim of breed "improvement". Of course improvement in this sense usually means greater productivity or higher quality yield, i.e. more muscle, less fat in animals reared for meat, greater yields in milk-producing animals and earlier oestrus or quicker growth to hasten profitability.

ET technology has the potential to make dairy cows give birth to beef-breed calves, and in the future farmers will be able to choose the sex of the embryos they buy.

All these potential "advantages" make AI and even ET attractive to farmers, as they envisage greater profits from the chosen semen/embryos. Breeding companies also foresee vast profits from the sale of semen and embryos.

Compassion in World Farming Trust believes that objectives such as so-called breed improvement (which really means profitability) and profitability of farmers/breeding companies and veterinary surgeons (who will profit from being paid for their services) are no justification at all for these reproductive technologies.

AI subjects both male donors and recipient females to a degree of discomfort and likely stress or frustration. Badly performed inseminations can cause physical harm.

ET carries much more obvious risks to the health and welfare of both donor and recipient animals. If it is hard to justify repeated injections to interfere with the normal oestrus cycle, it is even harder to justify invasion of a closed cervix and the stress of epidural anaesthesia in the case of cows, and the major stress of surgery and general anaesthesia for other species.

Some may argue that if the animals are appropriately anaesthetised, there can be no welfare objection. But this is to forget that the administration of anaesthesia in itself requires complete restraint of the animal against its will. Once the anaesthetic has worn off there may still be residual pain.

In addition, ET is associated with increased risks to the health and welfare of animals who may be forced to bear twins or calves too big for their reproductive physiology.

Current legislation is too little and too late and does little more than rubber stamp the technology and current practice.

There is as yet no specific legislation on ET in non-bovines. Codes drawn up by professional bodies or by government ministries are also of little use, as anyone may choose to ignore them with impunity.

As former BVA President Francis Anthony says, "Why is it that we subject an animal to a procedure in order to make it breed how we want it to breed rather than the way it is totally capable of breeding?". [24]

Perhaps the Editor of The Veterinary Record summed it up best when he wrote "The fundamental question remains, who benefits from embryo transfer?". (25)

Compassion in World Farming Trust believes that subjecting farm animals to discomfort, stress and pain could be justified if a therapeutic purpose was involved. To subject animals to adverse physical and psychological states for totally non-therapeutic purposes is completely unjustifiable. Worse still, the technologies are not even neutral or benign, but may themselves result in further suffering for the animals involved.

5. Cloning and other reproductive technologies

Apart from AI and ET, other new technologies are being developed with the same aim of increasing profitability. As one expert admits "The ultimate goal for most commercial embryo cloning projects is to be able to produce a large number, or better yet, an unlimited number of identical offspring from an original embryo". (26)

Technologies such as cloning do not in themselves directly affect the welfare of the living animal, but take place in the laboratory at the cellular level.

Although embryo splitting is the technique in use already in the cattle ET industry, nuclear transplantation and embryonic stem cell techniques hold greater potential for multiplication of large numbers of animals. "The experimental multiplication of embryos could theoretically reach 100,000 viable clones in just five generations of cloning". (26)

However, immediate welfare problems arise when clones are implanted and brought to term by surrogate mothers. For example, "many cloned calves are abnormal" one expert admits. (27) They grow to twice the normal size at birth. Birth will therefore inevitably be by caesarean, with all its attendant health and welfare problems for the cow. 10% of cloned calves have other abnormalities, for example joint problems.

A spokesman for Granada Biosciences Inc. admits "Higher birth weights in cattle represent a major practical problem in the form of increased dystocia. Even with intensive management at the time of parturition, calf losses are higher than normal". (28)

In addition, research shows that abortion rates are higher for second or later generation nuclear transfer embryos. (26)

Work is now taking place on interspecies nuclear transplantation, for example, cow nucleus to sheep oocyte. No viable pregnancies have been achieved.

Even nuclear transplantation is not that successful. So far only 20-25% of nuclear transfers result in transferable embryos and only 30% of the embryos transferred to cows result in completed pregnancies. Granada Genetics' 11 cloned calves born in 1990 is the largest number so far.

Cloning and ET are intrinsically linked to transgenesis. It is only by means of ET that genetically engineered embryos can be grown to term and in the future the fastest way to multiply a new transgenic line will be by cloning.

Dr N L First of the University of Wisconsin prophesies "an era of exciting possibilities for rapidly propagating and tailoring animals to meet product and environmental demands." (29)

Professor Peter Street of Reading University envisages the era of supermarket specifications for each meat-producing animal: "In effect, with this implanted, designed embryo, if we then are able to manipulate the feeding system, we can design the whole carcase, if you like, from embryo to plate to meet a particular market niche". [30]

5.1 Welfare and ethical implications of cloning:

Research so far shows that cloning carries inherent risks to both the cloned animals and their surrogate mothers. The animals are more likely to abort or die and the mothers more likely to endure the pain of abortion or caesarean as the abnormally large calves induce dystocia.

But the other inherent danger in cloning is that the production of genetically identical animals means that such animals are not only identically super-fast growing, super-lean, etc. etc., but also identically vulnerable to the same pathogens. Thus one strain of disease to which all the cloned animals were highly vulnerable could wipe out the entire herd.

Should agriculture become dependent on cloned animals, then there would of course also be a significant loss of genetic diversity, which could spell long term disaster for the livestock industry.

It is hard to raise welfare objections to laboratory work with a few cells. But of course the work may result in viable embryos and it is from this point that risks to animal health and welfare arise.

Ethically, Compassion in World Farming Trust believes it is unjustifiable to subject animals to such risks purely to produce identical animals, whatever their commercial potential. Indeed, if one views genetic diversity as a strength and a desirable aim, then cloning may be viewed as actively harmful.

6. Summary

Selective breeding imposes considerable injury, pain and physiological stress on many farm animals.

As a result of selection for rapid growth, each year millions of broiler chickens suffer from painful, sometimes crippling, leg problems. Likewise each year millions die of heart disease.

Pigs too suffer from painful joint and leg disorders and heart problems as a result of selection for faster growth and heavier muscle development.

Turkeys have been bred to have large breasts with as much meat on them as possible. The resultant body shape makes it physically impossible for their reproductive organs to come into contact and thus all reproduction depends on artificial insemination. Moreover, the very heavy weight of the upper body can lead to degenerative hip disorders in male turkeys which result in chronic pain.

Belgian Blue cattle have been selected for double muscling which leads to larger, heavier muscles particularly in the hind quarters. As a result, cows often carry calves which are too large for natural birth. This leads to some cows undergoing repeated caesareans which can cause surgical problems, wound problems and highly painful abdominal adhesions.

For male animals used as the donors of semen for artificial insemination, the animals are generally subjected to unnatural environmental conditions – bulls are kept indoors, in isolation; boars are made to mount a dummy sow. Both bulls and boars are subjected to unnatural feeding regimes.

In addition, physical harm may be inflicted on the animals: for male turkeys, research shows that semen collection results in the formation of primary haemorrhages throughout the proctodeum and urodeum.

The insemination of the female animal likewise frequently involves disruption and discomfort. This is exacerbated for sheep, where surgery is required because of the complex anatomy of the ovine cervix.

Embryo transfers for sheep, pigs, goats and deer all require surgery, for both embryo removal and implantation. After the general anaesthetic has worn off, there is a likelihood of residual pain.

Most cattle embryo transfers are non-surgical; nevertheless, embryo removal risks piercing the uterine horn, or rupturing the lining of the womb. Embryo implantation takes place when the cow's cervix is closed; it is clearly difficult and potentially painful to pass the required equipment through the cow's closed cervix. Epidural anaesthetic is required, but this does not have to be administered by a veterinary surgeon. A badly administered epidural anaesthetic can result in paralysis.

And of course, prior to any embryo transfer, the donor animal must be 'superovulated' by the administration of repeated hormone injections, and hormone-impregnated sponges inserted directly in the animal's reproductive tract.

Embryo transfer in cattle is being used to implant beef-breed embryos into dairy cows, and also to induce twinning. Both of these techniques place physical and physiological burdens on the cow, which the cow would not have to endure if it was allowed to mate naturally.

7. Conclusions

Most of our farm animals have been domesticated for thousands of years (except for turkeys and deer). For most of that time period, slow change has been achieved in their physiology and breeding potential.

Now, modern technology has given us tools to do in a year what might have hitherto taken many generations. Quick change in itself can be unpredictable and have inherent welfare problems.

But when the techniques themselves cause anything from discomfort to severe distress and pain for the animals involved, then the time has come to call a halt.

Compassion in World Farming Trust believes that animals are sentient beings, capable of enjoying a state of well-being (good welfare) but also capable of experiencing pain and suffering.

The only justification for inflicting pain on an animal would be to prevent or cure a poor health condition in that particular individual animal or its offspring (if it is pregnant). To inflict stress, discomfort, pain and distress purely to increase profit margins is totally unjustifiable.

Compassion in World Farming Trust believes that the law should be changed both at national and EU level:

a) to recognise the sentiency of animals;

b) to forbid breeding techniques which cause distress and pain to the animals involved; and

c) to reverse the selective breeding which has given us grossly mutilated animals so that they can be brought back to a state of physiological integrity and wholeness.

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Glossary:

Ascites: accumulation of fluid within the abdomen: causes distension and discomfort.

Dystocia: difficult birth requiring external help.

Endogenous (gene): arising within the body (as opposed to exogenous – from without).

Epidural anaesthesia: injection of local anaesthetic into the spinal cord.

Exogenous gene: a gene from another body.

Fusion gene: artificial gene construct.

Laparoscopy: insertion of an endoscope into the abdominal cavity: facilitates viewing of internal organs.

Laparotomy: surgical incision into the abdominal cavity.

Micelle structure: a microscopic cluster of molecules.

Oestrus: the fertile period of an animal’s reproductive cycle.

Oncogenic: an agent that can produce cancer.

Pathogenesis: something which causes disease.

Photo stimulation: use of light to influence behaviour/hormonal status.

Recombinant proteins: protein produced by rDNA technology.

Replication competent vector: a vector (e.g. a retrovirus) capable of reproducing itself.

Retroviral vector: when retroviruses are used as vectors, the aim is for the genetically engineered retrovirus to infect the host cell(s), thus transmitting the new gene sequence.