

Applying scientific advances to the welfare of farm animals: why is it getting more difficult?

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Abstract

Despite interest and willingness to apply advances in animal welfare science, it is becoming increasingly difficult to do so. This paper addresses three main areas. The first deals with economic consequences and, while recognising the cost of implementing change, highlights the importance of hidden costs in animal disease. It argues that when these costs are taken into consideration more money can be allocated to the prevention of welfare problems. The second section relates to the fact that as animal welfare science progresses, there will tend to be scientists who focus on theoretical concepts and those who focus on practical problems. This specialisation may mean that intermediate research is needed to bridge the gap between the original idea and its practical implementation. It may also mean that the scientist making the original advance may not be well placed or even interested in doing this. The final section on the difficulties of applying scientific advances makes the point that as the number of scientists in the area increases, so does the discussion of methods and results. In the long-term these intellectual exchanges obviously benefit the science, but in the short-term they slow down the implementation of findings. Scientists focus on differences in interpretation not on similarities, leading non-scientists to sometimes miss the large areas of agreement and see only uncertainty in other areas. The paper concludes by suggesting that awareness of the factors affecting the application of scientific advances will help to minimise the risks that good ideas and results are not implemented in practice.

Keywords: animal welfare, economics, farm animals, implementation, legislation, scientific debate

Introduction

It is obvious that advances in the welfare of animals should be based on sound scientific evidence. It is also clear that there is an increasing amount of welfare-related research being carried out around the world and many examples of good research being rapidly implemented into legislation or applied in practice, leading to improvements in the welfare of the animals concerned. This paper addresses the question of whether or not we can expect this positive trend to continue, and argues that the application of scientific advances to the welfare of animals is becoming more difficult. Although a depressing thought, awareness that this might be the case should help us address the problems at an early stage. This is not to imply that it has been easy to apply scientific advances previously, but rather that the barriers to their application are changing compared to previously and so the strategy of how best to apply advances may also need to change.

The paper is divided into three sections, each taking up for discussion a broad area of why applying scientific advances may be more difficult in the future. The first section deals with economics, the second with theoretical and technological advances and the third with the nature of science and scientists themselves. However, first I would like to demonstrate how dramatically the situation has changed regarding

applying knowledge about farm animals to improve their welfare, and how science plays different roles in different welfare situations. Although I start some 100–150 years ago, most major scientific advances regarding farm animal welfare have occurred in the past 40 years. The historical perspective is to differentiate the three examples more clearly.

The first example deals with animal protection and preventing cruelty, which was the reason for the formation of the first animal protection societies. Beating animals or forcing them to pull or carry heavy burdens would be examples here, although animal protection does include protecting animals from neglect. Animal cruelty is difficult even today to prove in a court of law, but such cruelty is nevertheless a rather extreme example of poor welfare and there is usually little conflicting opinion on the main issue. The scientific input is usually in the form of evidence that the animal was or was not mistreated. The change in attitudes in the 1960s triggered by, among other things, the book *Animal Machines* (Harrison 1964), drew attention to the more subtle welfare dilemma of how we keep animals, and so to my second example. The question of intensive farming systems is not a case of cruelty or neglect of animals by a few individuals, but a question for society in general. It is here that there start to be conflicting opinions,

and scientific input is often restricted to providing objective methods for assessing welfare. Politicians struggle with the results of these assessments, balancing animal welfare, economics and public pressure at national and international levels. The last example is that of a particular category of abnormal behaviour, so-called stereotyped behaviour. Stereotyped behaviour is an especially appropriate example in the context of this paper since it is proving to be an intriguing, multidisciplinary research topic with similarities to human mental health problems, and has attracted both applied and pure scientists alike. It is interesting that even though it is generally accepted that welfare involves both mental and physical components, and despite the large scientific input and advances in this area, an animal's physical health still seems to weigh heavier in a welfare debate than its mental health.

These examples show the changing faces of animal welfare and the application of scientific advances to improving the welfare of farm animals. Already the reader may suspect why this paper proposes that applying scientific advances to the welfare of farm animals is becoming more difficult, although it is not my intention to be as negative as this introduction may at first imply. My hope is that by focusing on this possible risk, we can already act to minimise it.

Economic costs versus welfare benefits and the view that prevention is cheaper than cure

It is tempting to start this section by saying that one reason why we may expect it to become more difficult to apply scientific advances to the welfare of animals is that all of the easy welfare problems have already been solved. But that would be to make a complex picture rather too simple, although there would be some truth in the statement. There is no doubt though, that when saving money and improving welfare go hand in hand, then changes are quick to occur.

Battery cages for laying hens have been criticised for many years, but in the early 1980s, in Sweden, serious discussions began about banning them. Knowing that not all cages had the same design, a simple, but large scale, comparison was made of the most commonly occurring designs (Tauson 1985). The focus was on mortality and on the number of birds accidentally trapped between the cage part and/or fittings, since under commercial conditions any trapped bird would eventually die as it would not be able to reach food and water. Six cage designs and 26,000 birds were used in the study. The frequency of trapped birds varied between 0.6 and 3.5% in the different cage designs, with most accidents happening at the front of the cage and involving the toes, claws or comb. This simple study had the effect of drawing the attention of producers and cage manufacturers to cage design, and several companies were quick to change their design to the obvious welfare benefit of birds.

In some countries, such as Sweden and Switzerland, the testing of new systems from a welfare point of view is compulsory. It is an effective method of preventing poorly designed systems or details within a system coming into commercial practice. The knowledge gained by the centres

involved in this testing is often presented at scientific conferences and so feeds back to help improve system design. These scientific advances, even if they are rather practical, save the companies money in the long-run, although sometimes to change to the design may involve extra construction costs. Since most of the faults with systems would affect the health of animals, such testing saves the farmer money. In all cases, the welfare of the animals benefits.

Another example where economics and welfare are linked is when it is made compulsory for all to do what the majority of farmers are doing already. Some farmers are quicker to pick up and implement scientific advances than others, and legislation is a way to bring into line the 'bottom end' of an industry. A similar example, but on a different scale, is when a whole industry is forced to make a major change that can be easily implemented since the industry as a whole is rather small and thus politically weak. For example, some countries were able to apply scientific advances to improve the housing of veal calves or fur animals relatively easily, whereas it was more problematic in other countries. The situation is not at all so easy when the advances to be implemented affect a large, well-organised and often multinational enterprise, such as the poultry industry. Even if the actual change may to some seem rather small, such as a slight change in stocking density for broilers, there can be prolonged debate. This is even more problematic if the discussion is about fundamental changes, such as banning a type of system, for example battery cages for laying hens. There are examples of each of these 'easier' cases for all farm animal species and for each country. The changes that are discussed nowadays often involve large industries and major changes on an international level and so are the 'more difficult' ones.

The saying "prevention is cheaper than cure" is commonly heard, but it is only in recent decades that it is being applied to human health as a more cost-effective way of using the limited resources available to the health services. Preventing welfare problems is obviously much better for the overall welfare of an animal than treating the problem afterwards, but only rarely is it argued that this can also save money for the farmer. A difficulty is in convincing the individual person (the human at risk of a heart attack to change their lifestyle, or a farmer to change his management practices) when the time interval between the initial effort and the possible benefit is unsure and when it is not guaranteed that they will always experience that specific problem.

An example to demonstrate this is the scientifically well-documented link between giving birds early access to perches and the number of eggs laid outside nest boxes (Appleby *et al* 1988), and also the more recent finding that early access to perches reduces mortality attributable to cloacal cannibalism (Gunnarsson *et al* 1999). Floor eggs can present a major economic loss for producers since they take time to collect manually and are often of a poorer quality. High mortality will also affect total profits. It seems that birds learn much better at an early age to move in three-dimensional space than they do when adult and this

promotes their use of the nest boxes, which are usually raised up off the floor, and even affects their escape behaviour. The industry has nevertheless been slow to effectively apply this knowledge.

The second example refers to the indirect and hidden costs of disease. Poor health is a major welfare issue and the consequences of disease are reduced production and, at worst, death of the animal. Economic loss is therefore unavoidably associated with disease. Farmers are well aware of this and actively try to reduce disease in their animals, but the effort put into preventing a disease reflects the risk and the potential economic consequences and these are often underestimated. For the majority of producers the cost of a disease is based on the cost of returning the animal to health and includes obvious costs such as the veterinarian's bill and medicines. However, it has been estimated that these costs represent less than 20% of the total cost of disease in dairy cattle. This is because it has been shown that diseases tend to occur together as a sequence of events, and as a consequence of the strong association between diseases, a small number of cows will experience the majority of the health problem (Oltenucu 2000). The two most 'costly' health problems are mastitis and lameness. Yet, whereas there are large programmes in several countries with systematic recording of cell counts to detect mastitis early and to reduce it, few countries have any systematic monitoring of lameness. Lameness has been identified as a major welfare issue (Whay *et al* 2003) and farmers would undoubtedly be much better at detecting lame cows and would take greater measures to reduce the incidence of lameness in their herds if they knew the true cost of the problem.

Other examples of welfare problems with large economic consequences are feather pecking in laying hens and tail biting in fattening pigs, since birds with poor plumage eat more food (Tauson & Svensson 1980) and pigs with damaged tails grow more slowly (Wallgren & Lindahl 1996) and are more likely to be downgraded at slaughter. A realistic economic calculation of the true costs of these welfare problems would go a good way towards motivating people to prevent them.

In conclusion to this first part of the paper, I would like to suggest that a greater emphasis on the cost of applying (or not applying) scientific advances would affect application in practice.

Theoretical and technological advances in a real world

Animal welfare science is still a relatively new discipline, but the number of researchers is increasing in an ever wider area. There is a broad group of welfare scientists interested in the practical implication of results and who tend to work close to the real world situation. Despite this, there are still some major problems related to welfare that have received relatively little attention compared to other areas and where even small improvements could have a big impact for a large number of animals on a daily basis. Such examples are

issues dealing with transport and slaughter. On the other hand, there is a diverse group of researchers struggling with philosophical questions of what welfare really is, or developing more technologically advanced methodologies of how to measure it. This research is inevitably further away from the day-to-day decisions on animal welfare, although the long-term impact of such research may be very great. This division into 'pure' and 'applied' research happens in most sciences, for example chemistry and physics to name just two, and can almost be regarded as necessary and inevitable. However, in the context of the subject of this paper on applying scientific advances to the welfare of animals, such a split potentially makes applying advances more difficult. The risk lies in how the link between the areas of applied research in animal welfare and pure research in animal welfare is maintained.

The first obvious criticism of the above argument is that the division into pure and applied research is not clean-cut. There are many researchers who have both pure and applied welfare projects, or who stand firmly in the middle, refusing to be classified as either one type of researcher or the other. However, as animal welfare science continues to expand, it will become more difficult to carry out good quality research in both the pure and applied areas. The pressure on researchers working in animal welfare to be knowledgeable in many fields is already great, but there is a limit. If the link between pure and applied research in animal welfare becomes too tenuous, with an insufficient number of researchers spanning the gap, then good ideas or techniques for advances will be less likely to be implemented in practice and some excellent ideas may deal with perceived rather than actual welfare problems.

We should nevertheless be pleased that animal welfare science is such a rapidly expanding area and that the majority of researchers were probably attracted to this area originally because they wanted to 'make a difference' and improve the situation for animals. But being a researcher is also a job and people want to succeed and be respected by other researchers. Whatever the original reason for a researcher to enter the area of animal welfare science, there is the risk that peer pressure will result in research for research's sake and the aim of the research changing from improving the animals' conditions to challenging the results found by other researchers. This has its risks for the application of scientific advances, although peer review is the best way we have of ensuring good quality science and it is not something that I propose should be removed. Again I would like to argue that awareness of the risk makes it more likely that the area of animal welfare science can continue to develop scientifically, while at the same time continuing to keep the end users — the animals — in focus.

To summarise this section, I believe it is inevitable that animal welfare science has its pure and applied sides or, perhaps one should say, consists of scientists working on more theoretical concepts and those working on more practical problems, since some might argue that ultimately all animal welfare science is applied. But such a division

will involve risks for the implementation of ideas if strong links are not maintained between these two areas.

Scientific debate

The third reason why I propose that the application of scientific advances may be expected to become more difficult, deals with the importance of scientific debate and in some respects follows on from points raised in the previous section. While scientists may work alone or in teams, the ideas and results that are produced are only really accepted if they can pass peer review and withstand criticism from the wider scientific community. If the idea is flawed, then there is little discussion and the idea will probably never be published. If it is clearly correct, then again there is little discussion, although the publication will probably be frequently cited. Most discussion about a topic occurs when scientists do not agree, or agree that not enough is known, in which case the discussion is about what research is needed. Clearly then, discussion is of benefit to the development of a subject. The problem relevant to the topic of this paper is related to the impression that is given to the outside world by scientists. Society is becoming increasingly interested in science, as the wide range of popular science television and radio programmes clearly demonstrates. Society is especially interested in animal welfare issues, but there is a risk of giving the impression that scientists do not agree about animal welfare. The truth is that scientists often quietly agree on many things, but tend to loudly debate what they do not agree upon. Likewise, difficult and interesting research areas such as stereotyped behaviour or stress can attract many investigators since there is a lack of consensus and thus the opportunity to make noteworthy and sometimes important contributions to the debate. Such areas can at least temporarily dominate welfare research.

The impression that scientists do not agree can slow down the rate at which the results of advances in animal welfare science are implemented. This is of course wise if there is genuine doubt regarding whether or not a particular scientific advance should be implemented. But it can have detrimental consequences for animal welfare in practice if farmers do not invest in change on their farm, policy makers do not incorporate research results into legislation, and if doubt by consumers about whether a product really did come from an animal with better welfare affects purchasing patterns.

To summarise this final section, it is important that scientists are aware that there is great interest in their work and that animal welfare scientists, perhaps more than many other scientists, have a responsibility to take into consideration all of the consequences of their research.

Conclusion — Can we improve the application of scientific advances?

I would like to conclude on a positive note since I believe that we can improve the application of scientific advances to the welfare of animals by increased awareness of the factors that slow down the rate of application. In the above sections I have named a greater emphasis on the economic aspects of animal welfare research, and an increased awareness that the published paper is not the end result, and that a scientist has the responsibility to take their research to the next step in its implementation. This may be to help in its implementation directly in practice, but may equally well involve collaboration with another researcher who will investigate the result in a more applied study and so ensure that the result progresses further towards practical application. The final factor is to act responsibly in the public debate on animal welfare issues.

References

- Appleby M C, Duncan I J H and McRae H E** 1988 Perching and floor laying by domestic hens: experimental results and their commercial implications. *British Poultry Science* 29: 351-357
- Gunnarsson S, Keeling L J and Svedberg J** 1999 Effects of rearing conditions on the prevalence of floor eggs, cloacal cannibalism and feather pecking in flocks of loose housed laying hens. *British Poultry Science* 40: 12-18
- Harrison R** 1964 *Animal Machines*. Vincent Stuart: London, UK
- Oltenucu P A** 2000 Does animal welfare pay? In: *Proceedings of a Conference Organised by the Swedish University of Agricultural Sciences 'Food Chain 2001 — Safe, Sustainable and Ethical'* pp 160-164. Uppsala, Sweden, 14-16 March 2000
- Tauson R** 1985 Mortality of laying hens caused by different cage design. *Acta Agriculturae Scandinavica* 35: 165-174
- Tauson R and Svensson S A** 1980 Influence of plumage conditions on the hen's feed requirement. *Swedish Journal of Agricultural Research* 10: 35-39
- Wallgren P and Lindahl E** 1996 The influence of tail biting on performance of fattening pigs. *Acta Agriculturae Scandinavica* 37: 453-460
- Whay H R, Main D C J, Green L E and Webster A J F** 2003 Animal-based measures for the assessment of welfare state of dairy cattle, pigs and laying hens: consensus of expert opinion. *Animal Welfare* 12: 205-217