

TESTING OF MASS-PRODUCED FARM ANIMAL HOUSING SYSTEMS WITH REGARD TO ANIMAL WELFARE**B. Wechsler****Abstract**

In 1981, an authorisation procedure regarding animal welfare, was introduced in Switzerland for mass-produced housing systems and equipment for farm animals. When asking for an authorisation, the manufacturer or importer of a housing system or equipment must send detailed documentation (plans, measures, technical data) to the Federal Veterinary Office. The authorisation can only be given if the housing system or equipment is in accordance with the requirements of the Swiss animal welfare legislation. Whenever possible, a decision is made on the basis of literature or experience with similar equipment. In some cases, however, practical tests are required. Such tests may include veterinary, physiological and behavioural measurements to assess animal welfare.

Authorisations are given by the Federal Veterinary Office. It may consult an advisory board which consists of experts in animal husbandry, animal housing construction, and animal protection. Over the last 20 years, more than 1300 authorisations were given, and 13 applications were rejected. The manufacturers may appeal against a decision of the Federal Veterinary Office. To illustrate the authorisation procedure and the indicators used to assess animal welfare, examples of current testing of housing systems are given.

In conclusion, pretesting of farm animal housing systems that are intended to be mass-produced is a promising way to increase and ensure product quality from livestock systems.

Introduction

In the 1960ties and 70ties, intensive housing systems became more and more popular in animal production. The animal was considered as part of a

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production system. Housing systems with minimum space requirements and minimum labour input were preferred. As a consequence, sows were housed in crates and fattening pigs in barren, fully-slatted pens. Calves were reared in individual pens and bulls for beef production on concrete slatted floors. As regards laying hens, the battery cage became the most widespread housing system.

Since the 1980ties, however, consumer demands concerning animal welfare play an increasing role in animal production. Nowadays, it is widely accepted that animals have behavioural needs. Housing systems and management should meet these needs to safeguard the welfare of the animals. Consequently, the quality of an animal product is not only defined by its appearance and its taste, but also by the housing conditions of the animals.

There are several ways to meet these consumer demands and to adapt production standards with regard to animal welfare. In many European countries, label production accounts for an increasing portion of total animal production. By choosing products of a given label, for example free-range eggs, the consumer can also make a choice for a certain type of housing system. In addition to label production, changes in national and international animal welfare legislation have set new standards for animal production. A recent and important example is the new EU directive for laying hens. According to this directive, conventional battery cages will be phased out by 2012.

A third way to improve housing conditions is to test mass-produced housing systems for farm animals from an animal welfare perspective. Such authorisation procedures already exist in Sweden, Norway and Switzerland. In Germany, facultative testing of housing systems is proposed by the national animal welfare legislation, and in Austria the introduction of pretesting of housing systems is discussed. Testing of mass-produced housing systems has two major advantages. First, it focuses on housing systems that will affect the welfare of, a large number of animals. Second, it is flexible and hence able to react within a short time to new developments in animal production. Changes in animal welfare legislation often take much more time.

Testing of farm animal housing systems in Switzerland

In 1981, an authorisation procedure (pretesting) regarding animal welfare was introduced in Switzerland for mass-produced housing systems and equipment for farm animals (Wechsler et al. 1997; Wechsler and Oester

1998). In article 5 of the Swiss Animal Welfare Act it is stated that "mass-produced housing systems and equipment for the keeping of animals for purposes of profit may not be advertised and sold without prior authorisation from a service designated by the Federal Council". The authorisation can only be given if the housing system or equipment is in accordance with the requirements of the Swiss animal welfare legislation (Wechsler and Oester 1999). The principles of the Swiss Animal Welfare Act are listed in article 2. It is stated that "animals shall be treated in the manner which best accords with their needs", that "anyone who is concerned with animals shall, in so far as circumstances permit, safeguard their welfare", and that "no one shall unjustifiably expose animals to pain, suffering, physical injury or fear". Article 1 of the Swiss Animal Protection Regulations contains general statements about housing conditions. It is stated that "animals shall be kept in such a way as not to interfere with their bodily functions or their behaviour, or overtax their capacity to adapt", and that "feeding, care and housing shall be deemed suitable where, according to existing experience and the state of knowledge concerning physiology, animal behaviour and hygiene, they comply with the animals' requirements".

The authorisation procedure applies not only to complete housing systems such as cages, boxes or crates but also to equipment with which animals frequently come in contact (e.g. feeding and watering systems, floor coverings, dung grids, tethering arrangements, nest boxes). When asking for an authorisation, the manufacturer or importer of a housing system or equipment must send detailed documentation (plans, measures, technical data) to the Federal Veterinary Office.

Whenever possible, a decision is made on the basis of literature or experience with similar housing systems or equipment. In some cases, however, practical tests are required. Such tests may include veterinary, physiological and behavioural measurements to assess animal welfare. Two research stations have been established by the Federal Veterinary Office for this purpose. Housing systems for cattle, goats, sheep and pigs are tested at the Centre for proper housing of ruminants and pigs in Tänikon, those for laying hens, broilers, turkeys and rabbits at the Centre for proper housing of poultry and rabbits in Zollikofen.

Practical tests are carefully designed with respect to the sample size and the distribution of data collection over time. The latter is done to identify both short- and long-term welfare problems of a given housing system or equipment. If appropriate, the tested housing system is compared with a reference system (e.g. farrowing crate versus farrowing pen). Sometimes practical tests are also carried out on commercial farms where the housing

systems or equipment under analysis are in use under temporary authorisation. For the authorisation procedure the results of a practical test are supplemented with evidence found in the literature.

Authorisations are given by the Federal Veterinary Office. It may consult an advisory board which consists of experts in animal husbandry, animal housing construction, and animal protection. Since 1981, more than 1300 authorisations were given (cattle 750, pigs 402, sheep 19, goats 4, poultry 122, rabbits 52), and 13 applications were rejected. Several housing systems were further developed and improved with respect to animal welfare in the course of the testing procedure. The Federal Veterinary Office can put a time limit on the validity of an authorisation and impose specific requirements concerning the use of a housing system or equipment. The manufacturers may appeal against a decision of the Federal Veterinary Office. A list of all authorisations given is published at: http://www.bvet.admin.ch/tierschutz/d/vollzugsWlfen/verkauf_stallstyst/stallliste_main.asp

In the following, five examples of practical tests of housing systems or equipment for laying hens, pigs and cattle are given to illustrate the authorisation procedure and the indicators used to assess animal welfare.

Group cages for laying hens

According to the Swiss Animal Protection Regulations, housing systems for laying hens must contain protected, darkened and soft-floored or litter-lined nest boxes, as well as suitable perches or a slatted floor. As conventional battery cages do not fulfil these requirements, they had to be replaced by alternative housing systems within a transitional period of 10 years which ended in 1991. The regulations for laying hens do not, however, explicitly ban cage housing systems. Consequently, several manufacturers asked for authorisation to mass-produce and sell modified cages for groups of 40 or more hens.

Two of these group cages, one with 42 hens per cage (Oekonom 165) and one with 58 hens per cage (Scharbo 162 V), were tested on commercial farms and at the research station in Zollikofen. The farms were visited when the hens were 18, 30 and 50 weeks old, and at the end of the egg-laying period. Data collected included scores of plumage condition, measurements of the length of the claws, recordings of injuries and mortality as well as observations on the behaviour of the hens. A total of 101 (Oekonom 165) and 132 (Scharbo 162 V) cages installed on three and five farms, respectively, were involved in the

testing. Detailed observations on resting, aggressive behaviour, feather pecking and cannibalism were made in hens housed in such cages at the research station. Both types of group cages were arranged in three tiers with automatic removal of droppings. They contained nest boxes with a sloped plastic floor. The feeding troughs were in front of the cages and the drinkers in the middle. The cages for groups of 42 hens had a slatted plastic floor whereas the cages for groups of 58 hens had a wire-mesh floor with perches. Neither system contained litter.

The behavioural observations revealed several welfare problems. First, the hens seemed not to differentiate between resting and activity areas; Resting bouts of individual hens were regularly interrupted by other hens that moved to the feeding trough or the nipple drinkers. Second, the hens frequently paced along the boundaries of the cages during the daily egg-laying period, indicating difficulties with the selection of a suitable nest-site. Third, the hens had no adequate substrate to perform dustbathing behaviour, as there was no litter in the cages. Vacuum dustbathing was regularly observed on the floor, and bill-raking (which hens usually show at the start of a dustbathing bout) was often directed at the food in the trough. Fourth, the absence of elevated perches prevented the hens from finding an appropriate place to rest at night. There was still much activity in the cages when the lights had been turned off. Fifth, normal foraging behaviour with scratching and ground-pecking was impaired because of the lack of litter. The hens showed bouts of repetitive pecking at parts of the cage as well as bouts of alternating pecking at food and at parts of the cage. Sixth, there were serious problems with feather-pecking. Although the average light intensity within the cages was less than 5 lux, the plumage condition deteriorated much with age. Seventh, there were major problems with regard to mortality. If light intensity in the cages amounted to 5 lux, which is the minimum requirement for poultry housing systems according to the Swiss animal welfare legislation, more than 30 % of the hens died before the end of the total laying period. With this light intensity, mortality was mainly due to cannibalism.

Based on the results of the practical tests, group cages for 40 to 60 laying hens were judged to overtax the hens' capacity to adapt (Frohlich and Oester 1989). The Federal Veterinary Office did not therefore permit the manufacturers to mass-produce and sell such modified cages. On the other hand, in 1986 authorisation was granted for the first five aviary systems that had been subjected to practical tests (Oester and Frohlich 1986). Today, various aviary systems are on the market.

Farrowing crates

When the Swiss Animal Protection Regulations were enacted in 1981, farrowing crates were already widespread in intensive pig production. Nevertheless, manufacturers who wanted to sell farrowing crates had to ask for authorisation. The practical tests of farrowing crates were conducted from 1984 to 1986 at the research station in Tänikon. The behaviour of sows kept in farrowing crates was compared with that of loose-housed sows.

Four types of farrowing crates from different manufacturers were tested at the same time. They differed in the size of the pen in which the crate was installed, the location of the piglet heater and the construction of the crate (Weber 1987). The loose-housed sows were kept in a straw-bedded farrowing pen (2.9 m x 2.4 m). The practical tests included 39 litters in the farrowing pen and 77 litters in the farrowing crates. The sows were introduced into the housing systems about one week before the expected farrowing date. The piglets were artificially weaned when they were about 35 days old. With six litters in the farrowing pen and 21 litters in the farrowing crates, detailed behavioural observations were made of the sows and the piglets.

Several welfare problems were evident in all four types of farrowing crates. Although the sows were offered straw in the crates (a requirement of the Swiss Animal Protection Regulations) their nest-building behaviour was impaired. During the last 6 h before parturition the sows in the farrowing crates showed significantly less straw carrying and pawing, but more manipulative behaviour directed at parts of the housing system (biting, chewing, nosing), than the loose-housed sows. It was also found that the total duration of the parturition was longer in the farrowing crates than in the farrowing pen (Weber and Troxler 1988). During parturition the farrowing crates prevented the sows from turning around and sniffing at new-born piglets, a behaviour that was regularly observed in loose-housed sows. The crates also affected other aspects of the sows' normal behaviour (Troxler and Weber 1989). For example, the sows could not leave the nest-site for defecation, they were very much restricted in their locomotory and exploratory behaviour, and they often struck parts of their bodies against the crates when lying down or standing up.

Based on these results, farrowing crates were judged not to be in accordance with the requirements of the Swiss animal welfare legislation, and the manufacturers were not given definitive permission to sell their farrowing crates. It was, however, not feasible to ban all farrowing crates, as there were

no practicable alternative farrowing systems at that time. As a consequence, research on new farrowing systems was intensified. Within a few years new farrowing pens were developed and tested at the research station in Tänikon (Schmid and Weber 1992; Schmid 1993; Weber and Schick 1996). These pens are divided into an activity area and a nest area. The floor of the nest area is covered with straw, and more straw for nest-building may be offered in a rack. The design of the pens is adapted to the peri-parturient behaviour shown by free-ranging domestic pigs (Stolba and Wood-Gush 1984; Jensen 1989). The sow can choose a nest-site and perform normal nest-building behaviour. She is free to sniff at new-born piglets, and she can leave her nest-site for defecation.

As part of the practical test, the reproductive performance of sows that were kept in the new farrowing pens was compared to the performance of sows of the same herd that were kept in conventional farrowing crates. There were no statistically significant differences in litter size and piglet mortality (Weber 2000). Given the results of the practical tests, the authorities decided that the new farrowing pens could be mass-produced and sold. In addition, the Swiss Animal Protection Regulations were revised in 1997. It is now prescribed that farrowing pens shall be designed to provide sufficient space for the mother sow to turn around freely. Only in exceptional cases, the sow may be enclosed in a crate while giving birth. Conventional farrowing crates have to be replaced on all farms by the end of June 2007.

Perforated floors in farrowing pens

As mentioned above, the authorisation procedure applies not only to complete housing systems, but also to equipment animals frequently come in contact with. As a consequence, mass-produced floors are also tested.

In the case of perforated floors for farrowing pens, the Swiss guidelines for the keeping of pigs recommend a maximum width between slats of 9 mm. The intention of this recommendation is to prevent claw lesions in the piglets. However, perforated floors with a width between slats of 10 mm are common in other countries, and manufacturers asked for authorisation to sell such floors also in Switzerland.

The practical test was carried out at the research station in Tänikon as well as on commercial farms. In this case, data on claw health were collected. Claws of piglets were cleaned and inspected at the age of 7 to 10 days. Two

types of lesions to the claws were differentiated: bruising on the wall of the claws and lesions on the coronet of the claws.

It was found that coronet lesions were significantly more frequent in piglets housed on perforated floors with 10 mm slat gaps compared to piglets kept on floors with 9 mm slat gaps. With regard to wall bruising, the difference was statistically not significant. A detailed analysis of the data showed that the frequency of claw lesions in piglets kept on floors with 10 mm slat gaps was increased only if less than 60 % of the total floor area of the farrowing pen consisted of solid floor. In this case, the piglets could not avoid walking on the perforated part of the pen floor during the first days after birth, and their claws were exposed to the negative effects of the perforated floor. As a consequence, a specific requirement concerning the use of perforated floors with 10 mm slat gaps was imposed when authorisation was given to the manufacturers: such floors may not cover more than 40 % of the total floor area of a farrowing pen.

Tube feeders for fattening pigs

Feeding systems are also tested from an animal welfare perspective. Over the last years, tube feeders for fattening pigs have become increasingly common in Switzerland. With this type of feeder, food is offered ad libitum, and the number of feeding places provided is lower than the number of pigs kept in a group.

In the practical test, which was carried out at the research station in Tänikon, the animal/feeding place ratio was varied in an experiment. Tube feeders were used in groups with 5 or 10 animals per feeding place (Kircher et al. 2001). In order to assess the consequences of different animal/feeding place ratios on the welfare of the pigs, data on behaviour, injuries and performance were collected.

The animal/feeding place ratio had a marked effect on the behaviour of the pigs. For example, aggressive interactions and displacements at the feeder were significantly increased in groups with 10 animals per feeding place compared to groups with 5 animals per feeding place. However, there was no difference in daily weight gain between groups with different animal/feeding place ratios. The final decision in the authorisation procedure for tube feeders has not been taken yet. However, given the effects observed in the behaviour of the pigs, it is recommended to use such feeders with less than 10 animals per feeding place.

Open stables for dairy cows

The last example is about open stables for dairy cows. Traditionally, Swiss cows were kept in tie-stalls and in closed stables. Nowadays, however, loose housing is the preferred housing system, and farmers aim at keeping costs for the construction of stables as low as possible. As a consequence, open stables become increasingly common. Such housing systems are mass-produced and hence subjected to the authorisation procedure with regard to animal welfare. The basic question addressed in the practical test was whether dairy cows are able to cope with the climatic conditions present in such a housing system (Zähner et al. 2001).

The study was carried out on commercial farms. On each farm, 10 lactating cows were chosen at random and various measures were used to assess the welfare of the animals both in winter and in summer. Lying behaviour was recorded automatically by means of a resting sensor fitted in a belt. The belt was fixed around the front part of the cow's body, just behind the forelegs. Also incorporated in this belt, was a Polar Horse Trainer for the continuous recording of the heart rate. The rectal body temperature was measured twice a day, in the early morning and in the late afternoon. At the same times, the surface body temperature was recorded by means of thermography. In order to check for increased levels of stress hormones, milk samples were taken and analysed with regard to cortisol concentration.

As expected, surface temperature was affected by air temperature. The effect was, however, much more pronounced on the surface of the legs than on the surface of the rump and udder. With respect to the rectal body temperature, no influence of the air temperature was observed. It was thus concluded that under the climatic conditions observed on the farms included in this study, the cows' thermoregulatory ability did not seem to be overtaxed.

Concluding remarks

The assessment of animal welfare is a problem that involves both scientific and philosophical elements (Fräser 1995). Given the fact that no one has access to the feelings of animals, one could argue that scientists are not able to measure animal welfare and that terms like 'well-being', 'suffering' or 'fear' should be avoided. The experiences with the practical examination of housing systems in Switzerland show, however, that such an argument is based on a

false assumption. In practice, politicians, farmers and consumers do not expect scientists to measure animal welfare as if it were an attribute like blood pressure that can be measured directly. They are satisfied if ethologists and physiologists are able to draw conclusions on animal welfare, based on indicators that can be measured in a scientific way.

Animal welfare is a concept that involves values (Sandøe and Simonsen 1992). In accordance with this view, the scientists' reports on the practical tests of housing systems and equipment in Switzerland not only include data of various measures that are assumed to be related to the feelings of animals but also an interpretation of these data with regard to animal welfare. Both the data and their interpretation help the Federal Veterinary Office to reach decisions on practical actions that should be taken to safeguard the welfare of animals.

In conclusion, the authorisation procedure chosen in Switzerland, with practical tests of housing systems that are intended to be mass-produced, proved to be appropriate. It has led to an improvement of the quality of housing systems with regard to animal welfare. In addition, it has promoted research into applied ethology and into new housing systems.

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TESTIRANJE MASOVNO PROIZVEDENIH SUSTAVA NASTAMBA ZA ŽIVOTINJE NA FARMAMA S OBZIROM NA DOBROBIT ŽIVOTINJA

Sažetak

Godine 1981. uveden je u Švicarskoj postupak odobravanja masovne proizvodnje sustava nastamba i opreme za životinje na farmama s obzirom na dobrobit životinja. Kad zatraži odobrenje proizvođač ili uvoznik sustava za smještaj ili opreme mora poslati detaljnu dokumentaciju (planove, mjere, tehničke podatke) Federalnom veterinarskom uredu. Odobrenje se može izdati ako je sustav za smještaj ili oprema u skladu s propisima švicarskog zakonodavstva za dobrobit životinja. Kad je moguće odluka se donosi na temelju literature ili iskustva sa sličnom opremom. U nekim slučajevima, međutim, potrebno je testiranje u praksi. Takvo testiranje može uključiti veterinarska, fiziološka i mjerenja ponašanja da se ocijeni dobrobit životinja.

Odobrenja izdaje Federalni veterinarski ured. Oni mogu konzultirati savjetodavni odbor koji se sastoji od stručnjaka za uzgoj stoke, konstrukciju nastamba za životinje i zaštitu životinja. U zadnjih 20 godina izdano je preko 1300 odobrenja a 13 zahtjeva je odbijeno. Proizvođači se mogu žaliti na odluke Federalnog veterinarskog ureda. Za ilustraciju postupka odobravanja i pokazatelja za ocjenjivanje dobrobiti životinja daju se primjeri tekućeg testiranja sustava za smještaj.

U zaključku, pretestiranje sustava za smještaj životinja, namijenjenih za masovnu proizvodnju, obećavajući je način poboljšanja i osiguranja kakvoće proizvoda stočarskih sustava.

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