Welfare Aspects of the Production of Foie Gras in Ducks and Geese

Report of the

Scientific Committee on Animal Health and Animal Welfare

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REQUEST FOR AN OPINION.

The Scientific Committee on Animal Health and Animal Welfare is asked to report on the animal welfare aspects of the production of foie gras using ducks and geese.

INTRODUCTION

There is widespread belief that people have moral obligations to the animals with which they interact, such that poor welfare should be minimised and very poor welfare avoided. It is assumed that animals, including farm animals, can experience pain, fear and distress and that welfare is poor when these occur. This has led to animal welfare being on the political agenda of European countries.

Legislation varies, but E.U. member states have ratified the Council of Europe's Convention on the Protection of Animal kept for Farming Purposes. Article 3 of that Convention states that " Animals shall be housed and provided with food, water and care in a manner which, having regard to their species and their degree of development, adaptation and domestication, is appropriate to their physiological and ethological needs in accordance with established experience and scientific knowledge" (Council of Europe, 1976).

In addition to political debate, the amount of information based on the scientific study of animal welfare has increased. Scientists have added to knowledge of the physiological and behavioural responses of animals and philosophers have developed ethical views on animal welfare. Nevertheless, all agree that decisions about animal welfare should be based on good scientific evidence (Duncan, 1981, Broom, 1988 b).

Scientific evidence regarding the welfare of ducks and geese in relation to foie gras production is gathered together in this report. In chapter 1, different definitions of animal welfare are presented, the four main indicators of animal welfare are discussed and the importance of combining results from several indicators is emphasised. In the second chapter the extent of production of foie gras is described and in the third, practical aspects of production are summarised. Chapter four concerns the behaviour of geese and ducks in relation to force feeding or "gavage". The consequences for the birds of force feeding are described in chapter five. The remaining chapters concern the likely socio-economic consequences of any changes whose aim is to improve the welfare of the birds, suggestions for future research and conclusions. Finally, there is a list of references quoted in the report.

1 WELFARE DEFINITIONS AND MEASUREMENT

1.1 Definitions of welfare

The terms " welfare " and " well-being " (Fraser, 1995, Hughes, 1989), are both used when referring to the state of animal. In this report, the term " welfare " and not " well-being "will be used. In discussions about animal welfare several definitions and descriptive statements have been used. Some of the more commonly quoted include:

1. Brambell report (1965): "Welfare is a wide term that embraces both the physiological and mental well-being of the animal. Any attempt to evaluate welfare, therefore, must take into account the scientific evidence available concerning the feelings of animals that can be derived from their structure and function and also from their behaviour".

2- Lorz (1973): "Living in harmony with the environment and with itself, both physically and psychologically ".

3- Wiepkema (1982): " The inadequacy of the programmes performed to control relevant aspects of the Umwelt, or the permanent failure of any behaviour, must cause severe feelings of distress. In this period the animal really suffers and its well-being is at stake ".

4- Broom (1986, 1996): " The welfare of an individual is its state as regards its attempts to cope with its environment ". "The origin of the concept is how well the individual is faring or travelling through life. The state can be good or poor but, in either case, there will often be feelings associated with the state, which we should try to measure, as well as using more direct measures."

5- " Welfare is solely dependent on what animals feel ", (Duncan and Petherick, 1989).

6- " Welfare is mainly dependent on what animals feel " (Dawkins, 1990).

The first of these statements are rather descriptive. The second, referring to the animal being in harmony with its environment, although commonly quoted is not very helpful in scientifically assessing the welfare of animals under different conditions. Others refer to adaptation to or control of the environment by the animal (3 and 4) and seem more operational because they present opportunities for measurement. Some are specifically concerned with the subjective experiences of the animal (5 and 6). However, there is general agreement amongst scientists about the overall meaning of the term welfare. The more effort the animal is putting into coping, or the greater the biological cost of responding, the worse the animal feels and the poorer its welfare. In most cases, the term welfare is used to cover a continuum from very poor to very good welfare. When the animal is coping well there are usually good feelings and welfare is good (Broom, 1996; Duncan, 1996; Moberg, 1996)

1.2 Assessment of Welfare

Before describing the health, production, physiological and ethological indicators of animal welfare, it is necessary to give a general picture of why these indicators have been selected by researchers. This is best achieved by outlining where they fit into the complex of interactions between the animal and its environment. In the course of evolution every animal species has adapted to an environment in which it is able to regulate its internal state and to survive and reproduce. Regulatory systems in animals consist of the detection of changes in that environment and responses to these changes which allow the animal to keep internal and external conditions at an optimal level. In other words, the animal tries to control its environment by using various coping mechanisms. Feelings play an important role in these coping mechanisms, as do behavioural, physiological, biochemical and immunological responses.

- 1.2.1 Health indicators

Health, which refers to the extent of any disease and injury, is an important part of welfare and an important criterion in the assessment of the quality of life of animals. A range of the measures which are used in welfare assessment are indicators of health. These include clinical signs of disease and anatomical, physiological and immunological signs that the individual is having difficulty in coping with its environment or is failing to cope. If some immunological weakness or abnormality means that the individual would be more likely to succumb to pathogen challenge, injury, etc. then the welfare is more at risk than in an animal which does not have this weakness or abnormality. In the same way, inadequacies of physiological or anatomical function, which have the same kinds of effects, are indicators of poor welfare. In some cases, the poor welfare can be recognised by measurement in basal conditions, in others a challenge is needed to reveal it, and it is increased mortality or morbidity which indicates the severe problem..

The term pathological is used for a body condition in which there are malfunctioning organs or systems with clinical or subclinical effects.

A disease is by definition a pathological state where the causal factors are often clearly identified and the clinical signs well defined. Pathogenic microorganisms and environmental factors are the most common causal factors for disease, although genetic factors must not be neglected. Environmental factors can precipitate the development of a disease process in the absence of specific pathogens. Most diseases are usually accompanied by obvious clinical and biochemical manifestations and the specific structural changes that affect a diseased organ can be recognised at autopsy. There is a general consensus that such diseases lead to suffering. However, not all diseases are always easy to recognise. A disease that develops in the absence of well identified causal factors and lacks anatomopathological features is called a functional disease (e.g. irritable bowel syndrome). Functional diseases are most often accompanied by barely visible clinical signs, and cannot be readily diagnosed unless abnormal changes in the affected physiological function are evidenced by appropriate clinical biochemistry methods. Deviations from normality do not necessarily imply suffering. In addition, there are functional diseases which occur without any evident biochemical abnormality but are accompanied by painful symptoms. This is likely to be the case for functional gastrointestinal disorders. Many functional diseases are reversible. It is not always easy to differentiate a functional disease from the preclinical stage of a slowly progressing disease, specially in an organism in which the duration of life is limited by the production process.

Injuries are painful when they occur in innervated bodily areas. In other parts of the body, they can lead to deformations and deformities which can be unaesthetic but are not necessarily painful. They may result in poor welfare in other ways. The occurrence of injury is an indicator of the constraints exerted by the environment on the species specific behavioural patterns of farm animals. Alterations in the skin and feathers do not necessarily compromise physical health, at least on the short term, but indicate that the environment does not allow the normal sequencing of body care activities.

From an epidemiological perspective, health indicators of animal welfare must also be studied with a broad population perspective, since frequently occurring problems must be considered by society to be more alarming than rare events of the same problem. Especially for farm animals, monitoring, recording, preventing and controlling disease take place routinely at the herd and higher population levels.

In a group of animals, such as a flock, house, herd or any other population unit, the amount of poor welfare caused by disease is a function of its incidence, severity and duration, as described by Willeberg (1991).

This relationship has a number of important consequences for practical use and proper interpretation of welfare-associated disease observations. The points relate to the source of available data on disease occurrence, which in practice concentrate around: frequency of treatment, mortality measures and frequency of lesions at slaughter.

Data on frequency of treatment for diseases are rarely consistently recorded by the farmer, who most often carries out the treatment of flock animals. In some countries treatment data do exist for dairy cattle, at least for treatments carried out by the veterinarian. In many field trials of new production systems such treatment data are collected (Willeberg, 1993, 1997). Measures which are indicators of the number of treatments are the amounts of drugs purchased or used in the production, but such information is not often published nor otherwise generally available, and it is also difficult to specify in which animals and for which conditions they were used.

Data on mortality can be found, or are legally required, in some production systems. Mortality data for regional or national populations may also be used to illustrate time trends in mortality of farm animals (Agger and Willeberg, 1991). In assigning welfare importance to mortality figures it is obvious that deaths are indicators of severe welfare problems, but information on the causes of death as well as an estimate of the duration of the condition before death should also be obtained in order to allow for a complete evaluation of a disease-associated welfare problem.

The frequency of lesions at slaughter is a prevalence estimate, not an incidence, and therefore it is in itself a function of the duration of the condition. Furthermore, causes of chronic conditions frequently seen at slaughter are often also determinants of the degree of pain associated with the condition, e.g. a floor surface which gives rise to frequent foot-lesions may also tend to magnify the pain of standing and moving in affected animals. However, there may not be proportionality between the prevalence of lesions at slaughter and the magnitude of the associated welfare problem which is particularly important in interpretations of comparative studies of different production systems (Willeberg, 1991).

- 1.2.2 Production indicators

Under controlled conditions relative changes in the productivity of individuals may indicate changes in welfare. A simple conclusion is that a sudden drop in productivity of an individual from a high level to a low level probably indicates a welfare problem. If young animals are not able to grow or if mature animals are unable to reproduce despite good opportunities to do so then their welfare is poor. Hence these measures can be used to identify particularly poor welfare. Welfare is also poor if a housing and management system results in a lower life expectancy, in the absence of human interference, than that which would normally be expected in such animals.

One of the main problems in using productivity as a measure of welfare is that, to the farmer, productivity may mean the average production of a flock, the production per unit of food intake, or the economic return per unit of capital or per unit of labour rather than the productivity of the individual (Duncan and Dawkins, 1983). No economic measure should be used when assessing welfare and, to be valid, assessment of production must be based on measures from individual animals, not flocks. Comparisons between individuals may be difficult because production is influenced by the strain and age of the bird, and can be manipulated by management strategies, such as the lighting programme or the nutritional content of the feed. A high level of production may even predispose the bird to production diseases and so increase the risk of poor welfare. As with health, good production does not necessarily indicate good welfare.

- 1.2.3 Physiological Indicators

The most frequently measured physiological indicators are those associated with stress responses, especially the activity of the hypothalamo-pituitary-adrenocortical (HPA) and the sympathetic axis. In birds, this has typically involved measuring heart rate, glucocorticoid concentrations, adrenal gland weight and responses to ACTH challenge.

However, as with the other measures, care must be taken in interpreting the results. Physiological responses to short-term stressors may be different from responses to long-term stressors because the system adapts when stress is prolonged. Furthermore, some of the adrenal responses can be elicited by positive experiences such as excitement. It is therefore too simplistic to equate an increase in adrenal activity with poorer welfare. Moberg (1996) argues that instead of just measuring the adrenal response we should be measuring the consequences of the stress, such as suppression of an immune response and failure to ovulate. While there are difficulties in interpreting measurements of HPA activity, entering a prepathological state clearly has an impact on the welfare of the animal.

Considerations when measurements of glucocorticoid levels in body fluids are made in order to assess animal welfare are: 1. the duration of the response; 2. the extent of daily fluctuations in normal adrenal cortex activity; 3. the variation in the magnitude of the response to different kinds of problems. Some of these problems in interpretation of adrenal cortex responses are discussed by Freeman (1985), Mason and Mendl (1993), Broom and Johnson (1993) and Zulkifli and Siegel (1995).

In most domestic birds, when an animal is disturbed sufficiently by an event for an adrenal cortex response to occur, the elevation of corticosterone in the blood takes at least two minutes to become evident (Lagadic et al., 1990). It rises to a peak after around 15 minutes and then decreases (quail: Launay, 1993; mulard duck: Noirault et al., in press). Hence the effect of short term physical experience such as handling or transport (Remignon et al., 1996) or psychological experience such as social disturbance or fear inducing stimulus (Siegel, 1982; Mills et al., 1993; Launay, 1993) can be assessed readily by measuring the magnitude of corticosterone increase in blood or other body fluids. During certain activities, such as e.g.

courtship and mating, adrenal cortex activity may increase but this would not necessarily be interpreted as indicating poor welfare.

When animals expect to be able to feed, or are frustrated because of absence of food, increased adrenal cortex activity often occurs but during ingestion of food, adrenal activity may well decline. Indeed, in situations where high levels of metabolism or general activity are undesirable, for example when the ambient temperature is high, increases in glucocorticoid production may not occur or may be actively suppressed (Broom and Johnson 1993). Such effects are clearly adaptive.

In some circumstances animals show a greater response to ACTH after experiencing difficult conditions over a long period. Other difficult conditions, however, do not elicit repeated adrenal cortex activity and do not result in elevated cortisol production following ACTH challenge (Ladewig and Smidt, 1989) If the conditions are prolonged and very severe in their effects, adrenal function may be impaired and a reduced response to ACTH challenge may result. Hence whilst an increased cortisol response to ACTH challenge indicates poor welfare, the lack of such a response does not necessarily indicate that the conditions posed no problem for the animal.

Endogenous diurnal fluctuations in glucocorticoid levels have to be taken into account when assessing the effects of an experimental treatment (Ladewig 1989). Another factor that has to be considered is that the plasma concentration of glucocorticoids is not only dependent upon the rate of hormone secretion, but also upon its rate of clearance from the blood. Elevations of glucocorticoids in response to different conditions at a particular time are seldom prolonged for more than 30 to 60 minutes after that time. Hence single blood samples usually reveal little about chronic problems and a sequence of samples must be taken at short intervals in order to gain information about such problems. Also, the nature of the aversive stimulus may influence the animal's reaction to it, including the extent of glucocorticoid secretion as a component of that reaction (Mason and Mendl 1993). Increased glucocorticoid levels have been associated with states of fear and anxiety, while pain does not always affect plasma glucocorticoid concentration (Bateson, 1991). Prolonged pain can result in reduced plasma glucocorticoid concentration (Lay *et al*,. 1992). Housing conditions may intermittently elicit adrenal cortex responses but random samples may miss these. Regular sampling of blood, using cannulated animals gives more reliable information than infrequent measures of resting levels but due to their small size and the constraint imposed by the canula this is rarely done in birds. Breed and individual differences also exist in the activity of the adrenal cortex (Mills et al., 1993; Launay, 1993).

A final but most important point concerning the use of measurements of adrenal cortex activity is that the sampling itself causes an adrenal cortex response. The sampling disturbance effect will commence as soon as any approach to the animal is made in all but animals thoroughly habituated to human proximity. However the response takes two minutes to be evident and it has been shown that hens are not affected by the blood sampling of birds of the same or neighbouring cages (Lagadic et al., 1990) .

As with corticosterone, heart rate is influenced by factors other than fear or anxiety. The level of heart rate reflects the animal's general metabolic demand, and is also influenced by circadian rhythms. In order to avoid conflicting and equivocal results it is important to distinguish between metabolic and emotional effects and to ensure that the measurement itself does not cause much disturbance to the animal (Mills et al., 1985; Broom and Johnson, 1993). Heart rate changes provide useful information about the effects of short term problems on the animal, but the measure gives little information about the long term effects. It is necessary to complement measurements of heart rate with other indices such as those pertaining to behavioural activity. An alternative to heart rate is the measurement of shank temperature which drops during the vasoconstriction following adrenal secretion.

All the cited measures are of short term (minutes to hours) stress reactions. In birds calculation of the heterophil/ lymphocyte ratio allows some measurement of longer term (hours to weeks) stress (Gross and Siegel, 1983 ; Mills et al., 1993).

- 1.2.4 Ethological Indicators

The advantages of ethological indicators, that are studies of animal behaviour, are that they are non-invasive and changes may precede those of other indicators. Ethological studies are of three main types.

a) In the first type, birds are placed in the environment under investigation and their behaviour is compared with that of birds either under feral conditions or in an environment assumed to be ideal. This approach is useful because it shows which behaviours are changed by the environment or treatment under investigation, so that further scientific study of these can be carried out. It also provides information about how birds choose to allocate resources in good conditions. However the problem with this approach is that it is not immediately obvious whether a particular behaviour, or change in behaviour, is an indication of regulatory disturbance or failure, or whether it is an appropriate adaptation to a change in environment. When the behaviour patterns have obvious detrimental effects, as is the case for feather pecking (Blokhuis, 1989), the interpretation of results is easy, but in other cases it is not. For example, Fölsch (1980) found differences in locomotion and acoustic behaviour of hens placed in different environments. But to use such parameters to demonstrate poor welfare, it must first be shown that these changes indicate frustration or some other problem.

b) The second method is to give birds access to more than one environment, resource, or opportunity for behaviour and assume that they will choose that which is in their best interest (Hughes and Black, 1973; Dawkins, 1976; Rutter and Duncan, 1991; 1992). Closely related to these choice experiments are operant conditioning techniques in which birds have to work to obtain, or to avoid, some aspect of their environment (Dawkins, 1983; Meunier-Salaun and Faure, 1985; Lagadic, 1992). Also, demand functions can be generated by making animals perform a variable amount of work in order to obtain the same amount of reward (Dawkins, 1983; Ladewig and Mathews, 1996). In all of such studies, the strength of preference should be assessed.

Poorly designed preference tests have been criticised by Duncan (1978) and operant conditioning is considered by Dawkins and Beardsley (1986) to be a problematic way of measuring animal motivation. However, others consider these to be the most powerful tools available for studying the needs of animals, to show certain behaviour or to obtain certain resources even if some caution should be taken in the interpretation of results (van Rooijen, 1982, Ladewig and Matthews, 1996).

c) The third type of ethological method used to assess welfare is to observe behaviour in experimental situations and compare their behaviour with the behaviour in the environment under study. In a situation where the animals do not appear to be coping, or cope only with great difficulty, several behavioural changes may be apparent, some of which may be called abnormal or stereotypic (Wiepkema, 1985). Although there is some controversy about the exact meaning of stereotypies (Dantzer and Mormède, 1981; Wiepkema, 1987; Savory, 1989; Cooper and Nicol, 1991; Mason, 1991), it is generally thought that suffering occurs before stereotypies are established and animals showing stereotypies are having difficulty in coping so their welfare is poor.

When birds are fearful, they may show retreat, avoidance behaviour or freezing behaviour as well as physiological responses. Stereotypies shown by birds including: head-shaking (Levy, 1944) the plucking and carrying of their own feathers (Hinde, 1958), route tracing (Keiper, 1970), pacing (Duncan, 1970) and spot-pecking (Staddon and Simmelhag, 1971).

The apparent simplicity of ethological studies can lead to them being misused. However, as with physiological indicators, when used appropriately ethological indicators can be a sensitive measure of animal welfare.

1.3 Combining Results from different indicators

When faced with one kind of difficulty, an individual may show a measurable response, such as increased adrenal activity, but other kinds of difficulty may elicit no adrenal change at all. Similarly, increased levels of abnormal activity, an overall reduction in responsiveness, a fever response, an increased T-cell activity, a loss of detoxification ability or a suppression of growth may occur in response to one problem but not in response to another. Hence it is agreed that there is no single indicator of animal welfare and that to get the best assessment, several different measurements have to be taken (Broom, 1986; Broom and Johnson, 1993). In some cases, all indicators, be they health, production, physiological or ethological, point in the same direction and the interpretation is clear. On other occasions there are conflicting results (Mason and Mendl, 1993). In each case a balanced overall assessment of welfare must be made.

Another problem in the evaluation of animal welfare is the lack of knowledge of how animals experience, for example, the states of disease, conflict or frustration. Are some states more important from a welfare point of view than the others? These questions are difficult to answer with our present knowledge of veterinary and ethological science. An alternative view, therefore, is that of Fraser (1995) who proposed that instead of attempting to "measure" animal welfare, the role of science should be to rectify and prevent all welfare problems.
Rushen and de Passillé (1992) acknowledged the problems in measuring welfare and proposed that criteria for assessing welfare can be divided into design criteria, which specify what must be included in an animal's environment to promote good welfare e. g. space allocations etc., and performance criteria, which indicate what parameters of the state of an animal indicate good or poor welfare e.g. production performance, physiological indicators of stress etc. They propose that housing can be assessed using an optimum mix of these two criteria.

1.4 Summary

Despite there being several definitions of animal welfare, scientists agree on many of the basic principles. For example, many agree that welfare particularly concerns what an individual animal feels, but think that the techniques to measure feelings are not very well developed at the present time. Techniques to measure the effort an animal is putting into coping with a situation are better developed and, since this should be correlated with feelings, it is argued that current research should concentrate on these measures as indicators of welfare. The most commonly used welfare indicators are measures of health, production, physiology and behaviour. Any one of these indicators may be used on its own to indicate poor welfare, but an integrated (Smidt, 1983) or holistic (Simonsen, 1996) approach gives a better indication of the effort the animal is putting into coping and hence the biological cost to the animal of responding. With regard to assessing housing for animals, recent thinking supports a balance between design and performance criteria and focusing on specific welfare problems. Hence the welfare of ducks and geese in relation to the housing and the procedures which are used during force feeding can be assessed.

2 THE ORIGINS AND DISTRIBUTION OF FOIE GRAS PRODUCTION

2.1 The products

The “foie gras” (or “fat liver”) products derived from the force feeding of ducks and geese are defined by the following European and French regulations.

Regulation N*f* 1538/91 of the commission dated the 5th of June 1991 (JO N°L 143, 7th of June, P. 11; JO N°L233, 22nd of August 1991, p. 31) defines norms for the characteristics of the products of different birds. In particular force fed ducks and geese are defined by the minimal weights of their livers, 300g for ducks and 400g for the geese.

A French regulation (Décret N° 93-999 du 9 Août 1993 relatif aux préparations à base de foie gras) defines the different types of products prepared with foie gras. All these preparations involve some percentage of fat liver (from 100% to 20%). Another text, “Arrété du 8 avril 1994 relatif aux méthodes officielles d'analyse des préparations à base de foie gras”, complements the first one by describing methods for the analysis of the different “ préparations“. Methods for determining the percentage of fat liver and the size of the pieces of the liver are given. A histological analysis is also described and the text defines as not acceptable products where the hepatocytes do not include fat globules, a high proportion of perivascular tissue, tissues other than fat liver from ducks and geese and a high proportion of tissue with lesions.

The different products are described as follows:

1 - “foie gras entier” (whole fat liver) the liver is sold as a whole,
2 - “foie gras” parts of liver are used but the livers do not have to be in one piece,
3 - “ bloc de foie gras” only fat livers are used but they are processed by mechanical devices and chunks of liver are not visible,
4 - “parfait de foie” includes at least 75% of fat liver processed by mechanical devices,

5 - “médaillon de foie” and “pâté de foie” product with at least 50% of fat liver. This fat liver is in chunks or is mechanically prepared and is clearly set in the centre of the preparation with products from other origins on the outside.
6 – “galantine de foie” product with 50% of fat liver mixed with stuffing.
7 – “mousse de foie “ product with 50% of fat liver mixed with stuffing and presented as a “ mousse”.
8- “produits au foie gras” products with foie gras which contains at least 20% of fat liver

Other products exist which include livers from non force fed ducks and geese, in particular “pâté” and “mousse”.

A new nomenclature for those products was defined at the European level and published in 1995 (nomenclature PRODCOM). The changes in this production are thus difficult to determine on a long term basis. However the general trend is of an increase of production in France during the last fifteen years (from 5900T in 1990 to 10670T in 1996; CIFOG, 1996) and a decrease in imports to France (from 2620T in 1990 to 1800T in 1996). The quantity processed by the industry increased from 4450T in 1990 to more than 6700T in 1996. The other part of the production is processed and some is sold directly at the farm level.

In 1996, 6200T of 100% foie gras products (products 1 to 3) and 700T of the other foie gras products (products 4 to 8) were sold by the food industry at prices of around 225FF/Kg and 155FF/Kg. 13000T of non foie gras “pâté and mousse” were produced in 1996 at a mean price of approximately 32F/Kg. These differences in prices are related also to the differences in the timing of the consumption. Foie gras products are sold usually towards the end of the year whilst «pâté de foie de volaille » is sold all year round. On average, each family in France buys foie gras products for 140FF on 1.7 occasions and “mousse ” and “pâté” for 37FF in 2.5 occasions every year.

2.2 Origins and species

Some geese have been reared since ancient times in such a way that an especially fatty liver could be obtained from them. There is reference to this practice in the satires by Horace

(Book ii, Chapter pIII) and in the statuette of a fattened goose more than 4500 years old from the Ancient Egyptian Empire exhibited at the Louvre. Other authors such as Herodotus and Homer have also described practices corresponding to force feeding in their works (Carrère, 1988). The feeding of geese according to the method carried out in Gascogne, south-west of France was described as early as 1619 by Olivier de Serres, "et jecur anseris albae pastum ficis pinguibus" the translation of which is "and the liver of a white goose fattened with oily figs".

The fat liver, internationally called "foie gras", was produced traditionally from geese. However in recent years there has been a widespread change to the use of ducks rather than geese, mainly for financial reasons. The change in France has been dramatic from an exclusively goose production in the 1950s to a current production of liver, 94% (9700 tonnes of foie gras) of which is from ducks and only 6% (600 tonnes) from geese.

The duck chosen for foie gras production is a hybrid between the muscovy duck (*Cairina moschata*) and the domestic duck (*Anas platyrhynchos*). There is an important sexual dimorphism in muscovy ducks, the adult male weighs between 4.5 and 5 kg while the adult female weighs between 2.2 and 3 kg. Farmers reported that during force feeding, these animals were too nervous and at the end of the force feeding period, their fatty liver had a tendency to lose fat by melting. For all these reasons, these animals were crossed with domestic ducks. A male muscovy duck is crossed with a female of a breed such as the Pekin duck. The product is a sterile hybrid, the so-called mulard duck. The males are used for foie gras production and the females are raised for meat consumption.

Geese (*Anser anser*) which are kept for force feeding are of specific strains: oie du Gers and oie grise du sud-ouest. These strains are selected because of the capacity of the animals to produce fatty livers.

2.3 Production in France

In France, by tradition, force feeding was mainly carried out in Alsace and in the south west of the country, including Aquitaine and Midi-Pyrénées areas. These areas still provide 80% of the total production. In the last 10 years, foie gras production has developed in a second area in the western part of the country (Pays de Loire and Bretagne) where the production represents nowadays 18% of the total French production. Some force feeding is currently practised in all geographical regions.

After a considerable increase in production over ten years, production levels have begun to stabilise with an increase of 7% between 1994 and 1995. In 1995, the French production of 10385 tonnes was supplemented by 2850 tonnes of imported foie gras, which is a decrease of 17% from the 1994 level, (CIFOG 1996). In order to obtain this production in France, 789,000 geese and 18,395,000 ducks were bred and force fed in 1995. The number of ducks kept for this purpose showed an increase of 7.6% between 1994 and 1995 but there was no increase between 1991 and 1995 in the number of geese kept.

In 1995, 342 tonnes of foie gras, as a raw product were exported and 12 893 tonnes were used in France. Of this 6 394 tonnes were transformed by food industries and 6 499 tonnes were used in restaurants or for private consumption. 380 tonnes of processed foie gras were exported in 1995 in particular to: Switzerland (73 tonnes), Belgium and Luxembourg (64 tonnes), Spain (43 tonnes). United-Kingdom (37 tonnes), Germany (32 tonnes), Japan (27 tonnes) and Netherlands (22 tonnes).
Meat production which is associated with the production of foie gras is estimated as nearly 28,000 tonnes. This corresponds to 10,000 tonnes of fillets (magrets), 10,000 tons of thighs (so called " cuisses à rotir ou à confire "), 4,500 tonnes of " manchons ", 1,200 tonnes of " aiguillettes ", 1,500 tonnes of gizzards and 450 tonnes of hearts.

2.4 Production in Belgium

The annual production was estimated as 40 tonnes in 1993. It had increased to 48 tonnes in 1995. The number of animals involved in this production was 98 000 ducks in 1995 (90 000 in 1993) and 2 000 geese in 1995 (same number in 1993). The annual consumption is of 200 tonnes.

2.5 Production in Spain

The annual production was estimated as 34 000 animals in 1990. It gradually increased to an average of 45 000 animals in 1995 and an estimated 55 000 animals in 1996.

3 THE PRACTICE OF REARING AND FORCE FEEDING

3.1 Management before the force feeding period

After hatching, the mulard ducks are kept in a building on straw for 4 weeks. They are then allowed to live outside, on grass for some weeks.

In contrast to certain other species, there is no crop in the goose and in the duck but the oesophagus can become dilated. The preparation of the animal is carried out in order to emphasise this dilation. Prior to force feeding, the bird is prepared for the various manipulations in two phases. In phase one from the third week onwards, the bird is subjected to training that is designed to dilate the oesophagus. This is achieved by grass ingestion for example. Such preparation makes it possible for the bird to receive a large quantity of food very rapidly, which will occur during the force feeding period.

In phase two, the bird is subjected to a period of rapid muscle growth (Bénard, 1992). During this period, which generally lasts about four weeks, the bird receives a large quantity of food which is fed ad libitum. This results in oesophagus dilation and progressively leads to the half-fatted state. The ration is distributed as a mash and is at this stage usually composed of maize 20%, wheat 53%, soya cake 19%, mineral and vitamin supplement 8%. In this diet, the metabolisable energy is around 680J. The composition is as follows: proteins 16.5%, starch 47.9%, cellulose 2.7%, fat 2.1%, lysine 0.78%, methionine 0.37%, tryptophan 0.20%, phosphorus 0.72%, calcium 1.16%, chloride 0.20%, sodium 0.16%. The dry matter is around 87.5% and ash is 6.3%. This diet is provided when the birds come in from the field. The periods when the birds are allowed to go out are then progressively reduced so as to condition them to the restraint associated with the force feeding period.

3.2 Management during the force feeding period.

During this period there is forced daily ingestion, for 12 to 15 days for ducks and 15 to 18 even 21 days for geese, of a large amount of energy-rich food, with a high carbohydrate and fat content and an uneven amino acid balance: lysine 0.28%, methionine 0.22%, tryptophan

0.07%, leucine 1.28%, arginine 0.49% (Larbier and Leclercq, 1992). Animals receive two meals per day (ducks) or three meals per day (geese).

The basic feed is maize which is usually boiled and mixed with fat principally to facilitate ingestion. It is administered by force using a funnel fitted with a long tube consisting of an auger or pneumatic system that forces the maize into the oesophagus. The amount is fixed so as to ensure that the crop-like area is full. Efforts are made to avoid any tearing or splitting of the oesophagus by the movements of the tube or the amount of food inserted.

Various parameters are of fundamental importance during this period. Water must be continuously available. Many farmers make the water alkaline by adding sodium bicarbonate. The maize used is at least one year old so that the starch is more easily assimilated. Some authors have shown that, based on the increase in body weight and liver weight, the administration of grain maize is preferable to that of a fluid paste obtained by grinding the maize in water. This may be explained by better assimilation of the starch, due to the slowing down of grain transit. Finally the addition of lactic ferments limits the multiplication of enterococci, and thus the risks of enteritis associated with poor digestion (Bénard, 1992).

To deliver the food, an auger (endless screw) is generally used. The auger is contained within the feeding tube. It is moved either by hand in traditional units or with an electric motor. With such systems, used for 30% of the birds, it takes between 45 and 60 seconds to deliver the meal. In larger units, pneumatic devices are used. They allow the farm worker to deliver the same quantity of food in 2-3 seconds. Such a system is connected through a computer which helps to determine the amount of food to deliver to each bird on the basis of the body weight and the amount of food which was delivered during the preceding meals.

Whether force feeding is to be carried out using an auger or using a pneumatic device, the bird must first be restrained and positioned by a person. In order to make catching the bird easier, the ducks or geese are either kept in groups in a small pen or cage or in a wire or plastic cage holding only one bird. Most ducks are now kept in cages of a size which does not allow the bird to turn around or stretch its wings. The head protrudes through a hole in the front of the cage roof. 20% of the ducks and all of the geese are kept in groups.

The person who will commence the force feeding grabs the neck of the bird, retrains the wings if the bird is in a pen, draws the bird towards the feeding pipe, thrusts the 20-30 cm long pipe down the throat of the bird and initiates the food pumping procedure. When food delivery is completed, the pipe is removed. The insertion and removal of the pipe must be carried out carefully in order to avoid injury to the oropharynx or oesophagus of the bird and potential mortality.

In some farms the ducks or geese are kept in near darkness for all of the time except the feeding period during the 2-3 weeks of force feeding.

3.3 Housing of ducks and geese during the force feeding period.

Three types of rearing systems are used for ducks and geese during the force feeding period (Table 1):

Table 1 Some characteristics of the 3 types of housing systems used for force feeding ducks and geese

	Frequency (%)		Group size		Surface (cm^2)	Surface per bird (cm^2)	
	Ducks	Geese	Ducks	Geese		Ducks	Geese
Individual cage	80		1		900-1050	900-1050	
Group cage	0.5	50	4-5	3	10000	2000-2500	3300
Pen	19.5	50	12-15	9	30000	2000-2500	3300

- Individual cages: These cages are made of wire mesh or plastic and are always of the flat-deck type. The size is 20 to 21 cm wide, 45 to 50 cm long and 27 to 33 cm high. The front and top of the cage are open to allow the duck to drink and to be force fed. Water is provided in a trough in front of the cage. The top and most of the time the front wall as well make the door of the cage **(Figure 1).**

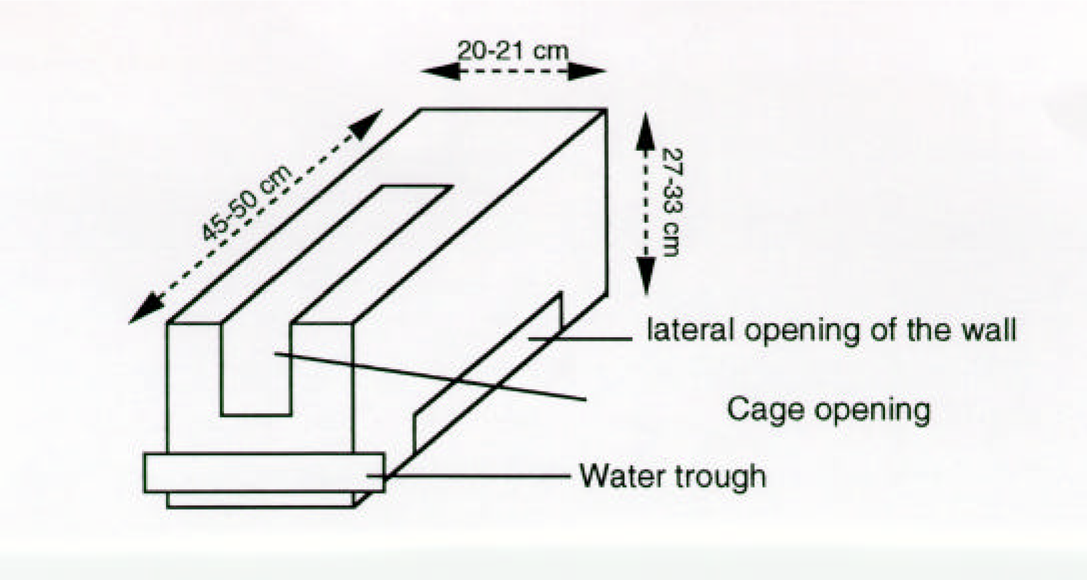


Figure 1. Schematic view of a cage

The basic type has a rectangular section but a lot of different shapes can be found **(Figure 2)** and in some of them the lateral walls are partly open to allow more space for the feet.

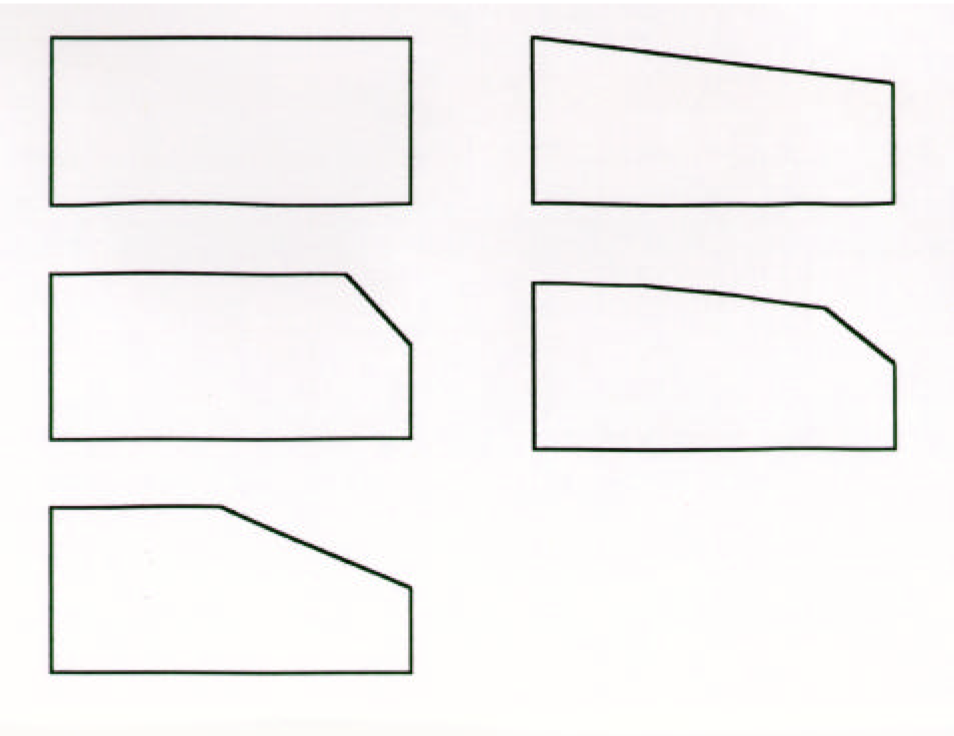


Figure 2: Longitudinal sections of various cages

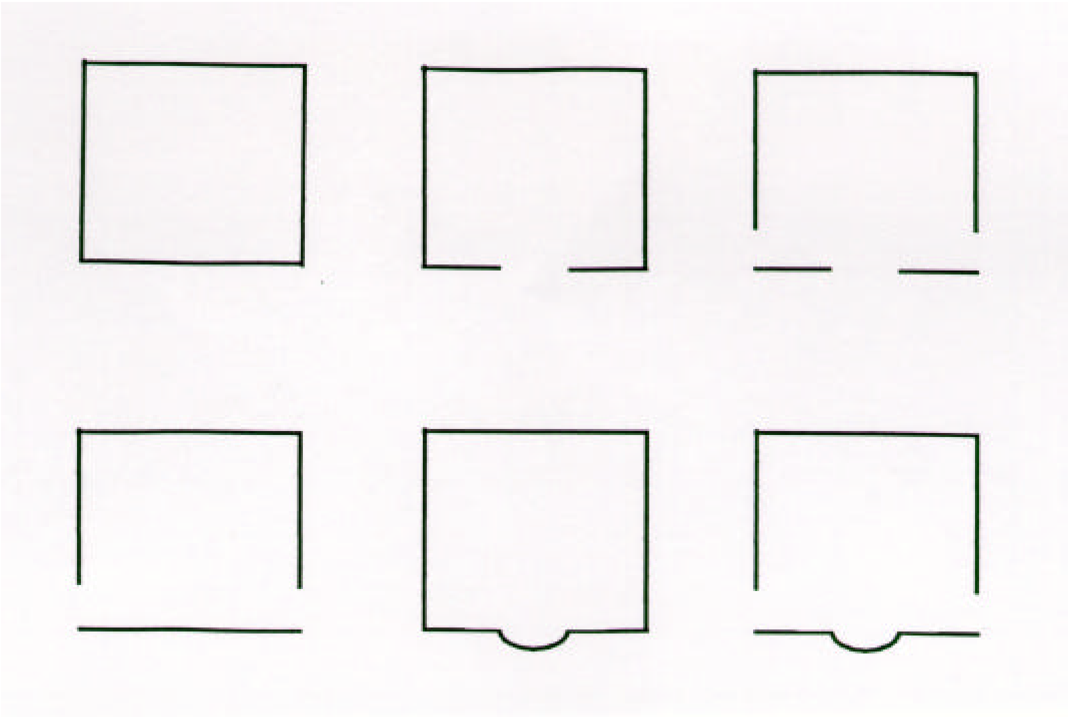


Figure 3 **Transverse sections of various cages**

The floor was originally flat but is now often either open or of a trough shape at the level of the breast in order to reduce breast blister incidence **(Figure 3).**

- Group cages: They are made of wire and have a flat wire mesh floor. They are usually square and measure 1 x 1 m in surface. The wire mesh walls are about 80 cm high and the front of the cage is made of bars to allow access to the water trough placed in front of the cage. They have no roof and a system permits the restraint of one animal at a time during the force feeding act.

- Pens: Pens are usually 3 m² (1 x 3 m) and are made of wire mesh walls and slatted floor. Water is available from a trough placed in the pen.

4 NORMAL BEHAVIOUR AND OTHER FUNCTIONING OF GEESE AND DUCKS RELEVANT TO FORCE FEEDING

4.1 The natural behaviour of geese, muscovy ducks, domestic ducks and their hybrids

Traditionally, "foie gras" has been produced by domestic geese. Today, by far the most common type of bird used for the purpose of "gavage" is the male hybrid between the muscovy ducks and domestic ducks. In the following, an account is given for the natural behaviour and ecology of these animals.

The ancestor of most modern geese is the greylag goose *(Anser anser)* (Clutton-Brock, 1981). It was domesticated probably more than 7,000 years ago (Clutton-Brock, 1981). Nevertheless, the basic behaviour patterns of the greylag goose have not been altered substantially, just as in other domesticated species, as revealed by different behaviour studies (Lorenz, 1950; Lorenz, 1972; Kretchmer and Fox, 1975; Bellrose, 1980; Clutton-Brock, 1981). Greylag geese are widely spread over the northern hemisphere where they occupy living areas in close connection with water. Most of their time is spent in water, but they move and forage extensively on land (Lorenz, 1972; Bellrose, 1980). They forage both on land, by grazing, and in water, by eating aquatic plants; also insects, molluscs and other animals form part of the diet. Most of the daytime is spent in search for food (Lorenz, 1972; Bellrose, 1980). Geese form pairs which usually stay together throughout life (Lorenz, 1950; Lorenz, 1972; Bellrose, 1980). The nests are built on the ground, usually close to the water, and the eggs are incubated by the females alone, whereas both sexes share the parental care once the young have hatched (Lorenz, 1950; Lorenz, 1972; Bellrose, 1980). Many greylag geese migrate extensive distances from the northern breeding grounds to southern winter areas, which in Europe range from central to southern parts of the continent (Bellrose, 1980).

The muscovy duck *(Cairina moschata)* belongs to Cairini, hence it is quite distantly related to the origin of the domestic ducks, the mallard *(Anas platyrhynchos),* which belongs to the Anatini, both subgroups within the family Anatidae (Leopold, 1959; Bellrose, 1980). The sexual dimorphism in size of the muscovy duck is considerable, the male being almost twice as big as the female which is not the case in mallards; however mallards have a pronounced plumage dimorphism which is not the case in muscovies. There are also some striking differences between the behaviour of the two species. The muscovy duck in the wild lives in Central and South America, where the climate is subtropical to tropical, and they are not migratory (Hoffman, 1992a). They are omnivorous and eat both animal- and plant-based nutrients, such as small fish, insects, molluscs, small reptiles, worms, algae and terrestrial plants (Brauer, 1991). Muscovy ducks are mostly active at dawn and dusk, when most of their time is used for foraging, whereas the middle of the days and the nights are usually spent on branches in trees close to water (Leopold, 1959). They have a promiscuous mating system and copulation takes place in water during the mating season which coincides with the rainy season (Breuer, 1991). Nest sites are selected by females alone, and the nests are mostly built in hollows in trees, but also sometimes on the ground. The clutches consist of 8-15 eggs which are only incubated by the female. The female is also solely responsible for caring for the young until they can fly (Leopold, 1959). Muscovy ducks were domesticated by native peoples in South America, but the date of the domestication is not known (Breuer, 1991). In the 16th century they were introduced to Europe and are today kept and farmed in large parts of the world. The behaviour of the domesticated breed is quite similar to that of the wild form (Breuer, 1991). Whereas most pure muscovy ducks are kept for meat production, the species is also important for production of fat liver, but in the form of hybrids with domestic ducks.

Domestic ducks originate from the mallard, the most abundant and widely spread duck in Northern Hemisphere (Bellrose, 1980; Clutton-Brock, 1981). Mallard may be largely sedentary in a small area or may range over some hundreds or even thousands of kilometres in search of feeding areas. Food choice is similar to that of muscovies (Bellrose, 1980). Unlike muscovies, mallards form pairs for a part of the year. However, the incubation and caring for the young is done completely by the female and the male usually leaves during the incubation period (Lebret, 1961). Nests are built on the ground and mallards are dependent on water and not inclined to go into trees (Bellrose, 1980). Domestic ducks have retained the behaviour of their ancestors, although thresholds for release of certain behaviour patterns such as aggression has been altered (Desforges and Wood-Gush, 1975 a and b, 1976.)

With respect to the social behaviour, both mallards and greylag geese live in pairs during the reproductive season, or on their own together with the offspring. However, before and during migration, large numbers of birds usually aggregate for foraging, resting and migrating (Bellrose, 1980; Breuer, 1991). Both species have a rich repertoire of social behaviour, comprising both visual displays and acoustic signals (Lorenz, 1972). Muscovy ducks spend a large part of their time in groups, both during daily activity and during night rest (Leopold, 1959). Hence, all three species may be considered as basically social animals to their nature.

The hybrid used for force feeding, obtained by crossing a male muscovy and a female domestic duck, or mulard, is sterile and shows a number of anatomical features from each species; for example, sexual dimorphism in size and coloration is almost absent, eggs hatch after an intermediate time of incubation (32 days in hybrids, 28 in domestic ducks and 35 in muscovies), the birds have claws like muscovies, but very rarely go into trees, like domestic ducks (Hoffman, 1992b). Hoffman (1992a) concludes that the general behaviour of the mulard appears to be most similar to that of muscovies, with the exception that they moved more slowly and spent more time in water, traits that are more similar to domestic ducks. Hoffman (1992b) also reported that mulards do not fly.

4.2 Occasions for Food Storage in Birds

Animals which migrate or hibernate are adapted to store food which can be made available later. For example the mean weight of the blackpoll warbler *Dendroica striata* increases from 10-12g to 20-23g before migration to the breeding grounds. In some birds this increase in weight is, in part, a consequence of fat accumulation in the liver but in other birds there is fat accumulation elsewhere in the body. Animals which feed irregularly in wild conditions are also often adapted to store food when a large meal is taken. It may be that such mechanisms are exploited when ducks and geese are given a large volume of food which results in a substantial expansion in the size of their liver. The greylag *Anser anser* is often migratory and may travel long distances during migration. Some wild mallard *Anas platyrhynchos* are sedentary but others migrate in some circumstances. However, the muscovy duck *Cairina moschata* is a tropical species which is not migratory. Hence whilst the domestic goose might well be adapted to store food before migration, it is less likely that a cross between the domestic duck and the Muscovy duck, the Mulard, has such a potential for food. These hybrids do accumulate fat in the liver when caused to have a high food intake but the biological origins of this are unclear.

4.3 The needs of geese and ducks in relation to feeding and possible consequences of force feeding.

Animals have some needs which can only be fulfilled if they are allowed to perform a particular behaviour (Hughes, 1980; Broom, 1988a; Jensen and Toates, 1993). There is no specific research into such needs in ducks but based on the general behaviour and ecology of the species, some probable needs may be outlined. It is clear from the general behaviour that muscovies, mallards, their domesticated breeds and the hybrids between these, all share some ethological traits with each other and with geese. They are omnivorous birds which are dependent on water for a number of purposes. In relation to force feeding the feeding behaviour is of particular interest. It is well known from other species, birds as well as mammals, that omnivorous animals are adapted to use most of their active time in exploring possible food sources and perform actual foraging (food search, food manipulation and ingestion), and this appears to be true also for wild muscovies and mallards. In addition, the birds can not digest cellulose and therefore obtain only a fraction of the nutrients from ingested plants, which under natural conditions forces them to forage for extended periods of times (Bellrose, 1980; Breuer, 1991). Other omnivorous species such as rats, pigs and hens possess highly inquisitive behaviour as an adaptation for exploring new food sources (Barnett and Cowan, 1976; Ljungberg, 1986; Holson et al., 1988; Inglis and Sheperd, 1994; Freire et al., 1996). In these other species, where scientific documentation is more widely accessible, it seems to be a general rule that thwarted feeding activities cause different behavioural problems commonly associated with poor welfare. Hence, barren environments and inability to perform species-specific feeding behaviour often cause behavioural disturbances which express themselves as mouth-based abnormal behaviour, such as bar-biting and tail-biting in pigs and feather pecking and cannibalism in laying hens (Colyer, 1970; Jericho and Church, 1972; Blokhuis and Arkes, 1984; Appleby and Lawrence, 1987; Fraser, 1987; Lawrence and Terlouw, 1993; Savory and Maros, 1993; Day et al., 1996). Abnormal pecking in birds is often interpreted as a sign of a thwarted motivation for performing normal feeding behaviour.

Feather-pecking, which sometimes develops into cannibalism, is also a frequent problem when housing and breeding muscovy ducks fed ad libitum (Breuer, 1991). It appears to be less of a serious problem in hybrids bred for ”foie gras”, and there is no scientific documentation of its occurrence in these animals. However, the working group observed during farm visits in France that in one farm, with group housing of ducks, the force fed animals were fitted with rings through the beaks. According to the staff on the farm, the reason for this was to prevent feather-pecking which can occur before the force feeding period. There are no data available to allow any judgement of the incidence of the problem.

Ducks are fed considerably more during the force feeding period than they would eat voluntarily, and they receive this food without having the possibility to forage in a species-specific manner. In other species, mainly rats and dogs, the motivation for foraging behaviour has sometimes been studied by using an experimental protocol involving tube feeding or fistula feeding. This allows the effect of stomach loading to be separated from the effects of the execution of foraging activities in reducing motivation for foraging. In the species studied, stomach-loading of normal meal sizes generally causes only a relatively small reduction in the need to express normal feeding behaviour (Toates and Jensen, 1991; Jensen and Toates, 1993). It cannot be excluded that the motivational processes work in the same manner in ducks. However, it should be remembered that the considerably larger-than-normal rations loaded into the stomach of force fed ducks may have different effects on the foraging motivation.

The possibility that there is a remaining motivation to perform normal foraging activities (such as, for example, seeking food, biting, nibbling, swallowing) in force fed ducks should be considered. If such a remaining motivation is present, this need is not met during the gavage period. This problem would most likely be greatest when the birds are kept in cages where they have limited freedom to execute the movements involved in normal feeding.

4.4 Feeding behaviour and activity of ducks and geese

Geese but also to a lesser extent ducks are good foragers and can make use of poor quality foods like grass (Metabolisable Energy between 1000 and 1200 kCal/kg dry matter). They are however, like other domestic birds, unable to digest cellulose (Plouzeau and Blum, 1980), but the quantity which they can ingest can be very high. Geese can eat 150 to 300 g of protein rich complete food plus 700 to 800 g of fresh grass (Larbier and Leclercq, 1992; Pakulska et al., 1995; Schneider, 1995). When fed with grass, geese decrease the proportion of complete diet and increase the proportion of grains which are protein poor (Snyder et al., 1955). When fed with carrots, a preferred food, geese decrease their consumption of complete food (100g) but they can eat up to 2.4 kg of carrots per day.

In ducks the usual feeding regime of animals that will be force fed is the following (figure 4):

Period 1) *Ad libitum* feeding up to 5 weeks of age.

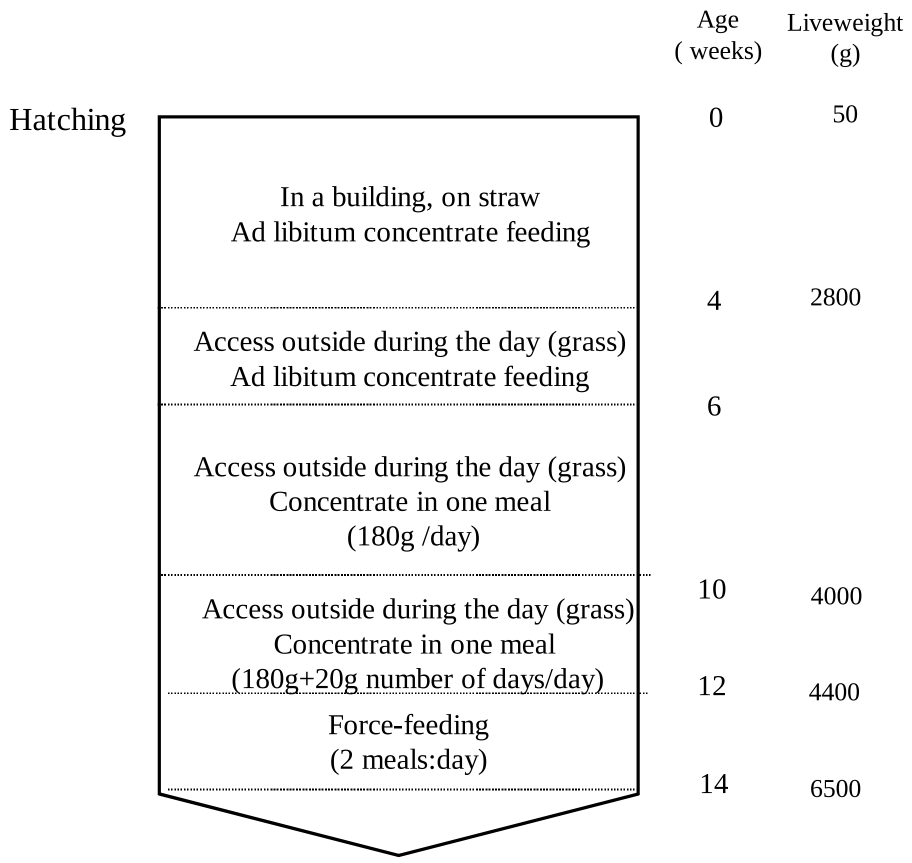
Period 2) Restricted feeding from week 6 to week 11 (180 g per day)

Period 3) Ten days of pre-force feeding with a 20 g daily increase of the amount of food distributed (up to 380 g per day).

During period 2 and 3, the food is distributed once a day which means that the food is available for only a short period of time (less than l5 min) and the animals only have one meal.

Period 4) During the force feeding period they receive 2 meals per day, starting at 190 g per meal on the first force feeding to reach about 450 g per meal on the last meal 14 days later.

Figure 4
Example of the usual management
of force-fed ducks



In order to evaluate the ingestive capacity of not force fed ducks, the animals were submitted to 3 feeding regimes during an experimental period following periods 1 and 2 as described above (Guy, Guémené, Faure, 1996, unpublished data) In every case the values given are the maximum amount of food consumed on one day.

Treatment a: ten more days with 180 g per day restriction and then two 300 g meals. The 600 g of food distributed were consumed on the first day.

Treatment b: Period 3 treatment (1 meal, 20 g daily increase) was continued until food consumption started to decrease. The maximum food consumption reached 440 g.

Treatment c: Periods 1, 2 and 3 were as described above except that during period 3, 2 meals were distributed. The animals were then fed *al libitum.* The amount of food consumed was then 603 g per day.

These results show that in ducks too, the gut capacity is sufficient for the largest amounts fed during the force feeding period of foie gras production.
Geese (Marcilloux and Auffray, 1981) and ducks (Reiter and Bessei, 1995) are about as active at night as they are during the day in confined conditions. When concentrate food is available *ad libitum,* 6 week old Mulard ducks spend less than 1% of time actually eating but a further 8% of time sieving in the litter which is a type of feeding behaviour (Reiter and Bessei, 1995).

Mulard ducks will bathe in water if given the opportunity (Matull and Reiter, 1995). In a study of muscovy ducks by Nicol (in prep), birds provided with nipple drinkers in the home pen lifted the heaviest weight in order to gain access to an adjacent pen with bathing water at least as frequently as they would lift such a weight in order to gain access to a pen containing food. Hence, muscovy ducks are highly motivated to have access to bathing water and welfare is likely to be poorer whenever such access is not available.

The time budget of force fed ducks shows that they spend more and more time resting during the first week of the force feeding period (no data are available for the second week). During the same period the times spent drinking and preening decrease. Winnicki et al., (1995 a,b) force fed geese for two weeks and then stopped force feeding. Geese had then free access to grass. They had free access to pellets during the whole experiment. The time spent resting and standing was about constant between day 5 and 15 of the force feeding period. After the end of the force feeding the time spent resting decreased whereas the time spent standing stayed relatively constant but an increasing proportion of time was devoted to feeding on grass. During this period the birds reduced their pellet intake to nearly zero for 18 days but still continued to eat grass. After the end of the force feeding period there was also an increase in the number of preening bouts and a decrease in the number of drinking bouts. Despite the fact that the results were obtained on two species and in different conditions a general picture can be drawn. During the force feeding period the time spent resting increases and the time spent standing and preening decreases. After the end of the force feeding period, the time spent resting decreases whereas the time spent standing and preening increases. During this recovery period the time spent active is relatively constant but the duration of feeding increases and compensates for the decrease in resting time.

5 CONSEQUENCES OF FORCE FEEDING: WELFARE INDICATORS

5.1 Force feeding and behavioural indicators

Daily hand-feeding of ducks and geese is normally associated with a positive response by the animals towards the person feeding them. In the preparation of this report, members of the Committee visited a number of farms practising force feeding but this behaviour was not observed by the visitors on these occasions. When ducks or geese were in a pen during the force feeding procedure, they kept away from the person who would force feed them even though that person normally supplied them with food. At the end of the force feeding procedure, the birds were less well able to move and were usually panting but they still moved away from or tried to move away from the person who had force fed them. In a pilot experiment carried out on ducks kept individually in cages, the birds displayed less avoidance behaviour to the force feeder's visit than to the visit of a neutral person coming along the cages one hour after the force feeding (Faure, personal communication). This suggests that the stranger is more aversive than the force feeder at this time but gives no information about the force feeding process itself.

Aversion behaviour to force feeding was studied experimentally by Destombes, Guy, Guémené and Faure 1996 (unpublished data). The time budget and readiness to go out of the living pen and into the feeding pen was compared in ducks for the 15 days before the start of the force feeding and for the 10 days following the force feeding. Half of the ducks (4 pens of 10 animals) were kept as control and had two *ad libitum* meals per day whereas the force fed animals received two meals with the same amount of food as the control. The control animals, which were fed ad libitum in the feeding pen, learned to leave the living pen and go to the feeding pen and went to this pen on the majority of occasions even when they were not driven. The animals which were force fed, however, did not leave the living pen and go to the feeding pen. When the force fed ducks were driven out of the living pen into the passage way, some then entered the feeding pen but some remained in the passageway. Since the feeding pen was attractive to the birds which were not force fed, the results indicate that the force feeding pen was not attractive to the force fed ducks and that the procedure might involve an aversive component.

The avoidance behaviour by most ducks and geese in pens during force feeding observed by members of the working group indicates aversion to the force feeding procedure. Ducks in cages had little opportunity to show avoidance but sometimes moved their heads away from the person who was about to force feed them.

The behavioural time budget in the living pen of the animals which were fed *ad libitum* or force fed a matched quantity of food showed high variation from day to day but no clear difference between the two treatments or with time. In the absence of opportunity for the force fed ducks to show normal feeding behaviour, it might have been expected that the birds would show more foraging activity in the living pen but this was not observed. These results do not allow any conclusions concerning the strength of motivation for foraging behaviour in force fed birds.

When the goose or duck is force fed, there is an increase in carcass weight and a substantial increase in the relative size of the liver (Villate, 1978; Georgiev et al., 1980; Bénard et al., 1991; Bénard, 1992; Jouglar et al., 1992). There appears to be no published evidence on the effects on gross body anatomy of force feeding. However, some experts of the working group observed on visits to fattening units that the legs of the force fed animals were pushed outwards, away from the mid-line of the body so that they met the ground considerably further apart than is normal and so that the leg could not be held vertically when the bird was standing or walking and they conclude that it was caused by the great expansion of the liver. They observed that the consequence of this was that birds with expanded livers had difficulty in standing and their natural gait and ability to walk were severely impaired. They assume that there must be increased lateral force on the leg joints when birds with hypertrophied livers are standing or walking but this has not been studied.

Some birds become unable to stand but there is no evidence available concerning the frequency of inability to stand, or of joint damage, or of the extent of difficulty in walking. Birds which are force fed seem to spend most of their time sitting rather than standing. The widespread use of small cages in which the birds usually cannot stand in a normal standing position makes it difficult to recognise leg problems and leg pain.

Hypertrophied livers can cause discomfort in a variety of other species. Hence it may be that some discomfort results directly from the hypertrophied liver in force fed ducks and geese. It appears that this has not been investigated.

When birds are kept in small cages they are unable to exercise, preen, explore or interact socially in a normal way. It is reasonable to conclude that when birds are kept in near darkness they are likely to show impaired exploratory behaviour and hence would not be likely to exercise properly.

5.2 Force feeding, management and pain

Birds, including ducks and geese, have a wide range of pain receptors and an elaborate pain recognition system. Most injuries caused by tissue damage during handling or tube insertion would result in pain. The oropharyngeal area is particularly sensitive and is physiologically adapted to perform a gag reflex in order to prevent fluids entering the trachea. Force feeding will have to overcome this reflex and hence the birds may initially find this distressing and injury may result.

The beak of a duck is richly innervated and the insertion of a ring through the beak would cause pain during the operation and might cause neuroma formation, and hence prolonged pain, thereafter. Similarly, most injuries to the feet caused by inadequate flooring would be painful.

Other than the data on behaviour mentioned in 5.1 above, no studies of pain during the force feeding procedure appear to have been carried out.

5.3 Force feeding and physiological indicators

Although several studies have been devoted to the technical, nutritional, histological and biochemical consequences of force feeding, very little information is available about physiological indicators of duck and goose welfare. A set of experiments has recently been carried out on the male hybrid duck (Mulard) as part of a programme instigated by INRA (Faure et al., 1996)

The hypotheses tested were that force feeding could produce acute or gradually accumulating stress. Acute effects could be induced by different aspects of the process itself, e.g. the handling, the introduction of the force feeding tube, the forced introduction of the food or the excessive food quantity. Gradually accumulating effects could be due to the fact that the procedure was repeated twice a day for 14 days or to the increasing weight of the animals.

To test these hypotheses four treatments were compared on four groups of 30 ducks: control (ad libitum fed animals); extensive force feeding (i.e. introduction of the quantity of food consumed by controls); intensive (i.e. normal) force feeding and prevention of feeding.
If the procedure was inducing acute stress, it could be that an increase in the corticosterone level would be observed shortly (15 min, i.e. the time required to have a maximum corticosterone secretion after ACTH injection) after the force feeding procedure.

Two types of reactions which could result from long-term problems are an increase in the heterophil/lymphocyte ratio and a variation in adrenal gland reactivity. According to species and conditions two types of changes have been described in the bibliography: a decrease of the adrenal capability to secrete corticosterone (exhaustion) and this hypothesis was tested by injecting doses of ACTH that give a maximum corticosterone secretion; or an increase in adrenal reactivity to ACTH stimulation and this was tested with injections of ACTH that were shown to induce about half of the maximum corticosterone secretion.

Blood corticosterone content was measured during the usual procedures associated with force feeding: catching the birds, putting them in pens, miscellaneous handling operations, insertion of the tube, food pumping procedures and the consequences of filling up the oesophagus (Guémené et al., 1996). Adrenal reactivity tests consisting of evaluating the capacity of the adrenal cortex to respond to induction with ACTH by secreting corticosterone were applied to assess the long-term effects of repeated stress. As complementary tests, creatine-kinase activities were measured together with leucocyte counts to determine the heterophil/lymphocyte ratios.

When the effect of manipulating the birds prior to force feeding was studied, no significant physiological response was obtained except for a reduction in creatine kinase activity. Although the regular nature of the manipulations led to a reduction in live weight, performance based on liver weight was comparable so that it was impossible to conclude that there was habituation to the handling processes.

The short-term physiological effects of the force feeding operation were studied to differentiate between the effect of tube insertion, and filling the oesophagus in birds of excess or normal weight, in relation to control birds. None of the situations considered in the study had any significant effect on short-term changes in blood corticosterone content, apart from the results observed on day 7 (14th force feeding operation), in which a significant increase in this parameter was measured in the group of over-weight force fed birds. Despite this isolated result, the adrenal reactivity data obtained from tests carried out at the end of the force feeding period did not show any difference and no statistically significant modification of any of the other measures was obtained between the prior fattening period and the force feeding period. This measure, therefore gives no evidence that intensive force feeding is stressful to the male hybrid duck.

Finally the effect of the force feeding technique on behaviour was investigated by comparing pneumatic equipment with traditional mechanical methods of force feeding on birds. No difference between the two methods of force feeding could be demonstrated.

None of the measures used by Faure and his colleagues (1995-1998) indicate welfare problems. This conclusion could be due to the fact that the adrenal responses were of a small magnitude and that the sample sizes used were not large enough to reach statistical significance but in most of the cases not even tendencies were observed. Adrenal responses are sometimes masked during feeding so that all individuals which are feeding show increases or other effects are suppressed. Destombes et al. (1997) showed that restraint of ducks in a net immediately after force feeding induced a large increase in corticosterone levels so it is clear that adrenal activity was far from the maximal level. However, because only the measurement of the pituitary adrenal activity has been taken into account, no definite conclusions can be drawn concerning the physiological activity of birds in response to force feeding.

5.4 Force feeding and pathology

General questions about pathology are considered in Section 1.2.1

The questions that are addressed in this section are:
1. Is fat liver a deviation from normality?
2. Is the condition reversible?
3. Is reversibility a factor that renders the condition non pathological?

- 5.4.1 Introduction

Whilst studies of the anatomy of ducks and geese kept for foie gras production have been carried out, the amount of evidence in the scientific literature concerning the effects of force feeding and liver hypertrophy on injury level, on the functioning of the various biological systems is small. In most animal production systems, such information is available so its scarcity in relation to foie gras production is regrettable.

The available evidence which could indicate pathological effects in foie gras production are considered in three parts. Those concerning biochemical and histological measurements are presented in this section, those concerning more general aspects of health are in section 4 and those concerning mortality are in section 5.

- 5.4.2 Liver structure and its biochemistry

Studies of the histological changes occurring in the liver have been described in various publications (Baldissera Nordio et al., 1976; Bénard et al.; 1991; Bénard, 1992; Labie and Tournut, 1970). Cellular hypertrophy has been demonstrated in both the duck and goose. Thus the mean hepatocyte diameter in the duck increases from 7-8 µm for a non fattened liver to 24-28 µm in a liver after 12 days of force feeding period. This cellular hypertrophy is the result of an excess of hepatocytes of microvacuolar type (Bénard, 1992).

Force feeding brings about considerable modifications in the chemical composition of the liver, increasing the percentage fat content, the protein content, and reducing the water content (Baldissera Nordio et al., 1976; Bénard et al., 1991; Blum and Leclercq, 1973; Blum et al., 1968; Bogin et al.,1984; Georgiev et al., 1980; Durand et al., 1968, Luret**,** 1987; Nir et al., 1972). An example of the differences between the two types of liver is given in Table 2.

Table 2: Mean weight and composition of the liver from force fed and not-force fed geese (Babile et al., 1998)

	Force fed	Not force fed
Liver weight (g)	982	76
Water content (%)	34.3	70.4
Protein content (%)	7.6	20.7
Lipid content (%)	55.8	6.6

- 5.4.3 Liver function

Hepatic function of force fed animals has been studied in particular to determine whether liver function is irreversibly impaired. During force feeding, blood flow through the liver decreases and this may affect hepatic function in various ways.

Firstly, hepatic function was evaluated using two markers, i.e. sulphobromophthalein and indocyanine green, with high extraction coefficients (Bengone-Ndong, 1996). When these markers were administered by intravenous route to ducks subject to force feeding, a progressive change in the pharmacokinetic parameters of these two markers was observed i.e. increase in the half life of elimination, area under the curve, mean residence time, etc. This shows that the hepatic steatosis induced in ducks during force feeding results in impaired hepatocellular function (Bengone-Ndong., 1996).

The consequences of force feeding were also assessed in ducks that had received chloramphenicol by oral route. When the antibiotic was administered as the carbon 14 labelled molecule, the plasma kinetics of the radioactivity showed that the blood concentrations were much lower in ducks at the end of force feeding than in normally fed birds. Similarly the residual concentrations of radioactivity, as demonstrated by quantitative whole-body autoradiography, were much lower in force fed birds (Bengone-Ndong, 1996). When chloramphenicol was administered in an unlabelled form, assay tests on the unchanged product revealed that absorption of the antibiotic was delayed in time and that the plasma concentrations were lower in force fed birds. The peak concentration occurred 2 hours after administration in birds in the final stages of force feeding compared with a peak of 20 minutes in normally fed birds (Mesplède, 1996). This result is clearly not because of lack of fat to absorb the antibiotic so it is likely to be a consequence of impaired hepatic function, for example reduced biliary secretion.

In a second phase of experiments, comparable studies were undertaken to monitor the fate of birds which, on reaching the terminal stage of force feeding, were then returned to basic zootechnical conditions with free access to food and drinking water. It was shown that under such conditions the birds recovered similar body weights to those of their congeners which had not been force fed. Similarly, plasma biochemistry studies showed a return to reference values, obtained from birds that had not been force fed, in various parameters (cholesterol, triglycerides, proteins and different enzymes). The return to normal took approximately four weeks (Prehn, 1996. Plasma biochemistry studies were corroborated by a study of hepatic histology which showed that the observed liver steatosis regressed when force feeding was stopped so that, 4 weeks later, the hepatic cells no longer showed any sign of excess lipids. Finally the study of hepatic function in birds subjected to a force feeding protocol showed that the pharmacokinetic parameters following intravenous injection of sulphobromophthalein and indocyanine green, were identical to those of birds that had not been force fed, within 28 days.

These various studies were mostly conducted in ducks but some were also carried out in geese. The biochemical and histological measures, show that force feeding induced hepatic steatosis in the duck or goose which was totally reversible, as demonstrated from a morphometric, biochemical, histological and functional viewpoint, within four weeks (Babile et al., 1996).

The reversibility of the consequences of force feeding was carried out in an other experiment (Prehn, 1996). The aim of this study was to investigate the morphological and functional changes of the liver of force fed ducks after three periods of two weeks of force feeding and four weeks of recovery. Using the same tests as previously described, it was demonstrated that, in these conditions, liver steatosis in force fed ducks was reversible (Prehn 1996).

These various data show that the liver steatosis obtained by force feeding induced an impairment of hepatic function, as demonstrated from morphometric, biochemical, histological and pharmacological points of view, but that this was completely reversible in the studies carried out. The reversibility of steatosis which is reported above for many birds which have been force fed does not mean that the changes in the liver are not pathological. Another indication of how pathological the liver changes are is to consider whether the birds would die if the steatosis which exists at the end of the force feeding period were to continue. All producers are careful to keep good technical results and not to continue the force feeding some extra days because if they do, very high mortality can occur. The livers of these birds would show slightly further advanced steatosis before they died. The experimental study in which the level of steatosis which exists at the end of force feeding is maintained for some days has not been carried out. However, if force feeding is continued after three to four days (Bogin et al., 1984), the level of cell damage rises significantly. This is consistent with reports from farmers that indicate that mortality increases if feeding continues for longer than usual. Hence it appears that the level of steatosis normally found at the end of force feeding would not be sustainable for many of the birds. For this reason, and because normal liver function is seriously impaired in birds with the hypertrophied liver which occurs at the end of force feeding this level of steatosis should be considered pathological.

A further source of information concerning whether the liver is in a pathological condition at the end of gavage is to ask qualified pathologists for their opinion on the histology of such liver. In non-statistical surveys (Beck; 1994, 1996 unpublished) the opinions of 25 pathologists from various countries were sought on this point. Most of these considered that the liver condition was pathological. Several of them pointed out that some degree of steatosis can occur in healthy animals at certain times of life but they considered that the degree of steatosis at the end of force feeding was much more severe than any naturally occurring steatosis.

- 5.4.4 Hepatic steatosis of the force fed ducks and geese

Hepatic steatosis of the force fed duck or goose results from the accumulation of lipids in hepatic parenchymal cells (hepatocytes). Among these lipids, storage cytoplasmic lipids, and especially triglycerides, predominate. Fatty liver occurs when the hepatic production of triglycerides is not matched by their secretion as VLDL (very low density lipoproteins) or their degradation by beta-oxidation. This imbalance may result from a number of toxic, nutritional or hormonal causes. The origin of hepatic steatosis in the waterfowl is nutritional. Indeed, during force feeding, over production of triglycerides is facilitated because :

- *de novo* lipogenesis is mainly hepatic in avian species (Leveille et al., 1975; Saadoun and Leclercq, 1987),
- lipogenesis is enhanced by dietary carbohydrates, which are the main component of the maize used for force feeding (Goodridge, 1987; Saadoun and Leclercq, 1987).

The product of hepatic lipogenesis is essentially triglycerides. In the case of overproduction, not all triglycerides can enter the secretion pathway and a large proportion remains stored in the liver (Hermier et al., 1991). In avian fatty liver, total lipids may account for up to 50 % of the liver weight in the goose (Fournier et al., 1997) and 60 % in the duck (Salichon et al., 1994; Gabarrou et al., 1996). Storage lipids predominate, with 95 % triglycerides and 1-2 % cholesteryl esters. Structural membrane lipids, such as phospholipids and free cholesterol, account for only 1-2 and <1 %, respectively (Fournier et al., 1997; Gabarrou et al., 1996).

Under natural conditions, some degree of hepatic steatosis occurs in the wild waterfowl, as a consequence of energy storage before the migration. In poultry production, this specific capacity is utilised for the production of commercial fat liver. Newly synthesised triglycerides are channelled towards secretion into plasma as VLDL, or beta-oxidation. When overproduction of triglycerides occurs, which is the case during force feeding, the liver responds in two ways :

- the secretion of VLDL is increased, as indicated by the very high concentration of plasma VLDL in the force fed goose compared with controls. After 14 days of force feeding, plasma VLDL concentration is 3.31 (0.29 g/l in controls), hence it appears that the secretion pathway is still very active and functional (Fournier et al., 1997). Indeed, force fed geese also exhibit a dramatic extra-hepatic fattening, which indicates that accumulation of plasma VLDL results from an increase in their secretion rather than from a defective catabolism in adipose tissues.

- the excess of triglycerides is normally stored in cytoplasmic storage vesicles. To enter the secretion pathway, these storage triglycerides need to be partially hydrolysed and reesterified, under hormonal influences found in the fasted state (Mooney and Lane, 1981). Since force feeding does not allow the birds to be fasted, the liver continues to accumulate triglycerides, until the last day, which indicates that the storage and secretion functions can still continue in these birds.

All these data indicate that susceptibility to hepatic steatosis is a natural response of waterfowl which is over expressed in response to force feeding. In most cases, lipid metabolism of the liver appears to function normally.

As described above, hepatic steatosis in the waterfowl is a normal metabolic response to the increased intake of diet carbohydrates and, in most cases, lipid metabolism of the liver appears to function. There seems to be a low prevalence of liver lesions (0.5%) when the animals are force fed (Bénard, 1992). If individual birds are given too much food or are fed for too long, their individual metabolic capacity will be overloaded and dysfunctioning will occur. An inflammatory process results in fibrosis, occlusion of the blood vessels, local liver haemorrhages, and jaundice. However, it is strongly in the interest of the farmer to avoid this phenomenon, because the animals suffer from the resulting diseases and because the resulting fat liver is of no commercial value. In some cases, hepatic steatosis is associated with cell damage, which results in an increase in the plasma concentration of hepatic enzymes (Bogin et al., 1984). However, these changes are not detected in geese before the 18th days of force feeding, whereas the maximal duration of force feeding in Europe is 15 days (Bogin et al., 1984).

- 5.4.5 Plasma biochemistry and other measures of function

This approach has been adopted in various investigations and has shown that force feeding produces modifications in a large number of biochemical parameters i.e. triglycerides, cholesterol, phospholipids, fatty acids, and lipoproteins, etc....(Auvergne et al., 1988; Bénard, 1992; Blum et al., 1970; Blum and Leclercq, 1973; Blum et al., 1968; Bogin et al., 1984; Bokori and Karsai, 1969; Braun et al., 1985; Csuska et al., 1977; Darraspen et al., 1949; Famose, 1990; Goranov, 1979; Hudsky et al., 1974; Ivorec-Szylit and Szylit, 1969; Jouglar et al., 1992; Labie and Tournut, 1970; De la Farge et al., 1989; Leclercq and Blum, 1975; Losonczy et al., 1970; Luret, 1987; Nir, 1972; Nir et al., 1971; Nir et al. 1972; Nitsan et al., 1973; Rico et al., 1983; Sevcikova et al., 1981; Szylit and Ivorec-Szylit, 1967; Szylit et al., 1968; Timet et al., 1976; Tournut et al., 1967; Trefny et al., 1979; 1980; Villate, 1978; Woszczyk et al., 1977; Yamani et al., 1973).

Hormone assays were performed on samples taken 4 days before force feeding began, on the first day of force feeding, and then on days 3, 7, 14 and 17. Thyroxine, corticosterone, testosterone, œstradiol and progesterone were assayed. The measured values of these sex hormones did not exceed those of the thresholds of detection, but the birds were not sexually mature. No statistically significant variation was recorded for thyroxine or corticosterone (Famose, 1990).

It would be of interest to have the results of studies of the effects of force feeding on other functions such as nitrogen excretion or water regulation but these do not appear to be available. The abnormal diet that the force fed birds are kept on may have other effects on the birds' homeostasis. For example, if the calcium and phosphate ratios, or uptake, or metabolism is affected in any way then the birds may become subject to some osteopathy making their bones more fragile or even more painful. This would be consistent with birds spending more time sitting than the non-force fed cohorts and with the high incidence of bone fractures seen at the abattoir. No studies appear to have been carried out looking at calcium and phosphate metabolism and associated hormonal imbalances.

- 5.4.6 General health indicators

It is generally observed that during force feeding, animals which are kept in groups are excited and nervous in the first two days. Then after the fifth day, they look quiet and they move their wings more frequently. They move when other birds move so they are generally responsive to one another.

From a clinical point of view, there can be some signs of digestive troubles. When the working group visited some units there was widespread evidence that faeces were more fluid than usual. At the beginning of the force feeding period, the feathers are bright and smooth. After some days, there can appear on some animals a change in which neck feathers become curved and sticky. This is called "wet neck" by farmers (cou mouillé).

Some signs of inflammation of the feet can be detected on some animals at the end of the force feeding period when they are maintained on wooden slats or on wire mesh.

In an epidemiological survey carried out in slaughter-houses, the prevalence of lesions which are observed on carcasses and livers was investigated. 20,000 carcasses have been systematically studied. Pathological lesions of the liver which would lead to the liver being unusable (perihepatitis, fibrosis, local necrosis) are very rare and the prevalence is below 0.5%. They have been reviewed in several papers (e.g. Bénard, 1992).

Different lesions can be observed on carcasses. The most frequent are bone fractures. They occur on wing bones, mainly the humerus. There is an important difference between muscovy ducks and mulard ducks. With muscovy ducks, Bénard et al (1992) observed less than 5% of bone fractures whereas with mulard ducks, the prevalence was between 30 and 70%. These fractures are produced during handling of animals at the slaughter-house. It seems that variations in the incidence of fractures can be correlated with staff care and climatic conditions. In this last case, it seems that under certain meteorological conditions, animals are more nervous and in this case, the incidence of fractures increases.

Another frequent lesion is localised on the sternum, where a necrosis of the skin can be observed. This is observed on animals maintained in cages but it is unusual on animals kept on the floor. The prevalence is again more important in Mulard ducks (40-70%) whereas it is under 6% in muscovy ducks. This difference between muscovy and Mulard can be related to the development of the pectoralis profundus major and minor muscles which are larger in muscovy ducks.

The working group was informed that ducks at the end of the force feeding period can have serious injuries to the oesophagus or, more usually, having clear evidence of tissue damage in the oesophagus. It seems likely that birds have sufficient damage to oesophagus tissue, caused by the force feeding process to have been painful to the birds. However, Levinger and Kedem (1972) observed no alteration of the tissue of the oesophagus of force fed geese. The prevalence of oesophageal lesions is not known at present although the industry has been asked for this information. In a study reported by Bénard (pers comm) signs of candidosis were observable in up to 6% of animals in each batch of birds.

The dilation of the lower part of the oesophagus which occurs in ducks which are force fed has not been reported in non force fed ducks. It is not known whether this change is painful.

- 5.4.7 Force feeding and mortality rates

Mortality rates during the two week force feeding period were estimated from surveys in France, Belgium and Spain.

In France a survey was carried out from 1987 to 1994 on mortality rates in force fed ducks and geese. The mean mortality of 5,661,000 ducks was 3.4% and varied from 2.5% to 4.2% between years. The mean mortality of 315,000 geese was 4.2% and varied from 3.5% to 5.3% between years (Koehl and Chinzi, 1996). A recently published study (Chinzi and Koel, 1998) gives the results of a survey conducted in 1996 on 380 farms during the whole year (about 10 batches per year and 200 ducks per batch). The survey concerns ducks housed in individual cages during the force feeding period. The main aim was to detect the effects of some variable factors (type of shed, presence of air conditioning and type of feeding device) (Table 3). The mean “loss” observed was as high as 3.6% when the animals were fed with a mechanical device but was limited to 1.7% when they were fed with pneumatic or hydraulic devices. No indication of the variations between farms and batches is given for each system in the text. The main conclusion is that the lowest mean loss rate is obtained in the most modern systems (specific building, air-conditioning, hydraulic device). In that text the effects of the 3 factors are presented independently but it can be expected that when the 3 factors are optimal, mortality rate would be lower than 1.7%.

The mortality rate of 77,519 ducks on 16 production units in Belgium was obtained by veterinary inspectors (Nicks, personal communication). The overall mortality observed was 2.75%, varying from 0 to 15% between farm and batches. It varied a lot according to the seasons, and was higher during the summer period.

In Spain, mortality was observed during 7 years in a farm feeding from 34,000 to 55,000 ducks per year. According to the year the rate of mortality varied between 0.9 and 1.1%. It was higher during the summer season (I. Estevez, personal communication).

These figures compare most unfavourably with mortality rates for ducks and geese during normal rearing. No data on the mortality rate of non force fed mulards were found. However mortality rates of muscovy ducks raised in fattening units exist (Sauveur and de Carville, 1990). The total mortality of 367,000 ducks observed during the 12 weeks before slaughtering was 3.60%. There were two peaks of mortality, the week after hatching and the fourth week. From the fourth week to the twelfth week the mortality decreased from 0.5% to less than 0.1% per week. Therefore for the two weeks before slaughter, the mortality rate would be 0.2% compared with 2 to 4% in the force fed mulard birds of about the same age.

Table 3: Effects of different types of housings and force feeding systems on the losses of mulards during the force feeding period. (Chinzi D., Koehl P.F., 1998)

BUILDING	Transformed	3.1	a
	Specific	2.0	b
AIR COOLING	No	3.2	a
	Yes	2.0	b
FORCE FEEDING SYSTEM	Mechanical	3.6	a
	Mechanic dose	2.4	b
	Pneumatic/hydraulic	1.7	c

Transformed: Building originally for a purpose other than force feeding;

Specific: Building purpose built for force fed ducks;

Mechanical: Food delivered by auger. The force feeder adapts the amount of food to each animal;

Mechanical dose: as above but every duck receive the same amount of food;

Pneumatic/hydraulic: Pneumatic or hydraulic device, every duck receives the same amount of food.

Groups with different letters are significantly different ($P<0.05$)

5. 5 Conclusion

In conclusion, there is good evidence that liver structure and function that would be classified as normal is severely altered and compromised in force fed ducks and geese, but that lipid metabolism biochemical pathways are still functioning normally, albeit at an increased rate. Other clinical signs that force fed birds exhibit which are not seen in age matched birds fed ad libitum on a ‘natural’ diet include: loose faeces, wet neck, increased time spent sitting and less time carrying out active behaviours, some aversion to the feeding process, increased incidence of bone fractures and liver lesions at the abattoir. Continued feeding would almost certainly result in an earlier death. Other areas of concern where there is a serious lack of data include: mineral metabolism and corresponding hormonal homeostatic controls, examination of the oropharynx for tissue damage, and ascertaining the adaptation times required to mitigate the gag reflex on force feeding.

The mortality rate in force fed birds varies from 2% to 4% in the two week force feeding period compared with around 0.2% in comparable ducks.

6 SOCIO-ECONOMIC ASPECTS OF IMPROVING THE WELFARE OF ANIMALS USED IN THE "FOIE GRAS" INDUSTRY

6.1 Introduction

The extent of production of foie gras in Europe is summarised in Chapter 2 but further information about the extent of the industry in France and the consumption of foie gras is given here. The Committee is grateful for the assistance of Dr Mainsant[1] who provided the material on which much of this chapter is based. This description is followed by consideration of various possible changes in the housing and management of geese and ducks used for foie gras production and their consequences for the public and the industry.

6.2 The foie gras industry in France

The world production of unprocessed foie gras for 1996 is estimated at 15,000 tonnes, of which 70% of the production was in France, 5% in the remainder of the European Union, and 25% in other countries. In the European Union, the main producer after France is Belgium, followed by Spain. Outside the European Union, foie gras is mainly produced in Eastern European countries and Israel, but also in Tunisia, Madagascar, China, and a few other countries e.g. in South America.

The general figures of the foie gras industry in France are given in Table 4.

In the European Union, outside France, foie gras production provides employment for the equivalent of up to one thousand full-time positions. In the Eastern European countries, which may one day join the European Union, employment is the equivalent of four thousand full-time positions.

85% of world consumption takes place in France, which emphasises the importance of the French tradition. More than half of the non-French production is destined for the French market taking into account the French exports. The world consumption, France excluded, amounts to about 2,300 tonnes, compared with 13,000 tonnes in France and a quarter of this non-French consumption is provided for by the French industry.

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[1] INRA, Ivry, France

In France foie gras is no longer reserved for the privileged few. At the present time, it is estimated that foie gras is consumed at least once a year by 4 in 10 French people and that on average they consume it on approximately 10 occasions per year. Two thirds of the annual consumption takes place during the end of the year festivities. Outside France, foie gras consumption concerns a wealthy minority of connoisseurs from developed countries.

In France, consumption in the home represents half of the national consumption. The fact that half of the consumption takes place in restaurants, while the French only eat 15% of their meals away from home also shows that foie gras consumption is associated with people who patronise restaurants and with the more festive events. All high class French restaurants currently have foie gras on their menus throughout the year whilst in the South West of France foie gras is also served in a great percentage of normal commercial restaurants.

Table 4. Figures for the French foie gras industry in 1995

	Activity	Number of Enterprises	Number of people employed (1)	Full time equivalent positions (2)
selection – breeding	400,000 ducks	4 companies	1,000	500
egg incubating		40 units		
rearing – force feeding	19,000,000 animals	l5,000 farms	19,000	4,000
slaughtering (3)	12,000,000 animals	35 abattoirs		
cutting up	14,500,000 animals	120 factories	6,000	6,000
processing	6,400 tonnes of liver (4)	500 factories	4,000 (contract workers)	
consumption	12,500 tonnes of liver			
Total direct employment			30,000	10,500

(1) INRA using information from CIFOG
(2) excluding on farm slaughtering
(3) estimation by INRA
(4) including prepared products

6.3 Consequences if there was no change in legislation or practice

In recent years, more and more consumers, within the European Union and elsewhere, have altered their food purchasing and consuming habits because of concerns about their own health, the welfare of the animals used in production and the impact of the production system on the environment. Some of these concerns have resulted in short-term avoidance of a particular product because of a health scare whilst others have been long lasting such as in some vegetarians. Most concerns, however, result in discrimination against specific products, especially where alternatives exist (Broom 1994).

There are many people within the E.U. who will not eat foie gras because of concern about the welfare of geese and ducks which are force fed. Indeed force feeding is forbidden by law in some countries. No published survey of public attitudes in this area is yet available but some producers have already taken account of the trend. In France and some other countries, however, the consumption of foie gras has been increasing rather than decreasing in recent years as the price of the product has declined consequent upon the change from the use of geese to the use of ducks which reduced the production costs. No study has been done to analyse if this increase in consumption will continue in the future or not and if the welfare concern will change the public demand. However, as more and more people in France become concerned about animal welfare, it seems likely that foie gras sales will be affected. If the production could be said to have no adverse effect on animal welfare, sales are very likely to be greater. It is clearly in the interest of the foie gras production industry for the product to be perceived to be acceptable on animal welfare grounds. If no publicly acceptable action to improve animal welfare is taken, a slow or rapid decline in foie gras sales is possible. This would affect imports from third countries unless these countries improved animal welfare. If the third country producers improved animal welfare and hence the public image of their product, before E.U. producers did so, the E.U. producers could lose much of their market. Some producers have already taken in account that trend. For example, the experts of the group had the opportunity to visit a well-known processor of foie gras product which imposes specific management practises to the farmers in order to improve the welfare of the animals. In particular ducks must be in groups during the force feeding period.

6.4 Socio-economic consequences if force feeding was banned

Several points could be important if a ban on force feeding was decided. The first one is the existence of alternative products which could be obtained without force feeding the animals or the existence of specific management excluding force feeding which result in the production of fat livers. The second one is on the Trade Agreement between the European Union and countries from other part of the world.

If force feeding does not occur, but birds are encouraged to feed ad libitum, the liver which is produced using the conventional diet is different, in particular because it includes less fat in the fat cells than the one from force fed animals. Different types of products, described in chapter 2, include fat liver from ducks and geese in different proportion from 100% to 20%. Other products with lean liver are also on the market. Up to now, the products from non-force fed birds have different markets so these cannot be said to be substitutes for the foie gras products. It is clear that work on alternative production methods is urgently needed within the foie gras industry and that the scope for the most rapid development is from the attempt to prepare a product from the livers from ad libitum fed birds and other materials.

A procedure for foie gras production which has been investigated in the past is the destruction of the appetite regulating centres in the brain. However, considering that the objective is to improve the welfare of the animals, this technique, achieved either by surgical or chemical means, is not appropriate. In the long term, it cannot be excluded that other means for increasing appetite will be developed: genetics, manipulating the composition of food or the feeding reflexes. It would be useful to consider the development of research programmes of this type but results would not be available for some years and up to now it is not possible to produce foie gras without force feeding the animals.

A ban on force feeding is likely to cause a considerable reaction from those involved in the foie gras industry, especially among the farmers and processors, as well as the public in general. The irritation of the 30,000 people directly concerned with the production would also be shared by restaurant owners and the consumers themselves because the consumers are also strongly attached to the regional and national origin of this product. The current fashion for local products can only reinforce this emotion and one could imagine a degree of public incomprehension when confronted with a ban on foie gras in the South West of France.

In Europe, an extreme option would be to prohibit production, import and distribution of foie gras produced by force feeding. Its consequence would be to abolish the consumption of foie gras in Europe. The French industry employs about 30 000 people involved in all aspects of production (from incubating the eggs to processing the livers) of whom 90% are situated in two regions of the French South-West (Aquitaine and Midi Pyrénées). Most of these two regions are under European programmes for rural development. These 30,000 people are not employed full-time and one could estimate that the foie gras activity represents 10,500 full-time equivalent positions (incubating, rearing, force feeding, slaughtering, processing) to which can be added a further 2 to 3 thousand indirect full time equivalent positions (suppliers of equipment, machines, feed, veterinary drugs, building constructors, veterinarians, commercial agents, transport companies, researchers). However, even though the French industry uses only 12 to 14 thousand full time equivalent positions, it is 30,000 jobs that would be put in jeopardy by the disappearance of foie gras production, due to the income that would be lost to each enterprise. One should expect the development of clandestine production and its marketing. A portion of the consumers would support the claims of the producers and would be tempted to buy foie gras from illegal clandestine production for which the prices would be very high.

If prohibition of production was not followed by a banning of imports, it would provoke a relocation of the production to other countries, chiefly in Eastern Europe: Hungary, Bulgaria, Romania, ex-Yugoslavia, Czech Republic, Slovakia, ex-USSR but also in a number of other countries (Tunisia, Madagascar, South American countries, Middle East, Far East and China). Instead of importing 20% of the amount processed in the country, France would have to import its total requirement (13,000 tonnes of unprocessed foie gras, 1,500 million FF). The production of fresh foie gras (without considering its preserving) concerns about 19,000 people and represents 4,000 full time equivalent positions. Abroad, there is no technical limit to the production and this European measure would represent a genuine windfall for countries that are already producing foie gras. The expertise is already present in a great number of countries. The relocation of the production might also result in a relocation of the European processing which is almost exclusively French. Again prohibiting force feeding in Europe would not prevent the development of clandestine production especially if the marketing of foie gras remains authorised.

6.5 Improvement of management for welfare reasons and the economic consequences

If the force feeding procedure continue, measures should be taken to avoid as many as possible of the negative effects of the management during the force feeding period. Several points can be considered.

The first one concerns the individual cages in which animals are held during force feeding. It is part of the general problem faced by industrial animal rearing (pigs, broilers, turkeys, laying hens, calves). In the case of force feeding, the animal cannot turn around in its cage, stand in a normal position, preen normally or spread its wings. First of all it should be noted that the use of cages only concerns ducks and represents 80% of the duck liver production. Geese and the remaining 20% of ducks are held in enclosures and the animals can move around several square meters.

Alternatives to the cage system exist and are well developed. From the point of view of animal welfare these enclosures should not pose any problems in respect to the norms for maximum density. By contrast, from the farmer's point of view they are much more arduous than individual cages. In respect of the cost of labour, individual cages, always coupled with pneumatic or hydraulic force feeders, permit the feeding of twice as many animals by one person. Despite the investment involved, the system of individual cages is becoming widespread in all units of production of a significant size.

In order to improve animal welfare, the use of individual cages might be permitted with sufficient increase in space to permit significant mobility of the animals but the efficiency of such large cages has never been investigated. The elimination of individual cages in favour of enclosures would have as a main consequence a very significant increase of the cost of production mainly due to the increase in labour cost.

There would also be a capital cost as the investment in cages is recent for most farmers. Any increase in cost could strongly affect the competitiveness of European products compared with imported ones. There is a risk of relocation of the production to other countries.

The other point concerns the methods, rate and amount of force feeding. It is not in the interests of farmers to cause injuries to birds used for foie gras production. However it is desirable for measures to be taken to reduce the incidence of any handling which results in poor welfare. A requirement to check birds for injury and to keep records of injury and mortality would require some labour costs but might improve sales by improving the public image of the industry.

Machinery for feeding birds very fast may have some adverse effect on bird welfare even if data does not exist. If the speed of food delivery were to be limited, more labour time would be required for feeding a given number of birds.

The amount fed to birds at a feed, or the maximum number of meals per day, or the amount of dry matter as a function of body weight, or the number of days of force feeding might be limited. Any of these changes would add to the cost of the product but it is likely that sales would not be substantially affected. Competition from third countries would have to be considered.

7 RESEARCH

7.1 Alternative Methods of Production

Research has been or should be carried out into methods of producing fat liver which do not require the use of force feeding.

Aufray et al. (1970, 1973) have experimented with new technical approaches in order to obtain fat liver without force feeding. These authors tried first to destroy the medio-ventral nucleus of the hypothalamus of geese by electrolytic lesion in order to induce hyperphagy. They obtained hyperphagy effectively for a short period, so that the animals had an increase in body weight and in the weight of the liver, but the weight increases were lower than those obtained with animals which were force fed. In the second approach, the researchers injected 6-hydroxy dopamine intracerebrally with the aim of inducing a degeneration of dopaminergic nerves. 6-hydroxy dopamine was delivered directly into the third ventricle and it was observed that animals developed obesity and hepatic hypertrophy. However, the weight increases were lower than those obtained with force fed animals. These methods have not been used commercially.

The other possibility for fat liver production could be to feed *ad libitum*. The resulting product, however, is not what is demanded by the consumer. The liver includes fat but to a much lower degree than in force fed birds. It might be possible to breed birds for a larger appetite. If this were done, it would be important to ensure that the resulting increases in the sizes of the body as a whole, or of particular organs, did not result in poor welfare, for example because of leg pain or organ malfunction.

If birds with good welfare and a large, but not pathologically changed, liver are produced, a high fat content pâté would have to be produced by the addition of fat.

7.2 Suggestions for Future Research

The examination of the welfare of force fed ducks and geese has been very difficult because of the lack of information available. Considerable research is needed in order to better evaluate the welfare of the force fed animals.

- ### 7.2.1 Health of the animals

The first and more important point is the health status of the force fed animals.

- Mortality and morbidity data of force fed animals and non force fed animals should be obtained.
- The health and the presence of pathology in different organs should be determined at the end of the force feeding period, including the oropharynx, oesophagus, liver, joints and foot, and compared with non force fed animals.
- The occurrence of disease, in particular, bone fractures and respiratory disease should be determined in terms of their aetiology and incidence in the different management systems.
- Statistics on the use of antibiotics and other drugs in these production systems should be obtained.

- ### 7.2.2 Feeding methods

- The reaction of the animals to the force feeding procedure should be determined.
- The effects on the birds of the competence and management behaviour of the persons working in the units
- The effects of the different devices used for force feeding should be evaluated.
- The dietary components of the animals could be changed to improve the digestion and liver metabolism.
- Studies on the physiology and genetic variability of the ducks and geese for eating large amount of food and for naturally having more deposits in the liver are needed. In such work, new genetic strains whose welfare is poor should not be continued.

- 7.2.3 Housing

- Investigation on the floor space requirements and on the optimal group size would help to determine the best housing systems. It should include studies on the flooring materials, in particular to avoid foot problems.
- water requirements for drinking, preening and swimming are needed.
- determination of the optimal climatic environment (temperature, humidity, air speed,...) is required.

- 7.2.4 Socio-economic factors

- Public perception of foie gras in different European countries.
- Interest of the consumers for new products which do not contain liver from force fed birds.
- Description of the foie gras industry.
- Influence of different constraints on the foie gras industry.

8 SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1 Summary

There have been many scientific studies of the welfare of farmed poultry but only a few of these have concerned the welfare of force fed ducks and geese. The following conclusions are based on these studies and on general information concerning the welfare of animals

- I. Foie gras and the ingestion of large quantities of food

1. Foie gras products are obtained at the present time from the livers of force fed ducks and geese and these livers are characterised by their large size and high fat content. There is a current E.U. Regulation 1538/91, and there are regulations in member states, which define a minimum weight for a liver and a minimum fat content for a liver to be used for foie gras production.

2. During the force feeding period, birds which had previously been fed an increasing but limited amount of food are forcibly fed large amounts of food twice per day for about two weeks (ducks) or three times per day for about three weeks (geese).

3. The production of foie gras by force feeding geese *Anser anser* has a long tradition, particularly in south west France, but beginning around 30 years ago the Mulard duck, a hybrid between the muscovy duck *Cairina moschata* and the domestic duck *Anas platyrhynchos,* has come to be used extensively (94% of foie gras production in 1995).

4. Of the three species mentioned in paragraph 3 above, wild members of the domestic goose species are often migratory, wild members of the domestic duck are sometimes migratory, but wild muscovy ducks are non-migratory. Migratory birds store food reserves prior to migration and the liver is one of the organs in which food reserves are stored. The procedure used for the production of foie gras may in part utilise such storage mechanisms and result in an increase in the size of the liver to about 6-10 times the normal liver size of a bird.

5. The amount of food fed during each force feeding is considerably more than normal intake and is the same as that recorded as being voluntarily eaten by ducks after being deprived of food for 24 hours. However, as the procedure is repeated 2-3 times a day, the quantity of energy rich food (maize) which the birds are forced to ingest during the two or three weeks of force feeding is much greater than that which the birds would eat voluntarily. If force feeding is stopped, the birds greatly reduce their food intake for several days.

6. The changes in hepatocytes and other cells in the liver of force fed ducks and geese are substantial. The most obvious change is the increase in the number of large fat globules visible in the cells. A limited increase in the presence of fat globules in liver can occur in normal liver in certain conditions but no normal animal has steatosis of the liver to the extent which occurs in all force fed birds. During the force feeding period, liver function is impaired. Some pathologists consider this level of steatosis to be pathological but others do not. The steatosis is reversible in many birds but reversibility exists for many pathological states.

7. Force feeding results in an increase in liver size to the extent that the abdomen expands. Logically this should result in the legs being held further away from the midline of the body, making locomotion more difficult. Panting occurs more often than in ducks or geese which are not force fed. Some members of the working group have observed this displacement of the legs and panting. This might cause pain and distress but no scientific study has been carried out on this.

8. Hypertrophied livers can cause discomfort in a variety of other species. Hence it may be that some discomfort results directly from the hypertrophied liver in force fed ducks and geese. It appears that this has not been investigated.

9. The large amount of food which is rapidly intubated during the force feeding procedure leads to immediate oesophageal distension, increased heat production and panting, and production of semi liquid faeces.

10. Those who conduct force feeding limit its duration and, in general, endeavour to avoid excessive steatosis that can result in livers of poor quality and eventually in death.

11. Surveys on mortality rates or losses during the two weeks of the force feeding period were carried out in France, Belgium and Spain. The mortality rate in force fed birds varies from 2% to 4% in the two week force feeding period compared with around 0.2% in non force fed ducks There is considerable variation of the figures between farms, batches in the farms and seasons. The precise causes of this mortality have not been documented but are likely to include physical injury, heat stress and liver failure.

12. There is some evidence indicating that if ducks or geese are force fed for longer than that which occurs commercially, mortality can be very high, largely as a consequence of failure of liver function. Hence it is clear that steatosis and other effects of force feeding are lethal when the procedures are continued. If force feeding is stopped and normal feeding resumed, mortality rates return to normal. However, the mortality rate if the steatosis is maintained at the level which occurs at the end of force feeding is not known.

- II. The Force feeding Procedure

1. The force feeding procedure deprives the bird of an important behaviour which is normal feeding.

2. The problems of the force feeding procedure itself are : (1) handling by humans which, in the commercial force feeding situation, can cause aversion and discomfort for ducks and geese, (2) the potentially damaging and distressing effects of the tube which is inserted into the oesophagus, (3) the rapid intubation of a large volume of food.

3. Pituitary adrenal activity does not appear to be enhanced by the force feeding procedure.

4. Various techniques are used for force feeding. Since these differ in the way and the rate food is delivered, they probably differentially impact on the welfare of the birds but those impacts have not been studied.

5. Members of the Committee observed that, prior to force feeding the ducks and geese show avoidance behaviour indicating aversion for the person who feeds them and the feeding

procedure. After a short period, birds which are able to do so move away from the person who force fed them. However there is no conclusive scientific evidence as to the aversive nature of the force feeding process.

6. The procedure of force feeding has been said to result in the presence of accumulated scar tissue in the oesophagus of ducks. If this organ has sensory innervation, this might indicate that there is pain during the force feeding procedure. However, it is not known how often injury or pain occurs and those conducting force feeding endeavour to avoid injury to the ducks and geese since injury to the birds at this time can cause mortality.

7. Geese and ducks do not have a crop. The increasing amount of food given prior to force feeding and the force feeding itself cause expansion of the lower part of the oesophagus. The risk of damage to stretched tissue is greater than that to normal tissue but it is not known how great this risk is in force fed ducks or geese.

- III. Housing systems

1. During the rearing period prior to force feeding, the birds are reared in a group, usually with free access to outdoors. With the exception that the ducks and geese may not be provided with sufficient water for swimming and preening, no particular welfare problems are evident.

2. During the force feeding period, the traditional housing system is to keep the animals in small groups on slatted floors. In the past 10 years, new housing systems have been developed for the ducks. In those systems animals are kept in small individual cages, with wire or plastic mesh floors. During the two weeks of the force feeding period the small cages do not allow the animals to stand erect, turn around or flap their wings.

3. A high percentage of ducks force fed in individual cages have lesions of the sternum and bone fractures at the abattoir. The use of cages obviates the necessity to chase birds before

catching hold of them to feed them but this advantage is counterbalanced, as far as bird welfare is concerned, by the restrictions placed upon the birds' movements by the individual cages.

4. Poor quality floors may cause foot injuries. However, the relationship between the type of floor and foot injuries has not been studied.

5. Ducks and geese are social animals. The housing systems for force fed animals must interfere with their social behaviour but there is no information about the extent of this or if abnormal behaviour such as feather pecking might develop.

6. During the force feeding period, ducks and geese are sometimes kept in near darkness except when being fed. This prevents normal investigatory behaviour, tends to prevent normal exercise and results in poor welfare.

7. Ducks and geese require water for preening and they have a preference to swim.

- IV. Socio-economic consequences of regulation for the welfare of the animals

1. The foie gras production and processing industry within the European Union is mainly concentrated in France. The total direct employment is about 10,500 full time equivalent positions in France and up to 1,000 in other member states.

2. In France a large proportion of the population consume foie gras at some time during the year, principally at festive periods and in restaurants. In the remainder of the EU, that consumption is limited to a wealthy minority of connoisseurs.

3. Foie gras consumption has increased in recent years as the selling price has declined. Public concern about welfare might affect this trend.

4. The abolition of the use of individual cages during the force feeding period would have a significant cost but is practicable, especially if imported products could be controlled in the same way.

5. The costs of modifying the handling, rate of feeding and amount of feeding in order to make small improvements in animal welfare are not likely to be great but competition with third countries needs to be considered and the consequences of those changes have not been studied.

6. Alternatives to foie gras produced by force feeding have not been adequately studied and it is not clear whether or not there can be products which would be acceptable on animal welfare grounds, palatable for the consumers and valuable to farmers.

7. If there are no alternatives to foie gras production using force feeding, a ban on force feeding would affect all or most of the jobs in the industry, whether or not imports were also banned. It would also likely affect French consumer’s behaviour and favour the development of parallel markets. Changes in legislation might encourage the development of alternative products involving better welfare.

8.2 Conclusion

The Scientific Committee on Animal Health and Animal Welfare concludes that force feeding, as currently practised, is detrimental to the welfare of the birds.

8.3 Recommendations

- ### 8.3.1. General statement

Force feeding is a technique that has been developed in order to produce a product, foie gras, that is highly appreciated and actively sought by an important number of consumers, especially in France, a country with a long tradition of foie gras consumption at festive events and is becoming more frequently consumed. However, the management and housing of the birds used for producing foie gras have a negative impact on their welfare.

It should be noted that these are the only farm animal that are force fed and in some countries this procedure is prohibited.

The physical characteristics of foie gras and its composition are an important aspect of the value of the product. With current regulations it is not possible to replace foie gras by alternative products even though preparations made from livers of non force fed animals are on the market.

Since foie gras needs to be produced in order to satisfy the consumers' demand, it is important to produce it in conditions that are acceptable from the welfare viewpoint and do not cause undue suffering. Consumers and producers should be informed of the effects of foie gras production methods on the welfare of the birds. Such information could promote appropriate changes in the industry. The traditional technique of force feeding has been substantially modified during the past thirty years to rationalise and industrialise the production of foie gras and increase profitability. This has impacted on the animal species that is submitted to the process, housing conditions, and food composition and delivery. These modifications have been introduced without paying attention to animal welfare considerations. There is evidence that not only animal welfare has not benefited from the change but that instead it has deteriorated. It is therefore important to assess the exact way animal welfare is affected by currently used force feeding procedures and to determine what can be done both immediately and in the longer term so as not to cause avoidable suffering.

- 8.3.2. The exact impact of currently used force feeding techniques on animal welfare

1. The impact of the different techniques and housing systems which can be used to produce foie gras should be better documented,

2. In particular, although there is evidence that large variations in mortality and morbidity exist between farms and batches, the exact roles of production and management factors have not been systematically investigated.

- 8.3.3. Solutions for improving the welfare of birds kept for foie gras production

There must a ban on the techniques that cause avoidable suffering. The objectives are, by order of priority:

- a. to reduce mortality and morbidity rates,
- b. to decrease the amounts of pain and distress that are endured in the process,
- c. to allow the animals to engage in normal behavioural activities

- 8.3.4 The specific recommendations are:

a. No process should be used that results in an increase in liver size such that its function is significantly modified or that it directly or indirectly causes increased mortality, pain, or distress to the animal.

b. No feeding procedure should be used that results in substantial discomfort to the animals, shown by aversion to the feeding procedure or any other indicator of poor welfare in the birds. Automatic feeding devices should not be used unless proved to be safe for the birds.

c. All persons in charge of birds kept for foie gras production should be properly trained and competent.

d. The use of small individual cages for housing these birds should not be permitted. Birds should be kept in social groups and be provided with adequate water and light sufficient for normal behaviour. Birds should be able to stretch their wings, preen themselves normally, walk and show normal social interactions.

e. All flocks should be subject to an official monitoring programme in which morbidity, mortality and other welfare indicators are recorded. Such programmes should include provision for immediate action when problems are detected. Records should be available for external audit.

f. Research should be carried out as detailed in Chapter 7.

g. The Committee is aware that many of the facts mentioned in the report are based on a relatively small number of scientific publications or on individual observations of experts deriving from visits of farms. The evidence however suggests that it is very important for the further development of foie gras production to introduce alternative techniques that do not require force feeding. This has to include new techniques (e.g. in breeding) as well as a better understanding of the mechanisms that regulate feeding behaviour in ducks and geese and the mechanisms that are involved in steatosis.

8.4 Minority Opinion - Dr D.J. Alexander

Although he endorsed the Report as a well-balanced factual account of the animal welfare aspects of the production of foie gras, Dr Alexander was unable to agree fully to the Recommendations made. In his opinion, based on the animal health and welfare data presented in the Report, the only recommendation that the Committee can properly make is that force feeding of ducks and geese should stop and that this could best be achieved by the prohibition of the production, importation, distribution and sale of foie gras. He agrees that should the Commission decide that foie gras production should continue, for example due to the socio-economic impacts discussed in Chapter 6 of the Report, then the recommendations in section 8.3.4 a-g should be enforced.

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