

## ANIMAL WELFARE ASPECTS OF FORCE-FEEDING AND FOIE GRAS PRODUCTION IN WATERFOWLS (REVIEW)

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### ABSTRACT – Animal welfare aspects of force-feeding and foie gras production in waterfowls

Fatty liver or 'foie gras' is a special product which produces with the force-feeding of waterfowl species (goose, Muscovy duck and mule duck). This delicacy originates from the ancient Egypt. The Romans and Greeks knew this product which was spread later (in the Middle Ages) by Jewish. In that time geese were primarily force-fed by wheat or fig. Since then the production technology, production level and efficiency have undergone notably changed. In Europe and in Israel (moreover lately in the USA) this activity has been pressed an attack and strongly criticised by animal welfare groups but their objections are confuted by scientific research. Hereby our knowledge constantly expands about fattening of liver (steatosis), physiology of stress reactions, ethologic and pain-feeling.

Since there is not available enough scientific data thus the aim of this review to summarizes the last knowledge about force-feeding and foie gras production in animal welfare aspects.

**Keywords:** animal welfare, foie gras, fatty liver, force-feeding, waterfowls

### ÖSSZEFOGLALÓ – A víziszárnyasok töméses hizlalásának állatvédelmi kérdései

A kihizlalt máj a foie gras speciális termék, melyet víziszárnyasok (a lúd, a pézsmaréce, valamint a házikacsa és a pézsmaréce fajhibridje a mulardkacsa) töméses hizlalásával állítanak elő. A hizott máj termelése ősi tradíció, amelynek legrégebbi nyomai az ókori Egyiptomból származnak. A tevékenységet a görögök és a rómaiak folytatták, majd a középkorban a zsidó népesség révén terjedt el. A töméses hizlalásra elsősorban a ludat választották, a madarakat akkoriban búzával vagy fügével tömték.

A töméses hizlalás gyakorlata jelentős változásokon ment keresztül. Európában és Izraelben (újabbán már az USA-ban is) az állatvédők részéről erős kritika és támadás éri napjainkban ezt a tevékenységet. Kifogásaikat a tudományos kutatások rendszeresen megcáfolják, újabb adatokkal gazdagítva ismereteinket a madármáj elzsírosodásának, a madár stressz-reakcióinak élettanáról, a madarak viselkedéséről és fájdalomérzetéről. A töméses hizlalást az állatjólét szempontjából ért bírálatok igazolására tudományos vizsgálati adatok nem állnak rendelkezésre, legújabb ismereteket és a foie gras termelés jövőbeni kilátásait foglalja össze az alábbi tanulmány.

**Kulcsszavak:** állatjólét, foie gras, hizott máj, töméses hizlalás, víziszárnyasok

## INTRODUCTION

### *Foie gras production in the world*

In 2004 the production was 23.670 tons in the world but it concentrated only few countries. About 80 % of the total production realized in France. Further important countries in foie gras production are: Hungary, Bulgaria, Israel and Poland. Nowadays the goose has been extruded from the local production by mule duck. This hybrid (Pekin duck layer × Muscovy gander) produces about 93-95 % of the total French production.

The goose has been overshadowed in France and it remain popular only few countries, for example in Hungary and Israel. *Table 1* shows the foie gras production in the world during 1995-2004 (source: CIFO data in <http://foie-gras-gers.com/filiere/chiffres.htm>).

Table 1.: Foie gras production in the world (1997-2004)

(tons)	1997	1998	1999	2000	2001	2002	2003	2004
<i>France</i>	11 680	13 464	15 017	15 766	16 430	17 015	16 400	17 500
<i>Hungary</i>	2 000	2 100	1 900	1 900	1 800	1 800	2 600	2 600
<i>Bulgaria</i>	800	800	800	1 000	1 000	1 000	1 280	2 000
<i>Israel</i>	300	300	300	350	300	300	300	500
<i>Poland</i>	200	150	30	0	0	0	0	0
<i>Others</i>	260	286	305	320	330	385	520	1070 (Spain 500)
<i>Total</i>	<b>15 240</b>	<b>17 100</b>	<b>18 352</b>	<b>19 336</b>	<b>19 860</b>	<b>20 500</b>	<b>21 100</b>	<b>23 670</b>

The Scientific Committee on Animal Health and Animal Welfare framed and published its scientific report in 1998. Since those fattening technologies designed with force-feeding have been banned by the European Union, now the greatest challenge for the foie gras industry and the goose sector to changeover other humane alternative methods until 2015. Until this time a grace period has given to the two greatest foie gras producer (France and Hungary) to find alternative methods (for example fattening without cramming). However the foie gras was pronounced traditional gastronomic and cultural product by one of the decision of the French Parliament. After all the French specialists declare unsteadily about the prospect of force-feeding and foie gras production whilst this business line employs more thousands people.

In the middle of the research project of the French National Institute for Agricultural Research (INRA is the largest agricultural research institute in Europe) stands force-feeding and animal welfare work programs and test indicates the seriousness of the discussion.

For justify to the criticisms of force-feeding and its animal welfare aspects are not available scientific data therefore the aim of this study to demonstrate the last knowledge from researchers and the report of the Scientific Committee and summarize the prospect of foie gras production.

## PHYSIOLOGY

### *The liver before and after the force-feeding*

Force-feeding causes a rapid overextension more than 10 times their normal size and weight in the birds' liver (BABILÉ ET AL, 1998; BLUM, 1997; BLUM AND LECLERCQ, 1973) (this condition is called "hepatic steatosis"). Several biochemical parameters (BOGIN ET AL, 1984, JANAN ET AL, 2000), morphologic and histological characters of the liver are changes during force-feeding. Cellular hypertrophy showed in both force-fed ducks and geese. The diameter of hepatocytes increased from 7-8  $\mu\text{m}$  to 24-28  $\mu\text{m}$  after 12 days force-feeding (BALDISSERA NORDIO ET AL, 1976; BÉNARD ET AL, 1991.) BABILÉ ET AL (1998) found the effect of force-feeding modifies the chemical composition of the liver, increased the weight and fat content of the liver and decreased the water and the protein content (Table 3).

### *Changes in the liver function*

Blood flow through the liver decreases during force-feeding and this may affect hepatic function. BENGDONE-NDONG (1996) examined the hepatic function using two markers (sulphobromophthalein and indocyanine green). These markers were administered by intravenous injection and changes in the pharmacokinetic parameters of markers were

observed; i. e. the half life elimination (increased) and mean residence time (increased also). During the force-feeding the hepatic steatosis induced impaired hepatocellular function in ducks.

First studies were made about the reversibility of fattening of the liver. Examine of BABILÉ ET AL, 1996, 1998 showed that the fattening of the liver is fully reversible, moreover after three consecutive force-feeding periods (a short pause between them) both for goose or mule ducks. Beyond the liver preserved its healthy function and histological structure (BABILÉ ET AL, 1996, 1998; BÉNARD ET AL, 1996).

Some examines were carried out to study the acute and chronic stress-effect related to force-feeding. Several stress indicators i. e. changes of corticosterone level were applied in the tests (FAURE ET AL, 1996, GUÉMÉNÉ ET AL, 1996, 1998). GUÉMÉNÉ ET AL (1999) measured the corticosterone level in the blood plasma and examined the reaction after ACTH injection. They observed that the force-feeding procedure did not induce significant increase in plasma corticosterone levels. They showed the force-feeding induced neither acute nor chronic stress in mule duck ganders kept in individual cage.

In contrary to there is greater corticosterone level was measure in group cage where the force-feeding attached with capturing of birds. In further experiments GUÉMÉNÉ ET AL, 1998 established that the hypothalamus-pituitary gland-adrenal glands system (corticotrope axis) comes into action under physical stress. The movement of birds were arrested for 15 minutes by a net; therefore they showed high corticosterone secretion.

### **Behaviour**

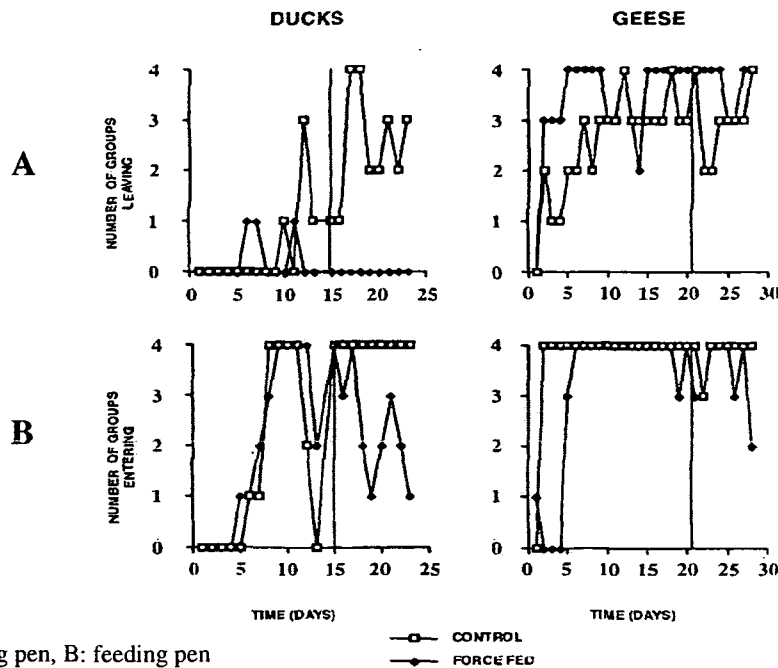
One of emphasised criticism of the animal protecting groups that the birds have to take and ingest too much feed day by day. Contradict under natural conditions certain degree of hepatic steatosis occurs in the wild waterfowl, as a consequence of energy storage before migration. This feature of waterfowl is utilised for the production of commercial liver production. GUY ET AL, 1998 observed spontaneous hyperphagia of the ducks in that a daily voluntary intake of concentrate.

Daily handling of the birds is normally associated with positive response by the animals towards the person who force-feeding them. Birds (kept in pen) kept away from the person who force-fed even though that person normally supplies them with food. At the end of the force-feeding birds were less able to move but tried to move away from the person who had force-fed them. At the same time in ducks kept in individual cages they showed less avoidance behaviour against the force-feeder than a stranger's visit coming to the cages one hour after the force-feeding. The appearance of the stranger was much aversive than the force-feeder person.

FAURE ET AL, 2001, GUÉMÉNÉ ET AL, 1998 studied the aversion behaviour against the force-feeding, too.

*Figure 1* demonstrates behaviour of ganders and drakes whether the force-feeding or the force-feeder induce aversion from them (FAURE ET AL, 2001). In 20 days training period the movement of birds from living room to feeding room were studied. Their movements were voluntary and free from force. After the training period the birds were divided into two groups, one group was force-fed in the feeding room; another one remained its origin place as control. Control group got feed ad libitum during the experimental period. In force-fed group the amount of feed was adjusted to the control group'. Under the test period all mule duck plied to the feeding room and at the same time 25-100 % of the individuals in the experimental group went voluntary to the feeding room. But the feeding room was attractive to the non-force-fed birds than the force fed ones; i. e. there was partial aversion in ducks against the force-feeding while the geese did not show aversion at all (FAURE ET AL, 1998; GUÉMÉNÉ ET AL, 1998; GUÉMÉNÉ ET AL, 1999).

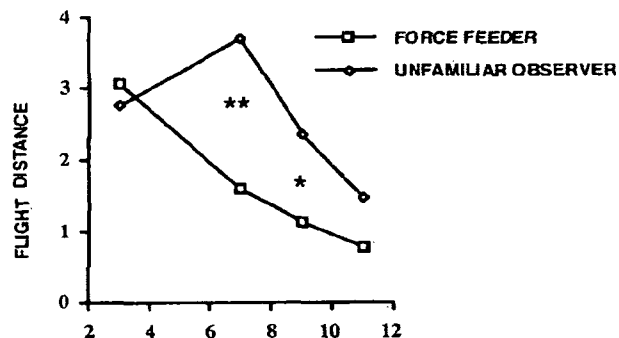
**Figure 1.: Number of groups of ducks and geese spontaneously leaving the rearing pen or entering the feeding pen**  
(adapted Faure et al, 2001)



A: rearing pen, B: feeding pen

The runaway behaviour in ducks was examined by Faure *et al* (2001). The Figure 2 well demonstrated that the intensity of runaway was stronger when a stranger appears than the appearance of the force-feeder person. Distance from the force-feeder was shorter and shorter in time which justifies that did not develop aversion against the force-feeder person (FAURE ET AL, 1998, 2001).

**Figure 2.: Distance of force fed ducks to the force-feeder person and an unfamiliar observer**  
(adapted from Faure et al, 2001)



\*significant differences ( $P < 0.05$ , Mann and Whitney U-test)

Further ethologic observation carried out in ducks kept in different keeping conditions. None notable changes were observed during the test period except for wheezing and respiratory difficulties which intensified the drawing to the end of the force-feeding period

especially in the ducks kept in individual cages. This phenomenon was correlated with changes of the thermoregulation (FAURE ET AL, 2001).

### **Pain**

The animal protectors often adjust that the force-feeding is painful for the birds. During handling and the insertion of the tube of the force-feeding machine may result pain and tissue injuries. The pharynx and the larynx area are sensitive and physiologically adapted to perform a gag reflex to prevent feed entering the trachea.

Neuro-functional indicators were examined and compared to show what kind potential signs of pain under the different phase of force-feeding period in ducks. In the test they wanted to visualise the pain. SERVIÈRE ET AL (2002) studied two situations: the force-feeding and the acute pain stimulation of the oesophagi. In the latter case they used the changes of corticosteron level for manifest the stress. The corticosteron level remained stable on the first day. Frequency of heart increased immediately after the pain stimulus and it remain ascendant in the next 2-3 hours ( $\times 1,5-2,0$ ). On the wall of the oesophagus evolved injuries consequence of sign the peripheral hemórrhagic inflammation and the source of pain.

Furthermore the rack of the cage and fast weight gain may cause leg problems and pain; the bird usually cannot stand in normal position. So the force-fed birds spend their time sitting rather than standing. Wing fracture may be caused by crude handling which may be source of pain.

## **CONCLUSIONS**

Since then the EU banned the force-feeding of geese except for France and Hungary, they have a 15-year grace period to find alternative methods to fatten geese for foie gras. Expectedly the technology, efficiency, and the volume of the foie gras production will be undergone notably changes because of the ban in the world-wide and the pressure of the animal protecting groups. However several scientific data described above support that the force-feeding may fully reversible. The changes of the consequence of the force-feeding are normally befallen in the wild waterfowl in the nature before migration. Force-feeding results dilate of oesophagus and increase of liver size and weight.

Force-feeding does not cause aversive behaviour in ducks if a familiar and professional person force-fed them. Besides it may cause injuries under crude handling. The procedure must be carried out circumspectly and be the force-feeder a competent person. At the same time the force-feeding induces wheeze (especially in lack of cooling) and leg deformation furthermore the inefficient design of the force-feeding causes very serious damages.

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