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HORSEMEAT AND HIPPOPHAGIA

Dobranić[1], V., A. Večkovec[2], M. Kadivc[3], B. Njari[1]

SUMMARY

Horsemeat represents special and valuable food. An increasing trend in the production of horsemeat in the world is noticeable. Within the EU countries, the average consumption of horsemeat per capita is 0.4 kg per year, but, because of their own insufficient production, they cover 66.7% of the market demand by import.

A higher content of water, proteins and glycogens, and a smaller content of fat in horsemeat make it more suitable for nourishment, particularly of more demanding people, in comparison to pork or beef.

The geographic position and the breed structure of the horse population in Croatia provide good chances for a profitable production of horsemeat with possible export orientation.

INTRODUCTION

The production of horsemeat in the world shows a slight upward trend with insignificant oscillations. In Croatia, total annual production in 1999 amounted to 581,000 t in comparison to 482,000 t in 1989 (FAO Production Yearbook). In 2002, in 14 biggest producers of horsemeat in the world about 700,000 t were produced, most of which in China, Mexico, Kazakhstan, Italy, Argentina and Mongolia. In 2001, the horsemeat production in Europe was over 153,000 t. The biggest producers were Italy, France, Belgium, Netherlands, Spain and Germany. However, the consumption per capita in Europe shows a slight drop, but after the stagnation in the mid '90-s of the last century, the consumption started to grow slowly. Within the EU countries, the average annual consumption of horsemeat per capita is 0.4 kg, with the exception of Italy, one of the leading countries in the consumption of horsemeat, where it is 1.3 kg (Martuzzi et al., 2001). There is a certain pattern in the seasonal trends of consumption, which coincide with the season of weaning of foals, and consequently, the highest consumption is recorded during winter months. The lowest consumption is during the summer because of a reduced supply of this type of meat (Manfredini and Badiani, 1993). The production of horsemeat in the West European countries is insufficient, so that 66.7% of the market demand is covered by import (Martin-Rosset, 2001). The term *hippophagia* is an obsolete, forgotten name used for horsemeat, consumption of meat of equidae respectively, and it originates from the Greek words: hippos= horse and phagein = to eat.

BREEDING OF HORSES FOR MEAT PRODUCTION

The production of horsemeat is based on an accurate evaluation of the relevant market indicators and ecological conditions under which this production is carried out, and also on the right selection of genotypes as the basis of production. Current production systems are in general of extensive type, in which waste, marginal and less cultivated pasture areas are used for grazing of more primi-

[1] **esna Dobranić, PhD, Senior Assistant; Bela Njari, PhD, Full Professor. Department of Hygiene and Technology of Foodstuffs of animal origin, Faculty of Veterinary Medicine, University of Zagreb, Heinzelova 55, 10000 Zagreb**
[2] **Anamarija Večkovec, DVM, Altiora d.o.o., Novačka 335, Zagreb**
[3] **Marina Kadivc, DVM**

tive, less productive, but more tough breeds of horses. According to the geographical, ecological conditions respectively, these areas can be divided into lowlands and highlands. Systems of horsemeat production are of either close (farm) or open type (free range grazing). The intensity of horse breeding is extensive, semi-intensive or intensive. Duration of the fattening cycle is in general limited to 6-12 months, 18-24 or 30 months. Farm rearing of foals is applied in the production systems when the animals reach the age of 7 or 15 months. The primary characteristic of the system is a high ratio of energetic feed in the foal ration (35% to 60%). Vigorous feed is of high nutritive and energy value and its main components are cereals and soy. Animals are usually fed *ad libitum*.

In general, the production of horsemeat includes cheaper fodder (grazing) and it usually lasts until the animals reach the age of 18-24 months (or 30 months). The production system until the age of 18 months makes possible to make use of two grazing seasons. After the weaning of foals, i.e. during the winter period, the weight gain is lower (600 - 700 g/day), but the compensation phase of growth takes place during the spring and summer (900 - 1000 g/day). Winter feeding can be based on qualitative silage or hay with the addition of 5% to 15% of concentrate feed, or on a less voluminous fodder but with a higher level of added concentrate (to 20%). During the second grazing season, the optimum stocking rate is 2.5 head/ha of pasture area, whilst during the last two months of fattening the animals are additionally given 3 kg of grains/day. System of prolonged fattening period to 24 months includes the castration at the age of 18 months. In the second winter period, the fattening ends with a higher ratio of concentrate feed in daily rations (≈ 25%). Fattening system until 30 months of age is rarely used. Weight gains during the first winter period are lower (500-700 g/day) in comparison with the following grazing season (700-800 g/day). In the second winter period, the weight gains range from 260 to 300 g/day and at the end of the third grazing season these values reach 600 to 800 g/day. This system requires greater investments, making the profitability of such production questionable. Consequently, this type of production is rarely used.

The basis of the systems of horsemeat production makes a proper organisation of mating in order to ensure timely foaling and to enable maximum exploitation of pastures by the mares and foals, sometimes together with other species of domestic animals (Martin-Rosset and Trillaud-Geyl, 1984). As a rule, partus should be planned for the end of March and beginning of April, shortly before the mares and foals are released to grazing land. During three winter months the mares are additionally fed in stables, when their average consumption amounts to 1300 kg of voluminous fodder and 150 kg of concentrate feed. Duration of additional feeding coincides with the last two months of gravidity and the first month of lactation. Grazing during spring and summer provides the mares and foals with sufficient quantities of nourishing feed required for the growth, development and renewal of the body deposits of fat tissue. Good condition of mares after the weaning of foals makes possible for mares to easily overcome partial malnutrition during the inferior autumn- and winter-feeding. Pastures cover 80% of annual demands of fodder, although the grazing season lasts about 9 months.

Grazing of mares starts in spring on pastures of inferior quality, which are not used for hay production or grazing of cattle (to 800 m). In June, the mares are moved to higher pasture areas (1300-1500 m) where they remain the next 4 months. In autumn, they return to lowland pastures (800-1200 m), where cattle have been grazing previously. Grazing system is combined with other species of domestic animals for more efficacious exploitation of grazing land, since horses can use pastures of inferior quality. During the winter period, the mares are given additional quantities of feed, in order to successfully end their gravidity period, have vital and healthy foals, start with lactation and prepare for the forthcoming new mating. Fertility rate of mares in is 80% to 90%, while the lactation period lasts for 180-190 days, and the drying off occurs usually by mid October.

In the production system adapted to lowlands, the partus should be planned for the beginning of April in order to make best use of the grazing season (Martin-Rosset and Trillaud-Geyl, 1984). During three winter months, the mares are additionally fed in stables, when they consume about 1500 kg of hay and 120 kg of concentrate feed. Grazing land in spring and summer provides the mares and foals with sufficient quantities of feed required. During the summer and autumn months, the mares graze on pastures earlier used by cattle. The mares can graze also on pastures of inferior quality, which have not been used for hay production, and for the purpose of optimum exploitation. The body reserves collected during the period of rich vegetation help the mares to easily overcome a partial malnutrition in the course of autumn and winter. Pastures cover about 70%-80% of annual feed demands, and the grazing season lasts from 8.5 to 9 months. Duration of lactation period is 190-200 days, till the second half of October, and then starts the weaning of foals. Number of weaned foals per 100 mares is 70 to 75.

In different systems of equine industry the grazing of horses is often combined with grazing of other ruminants for optimum exploitation of pastures. Jointly grazing of horses and cattle is regularly applied, the only recommendation being uniform age of animals (from one to two years). The animals graze in separated groups and there is no interfering between different animal species. The optimum ratio of

horses and cattle is 1:1-3, when the average production of meat is 400-470 kg/hectare. According to the finding of Der et al. (1995), the digestibility of crude proteins is by 2.4% higher compared to cattle, but that of crude fats (3.1%), cellulose and hemi-cellulose (2.0%) is more efficacious in cattle than in horses. Horses and sheep also often graze together without any mutual disturbing.

HORSEMEAT IN HUMAN NUTRITION (HIPPOPHAGIA)

Meat of equidae was more or less used as human food since the ancient times. Broken and charred bones of equidae in caves throughout Europe provide sufficient evidence. In the ante-history age, meat of horses and wild buffalo was supposedly the most wanted food of animal origin. The ancient Egyptians and Israelis considered horsemeat as unclean. Mohamed gave a similar recommendation to its followers, while the Persians, Greeks and Romans enjoyed in eating horsemeat. Meat of young fattened donkeys was a special delicacy for them. In general, hippophagia was widely distributed in Europe until the 8th century when the Roman Church banned the consumption of horsemeat under the pretence of being unclean, disgusting and causing leprosy. It is not known whether the objective reasons of high incidence of glanders, presenting a high risk to human health, were the main cause or it was the intention of the Church to eradicate the old pagan, habits of Germans, who used horses as the most valuable offering to the God Wodan and consumed horsemeat during religious festivities. In recent time, glanders has been eradicated in most countries and does not present a risk any more. However, the number of consumers of horsemeat is not great in a large number of countries, similarly as in Croatia. The disappearance of paganism led to disappearance of reasons for further banning of the horsemeat consumption. Reintroduction of horsemeat in the menu required a lot of efforts because of the deep-rooted prejudices. The Danes were the first in Europe who started eating horsemeat at the time of siege of Copenhagen in 1807. Since that time, hippophagia started to spread and more and more horses were slaughtered. Even the associations for animal protection in Germany and France approved the action and raised the questions of slaughter of horses and consumption of horsemeat. They considered the problems associated with economic losses induced by old and worn-out horses and focused their propaganda in that direction. Their starting point of view was that the consumption of horsemeat is healthy and valuable, and even proclaimed the horse as one of the cleanest animals. Special slaughterhouses were opened for slaughtering and processing of horses (equidae). The first slaughterhouse for horses was supposedly opened in Berlin in 1847, and then in other German cities. Regardless of that fact, the consumption of horsemeat in the European countries was always low and accounted for less than a ½ kg per capita annually. The exceptions were Belgium and Netherlands where even today the horsemeat is a regular food. In America the consumption of horsemeat is negligible, most probably due to good supply of other kinds of meat (Večkovec, 2003).

About 310,250 horses are annually processed in slaughterhouses in France, of which 80% come from other European countries, Argentina, Canada and USA. In general, ex-sport and riding horses are processed, but also other cheap horses marketed at public auctions. Meat of horses killed by euthanasia by veterinarians is not for consumption; instead safe disposal of their corpses is practised. When the meat of horses is used for human consumption, the horses, as well as cattle, are mechanically stunned.

The number of horses in Croatia was significantly reduced during the past few decades. The main reasons are the introduction of mechanisation in agriculture, depopulation of villages, recent Homeland War and social developments. Current guidelines of the horse-breeding development in Croatia put the emphasis on the breeding of horses for sport and recreation. The use of horses as working animals has almost disappeared. Reorientation to the production of horsemeat, with partially ensured export quotas has been offered as an alternative to the breeding of cold-blooded breeds, as already suggested before (Sukalić et al., 1985; Sukalić et al., 1990). Considering the ratio of cold-blooded breeds and their crossbreeds in total horse population (> 80%), and the possibility of sale of horsemeat on the home and foreign markets, this alternative production seems to be perspective. With an adequate expert support it might become highly profitable, too. Peculiarity of the geographical location and unused pastures in Croatia also provide good chances for this type of production. The national consumption of horsemeat is almost not worth mentioning, in spite of certain differences in individual regions and rural areas, as evident from the national data on moving and slaughterhouse processing of horses. On the other hand, the export of horses, regardless of the quantity, could be greater. Reasons are manifested by the fact that the slaughtering horses, in particular foals are quite wanted goods that are not subject to economic restrictions by the countries importers. When speaking about the consumption of horsemeat in our country, it should be pointed out that it has been increased, especially after the occurrence of bovine spongiform encephalopathy (BSE) when the horsemeat has been used as substitute for meat pastry.

As already mentioned, the horsemeat is quite popular and available in a large number of countries. Thus, in Austria are very popular meat cheese (*leberkäse*) and a

type of goulash made of horsemeat (roasts) and various vegetables. Basis of the meal makes the peanut sauce, horsemeat and sometimes viscera and rumen.

In Belgium, the meat of horses (*viande chevaline*) is very appreciated and is mostly used for preparing Tartar steaks, and the smoked meat is often used as an ingredient of sandwiches. The equine industry in the Canadian province Quebec is highly developed and almost all grocery shops are well supplied with this type of meat. In Chile, a kind of chips made of smoked and salted horsemeat (charqui) is usually served with beer. Since 1990, the horsemeat could be purchased in all big stores and butcheries throughout France, whilst earlier only specialised butcheries were allowed to sell horsemeat *(boucheries chevalines*). In Germany, the horsemeat has been traditionally used as marinated roast-meat (*sauerbraten)*, and often served with gnocchi. In Island, it is used for preparing *fondue* or goulash (stew) because of its strong aroma. In Italy, thin sliced, raw horsemeat is used for preparing marinated steaks (*carrpacio*) or *bresaole* (meat dried in the air for 2 to 3 months until becoming dry and of dark red to violet colour). Horse or foal steaks are also often a part of their gastronomy, especially in Tyrol in the Italian Alps. In the Japanese cuisine a raw horsemeat, known under the name *sakura* (cherry blossom) is often used because of its characteristic pink colour (Figure 1). It can be served in thin slices with the addition of soy sauce (*sashimi),* and often with the addition of onion and ginger (*basashi); Figure 2. Basashi* can be also made of the neck fat tissue, but then its colour is white and not pink. Grilled horsemeat (*yakiniku)* and ice cream are also well known. In Kazakhstan different equine parts are prepared as salted, dried and smoked meat. Horsemeat sausages (*kazy* and *shuzuk)*, hind leg meat (*zhaya)*, dried neck fat tissue (*zhal*) and dried meat (*suryet)* are known culinary specialty. A very popular breakfast in Netherlands is prepared from smoked horsemeat, cut in thin slices as ham, the so-called *paardenrookvlees (Figure 3).* Well-known meals there are also horsemeat sausages (in bread), salad made of horsemeat, potatoes and sour cucumbers *(Huzarensalade).* A large number of restaurants in Slovenia offer horsemeat steaks, the so-called "žrebičkov zrezek". There is a chain of fast food restaurants where hamburgers and horsemeat sausages («Hot horse») are offered. In Spain, minced horsemeat is used for preparing patty, which is roasted and served as a roll. Sales of horsemeat exceed total sales of lamb and mutton in Sweden. Smoked meat is widely available as cold meats (*hamburgerkött*). It is cut in very thin slices and mildly salted, something like pressed ham. *Gustavskorv* is a very popular kind of sausages in southern regions of Sweden. On the other hand, however, the horsemeat is used for preparing fondue in Switzerland, as well as steaks, in particular in the francophone areas (Kadivc, 2007).

Figure 1. Sakura

Figure 2. Basashi ice

Figure 3. Paardenrookvlees

As a conclusion, it is evident that horsemeat is a valuable food of animal origin. In spite of a slight increase in the production of horsemeat in the world, as well as in Europe, the market demands are obvious. Geographical location, insufficient exploitation of waste pasture areas and the breed structure of the horse population in Croatia provide good chances for a profitable production of horsemeat with possible export orientation.

ZUSAMMENFASSUNG

PFERDEFLEISCH UND HYPPOPHAGIA

Pferdefleisch ist ein besonderes und wervolles Nahrungsmittel animaler Herkunft. In der Welt ist ein größerer Trend der Pferdefleischherstellung bemerkbar. In den Mitgliederstaaten der EU beträgt der durchschnittliche Verbrauch von Pferdefleisch 0,4 kg jährlich pro Person. Wegen unzureichender eigenen Herstellung werden die Bedürfnisse des Binnenmarktes zu 66,7 % durch die Einfuhr gedeckt.

Ein größerer Teil von Wasser, Proteinen und Glicogen und ein kleinerer Teil von Fett im Pferdefleisch machen es günstier von Rind- und Schweinefleisch für die Ernährung bei der anspruchsvolleren Kategorie der Menschen.

Unser Land hat sowohl gute Rassen- als auch geographische Bedingungen für die Herstellung von hochwertigem Fleisch der Huftiere.

***Schlüsselwörter:** Pferdefleisch, Hyppophagia*

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ADDITIONAL KNOWLEDGE ABOUT HORSEMEAT DRY SAUSAGE "PIKET" FROM THE PAKRAC AREA

Šimić[1], D., B. Mioković[2]

SUMMARY

Though the horsemeat is very suitable for human diet owing to its chemical composition, it does not come as a usual product in our country. Its special quality is a low amount of cholesterol, which makes it especially fit for selected diets. The production of horsemeat products persists as a traditional course in Croatia for more than 100 years. It was brought and preserved in the villages around Pakrac by the Italian minority from their fatherland. Horsemeat sausages are still produced in the households there as one of domestic products.

This study describes the production of sausages of horsemeat and presents the results of sensory, chemical and bacteriological analysis of traditionally produced sausages from 5 households.

[1] Davor Šimić, DVM
[2] Dr. sc. Branimir Mioković, PhD, Full Professor, University of Zagreb, Faculty of Veterinary Medicine, Department of Hygiene and Technology of Foodstuffs of Animal Origin, Heinzelova 55, Zagreb