European perspectives on the public health risks posed by farmed game mammals

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Summary
As consumers have become aware of the health risks associated with the high levels of saturated fats present in conventional red meats, an interest in new domesticants has developed. Meat from these species represents the only sector of the European red meat industry which is currently experiencing growth. The production of meat from grazing animals other than cattle and sheep is not subsidised within the European Union (EU), so that despite the fact that game farming for meat exists in all the Member States, much of the farmed game meat consumed within Europe is imported from the rapidly developing deer farming industry in New Zealand.

Less severely regulated industries world-wide also export a great variety of wild game into Europe, but health controls and labelling do not permit the consumer to discriminate between wild and farmed produce, or even between species or countries of origin.

This paper describes the scale of game farming within Europe, and the quantities of game imported. The author reviews the diverse production systems in different regions of Europe and the various harvesting systems, including the present measures enforced for veterinary public health reasons, and considers the threats posed by the zoonoses known to affect game mammals and the public health risks posed by contamination. An explanation is given of the differences between the production and processing of farmed and wild game.

Keywords

Introduction
In the early 1970s, the high prices paid for game meat in Germany, coupled with falling prices for beef and lamb and the high levels of subsidy paid to cattle and sheep farmers, encouraged workers in both Germany and Scotland to investigate deer farming. Parallel developments took place simultaneously in New Zealand.

Techniques were developed in Scotland and New Zealand for the production of venison from red deer (Cervus elaphus) at stocking densities comparable in biomass with those used for conventional grazing livestock and using similar husbandry systems. In Germany, a preference for fallow deer (Dama dama) prevailed and more extensive systems were used (12).

Whilst there has been some development of farming systems for other species such as bison (Bison bison) and wild boar (Sus scrofa) throughout Europe, deer farming has shown by far the greatest growth.

Due to the continuance of high levels of agricultural support provided to cattle and sheep farmers under the Common Agricultural Policy, and the absence of such support for other species, game farming within Europe remains a relatively small industry in comparison with the rapid growth of the industry in New Zealand (Table I), where the annual farmed venison kill in the year 2000 is projected to reach around 100,000 tonnes. In New Zealand, 75% of the farmed venison is scheduled for export to Europe in 1997, particularly to Germany where venison prices are normally at least twice those of beef (Table II).
It is interesting to note that the farmed deer imported as venison from New Zealand, despite being killed in abattoirs, gain access to the European Union (EU) at the game meat tariff of 3% in comparison with the higher tariff of 14% levied on the conventional farmed red meats. The justification for this appears to be that farmed deer in New Zealand are killed in abattoirs specifically designed for deer; these deer slaughter premises (DSPs) kill only deer. Nevertheless, since even meat from reindeer (Tarandus tarandus) is levied at 14% on entry into the EU, this does seem to be a discrepancy which obviously favours the growth in imports of venison rather than conventional, higher-fat red meats into the EU.

Wild game meat produced within the EU can be of the very highest quality, but the controls provided by EU Directive 92/45/EEC for wild game meat are not rigorous and there is an inevitable tendency for the hunter to keep the best quality meat for personal consumption whilst selling the old or poorly shot animals (6). There are many reports of consignments of carcasses entering EU markets frozen in fur and occasionally even uneviscerated.

Unfortunately, meat from any of these less reliable sources may be dissembled in the catering or retail trade as farmed game meat. Furthermore, imported produce can be labelled legitimately as domestic produce, by the retailer at the point of sale, provided that the meat has been cut and packed within the EU.

With this background to imported wild game meat, the greatest public health risk inevitably stems from contamination of the meat by organisms associated with a lack of hygiene.

The extent of game farming in Europe

A survey of the nature and extent of European game farming, commissioned by the United Nations Food and Agriculture Organisation Regional Office for Europe, was published in 1993 (3). The authors experienced difficulty in gaining responses from several nations, especially regarding wild boar, and much has changed in this fast-moving field since 1991, when most of the data was collected. Nevertheless, Bartos and Siler made clear that the only wild mammal species ‘farmed’ to any extent within Europe was deer, almost entirely red and fallow, and wild boar. Other cervids such as sika (Cervus nippon), wapiti (Cervus elaphus canadensis) and Pere David deer (Elaphurus davidianus), and other bovids such as mouflon (Ovis musimon) and the American bison (Bison bison) are farmed, but the development of those industries is still small. Reindeer were also excluded from the survey. The findings of the survey with regard to the extent of deer and wild boar farming are summarised in Table III.
Table III
Numbers of European game and game farms in 1991 (3)

<table>
<thead>
<tr>
<th>Country</th>
<th>Fallow deer</th>
<th>Red deer</th>
<th>Wild boar</th>
<th>Fallow deer</th>
<th>Red deer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Czech Republic</td>
<td>1,000</td>
<td>600</td>
<td>?</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Denmark</td>
<td>3,500</td>
<td>5,000</td>
<td>?</td>
<td>300</td>
<td>50</td>
</tr>
<tr>
<td>France</td>
<td>3,000</td>
<td>3,000</td>
<td>10,000</td>
<td>65</td>
<td>50</td>
</tr>
<tr>
<td>Germany</td>
<td>57,600</td>
<td>14,400</td>
<td>?</td>
<td>3,360</td>
<td>840</td>
</tr>
<tr>
<td>Hungary</td>
<td>160</td>
<td>100</td>
<td>?</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Italy</td>
<td>10,000</td>
<td>600</td>
<td>4,000</td>
<td>325</td>
<td>20</td>
</tr>
<tr>
<td>Norway</td>
<td>1,096</td>
<td>556</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td>Poland</td>
<td>960</td>
<td>171</td>
<td>1,354</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Slovakia</td>
<td>280</td>
<td>230</td>
<td>?</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>50</td>
<td>650</td>
<td>?</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Sweden</td>
<td>26,000</td>
<td>6,500</td>
<td>?</td>
<td>560</td>
<td>140</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1,064</td>
<td>20,000</td>
<td>?</td>
<td>16</td>
<td>300</td>
</tr>
</tbody>
</table>

1: unknown

Table IV
Estimated numbers of farmed deer and deer farms in Europe in 1997

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of females</th>
<th>No. of deer farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red deer</td>
<td>Fallow deer</td>
</tr>
<tr>
<td>Austria</td>
<td>37,700</td>
<td>7,000</td>
</tr>
<tr>
<td>Belgium</td>
<td>200</td>
<td>1,300</td>
</tr>
<tr>
<td>Denmark</td>
<td>12,000</td>
<td>2,000</td>
</tr>
<tr>
<td>France</td>
<td>10,000</td>
<td>6,000</td>
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<tr>
<td>Germany</td>
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</tr>
<tr>
<td>Ireland</td>
<td>1,000</td>
<td>18,000</td>
</tr>
<tr>
<td>Italy</td>
<td>10,000</td>
<td>1,600</td>
</tr>
<tr>
<td>Netherlands</td>
<td>?</td>
<td>200</td>
</tr>
<tr>
<td>Norway</td>
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<td>400</td>
</tr>
<tr>
<td>Portugal</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>Spain</td>
<td>?</td>
<td>2,000</td>
</tr>
<tr>
<td>Sweden</td>
<td>17,364</td>
<td>5,958</td>
</tr>
<tr>
<td>Switzerland</td>
<td>4,500</td>
<td>100</td>
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<tr>
<td>United Kingdom</td>
<td>2,100</td>
<td>16,000</td>
</tr>
<tr>
<td>Total</td>
<td>196,024</td>
<td>64,408</td>
</tr>
</tbody>
</table>

1: unknown

Source: Federation of European Deer Farmers’ Associations

In 1990, a Federation of European Deer Farmers’ Associations (FEDFA) was established in the United Kingdom (UK). The most recent figures collated by the President, Professor Dr G. Reinken, which provide an indication of the extent of deer farming in 1997, were provided by the FEDFA (Table IV). These figures cannot claim accuracy for each nation; however, the small size of the industry in comparison to the New Zealand deer farming industry is evident (Table I). The figures clearly demonstrate that in Germany, Sweden and Denmark, fallow deer predominate whilst in other countries, such as the UK, Ireland and Spain, red deer are more popular. This appears to be an effect of cultural differences between nations, availability of foundation stock and climate. Despite the species differences, stocking densities across all nations (calculated on the basis of two fallow does being equivalent to one red deer hind) are quite consistent at approximately 8 red deer females or 16 fallow does per hectare. Approximately 100,000 hectares of land are occupied by European deer farms.

Figures for the extent of European wild boar farming are less easily obtained. In the UK, there are approximately 31 wild boar farmers who produce some 1,500 carcasses per annum (4). In France 1,479 boar farms yielded approximately 1,000 tonnes of wild boar meat from a kill of the order of 20,000 animals in 1995; this compares with a kill of wild boar by hunters in the French forests of 211,000 animals in the same year (11).

Management systems on European game farms

Despite similar overall stocking densities, management systems vary greatly from enterprise to enterprise and from nation to nation. At the most extensive, deer may be maintained within a perimeter fence, never handled, and merely culled by rifle. Such deer may not be considered as farmed and the meat may legitimately be placed on the market as wild game in accordance with EU Directive 92/45 (6).

Usually, however, deer farm management entails routine handling for treatment with anthelmintics, the weaning of progeny and, in approximately 50% of farms, slaughter. In some cases in northern Europe, the winter may be so cold or wet that weaned calves are better housed.

Apart from very occasional immobilisation by the use of tranquillisers drugs for such interventions as antler removal to avoid risk of injury to man or other deer, the only drugs which deer farmers will use are anthelmintics. Additionally, antibiotics may be used for therapeutic reasons on rare occasions. The use of clostridial or other vaccines is not widespread.

Within some parts of Europe, calves are weaned in the autumn and may then be transported to other deer farms for wintering and finishing. This stratification of the deer farming industry reflects the fact that farms on the hills, for example, may be best suited to operate as breeding units, whilst those on lower ground may be nearer the markets and the abattoirs, and may be better situated to benefit from the availability of cheap arable by-products such as straw, barley, or roots such as potatoes, carrots, etc.
The risks posed by the produce of European game farms

Drug residues are unlikely to be a problem with regard to venison from farmed deer since, as indicated above, very few drugs are used routinely on deer farms within Europe.

However, slaughter on very extensive farms or parks (which are not classified as farms), is carried out by rifle and the meat may then be treated as wild game which requires virtually no controls (wild game Directive 92/45/EEC) (6).

For bona fide farms, however, the venison must be handled as directed by the farmed game Directive 91/495/EEC (5). This requires ante-mortem inspection, handling of the carcasses in rigorously controlled premises and meat inspection by qualified inspectors. These regulations are similar to those which control the handling of other red meat from cattle and sheep.

Slaughter may take place on the farm using a captive bolt or a rifle, and the carcass, after bleeding, is taken within a specified time limit to licensed premises for evisceration and dressing. Alternatively, the deer may be transported live to a conventional red meat abattoir and slaughtered there in facilities adapted from cattle or pig lines. Whether killed on the farm or at an abattoir, the deer must be subjected to ante-mortem inspection by a veterinary surgeon and meat inspection by an authorised meat inspector, who will then stamp the carcasses with the red meat stamp appropriate to that abattoir.

Some larger farms have constructed on-farm meat-handling facilities which are registered as low throughput, farmed game-meat processing plants with an individual stamp.

To summarise, game meat, if genuinely farmed, is subject to the same requirements as conventional red meat. For this reason, most multiple retailers prefer to source venison from farms rather than the wild: not only is the farmed product more consistent than the wild product and available for twelve months of the year, but the retailer can be sure of complete traceability and hygienic processing.

The risks posed by game meat imported into Europe

Both wild and farmed game meat are imported into Europe. The farmed meat (12,000-13,000 tonnes per annum) is almost entirely of New Zealand origin and the quantities imported into each nation from New Zealand between 1993 and 1996 are given in Table II.

Of the deer farmed in New Zealand, 95% are red deer. The animals are farmed semi-intensively and are all transported from the farm for slaughter in specially constructed abattoirs, where each animal is handled using the same hygiene standards as those used for conventional red meat. When the meat enters Europe, importers are charged a 3% levy instead of the 14% levy imposed on other red meats (including reindeer meat).

From the public health point of view, the farmed venison imported into Europe from New Zealand poses almost exactly the same risks as the importation of cattle and sheep meat slaughtered in that country. The venison will have been exposed to a similar level of anthelmintics and will have grazed on grassland fertilised with similar levels of artificial fertiliser. Most of the deer are slaughtered between 12 and 24 months of age, but some of the venison is derived from older deer, the males of which will have been exposed to the practice of 'velvetting'. This is the amputation, usually under sedation and local anaesthesia, of the growing antler which is sold to the traditional Chinese pharmaceutical industry. This procedure is illegal within Europe for welfare reasons.

From the point of view of residues within the venison, farmers in New Zealand administer anthelmintics more frequently than European deer farmers due to the benign climate in that region, and there is also at least a theoretical risk of residues associated with stags killed after velvetting. Nevertheless, the nature of the tight controls associated with the administration of the DSPs and the way in which the farmed meat is processed makes the risk of significant levels of residue reaching the European consumer extremely remote.

Once the meat has entered Europe, there is no requirement to label the country of origin on the food package, provided that the product has been cut and packed within the EU. Thus the consumer may justifiably feel misled that the venison available to the traditional Chinese pharmaceutical industry. This practice of 'velvetting' is illegal within Europe for welfare reasons.

Once the deer have been slaughtered at the DSP in New Zealand, the venison is electrically stimulated to ensure tenderness and then vacuum-packed for export either chilled or frozen.

The risks posed by imports of game into Europe from countries other than New Zealand are, however, of a very different nature. These products certainly represent the greatest health risk category. There is no control with regard to the age or sex of the animals from which the meat is derived, and the labelling of even the species is frequently inaccurate. Meat inspection is often rudimentary. Heavy levels of bacterial contamination of the meat are inevitable.
Consignments of meat labelled as game may originate in South America, Australia, Africa or elsewhere, and may contain meat derived from a wide variety of species. Since Africa has no deer, all 'venison' from that continent must come from bovids rather than cervids, which may have been shot in the wild or killed on a game ranch. There have been reports of kangaroo meat from Australia being sold as roe deer, of deer entering European markets deep-frozen in fur and even occasionally arriving uneviscerated. Wild boar meat from Eastern Europe may contain classical swine fever (hog cholera) virus (10), and may enter the EU labelled as deer meat.

The poor quality and inadequate control of the wild game meat imported into Europe is a cause for concern amongst European game farmers as well as European hunters and those in the domestic game trade, as the imports jeopardise the reputation of the good quality product.

Similar reservations must be made with regard to the quality of a large percentage of the venison marketed by hunters operating within the EU. Much of the venison is a by-product of the sporting industry and the animal may be shot in such a way that the meat is damaged. The hunter is likely to preserve the best venison for personal consumption and that which reaches the market is therefore often sub-standard. The wild game Directive 92/45/EEC does not impose stringent operating within the EU. Much of the venison is a by-product of the sporting industry and the animal may be shot in such a way that the meat is damaged. The hunter is likely to preserve the best venison for personal consumption and that which reaches the market is therefore often sub-standard. The wild game Directive 92/45/EEC does not impose stringent demands (6). This provides yet another example of the exposure for sale of sub-standard products which is opposed by both game farmers and those in the game trade who fear that the reputation of game meat may suffer.

Risks associated with specific epizootic disease

Due to the extensive nature of game farming, the health status of the product is generally good. Epizootic risks are further reduced by the controls demanded by the farmed game Directive 91/495/EEC (5).

It is not within the scope of this paper to catalogue all the diseases of deer; this short communication mentions only some of those diseases which are more important as epizootics and as zoonoses. The range of diseases to which deer are susceptible has been reviewed elsewhere (1, 9).

Bovine spongiform encephalopathy

No cases of bovine spongiform encephalopathy (BSE) have been reported in deer, despite the use of infected meat-and-bone meal as feed for many deer on farms and zoos prior to the withdrawal of this product: therefore deer meat is not considered to pose any risk of spreading BSE. In contrast to the family Cervidae, five species of antelope of the family Bovidae succumbed to BSE at that time in zoos. A scrapie-like spongiform encephalopathy known as chronic wasting disease of deer (CWD) has been recognised in deer in Colorado and Wyoming since 1967 (13).

Tuberculosis

Of the recognised diseases of farmed deer, tuberculosis (*Mycobacterium bovis*) has historically caused the greatest financial losses to the industry, but in fact deer appear to be no more susceptible to this disease than cattle and the post-mortem controls are similar for both species. An industry-funded but Ministry-administered Deer Health Scheme within the UK has created a group of accredited tuberculosis-free herds. No other European Member States have similar schemes, despite the widespread prevalence of tuberculosis within Europe. There is evidence of a rising incidence of the disease in wild deer of several species.

Brucellosis

Deer do not appear to be particularly susceptible to brucellosis and no cases of brucellosis have been reported in European deer. However, infection of wapiti with *Brucella abortus* in North America is widespread.

Other bacterial diseases

Anthrax has been recognised in white-tailed deer (*Odocoileus virginianus*) in North America but this disease has not been reported in Europe. Listeriosis has been reported in fallow and red deer in Europe, as have many serotypes of *Clostridium*, *Salmonella* and *Lepospira*. Deer seem particularly susceptible to *Yersinia pseudotuberculosis*. Both *Pasteurella multocida* and *P. haemolytica* have been reported as causing disease in red and fallow deer. *Fusobacterium necrophorum* is one of the most common causes of disease in fallow deer.

Foot and mouth disease

Among the viral diseases, all species of deer which have been experimentally exposed to foot and mouth disease (FMD) have proved susceptible (7, 8). Although not a public health hazard, this should be borne in mind when control measures are considered for the importation into Europe of game meat from FMD-endemic regions.

Classical swine fever

There is concern about the level of classical swine fever infection in wild boar. The virus spread into the wild boar population in the Czech Republic from Austria in 1990 to 1991 and infected domestic pigs in 1993 (10). In early 1997, an outbreak of the disease in Germany was attributed to the evisceration by a hunter of a wild boar on a domestic pig farm (2).

Malignant catarrhal fever

Malignant catarrhal fever (MCF) causes sporadic disease in red deer and most other species of deer seem susceptible, in particular Pere David deer. Care should be taken to prevent contact with sheep.
Parasitic diseases

Of the protozoan parasites of farmed game, Cryptosporidium is a zoonotic agent which causes serious losses amongst farmed deer.

Helminth parasites of deer in Europe are of economic importance and necessitate the use of anthelmintics at commercial stocking densities in most regions. They are not, however, of major importance from the epizootic or zoonotic perspective. Hydatidosis has been recorded in North American wapiti.

Conclusions

Public health risks associated with the marketing of game meat from European game farms are no greater – and in fact are probably less – than those associated with other red meats. The meat is produced extensively and handled hygienically under the stringent controls of the farmed game Directive 91/495/EEC (5).

Imported farmed game meats originate in most cases from New Zealand, where the product is handled as hygienically as other red meats. The opportunities for contamination of carcasses by residues are only marginally greater than for the European product. However, inadequate labelling legislation makes it impossible for the consumer to distinguish between different sources of game meat. Since much imported game meat is of doubtful origin and of poor quality, possibilities exist for consumers to be exposed to meat which is sub-standard.

Acknowledgements

The author wishes to express his thanks to Professor Dr Gunter Reinken and Mr John Elliot, respectively President and Chief Executive of the Federation of European Deer Farmers’ Associations, and to Dr Derek Booth of the Wild Boar Information Service, for assistance in the preparation of this paper.

Risques pour la santé publique liés à l’élevage du grand gibier : une perspective européenne

T.J. Fletcher

Résumé
Devant les risques pour la santé que présente la teneur élevée en graisses saturées des viandes rouges traditionnelles, et suite à la prise de conscience de ce problème par les consommateurs, les producteurs se tournent désormais vers de nouvelles espèces animales pour la production de viande. En Europe, la filière de production de viande rouge issue de la domestication de ces espèces est la seule qui soit actuellement en expansion. En dehors de la viande bovine et ovine, l’Union européenne ne subventionne pas la production de viande d’autres espèces élevées au pâturage. C’est la raison pour laquelle, malgré l’existence d’élevages de gibier destiné à la production de viande dans tous les pays européens, une bonne partie de la viande de gibier domestique consommée en Europe est importée de Nouvelle-Zélande, où l’élevage de cervidés connaît un développement remarquable.

D’autres pays, où la réglementation est moins sévère, exportent également une grande variété de gibier sauvage en Europe, mais, dans ce cas, les contrôles sanitaires et les normes d’étiquetage ne permettent pas au consommateur de distinguer entre animaux sauvages et animaux domestiques, ni entre les différentes espèces ou pays d’origine.

L’auteur donne un aperçu de l’ampleur de ce type d’élevages en Europe et des quantités de gibier importées. Il présente également les différents modes de
production selon les régions d'Europe et les divers systèmes d’abattage, y compris les mesures actuelles mises en œuvre en matière de santé publique et animale. Il examine, par ailleurs, les risques connus de zoonoses liés au gros gibier et les dangers de contamination pour l’homme. Il donne enfin une explication sur les différences existantes en matière de production et de transformation de la viande d’espèces sauvages et domestiques.

Mots-clés

Punto de vista europeo sobre los riesgos de salud pública que presentan los mamíferos cinegéticos de granja
T.J. Fletcher

Resumen
A medida que los consumidores cobran mayor conciencia de los riesgos sanitarios inherentes al alto contenido en grasas saturadas de las carnes rojas tradicionales, un creciente interés por nuevas especies domésticas ha empezado a ser notado. La carne de estas nuevas especies es hoy el único sector en auge de la industria de la carne roja europea. Los bovinos y los ovinos son las únicas especies para carne cuya producción a pastoreo esté subvencionada por la Unión Europea (UE). Ello propicia que gran parte de la carne de animales cinegéticos de granja que se consume en Europa venga importada de la floreciente industria neozelandesa de cría de ciervos, a pesar de que en todos los países de la UE existan granjas donde se crían animales cinegéticos para la producción de carne.

Los sectores productores de otras partes del mundo, sujetos a normativas menos estrictas, también exportan hacia Europa una gran variedad de carne de caza salvaje, pero los controles sanitarios y las normas de etiquetado vigentes no permiten al consumidor distinguir entre la carne de animal salvaje y de granja, o incluso entre las especies o los países de origen de la carne. El autor describe las dimensiones de este sector en Europa y cifra el volumen de las importaciones de carne de caza. El autor repasa los variados sistemas de producción y sacrificio que se emplean en distintas regiones europeas y las medidas vigentes de salud pública y de sanidad animal, así como las amenazas derivadas de las zoonosis que afectan a los mamíferos cinegéticos y los riesgos de salud pública ligados a una contaminación. El autor se extiende también en explicar las diferencias entre los animales cinegéticos de granja y los salvajes en lo que a su producción y procesado se refiere.

Palabras clave
References


