Animal health risks associated with ostrich products

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Summary
Five diseases recorded in ostriches are regarded as posing a potential animal health threat to meat-importing countries. Newcastle disease causes an atypically low mortality in ostriches: infected birds display typical nervous symptoms but no pathognomonic lesions which could be detected during post-mortem inspection. The vaccination of feedlot birds and a thorough ante-mortem examination are regarded as necessary precautions to ensure virus carriers are not among those animals destined for slaughter and subsequent export.

Avian influenza produces clinical depression and lesions can be detected at post-mortem examination. Borna disease appears to affect mainly younger birds, and the virus is probably not present in the meat of affected birds. Finally, there is little evidence to suggest that ostriches could play a role in the epidemiology of transmissible spongiform encephalopathies. Cases of anthrax are extremely rare. The importation of deboned ostrich meat reduces the risk of infected scraps being fed to susceptible animals.

Keywords

Introduction
In recent years, there has been a rapid, world-wide expansion of ostrich production. Large quantities of ostrich meat are exported by a number of producing countries, chiefly South Africa, Israel, Zimbabwe, Namibia and the United States of America (USA). Other countries are rapidly approaching the slaughter and exporting stage in the development of their own ostrich industries. Consequently, there is – from an animal health point of view – growing concern about the safety of ostrich products for importing countries.

Ostriches do not have any specific viral or bacterial infections of their own, but are susceptible to a number of infectious agents of other avian and mammalian species. This paper reviews the current literature on the occurrence of Newcastle disease, avian influenza, Borna disease, transmissible spongiform encephalopathies and anthrax in farmed ostriches, all of which could pose a threat to animal industries in importing countries.

Newcastle disease
Newcastle disease (ND) is a highly contagious viral infection which affects domestic poultry in particular. There are many different strains of the ND virus: these are indistinguishable serologically, but vary in their virulence, pathogenicity, infectivity and to a certain extent, their host range.

According to their virulence, the strains are classified as lentogenic (of low virulence), mesogenic (of moderate virulence) and velogenic (of high virulence). Lentogenic field virus is of little concern, except as a source of antibodies in exposed birds, and while mesogenic virus is readily controlled by normal vaccination practices as used in the poultry industries of many countries, outbreaks of velogenic ND can cause severe losses in affected poultry flocks regardless of the vaccination measures taken.

Some countries have successfully eliminated the velogenic ND virus and even mesogenic viruses, obviating the need to vaccinate against ND. In other countries, however,
particularly in Africa, South America and tropical Asia, velogenic ND still is endemic, predominantly in backyard or village poultry, and from time to time major outbreaks of the disease occur. The perpetuation of velogenic ND virus in backyard poultry flocks depends on a number of factors, such as the absence or use of night quarters, and the separation of brooding and rearing hens (8).

While all birds are considered susceptible to ND virus infection – and the virus has been isolated from many wild species – few cases of clinical disease or mortality have been reported from birds in the wild. Members of the following avian families have been identified as carriers or reservoirs of ND virus: Anseriformes (waterfowl), Psittaciformes (parrots), Passeriformes (songbirds), Strigiformes (owls) and Falconiformes (diurnal birds of prey) (25).

From time to time, cases of ND in ostriches have been reported from zoological gardens (7, 12, 14, 19), and these cases have been reviewed (9, 11). Outbreaks of ND with chronic nervous symptoms were seen in Israel in farmed ostriches reared in close proximity to commercial poultry (21).

In 1993, an outbreak of ND occurred in poultry in South Africa and spread to ostriches (2, 10, 11, 25); the disease is still present four years later. The pathogenicity of ostrich isolates from South Africa and Botswana (intracerebral pathogenicity index in specific pathogen-free chicks) was similar to that of poultry isolates from the same area, while ostrich isolates from Zimbabwe were indistinguishable from lentogenic poultry vaccine strains (17). Thus, it appears that commercial and village poultry flocks in the vicinity of ostrich farms act as main reservoirs of the ND virus and as the source of infection, although the role of wild birds in the dissemination of ND, particularly to ostrich feedlots, cannot be excluded.

From observations of field and experimental cases made by the author, it appears that, in ostriches, the route of infection has a major impact on the clinical manifestation of the disease. If ostriches are kept indoors and are exposed to infection via the respiratory route, severe respiratory disease with rapid spread and high mortality may result, while ostriches kept in outdoor runs usually contract the disease by the oral route, with resulting nervous symptoms and a very slow spread of infection. The nervous symptoms are very specific, and appear in a progression from slight head shaking and head scratching to the complete loss of control of neck movements and total ataxia (10). However, there are no pathognomonic pathological or histopathological lesions. Consequently, diagnosis can be confirmed by virus isolation only (10, 21).

For effective control of the disease in ostriches, it is necessary to vaccinate all poultry within a certain radius around ostrich farms, to disallow the keeping of any susceptible non-ratite birds on ostrich farms, and to vaccinate all ostriches following a strict schedule. Preliminary trials conducted by the author indicate that the virus does not persist in the muscles of immunised infected birds after the initial viraemic stage. Therefore, the vaccination of feedlot ostriches at least one month before slaughter with approved vaccines (e.g., a combination of live and killed emulsified vaccines) is deemed sufficient to eliminate the danger of ND virus being exported in the meat obtained from these birds.

A pre-slaughter inspection for the absence of the typical – or any – nervous symptoms is another important requirement for preventing the slaughter and subsequent export of meat from ostriches with clinical ND.

Avian influenza

Avian influenza (AI) is a highly contagious infection which occurs mainly in wild birds, particularly waterfowl. There are fourteen serologically different subtypes and, in addition, there are differences in infectivity and pathogenicity to different bird species. The various subtypes of the AI virus are based on antigenic differences in the haemagglutinin (H) protein (17). Isolates of AI virus which are highly pathogenic to poultry have always belonged to the H5 and H7 subtypes (17).

Outbreaks of AI occurred in ostriches in South Africa in 1992 and subsequent years (1, 2, 3). The virus has also been isolated from ostriches in Zimbabwe (17), and from other ratites in the Netherlands (17) and the USA (18).

The subtypes isolated from ostriches in South Africa were: H5N9, H7N1 and H9N2; from Zimbabwe: H5N2; and from other ratites in the Netherlands: H5N9 (17); and in the USA: H5N2 and H7N1 (18). None of the ratite AI virus isolates from South Africa, Zimbabwe or the Netherlands were pathogenic for chickens (intravenous pathogenicity index 0.00). It is believed that the ostriches contracted the infection from wild bird reservoirs (17).

Clinical symptoms seen in ostriches aged between 5 days and 14 months varied in that the younger birds were more severely affected. Symptoms included green discolouration of the urine, ruffled feathers and, in cases of secondary bacterial infections, airsacculitis and ocular discharge were observed. Birds over eight months of age often showed only a green discolouration of the urine and a slight depression, and usually recovered within two to three weeks (1, 3).

Post-mortem lesions were influenced by concurrent bacterial infections. Most commonly observed were focal areas of necrosis in the liver, a severe congestion of the proximal small intestine with mucous contents, and pale kidneys which excreted a greenish urine (1).
Vaccination with strain-specific killed vaccines did suppress clinical disease and mortality, but did not prevent the shedding of the virus (1).

Ante-mortem inspection of slaughter birds aimed at preventing depressed ostriches from being slaughtered, a reliable post-mortem inspection, and strict quarantine measures for farms in a known outbreak, should suffice to prevent the slaughter of viraemic birds and the possible export of their meat.

**Borna disease**

Borna disease (BD) is a viral infection which can affect several species of livestock. In 1993, a paretic condition was seen in ostriches in Israel (26), which subsequently was diagnosed as being associated with or caused by the BD virus (4, 5, 6, 15, 16, 27).

Ostrich chicks aged between 14 and 42 days were most susceptible to disease. Sometimes incoordination was seen a few days before the onset of paresis, from which only 1% recovered if submitted to intensive care treatment. On affected farms, the disease is a significant cause of mortality (16).

There were no gross post-mortem lesions. Histopathologically, there were lesions in the lumbosacral region of the spinal cord consisting of neuron degeneration in the central grey matter, accompanied by satellitosis and neuronophagia (16).

On threatened farms, further outbreaks were prevented by prophylactic injection of reconvalescent serum (4, 16, 26).

The questions of a carrier state in ostriches and of virus replication sites outside the nervous tissue have not yet been addressed. However, it is unlikely that the BD virus could be transmitted through the meat of slaughtered ostriches. The disease has not yet been found in ostriches in any other country.

**Transmissible spongiform encephalopathies**

Transmissible spongiform encephalopathies (TSEs) have been reported from a number of mammalian species, and in recent years bovine spongiform encephalopathy (BSE) has become prominent. Through the feeding of contaminated carcass meal and of raw meat from emergency-slaughtered cattle, the condition appears to have spread to a large number of captive herbivorous and carnivorous wild mammal species (13).

Three ostriches from two zoos in Germany, which were slaughtered following the detection of protracted central nervous symptoms with ataxia, were found to present histopathological lesions suggestive of TSEs (22, 23). These cases occurred in 1986, 1988 and 1989. Reports that the birds had received commercial rations containing carcass meal and had also been fed meat from emergency-slaughtered cattle were made, although it is most unlikely that ostriches should be fed or should eat meat. However, the brain material of these birds was not examined for the scrapie-associated fibrils.

While scrapie-associated TSEs have not yet been reported from any other avian species, the longer life-span of ostriches could allow these birds to survive long enough for the disease to manifest itself clinically. The first of the reported cases occurred at a time when Germany was officially free from BSE cases. There is also reason to doubt the statement that the birds had been fed meat. However, the possibility that transmissible TSEs could and did infect ostriches cannot be dismissed entirely and, consequently, slaughter offal and carcass meal from ostriches in countries with endemic BSE should be processed accordingly, to prevent the spread of the agent through this material.

**Anthrax**

Cases of anthrax have been reported from ostriches (20, 24). The normal picture is that of peracute deaths with typical post-mortem lesions. In this form, the bacteria are present in the blood and can be demonstrated in stained blood smears. However, there is also a mild form referred to as 'anthrax fever' with somnolence and anorexia, from which some birds may recover after a few days (24). No cases of anthrax in ostriches have been reported in recent years. Ante-mortem inspection will prevent clinically depressed birds from being slaughtered and will eliminate the danger of infected ostriches entering the food chain.

**Risks of disease transmission through ostrich products**

**Deboned meat**

Ostrich bone marrow is much more likely than muscle tissue to harbour any of the viruses of the conditions described above. Therefore, the exclusive importation of deboned ostrich meat must be regarded as a further general measure to reduce the risk of introducing any of these diseases. Also, the deboned ostrich meat contains very few parts which could be discarded and fed to susceptible animals (fowls) in the backyard.

**Dried meat**

Dried meat (biltong) has the same properties as raw meat and carries the same dangers.
Processed meat

Heat processing sterilises the meat. Heat-processed meat products are therefore safe from an animal health point of view, except with regard to TSE agents (prions) which are resistant to heat sterilisation.

Eggs

There is no evidence that any of the five diseases discussed above could be transmitted through the egg, nor have any of the egg-transmitted Salmonella serovars been reported from ostriches. There are, however, indications that ostriches can be infected with poultry mycoplasmas, and these in turn could be transmitted transovarially.

Egg shells

The shells of ostrich eggs could become infected secondarily with ND, AI and BD viruses. However, heat sterilisation or fumigation with formalin should suffice to render cleaned ostrich egg shells safe.

Feathers

Untreated ostrich feathers could carry ND, AI or BD viruses. Hot washing or fumigation should eliminate such a threat.

Skins

Raw and salted ostrich skins could also carry the above viruses, while tanned skins are rendered sterile by the tanning process.

Risques zoosanitaires liés aux produits à base d’autruche

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Résumé

Cinq maladies affectant les autruches constituent une menace zoosanitaire potentielle pour les pays importateurs de viande. La maladie de Newcastle entraîne chez les autruches une mortalité atypique peu élevée ; les symptômes nerveux observés sont caractéristiques chez les individus atteints, mais l’inspection post-mortem ne révèle aucune lésion pathognomonique. La vaccination des autruches destinées à la consommation humaine et un examen ante-mortem approfondi sont des précautions indispensables pour s’assurer qu’il n’y a pas de porteurs du virus parmi les autruches destinées à l’exportation de viande.

L’influenza aviaire se traduit par une grave atteinte clinique et par des lésions visibles lors de l’inspection post-mortem. La maladie de Borna semble affecter essentiellement les jeunes autruches et le virus n’est probablement plus présent dans la viande provenant des animaux atteints. Enfin, il y a peu de preuves que les autruches puissent jouer un rôle dans l’épidémiologie des encéphalopathies spongiformes transmissibles. Les cas de fièvre charbonneuse sont extrêmement rares.

L’importation de viande désossée d’autruche réduit le risque de faire consommer à des animaux sensibles des déchets de viande infectés.

Mots-clés

Riesgos zoosanitarios asociados a productos derivados de avestruz

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Resumen
Cinco son las enfermedades del avestruz que se consideran una potencial amenaza zoosanitaria para los países importadores de carne. La enfermedad de Newcastle causa en los avestruz una tasa de mortalidad atípicamente baja: las aves infectadas exhiben síntomas nerviosos característicos, pero en cambio no presentan lesiones patognómicas visibles durante la inspección postmortem. Para garantizar la ausencia de portadores del virus entre los avestruz destinados a la exportación de carne, se estima necesario vacunarlos en la granja y someterlos a una cuidadosa inspección antemortem. La influenza aviar induce depresión clínica y causa lesiones que se pueden detectar durante la inspección postmortem. La enfermedad de Borna parece afectar básicamente a los avestruz jóvenes, y es probable que el virus no permanezca en la carne obtenida a partir de casos infectados. Existen pocos indicios, por último, de que los avestruz desempeñen un papel en la epidemiología de las encefalopatías espongiformes transmisibles. Casos de carbunco bacteridiano no ocurren sino muy excepcionalmente. La importación de carnes deshuesadas de avestruz reduce el riesgo de suministrar restos infectados de comida a animales receptivos.

Palabras clave

References


