



Food-borne Zoonoses

Stuart A. Slorach

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Definition

- For the purposes of this paper, food-borne zoonoses are defined as *infections and diseases that are transmissible between animals and humans via foodstuffs*.
- The above definition encompasses not only zoonoses caused by bacterial zoonotic agents, but also parasites and prions.
- Viruses can be transmitted between humans via foodstuffs, but are not considered here mainly because current knowledge about their importance as food-borne zoonotic agents is limited.

Public health importance

- One of the most important public health problems associated with foodstuffs, resulting in millions of cases of human diseases annually.
- In 2007, over 200,000 reported confirmed cases of campylobacteriosis and over 150,000 cases of salmonellosis in the EU.
- Severity of zoonotic diseases can vary from mild gastrointestinal symptoms to acute renal failure, chronic debilitating diseases (such as Guillain-Barré syndrome), abortion & death.
- Official statistics on such diseases represent only the tip of the clinical iceberg.
- WHO Food-borne Disease Burden Epidemiology Reference Group (FERG)

Economic impact

- Enormous economic impact, in the form of increased costs for health care, loss of earnings and production, loss of market access, etc.
- The economic burden of food-borne zoonoses, such as campylobacteriosis and salmonellosis, is borne mainly by the affected food consumers and the health services, rather than by agriculture and the food industry.

Increasing risks

- Increased international travel and globalisation of the food and feed trade have increased the risk of rapid global spread of food-borne zoonoses.
- Changes in microorganisms and in human demographics and lifestyle have also increased the risk.
- Climate change may also result in an increase in such zoonoses.

Goals of veterinary education (1)

- **The education and training of veterinarians**, which includes both animal health and food hygiene components, **should prepare them to play a central role in ensuring food safety**, especially the safety of foods of animal origin.
- It should provide them with broad knowledge about the food-borne zoonoses of global importance and in-depth information about zoonoses of particular national and regional importance.
- Regardless of whether they intend to work in the public or private sector, their education and training should enable veterinarians to play a key role in the detection, investigation, prevention and control of food-borne zoonoses.

Goals of veterinary education (2)

- Main focus on measures to be taken during primary production and slaughter/harvesting, but it should be borne in mind that veterinarians often play an important role at later parts of the food chain, in industry, trade & the food safety authorities.
- Information on relevant policies, goals and strategies regarding zoonotic diseases, including programmes to combat the spread of such diseases.
- National legislation and recommendations related to food-borne zoonoses, including the role and responsibilities of the Veterinary Services, and also standards, codes of practice, recommendations, etc on food-borne zoonoses adopted by international organisations (esp. OIE, Codex, WHO, FAO)

Food-borne zoonotic hazards

- In view of the possibility of rapid global spread of zoonoses, veterinary education should give a good general coverage of the most important food-borne zoonoses of global importance.
- More in-depth information about zoonoses of particular national/regional importance.
- Both zoonoses transmitted to man from terrestrial animals and those transmitted from aquatic animals should be covered.
- Information about the occurrence, characteristics, routes of transmission, symptoms of human disease and infective dose and methods used to identify and eliminate or control zoonotic hazards.

Bacterial zoonotic hazards

- *Bacillus Anthracis*
- *Brucella* spp.
- *Campylobacter* spp.
- *Echinococcus Granulosus*
- *Listeria Monocytogenes*
- *Mycobacterium Bovis*
- *Salmonella* spp.
- Shiga-toxin-producing *Escherichia Coli* (STEC) (also called VTEC or EHEC)
- *Vibrio* spp.
- *Yersinia Enterocolitica*

Parasitic zoonotic agents, prions

Parasites

- *Clonorchis* spp.
- *Cryptosporidium* Parvum
- *Giardia* Intestinalis
- *Opisthorchis* spp.
- *Taenia* spp.
- *Toxoplasma* Gondii
- *Trichinella* Spiralis

Prions

- TSEs, in particular Bovine Spongiform Encephalopathy (BSE)

Pathways of transmission (1)

- Foodstuffs may become contaminated with zoonotic agents at many different points along the food chain from primary production to the final consumer .
- Food-producing animals may be infected already at birth and can also become infected by contact with other animals (including wildlife) and via contaminated feed, pasture and drinking water, animal housing, insects, etc.
- Fish and shellfish may become contaminated with such agents due to contamination of the aquatic environment and feed.

Pathways of transmission (2)

- Growing food plants (e.g. spinach and lettuce) and drinking water sources may become contaminated with zoonotic agents (e.g. STEC) from water contaminated with excreta from infected animals and the use of such water for crop irrigation.
- Animal feed is an important route for introducing *Salmonella*, BSE and other hazards into the food chain.
- Need for primary producers to take measures to reduce or eliminate the risk of contamination of feed with zoonotic agents and about the Codex, OIE and FAO recommendations on good animal feeding practices.

Antimicrobial resistance

- Use of antimicrobial agents in animal production may lead to the development of zoonotic agents that are resistant to the antimicrobials commonly used to treat human infections.
- Veterinary students should be taught about the importance of responsible and prudent use of antimicrobials in animal husbandry and the OIE recommendations on this subject.

Meat inspection

- Education about a modern risk-based approach to meat inspection, as outlined in the Codex Code of Hygienic Practice for Meat and the OIE Terrestrial Animal Health Code, are core components of veterinary education, as is practical experience on meat inspection in slaughterhouses.
- Students should be made aware of the dual function of *ante-* and *post-mortem* meat inspection, i.e. to ensure the safety and suitability of the meat for consumption and to provide information on animal health/diseases to be used as a basis for corrective measures in primary production.

Campylobacter & Salmonella

- Eradication or significant reduction of *Salmonella* Enteritidis, as well as other serovars of *Salmonella*, from flocks producing eggs or poultry meat through a guided policy for eradication from the top of the production pyramid.
- Poultry meat is a major vehicle for transmission of *Campylobacter* spp. and *Salmonella* spp.
- Veterinary students should be informed about the recommendations made and under development by relevant international organisations (e.g. OIE, CAC, WHO, FAO) to tackle this problem by applying measures along the whole of the food chain.

Inactivation/reduction of levels of zoonotic agents

- Veterinary education should include information on how different zoonotic agents can be inactivated or their levels in foodstuffs reduced to safe levels during food processing or preparation by heat treatment (e.g. pasteurisation), freezing, irradiation, chemical agents or the application of other techniques.

Investigating outbreaks of food-borne zoonoses (1)

- Veterinarians should be trained to play a key role, together with other professionals, in investigating and terminating such outbreaks and taking action to prevent further outbreaks.
- Many other professionals and organisations involved: importance of close cooperation and clear and rapid communication between all involved.
- Veterinarians should be taught how such investigations are best carried out and strengths and limitations of the epidemiological (e.g. case-control studies) and other methods used in such investigations and of the importance of animal identification and traceability.

Investigating outbreaks of food-borne zoonoses (2)

- Sensitive, specific and reliable analytical methods are a key factor in investigations of outbreaks of food-borne disease.
- Recent developments in analytical methodology, including advanced molecular testing techniques, e.g. “molecular fingerprinting”, which have opened up new possibilities to more specifically identify the causative organisms in persons affected by food-borne zoonoses and to identify the food(s) involved with greater certainty.

Modern approach to food safety

- Food safety and quality are best assured by an **integrated, multidisciplinary approach, considering the whole of the food production-to-consumption chain.**
- Eliminating or controlling zoonotic hazards at source, i.e. a **preventive approach**, is more effective in reducing or eliminating the risk of unwanted health effects than relying on control of the final product.
- **Evolution** of approaches to food safety, **from** traditional controls based on **best practices** (Good Agricultural Practice, Good Hygienic Practice, etc.), **via** more targeted food safety systems based on **hazard analysis and critical control points (HACCP)** **to** risk-based approaches using **risk analysis.**

Risk communication

- Food safety risk communication is an important component of food safety risk management.
- Veterinarians have an important role to play in informing the catering industry and the general public about potential problems associated with zoonotic agents in the foods they handle and about good hygienic practices in the kitchen (storage of perishable foods, adequate heating of certain foods, and how to avoid cross contamination, etc).

Keeping up-to-date

- Changes in microbiological populations can lead to evolution of new pathogens, development of new strains of “old” pathogens, development of antimicrobial resistance that can make a disease more difficult to treat and changes in the ability of pathogens to survive in adverse environmental conditions.
- Important that veterinarians receive information and guidance on sources of further information and how they can keep themselves abreast of developments in the field, including emerging and re-emerging food-borne zoonotic diseases.
- Developments in their own and neighbouring countries and international developments.

Sources of further information

Sources of information on food-borne zoonoses:

- OIE website (www.oie.int)
- Codex website (www.codexalimentarius.net)
- WHO website (www.who.int)
- FAO website (www.fao.org)
- US Centers for Disease Control and Prevention, CDC, (www.cdc.gov).
- European Food Safety Authority website (www.efsa.europa.eu)
- European Centre for Disease Prevention and Control (www.ecdc.europa.eu)