Epidemiology of Salmonellosis in Australia: surveillance of serovars and phage types from human and food animal sources.

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Summary: Data are presented on Salmonella in food animals in Australia, including pigs, cattle, sheep, broiler chickens and raw meats. These are compared with the most common types found in the human population. Questions are discussed regarding the importance of food animals versus other vehicles as sources of Salmonella in human infection.

Keywords: Pigs, cattle, sheep, chickens, raw meats

Introduction: The Australian Salmonella Reference Centre serotypes Salmonella isolates of both human and animal origin. Phage typing of the more common Salmonella serovars is also been performed. Laboratory-based surveillance data are presented. Long-term historical data can be extremely useful in following the epidemiology of salmonellosis.

Pigs: Data for pigs show a gradual shift in the more common serovars over the last 20 years. Salmonella serovars Typhimurium and Derby have remained common, while numbers of serovar Anatum have declined from 19.2% of isolates in 1981-1985 to 4.0% in 1996-2000. Serovar Bovismorbificans has become more common, increasing from 5.1% of isolates in 1981-1986 to 9.0% in 1996-2000. The overall number of isolates from pigs has declined over the years. Recent surveys of pig farms (Barton, 1998) and pig carcasses at abattoirs (Pointon, 2001) showed only 15 isolates from 1000 faeces samples, and 7 isolates from 680 carcasses respectively.

Cattle and sheep: Data for cattle show that while Salmonella serovar Dublin has traditionally been the most common serovar, this has been replaced in recent years by serovar Bovismorbificans, which has increased to 28.5% of isolates in 1996-2000 from 2.1% in 1981-1985. Serovars Typhimurium and Anatum have also
consistently been among the most frequently isolated serovars from cattle. As for pigs, the overall number of isolations from cattle has declined over the years. Data for sheep also show serovars Typhimurium and Bovismorbificans as the most common.

A phage typing scheme for serovar Bovismorbificans was developed in our laboratory in 1982. Data since that time show that phage type 32 has emerged as the major phage type in cattle in recent years, while phage type 7 has declined. Phage types 13 and 14 have remained at similar levels over the years. Phage type 32 is uncommon in sheep and pigs and rarely seen in chickens.

**Chickens:** Data from chickens is derived from monitoring of broiler flocks. *Salmonella* subspecies II Sofia first appeared in chickens in Australia in the early 1980s. It spread rapidly and quickly became the most common serovar isolated from chickens, reaching levels of 50-60% of all isolates. However, this change has not been reflected in the human population, where infections with subspecies II Sofia have remained at negligible levels. Serovar Typhimurium is also prevalent in chickens.

**Raw red meats:** In raw meats, serovar Anatum has declined in frequency, as has been the case for cattle. Serovars Chester, Derby, Typhimurium and Bovismorbificans have been the most commonly isolated serovars in recent years. Overall levels of contamination of raw meats are low. Of raw red meats tested at the IMVS for the three years 1998-2000, there were 7 *Salmonella* isolates from 1,147 samples (approximately 0.6%).

**Humans:** Serovars Typhimurium, Virchow and Saintpaul have consistently been among the most common isolates from humans over the years. Isolates of serovar Enteritidis have slowly increased in recent years, many of these having been acquired by travellers overseas. However serovar Enteritidis is rarely isolated from non-human sources in Australia, and in general does not occur in food animals. Serovar Typhimurium is widespread in Australia, as in most countries world-wide, and has consistently been among the most common serovars from all food animal sources as well as humans. The most common phage types of serovar Typhimurium in humans in recent years have been 135, 9 and 64. Phage types 135 and 9 are common both in cattle and chickens, while phage type 64 is seen mainly in chickens. The epidemic DT104 is not seen in Australia.

Serovars Virchow and Saintpaul have consistently been among the more common isolates in human infection for many years. However their numbers are either very low or absent from the data for food animals and raw meats. While serovar Virchow occurs in all Australian states, much of the burden of infection is in the
tropical northern areas of the state of Queensland. Surveys of wildlife in north Queensland have indicated that serovar Virchow is frequently present in macropods. (Thomas et al, 2001).

Data from other countries also often shows inconsistencies between the serovars which are common in food animals and humans. For example, recent data published by the Veterinary Laboratories Agency in the UK shows that with the exception of Typhimurium, serovars which are common in livestock do not cause significant amounts of human disease. The converse is also the case, namely that serovars common in human disease are not prevalent in livestock.

**Discussion:** It is clear that the relationship between humans and food animals as sources of *Salmonella* is far from simple and that other explanations must be sought for the prevalence of those serovars which are common in human infection but uncommon or absent in food animals. An explanation must also be sought for the fact that while levels of *Salmonella* in food animals have in many cases decreased, there has been little or no corresponding change in the level of human infection. *Salmonella* is widely disseminated in the environment, allowing diverse means by which the organism can enter the human food chain. Sources to which outbreaks of human salmonellosis in Australia have been traced in recent years have included fruits and vegetables, peanut butter and orange juice. Reports from other countries show a similar trend.

**Conclusion:** Improvements in the management of livestock are able to reduce the burden of *Salmonella* in these animals, with a consequent improvement in the quality of meats for human consumption. However, it is apparent that *Salmonella* is widely spread in the environment and other sources of contamination of human food are becoming increasingly important.

**References:**

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Pointon, A., 2001, South Australian Research and Development Institute, personal communication.