

## IDENTIFICATION OF *SALMONELLA* SEROTYPES ISOLATED FROM MEAT SAMPLES IN MALAYSIA

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**ABSTRACT.** This study reports the identification of *Salmonella* serotypes in meat samples submitted to the Veterinary Research Institute (VRI) for diagnosis. A total of 425 *Salmonella* isolates were received from the Veterinary Public Health Laboratory and Regional Veterinary Laboratories, Malaysia from January to December 2009. All were serotyped for *Salmonella* serotypes using Kauffmann-White classification scheme. Out of the total, 31 different serotypes were identified from buffalo, beef, poultry and pork meat. The dominant serotypes identified were *S. Typhimurium* (12.7%), followed by *S. Enteritidis* (12.5%), *S. Corvallis* (11.6%), *S. Senftenberg* (11.1%) and *S. Indiana* (8.1%). Other *Salmonella* serotypes isolated included *S. Typhi-Suis*, *S. Weltevreden*, *S. Albany*, *S. Agona* and *S. London*. In poultry meat, *S. Enteritidis* (23.3%), *S. Corvallis* (21.8%), *S. Indiana* (15.9%) and *S. Typhimurium* (13.4%) were the common serotypes isolated. *Salmonella* Senftenberg (35%) was the most common *Salmonella* serotype identified in buffalo meat whereas, *Salmonella* Senftenberg (17.3%) and *S. Agona* (17.3%) were most commonly isolated from beef. *Salmonella* Typhi-Suis (51.2%) was mostly identified

in pork followed by *S. Typhimurium* (34.1%), *S. Weltevreden* (7.3%) and *S. Corvallis* (4.9%). Results of the present study indicated that the *Salmonella* species were commonly found in beef, pork, buffalo and poultry meat samples from retail plants in Malaysia. Therefore, it is highly recommended to adopt proper personal and meat hygiene procedures in the meat production line to ensure that meat and meat products are safe for human consumption.

*Keywords:* *Salmonella* serotypes, buffalo, beef, pork, poultry meat

### INTRODUCTION

Salmonellosis is caused by two species of *Salmonella* (*Salmonella* enteric and *Salmonella* Bongori) and is considered as one of the most important food-borne zoonoses of public health importance. The disease which is most prevalent in areas of animal husbandry can also affect all species of domestic animals. Salmonellosis is commonly associated with the consumption of contaminated food products such as poultry, beef, pork and eggs. Direct contact with the infected animals may also serve as a source for

*Salmonella* infection (Mead, 1999; Tauxe, 1991 and Benenson *et al.*, 1995). Many animals, especially poultry and pigs, maybe infected with the disease but may not show any clinical sign. These animals may spread the infection between flocks and herds thus entering the food chain, causing food poisoning in humans. In the livestock industry, it may cause losses due to deaths of young animals, abortions and decrease in milk, meat and egg production (Houston, 1984). Reports from Malaysia showed that since 1993, more than 30% of salmonellosis in human cases were due *S. Enteritidis* infections (Mokhtar, 1996). Therefore, the identification of *Salmonella* serotypes is important to understand the distribution and means of introduction of the disease into a country. This study reports the distribution of *Salmonella* serotypes from meat samples in Malaysia.

## MATERIALS AND METHODS

### *Salmonella* isolates

A total of 425 *Salmonella* isolates were received by VRI from various Regional Veterinary Laboratories and Veterinary Public Health Laboratory (VPHL) between January to December 2009. These isolates were isolated from 38 retail plants in the states of Selangor, Kedah, Perak, Johor and Sarawak. The isolates were confirmed biochemically as *Salmonella* species at the Regional Veterinary Laboratories and submitted to the Veterinary Research

Institute (VRI) on nutrient agar slant for serotyping.

### *Salmonella* serotyping

*Salmonella* serotyping was conducted according to the Kauffmann-White classification scheme using a battery of somatic and flagellar antisera. (OIE Terrestrial Manual, 2008)

## RESULTS

A total of 425 samples received from 38 retail plants between January to December 2009 were identified. Of these, 31 different serotypes were identified from buffalo, beef, poultry and pork meat using the Kauffmann-White classification scheme. The predominant serotypes identified were *S. Typhimurium* (12.7%), *S. Enteritidis* (12.5%), *S. Corvallis* (11.6%), *S. Senftenberg* (11.1%), *S. Indiana* (8.1%), *Salmonella* Thyphi-suis, *S. Weltevreden*, *S. Albany*, *S. London* and *S. Agona*. Poultry meat samples formed the highest number (56%) of samples received, followed by buffalo meat (23.0%), beef (11.6%) and pork (9.4%). *Salmonella* Typhimurium, was most commonly isolated from pork (34.1%), followed by poultry meat (11.3%), beef (6.4%) and buffalo meat (6.1%).

In poultry meat, *S. Enteritidis* (23.3%) and *S. Corvallis* (21.8%) were the most common serotypes isolated, followed by *S. Indiana* (15.9%), *S. Typhimurium* (13.4%) and *S. Albany* (11.6%) (see Figure 1).

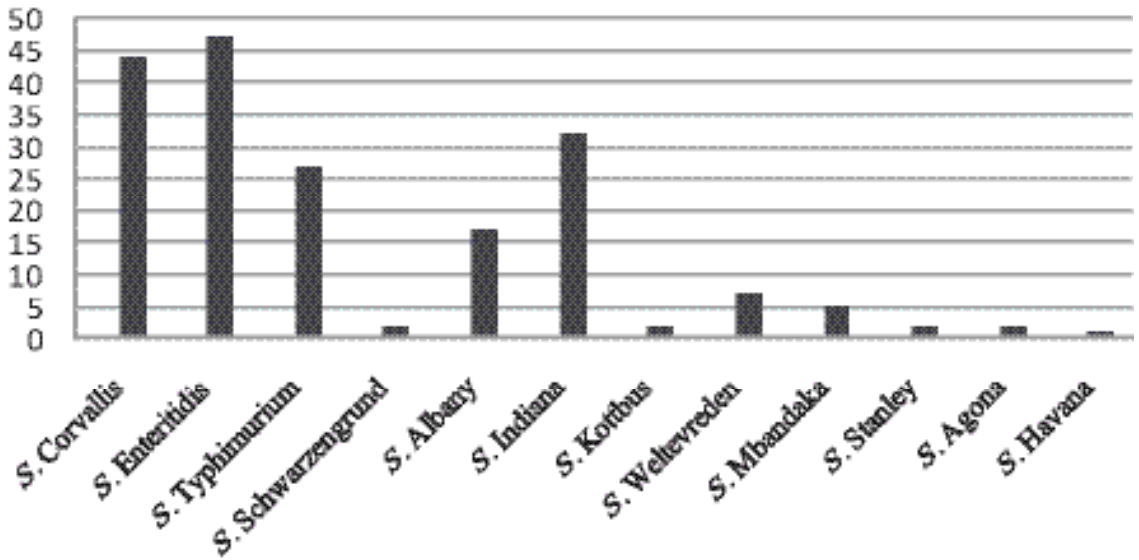


FIGURE 1. *Salmonella* serotypes identified in poultry meat

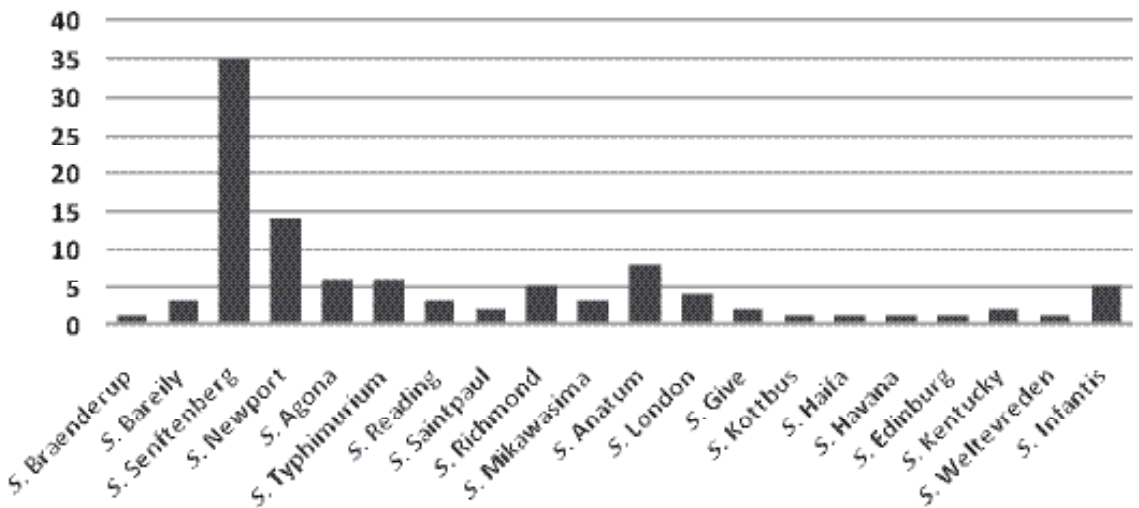


FIGURE 2. *Salmonella* serotypes identified in buffalo meat

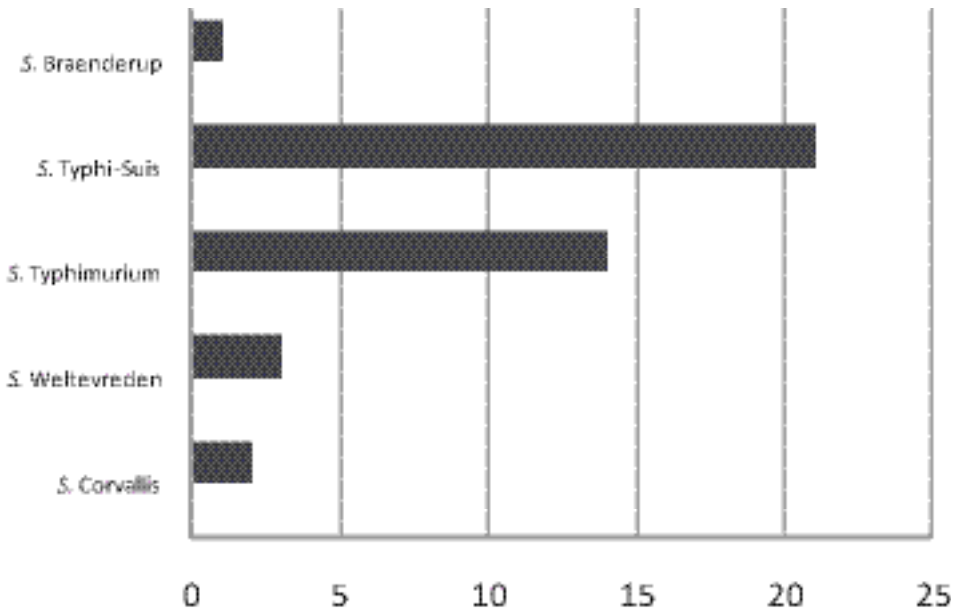


FIGURE 3. *Salmonella* serotypes identified in pork

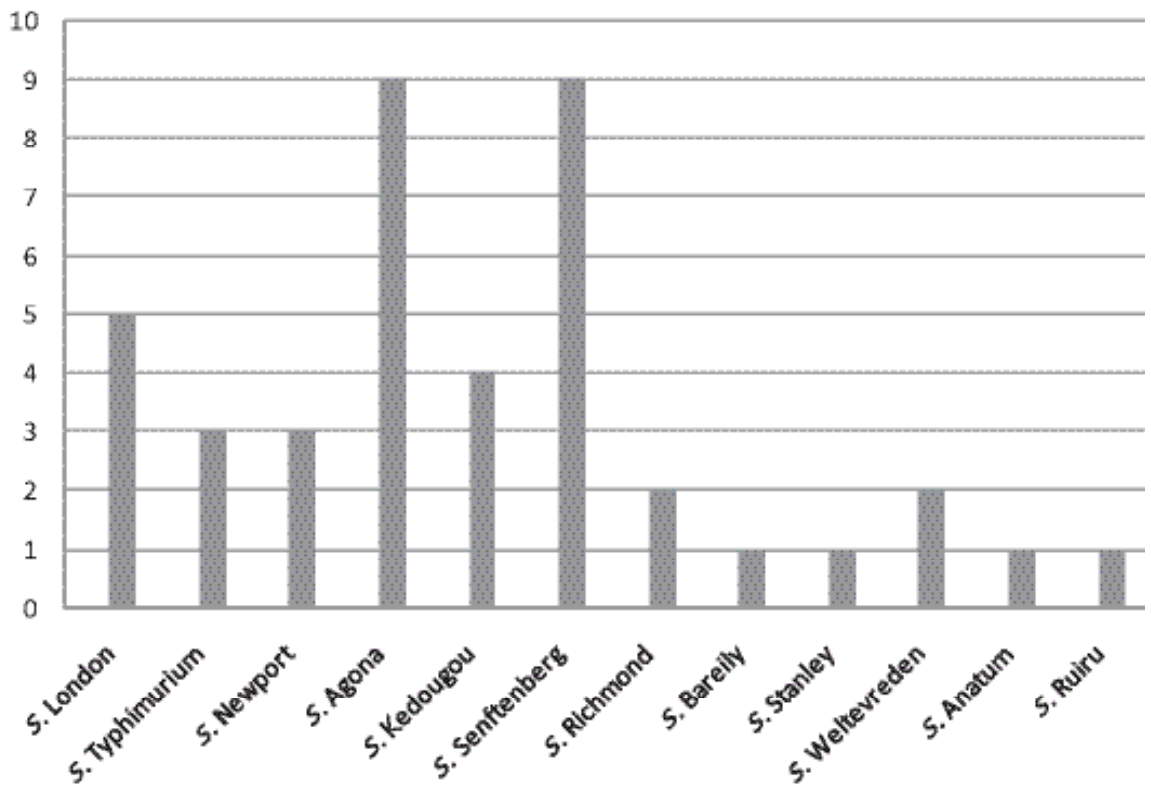


FIGURE 4. *Salmonella* serotypes identified in beef

*Salmonella* Senftenberg was the commonest *Salmonella* serotype identified in buffalo meat (35%) followed by *S. Newport* (14.4%), *S. Anatum* and *S. Typhimurium* (see Figure 2). *Salmonella* Senftenberg (17.3%) and *S. Agona* (17.3%) were most commonly isolated from beef (see Figure 4) while *S. Typhi-Suis* (51.2%), *S. Typhimurium* (5.8%) and *S. Weltevreden* (1.9%) were the most identified serotypes in pork (see Figure 3). *Salmonella* Typhi-Suis was isolated only from pork, while *S. Enteritidis* only from poultry samples.

## DISCUSSION

Isolation of the various serotypes of *Salmonella* in meat samples from retail plants indicated the presence and widespread distribution of *Salmonella* originating from animals, which is significant in the veterinary and public health sectors in this country. Analysis of the *Salmonella* serotypes isolated showed that various *Salmonella* serotypes found in various meat samples, which could potentially be acquired by humans through ingestion of contaminated food and food products. This study showed that *Salmonella* Typhimurium and *S. Enteritidis* were the most frequently identified serotypes from meat samples. In Malaysia, previous study showed that *Salmonella* Enteritidis, *Salmonella* Agona, *Salmonella* Weltevreden, *Salmonella* Typhimurium and typhoidal *Salmonella* (*Salmonella* ser. Paratyphi B and *Salmonella* ser. Typhi) were the most common strains that were

isolated either from environment, food or clinical samples (Yasin *et al.*, 1995; Lee *et al.*, 1998 and Bakeri *et al.*, 2003). Previous study showed that *S. Typhimurium* was 4.8% isolated from meat and meat products in year 1996 to 2001, but increased tremendously to 12.7% by year 2009. The study also showed that more than 70% of all *Salmonella* cases in poultry meat was due to *S. Blockley* (Zaliha, 1993), but in this recent study the most frequently identified serotype in poultry meat was *S. Enteritidis*. This pattern could be due to the increase in consumption of poultry meat and meat products nowadays. For beef and buffalo meats, the most commonly identified serotypes was *S. Senftenberg* which was different from previous findings where *S. Weltevreden* was most frequently isolated (Zaliha, 1993). Based on several reports, *S. Typhimurium* and *S. Enteritidis* will remain the most frequently isolated serotypes from animal and livestock products in the future (Rohaiza, 2005).

*Salmonella* infection of food animals play an important role in public health particularly in food safety, as food products of animal origin are considered to be the major source of human salmonellosis. Therefore, increased isolation of pathogenic *Salmonella* serotypes from meats should be a concern to health and veterinary personnels. The available evidence on the prevalence of *Salmonella* in meat and meat products is used as an indicator for the control of *Salmonella* into the food chain. The use of HACCP (Hazard Analysis Critical Control Point) for the

reduction of *Salmonella* in other livestock products play an important role, where all producers will be made responsible for the production of high quality and safe food. On the other hand, public health education about the infection must be involved to gain awareness of consumers about food safety and hygiene. Further research and information is needed to examine the association between humans and the isolates in view of the potential transfer of pathogenic strains from animals to man. In addition, the identification of pathogenic and invasive *Salmonella* strains could be important in the future to be used as markers in epidemiological studies of Salmonellosis (Bayleyegn, *et al.*, 2003) in meat and meat products in Malaysia.

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