SALMONELLA SEROTYPES FROM 1997-2003 NARMS SWINE DIAGNOSTIC, ON-FARM, AND SLAUGHTER SAMPLES

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Abstract The veterinary component of the National Antimicorbial Resistance Monitoring System (NARMS) identified 8527 *Salmonella* isolates from swine samples in the years 1997-2003. Fifty-one *Salmonella* serotypes were identified from 3147 diagnostic, 2138 on-farm, and 3246 slaughter samples. The most frequently identified serotypes were Derby, Typhimurium var. Copehnagen, Typhimurium, Heidelberg, Infantis, Anatum, Johannesburg, and Agona. The top three serotypes from each sample type were as follows: Diagnostic; Cholera-suis (28.6%), Typhimurium var. Copenhagen (18.0%), Derby (9.5%); On-farm; Derby (18.5%), Agona (16.7%), Typhimurium var. Copenhagen (7.7%); Slaughter; Derby (25.4%), Typhimurium var. Copenhagen (10.6%), Johannesburg (6.7%). Six serotypes (Derby, Typhimurium var Copenhagen, Typhimurium, Heidelberg, Anatum, Agona) were found among top serotypes from each sample type. *S*. Cholera-suis was found primarily in diagnostic samples, and *S*. Johannesburg and Schwarzengrund were found primarily in slaughter samples. Only two of the top five slaughter isolates, Typhimurium and Infantis, were also seen on the 2002 CDC top 10 list of human isolates.

Introduction The National Antimicrobial Resistance Monitoring System (NARMS) was established in 1996 by the Food and Drug Administration (FDA), the United States Department of Agriculture (USDA), and the Centers for Disease Control and Prevention (CDC) to monitor changes in antimicrobial susceptibilities of zoonotic pathogens from humans and animal diagnostic specimens, from healthy farm animals, and from raw product collected from federally inspected slaughter and processing plants. Non-typhoid *Salmonella* were selected as the sentinel organism and have been continuously tested for since 1997. This paper focuses on the serotype distribution of *Salmonella* which have been identified from all veterinary swine samples collected by the NARMS program from 1997-2003.

Materials and Methods On-farm samples collected by USDA, APHIS or in special projects by USDA, ARS scientits and shipped to USDA, ARS in Athens, GA for cultural analysis in 1997, 1999, and 2000. Slaughter samples were collected and cultured by, USDA, FSIS, and diagnostic samples were collected and cultured by state veterinary laboratories around the U.S or the USDA, APHIS, National Veterinary Services Laboratory (NVSL). Slaughter and diagnostic were collected in all years and isolates shipped to USDA, ARS in Athens, GA. All *Salmonella* isolates were serotyped at the NVSL in Ames, IA.

Results A broad representation of the *Salmonella* population is the U.S. swine industry is seen in the 8527 *Salmonella* from diagnostic, on-farm, and slaughter swine samples from the years 1997-2003. Isolates from 3147 diagnostic, 2138 on-farm, and 3246 slaughter samples yielded a total of 51 different serotypes. The eight most frequently identified serotypes of *Salmonella* were Derby, Typhimurium var. Copehnagen, Typhimurium, Heidelberg, Infantis, Anatum, Johannesburg, and Agona.

The top three *Salmonella* serotypes from each sample type were as follows: Diagnostic; Cholera-suis (28.6%), Typhimurium var. Copenhagen (18.0%), Derby (9.5%); On-farm; Derby (18.5%), Agona (16.7%), Typhimurium var. Copenhagen (7.7%); Slaughter; Derby (25.4%), Typhimurium var. Copenhagen (10.6%), Johannesburg (6.7%). Six serotypes (Derby, Typhimurium var Copenhagen, Typhimurium, Heidelberg, Anatum, Agona) were found in the top ten serotypes from each sample type.

Salmonella Cholera-suis was the most frequent (28.6%) serotype from diagnostic samples, and interestingly was not seen in on-farm samples and in only 2.1% of slaughter samples. *S*. Derby was by far the most frequent *Salmonella* seen for all sample types. In 1997 and 2003 there were about equal numbers of *S*. Derby seen in slaughter and diagnostic samples, but in 1998-

2002 there were about 4 times more *S.* Derby in slaughter compared to diagnostic samples. In the last 3 years of this study, 2001-2003, the percentage of diagnostic isolates of *S.* Typhimurium var. Copenhagen, *S.* Typhimurium, and *S.* Agona more than doubled the number of slaughter isolates compared to previous years when the numbers in each category was about the same. *Salmonella* Johannesburg was found primarily (90.8%) in slaughter samples from 1998 to 2003.

Discussion There are approximately 2,400 known serotypes of *Salmonella* found in animals and the environment. *Salmonella* in swine must be viewed as two separate problems. First, certain serotypes of *Salmonella* can cause a disease of swine characterized by a septicemia with pneumonia and or diarrhea as a clinical sign. The second issue is the contamination of pork carcasses and retail products with the potential of causing a food-borne salmonellosis in people.

Historically, *S.* Cholera-suis has been known as the swine type strain responsible for the majority of *Salmonella* caused disease in swine. Our study confirmed that from diagnostic samples that *S.* Cholera-suis was the predominate serotype (28.6%) identified with *S.* Typhimurium var. copenhagen (18%) also present in a significant number of samples. It is noteworthy that by far the most frequent serotypes of *Salmonella* found in slaughter samples, *S.* Derby (25.4%) and *S.* Typhimurium var. Copenhagen (10.6%) were not seen in the CDC list of 10 most frequent serotypes from human isolates in 2002.

Conclusion Before any conclusions can be drawn from serotype survey data, it is critical to know the source of samples and to assure that an adequate number of representative samples are evaluated and compared. The *Salmonella* isolates from these studies serve as the source for antimicrobial resistance and phage type testing for the NARMS database.

POSTER PRESENTATIONS