Presence of Salmonella spp. in pork in Central region of Russia from 2005 to 2008

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Abstract

Pathological material samples from diseased pigs from the Vladimirskaya, Moskovskaya and Nizhegorodskaya Oblas and from pork products delivered into this region from local premises and establishments as well as from other Oblas and foreign countries were tested for Salmonella spp bacteria during 2005 – 2008.

All in all 1,255 pathological material samples, 6,363 fresh and frozen meat samples, 3,856 by-product samples, 520 samples of raw fat and faeces were tested.

Samples were delivered to the Laboratory during 1-3 hours after their collection. Analysis was conducted according to the Sanitary Rules of the RF (SR 1.2.036-95) and ISO 6579:2002: Microbiology of food and animal feeding stuffs-Horizontal method for the detection of Salmonella spp. Samples were then inoculated into enrichment media, brilliant green agar and xylose lysine desoxycholate agar.

As a result 141 samples (11,2%) of pathological material were salmonella positive. Salmonella isolates were serotyped and it was determined that they belonged to S. choleraesuis (105 isolates), S. typhimurium (33 isolates), S. heidelberg (2 isolates), S. derby (1 isolate) serovars.

582 samples (5,7%) of fresh and frozen meat and by-products were salmonella positive. Isolated salmonellas belonged to S. choleraesuis, S. typhimurium, S. salinatis, S. kisangani, S. saintpaul serovars.

S. typhimurium, S. harrisonburd, S. westhampton, S. ndolo were isolated from 22 samples (4,2%) of raw fat and faeces.

The results indicated relatively low prevalence of this pathogen in pork product.

Introduction

Salmonellosis occurs throughout the whole world. It is one of the most widespread anthropozoonosis circulating in the developed countries including Russia.

As for farm animals, salmonellosis mostly affects the young stock. Salmonellosis causes septicemia and gastroenteritis, acute and chronic phases are characterized by pneumonia and arthritis. Salmonella causes food toxicoinfection in people when they consume infected food products of animal origin.

Food products may be infected at any stage of production. Pork together with eggs and poultry meat is considered to be the main source of food salmonellosis (Golubeva, I.V., 1985).

Bacteriological analysis with the following identification of serovariants of the detected bacteria is the main method used for detection of Salmonella bacteria. Salmonellosis in swine is annually reported in the territory of the Russian Federation. 508 Salmonellosis-affected areas have been identified for last three years (2005-2008).

Our purpose is to determine prevalence of Salmonella serovars both in pig farms and in pork products in the central region of the Russian Federation.

Materials and methods

Laboratory tests were carried out in the Laboratory for Diagnosis of Animal Bacterial Infections in the FGI “Federal Centre for Animal Health”. Samples of pathological material were taken from affected pigs on the farms of the Vladimirskaya, Moskovskaya and Nizhegorodskaya Oblas, whereas pork products were brought to the region from both local farms and plants and from other oblas and foreign countries.
Blood, parenchymal organs (spleen, liver, lung) and lymph glands were taken from the diseased pigs as pathological material and used for bacteriological research. Test materials were taken within two hours after death, abortion or emergency slaughter. The tested material was delivered to the laboratory with all necessary precautions excluding the disease agent distribution.

Samples of pork products (6,363 samples of raw and frozen meat, 3,856 samples of offal, 520 samples of raw tallow and fatback) were delivered to the laboratory within 1-3 hours after being taken. The samples were analyzed according to the sanitary rules of the RF (SP 1.2.036-95) and ISO 6579:2002: Microbiology of food and animal feeding stuffs—Horizontal method for detection of Salmonella spp. The samples were seeded in enrichment medium, brilliant green agar and xylose lysine deoxycholate agar. Primary seed was incubated at 37°C for 24 hours. Morphological and biochemical properties of the colonies typical for Salmonella spp. were tested for compliance with Salmonella spp. Mobility of salmonella was determined during seeding the culture by injection into semi-liquid agar (0.2% agar-agar).

Agglutination test on the glass slides was performed for serological identification of the detected Salmonella bacteria. Polyvalent and monoreceptor hyperimmune sera specific to Salmonella bacteria and produced by the Federal State Unitary Enterprise "St. Petersburg Scientific-Research Institute of Vaccines and Sera" were used for this purpose. 0.85% isotonic solution of sodium chloride was used for diluting the sera.

Results

141 Salmonella isolates, i.e. 11.2% of the total number of samples, were isolated when testing 1,255 samples of pathological material from swine of different age.

These were gram-negative bacilli of 2-4 μm long and 0.5 μm wide. They had cilia, were mobile and grew well in nutrient media at the temperature of 37°C. The growth was noted 18-20 hours after incubation. When salmonella grew in meat-peptone broth, first turbidity and then sedimentation was observed at the bottom of the tube, film and wall ring were observed on the surface. Accumulation medium with brilliant green changed its colour due to salmonella growth. Endoclonies of salmonella in the medium were transparent, sometimes pinkish. Salmonella formed black colonies with typical metallic luster in xylose lysine deoxycholate agar, at the same time the medium area under the colonies was also black.

In case typical or suspicious colonies were observed, morphological and biochemical properties of the bacteria were studied. Colonies, which were suspected to be salmonella, were reseeded in meat-peptone agar, incubated at 37°C for 18-20 hours, then serovar identification using agglutination test was performed.

According to the figure Salmonella isolates isolated from the pathological material belonged to serovars S. choleraesuis (105 isolates), S typhimurium (53 isolates), S. heidelberg (2 isolates), S. derby (1 isolate).

68.5% of the isolates S. choleraesuis (72 isolates) were isolated from the lymph glands and spleen, 30.5% (32 isolates) – from spleen and liver, 1% (1 isolate) – from a lung. All the isolates were pathogenic for laboratory animals. Isolates S typhimurium in 78% of cases were detected from parenchymal organs (lymph glands, spleen, liver). S. choleraesuis, S typhimurium, S. salinatis, S. kisangani, S. saintpaul were isolated from samples of fresh, frozen meat and offal. Salmonella detected in the samples of raw tallow and fat back belonged to the following serovars: S typhimurium, S. harrisonburg, S. westhampton и S. ndolo.
Fig. 1. Salmonella serovar variants isolated from the pathological material and pork product samples in the RF territory during the period from 2005 up to 2008.

Discussion

Results of the bacteriological testing demonstrated significant prevalence of Salmonella serovars in the Russian Federation. Isolation of S. choleraesuis (10.4%), S. typhimurium (4.1%) serovars both from pathological materials and pork product samples is due to the fact that these serovar variants are the main agents of salmonellosis in pigs (Garayev I.M., 1996; Bager et al., 1991). The majority of salmonella isolates (68 – 78%) were detected in lymph nodes, which is consistent with the data from other reporters (Barco et al. 2007; Nollet et al., 2005) about the preferability of the bacteria isolation from lymph nodes on a sick animal.

Conclusion

The obtained results suggest the following conclusions:
- the most prevalent in the central region of the Russian Federation are the following salmonella serovar variants: S. choleraesuis and S typhimurium;
- detection of these isolates in pork product samples testifies that the pork was supplied from salmonellosis infected farms rather than it was infected during the animal slaughter;
- bacteriological analysis of lymph nodes is the most sensitive test for salmonella detection in pathological material.

References