

## SEROPREVALENCE OF SALMONELLA SPP. ON IMPORT BOARS FROM DENMARK TO SERBIA

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### Abstract

The sera from 120 boars from 3 farrow-to-finish swine herds in Serbia were examined for *Salmonella* spp. antibodies in a cross-sectional study using an ELISA test. A total of 120 blood serum samples from boars imported from Denmark were examined. All boars were seronegative to *Salmonella* during the import, while after one year *Salmonella* spp. seroprevalence ranging from 0% to 45% was found in 3 herds using two tests in the time span of one year. Only on one farm during the import in 2011, after a year boars were still seronegative. A year later on the same farm, in boars imported in 2012 the seroprevalence was 30%. Seroprevalence of *Salmonella* spp. in boars tested on all farms was 24,17%.

**Key words:** boar, seroprevalence, *Salmonella*, import

### Kratak sadržaj

Serumi od 120 nerastova iz tri farme u Srbiji sa zatvorenim ciklusom proizvodnje su ispitani na prisustvo antitela specifičnih za *Salmonella* spp. metodom ELISA testa. Svih 120 krvnih seruma je ispitivano od nerastova uveženih iz Danske. Svi nerastovi su bili seronegativni prilikom uvoza, dok godinu dana kasnije seroprevalenca *Salmonella* spp. se kretala od 0 do 45% u tri ispitivana zapata u dva navrata ispitivanja u period od godinu dana. Samo na jednoj farmi nerastovi uveženi 2011. godine su bili seronegativni i posle godinu dana. Na istoj farmi nerastovi uveženi 2012. godine posle godinu dana su imali seroprevalencu od 30%. Seroprevalenca *Salmonella* spp. kod svih uveženih nerastova na svim farmama je bila 24,17%.

**Ključne reči:** nerast, seroprevalenca, *Salmonella*, uvoz

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## INTRODUCTION

*Salmonella* spp. does not normally cause clinical disease, but subclinical *Salmonella* spp. infections constitute an important food safety problem throughout the world (Kranker et al., 2003). *Salmonella* spp. transmission in swine herds is a significant health and hygiene issue concerning public health and food safety. The major source of *Salmonella* contamination in pork is fattening the pigs from latently infected herds (Beloeil et al., 2004). In spite of the widely acknowledged value of controlling *Salmonella* in the live animal reservoir, and copious research endeavors, there is still much to learn about the control of *Salmonella* pre-harvest, as well as discerning the most cost-effective approaches to approaching control in the pork chain (Gorton et al., 2000). *Salmonella* IgG antibodies have been demonstrated in blood serum from boars using commercial kits, because these antibodies persist long after the infection (Šišak et al., 2011). The presence of antibodies indicates that the pigs were exposed to the enteric pathogen in a period of development, but on the other hand, the time needed for seroconversion suggests that pigs are carriers of *Salmonella* while still seronegative, and also different immune responses can affect the serological tests (Boyen et al., 2008).

Import of boars to Serbia occurs regularly in recent decades. When importing boars from breeding stock and/or countries free of certain diseases, there is a chance to confirm the presence of latent infections by certain diseases. The objectives of this study were to: examine *Salmonella* seroprevalence in boars from 3 farrow-to-finish herds, imported from Denmark. Boars were imported twice, in 2011 and 2012.

## MATERIAL AND METHODS

**Selection of herds.** Three Serbian farrow-to-finish swine herds with a capacity of 2000 sows, with an intensive way of keeping the pigs were selected for the study. Each farm imported 20 boars from Denmark in 2011 and 2012. Boars spent 30 days in quarantine, and after that were forwarded for exploitation. All the boars had tags on their ears and a tattooed number. Artificial insemination has been performed on examined farms.

**Sampling and laboratory analysis.** Before leaving the quarantine (within 5 days from the due date), blood samples were taken from all boars for testing. After a year, blood samples were again taken from the same boars. Blood was taken by the puncture of the brachiocephalic plexus of the boars. A blood serum sample from each boar was frozen, and blood serum (harvested after

thawing) was examined for specific anti-bodies against *Salmonella* spp. using an indirect ELISA. Samples with an OD% > 10 were considered seropositive.

**Data analysis.** Data were entered into an Excel spreadsheet (Microsoft Excel 2010) and imported into Stata (Stata 8 Intercooled for Windows 9x) in which data were analyzed. Descriptive analysis was done in MiniTab version 14 (MiniTabR14b) and Excel (Microsoft Excel 2010).

## RESULTS

Table 1. shows the prevalence estimates provided by blood serum sample collected from boars imported from Denmark. The sera from 120 boars, originating from 3 different farrow-to-finish herds, were examined by ELISA test for the presence of *Salmonella* antibodies.

Table 1. *Salmonella* spp. prevalence estimates provided by blood serum sample collected from boars imported from Denmark

Farm	Year	Number tested	Number positive (in quarantine)	Number positive (after year)	Prevalence estimates (%)
I	2011	20	0	4	20
	2012	20	0	3	15
II	2011	20	0	0	0
	2012	20	0	6	30
III	2011	20	0	7	35
	2012	20	0	9	45
Total		120	0	29	24.17

After the import, boars were placed in quarantine. After a period of resting from transport, within 5 days from the due date, blood samples were taken from boars for serological testing. All of the tested blood serum samples taken from boars during the quarantine in 2011 and 2012 were negative for the presence of antibodies specific for *Salmonella* (Table 1).

A year after the first blood sampling for serological testing, blood serum samples were taken again from the same boars.

In farm 1, *Salmonella* spp. seroprevalence in the boars was 20% (4/20) and 15% (3/20) in 2011 and 2012, respectively.

In farm 2, the blood serum sample from boars was negative in 2011. In 2012, the blood serum sample was positive in 30% (6/20).

In farm 3, Seroprevalence in the boars was 35% (7/20) and 45% (9/20) in 2011 and 2012, respectively.

## DISCUSSION

This study provided a unique opportunity to compare serological status of boars prior to arrival and after spending a year in Serbia. All boars were seronegative upon arrival to Serbia. Boars were located on three different farms, where after a year their serological status should represent an indicator of *Salmonella* spp. presence on monitored farms. After one year from import of 60 boars in 2011, 11 boars were found seropositive, whereas on one farm they were all seronegative. The farm where all boars were seronegative after one year, conducted high-level biosecurity measures during that year, boars were kept in a separate building, had no contact with other animals, as well as people who worked with them. After one year from import of boars in 2012, on the same farm there was 6/20 seropositive boars. On the farm during this period isolated *Salmonella* from feed and as a result of the findings of six seropositive boars. Feed as a source of infection for pigs and the prevalence of *Salmonella* in feed have been investigated by Molla et al., 2010. While the other two investigated farms had not high levels of biosecurity measures. According to the literature data, herd seroprevalence rates for *Salmonella* are 93% in Germany, 59% in Denmark, 79% in Greece and 72% in Sweden, evaluated at test cut-off of OD%>10, and herd cut-off of 1 or more seropositive animals. The average rate within herd seroprevalence was 24% for Germany, 9% for Denmark, 14% for Greece and 10% for Sweden (Lo Fo Wong, 2001). Our study found higher seroprevalence in 5/6 herds; interestingly, the same herd that was seronegative became positive in the next year. The average seroprevalence within herd was 24.17, which is also a higher level compared to research results of other authors (Nowak et. al., 2007; Bonde and Sørensen 2012).

## CONCLUSION

Based on the results the survey to be concluded that in Serbia there is a high seroprevalence of *Salmonella*. This suggests the necessity of more intensive implementation of biosecurity measures on farms, as well as control of feed for pigs, which can be a potential source of various infections. The high seroprevalence of *Salmonella* in pigs Serbia is a potential risk of contamination of the meat, and therefore infection in human.

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