

MONITORING OF FORAMEN OVALE PATENS IN DIFFERENT LINES OF FOUR FATTENING PIG BREEDS

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The occurrence of foramen ovale patens was investigated in four different meat-type pig breeds: Slovak White Improved (WI), Landrace (LA), Slovak meat-type (SM) and a crossbreed of Pietrain x Slovak meat-type (PN x SM) at the Station for Research and Meat Quality Evaluation. The highest incidence of foramen ovale patens (FOP) cases was recorded in the SM breed (13.7 %) and the least in the LA breed (10.5 %). Two sizes of the openings were registered (2 and 3 mm diameter). Only the 2 mm size gap was observed in the PN x SM crossbreed. This defect was observed in all sisklines of WI, all four lines of LA and all three lines of SM and PNxSM.

No case of FOP was found in the Pietrain (PN breed). Only 2 mm size gaps were found in the crossbreed PN x SM. Therefore it is important to look for a rise of this heart defect in crossbreed lines of these two breeds.

Key words: pigs, foramen ovale patens, breed, line

INTRODUCTION

The *foramen ovale patens* (FOP) is an interatrial communication that permits blood from the inferior *vena cava* to freely enter the left atrium *in utero*. Anatomically, a thick muscular ridge, the limbus of the *fossa ovalis*, borders the *foramen ovale*. A thin tissue flap on the left atrial side of the septum, which represents an embryological remnant of the *septum primum*, forms the valve of the *fossa ovalis*. At birth, the left atrial pressure exceeds the right atrial pressure and forces the valve against the limbus, thus achieving physiological closure.

The *foramen ovale* permits oxygenated blood to pass from the placenta in the sow's uterus to the left side of the fetal piglet heart. From there it travels to the vital organs in the piglet body. Once the piglets are born, the lungs expand with air, and the pressures inside the heart change. This forces a flap to close over the FOP passageway. This flap seals over with scar tissue and does not permit any blood between the left and right sides of the heart to mix postnatally. However, in some breeds of pigs, the *foramen ovale* passageway does not always seal over and it remains open.

A few authors have described the occurrence of the cardiac defect, *foramen ovale patens*, since the beginning of the twentieth century (Steger, 1927; Bajan *et*

al., 1998a; Bajan *et al.*, 1998b). However, little attention has been given to solving this problem throughout the world. *Foramen ovale patens* in pigs is a serious cardiac defect, which influences breeding process by decreasing the utility of the animal (Bajan and Duran, 1997). There is little interest in solving this problem in Slovakia even though the incidence and the circumstances of *FOP* in pigs have been reported (Jelinek, 1962; Popesko et Mesáros, 1968; Gábriš *et al.*, 1975).

Pork plays the foremost role in the meat consumption of Slovaks and also in many other most European countries. Commercial factors dominate its production. These factors may have a negative influence on the production of pork (Bajan *et al.*, 1999). *FOP* is one negative factor. Therefore we have decided to investigate this problem in detail. Our last work showed that it is very important to solve the problem of *FOP* especially at the level of each breed line (Bajan *et al.*, 1999).

MATERIAL AND METHODS

The hearts from the pigs were collected at the Station for Pig Fattening and Pork Evaluationg. We always used the method of Bajan and Duran (1997) to investigate *FOP*. All documents about the history of the animals were present at the station.

We observed the occurrence of *FOP* in the following breeds: Slovak White Improved (WI), Landrace (LA), Slovak meat-type (SM) and a crossbreed of Pietrain x Slovak meat-type (PN x SM).

RESULTS

We found *FOP* in all observed breeds (Table 1). The relative occurrence of this heart defect was between 10.5 and 13.7 %, in LA and SM respectively. This heart defect had a higher incidence in females than in males except in the PN x SM crossbreed.

Table 1. The occurrence of *FOP* in each of the observed breeds of pigs

Breed	Total No. of examined pigs	Number of		Number of positive cases	% of positive cases/total	Amount of positive cases	
		Male	Female			Male	Female
WI	494	242	252	52	12,3	22	30
La	104	54	50	11	10,5	5	6
SM	96	50	46	7	13,7	0	7
PNxSM	45	25	20	4	11,2	2	2

In WI, LA and SM the number of 2 mm diameter gaps was very similar to the number of gaps with 3 mm diameter (Table 2). No 3 mm diameter gaps were found in the PN x SM cross breed.

Table 2. The size of *FOP* in the observed breeds of pigs

Breed	Total No. of cases	Size of gap			
		2 mm		3 mm	
		Number	%	Number	%
WI	52	27	51.9	25	48.1
La	11	5	45.4	6	54.6
SM	7	4	57.1	3	42.9
PNxSM	4	4	100.0	0	0

Evaluating the positive cases according to the line (Table 3) we observed the following situations: in each of the 6 lines of WI the occurrence of *FOP* was evident. We also found this heart defect in all four lines of LA and the three lines of SM.

Table 3. Positive cases of *FOP* in different pig breed lines

Breed	Positive cases	Size of gap	
		2 mm	3 mm
WI			
1935 Akademik	10	5	5
1334 Jatif	8	5	3
1349 Arkad	9	3	6
1348 Daberna DK	8	4	4
1818 Amulet CZ	11	7	4
1940 Financ	6	3	3
LA			
1974 Datel CZ	4	2	2
1970 Daliba CZ	3	1	2
1448 Stinus	2	2	0
1853 Dalego CZ	2	0	2
SM			
1017 Norron	4	2	2
1170 Kaiser	2	1	1
1154 Leger	1	1	0
PNxSM			
0485 Favorit	1	1	0
1342 Sunar CZ	2	2	0
1983 Prsten D	1	1	0

Moreover, *FOP* occurred in all three lines of PN x SM. In this breed no *FOP* gaps wider than 2 mm in diameter were observed.

DISCUSSION

As observations and studies dealing with *FOP* in swine are very rare, we have not found any reports elsewhere. Therefore we have compared the results obtained with those of our previous work including of Gábriš *et al.* (1975).

In the WI and LA breeds we registered a high incidence of *FOP* similar to that found by Gábriš *et al.* (1975), but lower than the incidence recorded by Bajan and Duran, (1997), which was 19.2 % in WI, 14.0 % in LA and 15 % in SM.

The matter we consider important is that the occurrence of *FOP* was constant in these breeds (Bajan *et al.*, 1999, 2001). As far as the utility of the final product is concerned, our results coincide with those of Bajan *et al.*, (1999); that losses may occur in pork production, because of increased feed consumption, which affects the total economy of pig breeding.

We recorded this heart defect in all lines of three breeds with both diameters (2 and 3 mm). In PN x SM crossbreeds we recorded the occurrence of *FOP* in all three lines but no gaps with 3 mm diameter. However, no *FOP* cases were recorded in the Pietrain breed (Bajan *et al.* 2001, Gábriš *et al.*, 1975). Thus, quantitative and qualitative detection of *FOP* is necessary in crossbreeds, in order to detect the influence of the parent breeds and the subsequent effect on production economy.

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MONITORING *FORAMEN OVALE PATENS* SA AKCENTOM NA LINIJE ČETIRI TOVNE
RASE SVINJA

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SADRŽAJ

Kod tovnih svinja rase Bela plemenita (BP), Landras (LA), Slovačka mesnata (SM) i Pietrain x Slovačka mesnata (PN x SM) pratili smo pojavljivanje *foramen ovale patens*. Najveća zastupljenost ove mane zabeležena je kod rase SM (13,7%), a najmanja kod rase LA (10,5%). Kod svih rasa su registrovane veličine od 2 ili 3 mm, a samo kod PN x SM nisu uočeni otvori veličine 3 mm. Pri posmatranju raznih linija ovih rasa, ova mana je bila evidentirana kod: BP — 6, LA — 4, SM — 3, i PN x SM — 4.

S obzirom da do sada, pri našim višestrukim posmatranjima, kod rase Pietrain (PN) ni u jednom slučaju nije registrovan *foramen ovale patens*, kao i činjenicu da kod PN x SM nisu otkriveni otvori veličine 3 mm, smatramo da je potrebno pratiti zastupljenost ove srčane mane i kod jedinki drugih kombinacija rasa.