Available online at www.sciencedirect.com
ScienceDirect
Theriogenology 76 (2011) 1022–1026
Theriogenology
www.theriojournal.com

Ovarian activity and uterus organometry in delayed puberty gilts

Ivan Stancic[a,*], Blagoje Stancic[a], Aleksandar Bozic[a], Robin Anderson[b], Roger Harvey[b], Dragan Gvozdic[c]

[a] *University of Novi Sad, Faculty of Agriculture, Republic of Serbia*
[b] *United States Department of Agriculture/Agricultural Research Service, Southern Plains Agricultural Research Center, College Station, Texas*
[c] *University of Belgrade, Faculty of veterinary medicine, Republic of Serbia*

Received 2 March 2011; received in revised form 27 April 2011; accepted 10 May 2011

Abstract

About 30% of the total number of gilts selected for reproduction at the large breeding farm units in Vojvodina (Republic of Serbia) are culled due to prolonged pre-insemination anoestrus (estrus not detected until 8 mo of age). The aim of this study was to provide the answer to the following question: do the culling gilts reach cyclic ovarian activity at all? One hundred seventy five culled gilts in which external estrus manifestations were not detected by 8 mo of age were sacrificed and their reproductive organs were examined for determination of sexual maturity (ovaries exhibiting pre-ovulatory follicles 8 to 11 mm in diameter, corpora hemorrhagica, corpora lutea and corpora albicantia). Uterine weights and horn length were also determined. Functional ovaries were observed in 107 (61.1%) examined gilts, with 62 animals having one and 45 having two puberty ovarian cycles (57.9% and 42.1%, respectively). Pathomorphological changes which could result in prolonged pre-insemination anoestrus were not observed on the reproductive organs of sexually mature gilts. Our results indicate that most of the culling gilts have reached cyclic ovarian activity. The main reason for culling due to the absence of external estrus manifestations in sexually mature gilts could be inadequate estrus detection technology.

Keywords: Delayed puberty; Ovarian activity; Uterus; Gilt

1. Introduction

It is generally accepted that gilts of most modern European pig breeds should reach puberty (occurrence of the first estrus) at the age of about 200 days and a body weight of about 100 to 110 kg [1]. However, studies by Eliasson et al [2] revealed that only about 15% of Swedish gilts reached puberty at 209 d of age, whereas the remaining gilts reached puberty 60 d earlier or later. The disparity between age and sexual maturity is due to interactions of paragenetic factors such as nutrition, season, contact with a sexually mature boar, housing, stress, treatment with exogenous hormones and health condition [1,3]. A prolonged prepuberty anoestrus (when estrus is not detected in gilts older than 8 mo of age) is the most frequent reason for culling gilts from the breeding herd [4,5]. Consequently, it can be very difficult under some farm conditions to have a sufficient number of gilts of adequate age, body weight, back fat thickness, and reproductive status (second and third estrus) available for insemination [6].

At the large breeding farm units in Vojvodina (Republic of Serbia), a prolonged pre-insemination anoes-

* Corresponding author. Tel.: +381 (21) 485-33-65; fax: +381 (21) 6350-019.
E-mail address: dr.ivan.stancic@gmail.com (I. Stancic).

0093-691X/$ – see front matter © 2011 Elsevier Inc. All rights reserved.
doi:10.1016/j.theriogenology.2011.05.004

trus is a major reason for culling of gilts. Recent observations have suggested that 30 to 40% of gilts in these herds fail to exhibit external signs of pre-pubertal estrus even after 8 mo of age and these gilts are culled from the breeding herd, increasing economic problems for the swine producers [7]. The aim of this work was to provide the answer to following question: did the culled gilts reach cyclic ovarian activity at all?

2. Materials and methods

This research was conducted on a swine breeding farm in Vojvodina (Republic of Serbia) with the capacity of 5,500 sows, based on "all-in-all-out" system with an average lactation duration of 30 d. All animals were fed and housed in the same way and in the same period of the year. The estrus detection at the farm was conducted once in 24 h by the examination of external signs of estrus (edema and hyperemia of vulvae and for standing reflex to digital lumbosacral pressure) combined with the use of teaser boars that were not in direct contact with gilts.

Experimental animals (n = 175) were culled from the breeding herd due to prolonged anoestrus (estrus not detected until 8 mo of age). All gilts were euthanized and their reproductive organs were examined in the laboratory. Based on the present ovarian structures, the gilts were classified as sexually mature (cyclic) or sexually immature i.e., pre-pubertal (acyclic). Sexually mature (cyclic) gilts were first classified as those with pre-ovulatory follicles of 8 to 11 mm in diameter (PoF), *corpora hemorrhagica* (CH), *corpora lutea* (CL), and *corpora albicantia* (CA) on their ovaries. Sexually mature gilts were further categorized as those with one (first) pubertal cycle based on ovaries having simultaneously: (a) pre-ovulatory follicles, (b) *corpora hemorrhagica*, or (c) *corpora lutea*. Sexually mature gilts were categorized as having two ovarian cycles (the first and the second pubertal cycle) when their ovaries had one of the following combinations: (a) pre-ovulatory follicles and *corpora albicantia*, (b) *corpora hemorrhagica* and *corpora albicantia* or (c) *corpora lutea* and *corpora albicantia*. *Corpora albicantia* are the regressed *corpora lutea* from the previous estrus cycle. Gilts were considered sexually immature (acyclic, prepubertal) when their ovaries had follicles ≤ 7 mm in diameter and lacked any other ovarian structures. Uterine weights, excluding the wide ligments (*lig latum uteri*), and uterine horn length, measured from the bifurcation to utero-tubal junction, were tested for differences due to maturity using a general analysis of variance with a Tukey's separation of means (Statistix 8 Analytical Software®, Tallahassee, FL, USA). Reproductive organs were also examined for possible pathomorpholocigal changes inducing prolonged anoestrus (infantile reproductive organs, congenital reproductive tract malformations, inactive ovaries, tumor-like ovarian lesions, ovarian cysts or adhesions, uterine infections).

Table 1
The distribution of culled gilts reproductive status at the examination.

	n	%
Studied gilts in total	175	100.0
Sexually immature (prepubertal) gilts	68	38.9
Sexually mature (pubertal)gilts	107	61.1
With one (first) pubertal ovarian (estrus) cycle	62	57.9
With two (first and second) pubertal ovarian (estrus) cycles	45	42.1

3. Results

One hundred seven gilts (61.1%) reached cyclic pubertal ovarian activity, having one of the following ovarian structures: pre-ovalatory follicles, CH, CL, or CA. From the total number of 107 sexually mature gilts, 57.9% had one and 42.1% had two pubertal estrus cycles. The remaining 68 gilts (38.9% from total number of gilts studied) did not reach sexual maturity as their ovaries had small follicles (≤4 mm diameter) without any other ovarian structures. Distribution of the gilts reproductive status at examination is presented in Table 1.

Based on the present ovarian structures, 48.4% of gilts with one estrus cycle and 64.4% of gilts with two estrus cycles were sacrificed in the luteal phase of the cycle during the diestrus. The average ovulation rate was 10.3 CL or CH in the first puberty cycle and 12.3 CH or CL in the second puberty cycle. Distribution of the ovarian structures in sexually mature gilts is presented in Table 2.

Infantile reproductive tract was observed in 16.6% of gilts, whereas 83.4% of gilts had mature reproductive tract. Sexual organs were normally developed in 58.8% of sexually immature, in 98.4% of sexually mature gilts with one estrus cycle, and in 100% of gilts with two estrus cycles. The average uterine weight was 181 ± 61 g and the average length of one uterine horn was 36.2 ± 10 cm in sexually immature gilts (Table 3). Uterine weights were higher and average uterine horn length was longer ($P < 0.05$) in the sexually mature