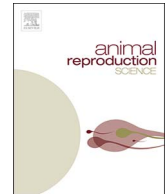




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## Selected serum acute-phase proteins in peripartum sows and evaluation of their diagnostic usefulness

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### ABSTRACT

Lactation impairment in sows is a frequent and significant clinical problem. Due to a complex aetiopathogenesis, early diagnosis of postpartum dysgalactia syndrome (PDS) is difficult and so far has usually been based on physical examination performed in the first days after farrowing. To date no data have been provided on the diagnostic usefulness of acute phase proteins (APP) in early diagnosis of peripartum disorders, including lactation disorders in sows. This study aimed at measuring the serum concentration of selected APP (C-reactive protein (CRP), haptoglobin (Hp), serum amyloid A (SAA) and pig major acute phase protein (Pig-MAP)) in sows with physiological and pathological course of the peripartum period and at evaluating the possibility of utilising the studied markers in the early diagnosis of lactation disorders. Also, the correlation between the studied APP serum concentration and production parameters was assessed. To the best of the authors' knowledge, the present study is the first such performed on sows. The experiment was conducted on 139 sows divided into three experimental groups based on the course of peripartum period: HEALTHY (n = 58) – clinically healthy sows, PDS (n = 45) – sows with milk production disorders, and OTHERS (n = 36) – sows which had experienced difficult parturitions, inflammations not connected with mammary glands (abscesses, hooves infections), or lameness. Thirteen serum samples from each sow were analysed, samples being taken on days -28 (-30 to -25), -14 (-16 to -11), -7 (-8 to -6), -5, -3, -1, 0 (parturition day), +1, +3, +5, +7, +14 and +28 (prior to or post farrowing). In order to measure the level of serum APP, commercial, quantitative ELISA tests were used. The results of the study indicate that the diagnosis made on the basis of the assessment of SAA levels on day 7 before the farrowing was not statistically different from the diagnosis made on the basis of the physical examination in the first days after the farrowing, that is the so-called “gold standard”. The achieved results indicate that SAA may be a useful early marker of lactation impairments in sows, which allows detection of which sows are susceptible to lactation disorders with high probability even as early as one week before parturition.

### 1. Introduction

Lactation impairment in sows poses a frequent grave clinical problem. Due to a complex aetiopathogenesis, early diagnosis of postpartum dysgalactia syndrome (PDS) is difficult and so far has usually been based on physical examination performed in the first

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days after farrowing.

Field practice shows that the diagnosis is predominantly made on the 2nd to 3rd day postpartum, but sometimes later. Consequently, the proper treatment of the sows is instituted as late as on the 2nd to 3rd day of the piglets' lives. The period of several days after the farrowing is crucial to the survival of the suckling piglets, and their future life in the herd. Physiologically, the piglets are born with a low energy reserve and zero passive immunity, and their immune system is not yet fully effective (Stepanova et al., 2007; Sinkora and Butler, 2009; Pomorska-Mol and Markowska-Daniel, 2010; Pomorska-Mol and Markowska-Daniel, 2010; Pomorska-Mol and Markowska-Daniel, 2011). Hence, obtaining enough high-quality colostrum, and later milk, is particularly important. The diagnostic techniques which are currently used in field practice (physical examination of postpartum sows) allow for making the diagnosis of lactation impairment *de facto* after its clinical signs occur. Therapy is accordingly introduced during the clinical manifestation of the disorders. A properly selected treatment most often leads to a relatively quick improvement of the sows' clinical state, but the losses connected with insufficient intake of the colostrum and milk by the piglets are impossible to remediate. That is why it is essential to identify markers which would allow for early diagnosis of PDS. It would be especially important not only from the scientific, but also from the practical point of view. The literature shows that acute-phase proteins (APP) may be considered in research to identify early markers of health disorders, including those of lactation (Petersen et al., 2004; Gelder and Bilkei, 2005; Eckersall et al., 2006; Suojala et al., 2008; Szczubiał and Urban-Chmiel, 2008; Pomorska-Mol et al., 2011b; Sabedra, 2012; Pomorska-Mol et al., 2013; 2015a; Ibrahim et al., 2016).

So far, no data have been provided on the diagnostic usefulness of APP in early diagnosis of peripartum ailments, including lactation disorders in sows. Neither have comprehensive studies been carried out concerning the kinetics of changes in APP serum concentration in the sows experiencing physiological and pathological abnormalities in the peripartum period. Such data are necessary to define the possibility of APP usage in diagnosis of peripartum disorders.

Considering the above, the study aimed at measuring the serum concentration of the selected APP (C-reactive protein (CRP), haptoglobin (Hp), serum amyloid A (SAA) and pig major acute phase protein (Pig-MAP)) in sows with physiological and pathological course of the peripartum period (day -28 to +28) and to evaluate the possibility of utilising the studied markers in the early diagnostics of lactation disorders in sows. Also, the correlation between the studied APP serum concentration and production parameters was assessed. To the best of the authors' knowledge, the present study is the first study performed on sows.

## 2. Materials and methods

### 2.1. Animals

Animals from two herds (A and B) were used in the study. Criteria necessary to qualify the herd to the study included: a full production cycle, complete production documentation, professional veterinary supervision, and lactation problems (together with clinical manifestation of the disease). The pigs used in the study were deliberately selected from among animals of various genetics and bred in various conditions. It allowed for investigating whether these factors would affect the kinetics of APP serum concentration changes in peripartum sows. During the study, the clinical condition of the sows was monitored and blood samples were collected for further analyses. The whole peripartum period of the study was under veterinary supervision.

To carry out the experiments, the consent of the II Local Ethics Committee for experiments on animals in Lublin was obtained (University of Life Science in Lublin, Resolution No. 38/2014 of 24/06/2014).

#### 2.1.1. Herd A

The basic herd included 990 sows with genetics from DanAvl. The F1 gilts (Landrace x Large White) were all purchased from Denmark. The farm in the study operated on a weekly production cycle, with 45 sows farrowing each week. The sows were transferred to the farrowing facilities 8–10 days before the expected parturition. The loose pregnant sows were fed with powdered feed delivered by a feeding line according to a feeding curve, being fed once per day at 6 a.m. When the sows were transferred to the farrowing pen, the feeding system changed - the dry feed was replaced by liquid feed, and the frequency of feeding also changed (the sows were fed 3 times per day). The herd production results were as follows: the average number of live piglets in a litter was 15.3; the average number of weaned piglets in a litter was 12.9; the average weaning weight was 6.5 kg; and the average number of weaned piglets per year was 29.5. The average lactation period was 26 days (21-30 days). The herd's health status was: PRRSV positive and stable, and it was also positive for: *Mycoplasma hyopneumoniae*, *Actinobacillus pleuropneumoniae* serotype 2, and dermonecrotic *Pasteurella multocida*. The animals were vaccinated against PRRS (on day 60 of pregnancy), parvovirus, erysipelas (two weeks after parturition), atrophic rhinitis and neonatal colibacillosis (1 month before parturition).

#### 2.1.2. Herd B

The basic herd included 1800 sows in a confined cycle, with Dutch Hypor genetics. The collaborating farm had its own reproductive herd of 150 Large White sows, and the rest of the animals of the basic herd consisted a line of F1 animals (Large White x Landrace). The farm operated on weekly production cycle, with 85 sows farrowing each week. The sows were transferred to the farrowing pen 8–10 days before the expected parturition. The loose, pregnant sows were fed with powdered feed delivered by a feeding line according to a feeding curve, being fed once per day. When the sows were moved to the farrowing shed, the frequency of feeding changed (they were fed twice per day during the first 7 days, and then 3 times per day). The herd production results were as follows: the average number of live piglets in a litter was 12.7; the average number of weaned piglets in a litter was 10.9; the average weaning weight was 6.9 kg; and the average number of weaned piglets from the sow per year was 25.3. The average lactation period

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