# ABSTRACT

## Sow gynecopathies, as a cause of infertility

The important progress achieved lately by the medical and biology sciences, together with the larger extension of the intensive breeding systems enforces solving new problems and reconsidering old views regarding a quick rise of the herds and a good health defense.

Now, we have enough scientific data about animal health defense, but we must correctly apply the knowledge in order to get best results.

Sow fertility is defined as the ability to produce viable descendents in natural conditions, which is an hereditary characteristic, strongly consolidated by the relations between organism and environment. Hereditary factors and especially environmental factors, always induce an alteration in the expresion of the specific characteristics. The fertility or the lack of it depends on the female or male organism and also on the genetic or immunological incapacity of the two partners, also each of them, separately has been proven fertile in another mating combination.

As a rule, infertility in farm animals varies depending on many factors: agro-environmental, technical-organizational, dismetabolic, infectious and genetical. Sow fertility is aproximately 10-40%. It has been demonstrated that 50% of the reformed sows appear at the first 4 pregnancies and 21,2%, after the first weaning, and the eliminations for infertility are more numerous during summer.

The thesis includes 221 pages, 9 chapters and it is structured in two parts, according to the requested criteria. The first part (chapters I, II and III) includes the main bibliographic data from the specific litterature regarding the sow infertility syndrome, the main infertility causes and the most important diagnostic techniques, representing the „Stage of Knowledge". The first part has 64 pages, (30,69%). Each chapter of the second part includes material and methods, results, discussions and partial conclusions representing 135 pages, (69,31%).

Chapter IX includes the 37 final conclusions, the main results of the research.

The thesis is illustrated with 91 pictures, 10 tabels and the bibliographic data include 232 titles.

The first part of the thesis represents a synthesis of the specific litterature regarding the organ genesis and the morfophysiology of the sow genital tract, the sow infertility syndrome and the specific diagnostic techniques.

Chapter I includes the scientific data regarding the organ genesis and morfophysiology of the sow genital tract: ovary genesis, internal genitalia genesis, external genitalia genesis and also the morfophysiology of the vulvovestibular and vaginal tract. An important subchapter includes the neuroendocrine regulation of the reproductive function (subchapter 13).

Chapter II explains the infertility concept. According to the available scientific data, infertility can be classified as congenital (genetical) infertility; acquired infertility and senile infertility. In subchapter 2.3. there have been described the modern techniques used to diagnose sow infertility (hormonal and echographic diagnostic).

Chapter III presents a synthesis of data regarding the therapy of sow reproductive disorders. Depending on the degree of the metabolic disorder, of the hormonal imbalance and the morfophysiological alteration, the treatments used will have immediate or later results. For the reproductive issues a clinical recovery is not enough and it must be dubbled by the reproductive and productive rehabilitation.

The premises for our research were represented by the fact that swine breeders encountered problems regarding the reproductive management. By the present study, we planned to provide to the interested breeders, surveillance and diagnostic technologies that had not been available to them, as: hormonal screening, echographic scans, histopathological exams. Following the research, economical benefits has been obtained, as a result of the time gained and of the improval of the reproductive process by accurate hormonal therapy (in big exploitations, the hormonal therapy recquires bigger costs).

The second part, represented by Personal Research, includes 5 chapters. The investigations regarded: „The clinical screening of the sow reproductive process" (chapter IV), „The metabolic profile as an instrument in the evaluation of the main reproductive parameters" (chapter V), „ The evaluation of the ovarian function during the sexual cycle using hormone detection and quantification (estrogenus, preogestogens)" (chapter VI), „the presentation of the main sow reproductive disorders that cand be diagnosed by echographic scan" (chapter VII ), „the diagnostic of the sow reproductive pathology using the histological exam"(chapter VIII).

Chapter IX represents „Final conclusions" that have been obtained following the clinical, metabolic, hormonal, echographic and morfopathological investigations.

The diagnostic investigations were as a response to the breeder's request that encountered the following problems: low estrus incidence in weaned sows and young sows, the presence of estrus after one or two inseminations, the increased number of the non-pregnant females.

From the entire effective of more than 3000 swine, existing in the intensive breeding farms from Moldavia county, the clinical investigations were made on 265 females with various pathology. A mating and birth register was prepared and analized and individual charts for the sow reproductive function were also made (chapter IV).

After the evaluation of the reproductive parameters and the visits made in the reproductive sector, the sows were assigned to three different groups depending on the pathological fenomena. The next step was to identify each disorder after individual clinical and paraclinical investigations.

Analyzing the data from chapter IV, it can be observed that the biggest number is represented by the reinstalation of estrus after the first estrus cycle (19-23 days): 183 sows (69.05%) out of 265.

The reinstalation of estrus after the second estrus cycle (40-44 days) was identified in 62 animals, out of 265 studied (23.39%).

The diagnostic of the recurrent estrus after 21 days was done by echographic scan on the females suspected with reproductive disorders. The ovarian dynamic was evaluated by biochemical and hormonal screening.

The reinstalation of estrus after approximately 3 weeks after the insemination depends can be the result of: improper determination of the insemination moment; fecundation anomalies, belayed ovulation, abnormal estrus.

Out of the 183 sows with recurrrent estrus at 21 days, 63 (34.42%) were not pregnant because the bad-timing of the artificial insemination. 10 sows out of 183 (5.46%), because of the fecundation anomalies, and 23 (12.56%), because of the belayed ovulation.

87 sows (47.54%) presented abnormal estrus cycles.

Another cause of sow infertility was represented by the reinstalation of estrus after 42 days after the artificial insemination or after a time period corresponding to the second estrus cycle.

As causes of reccurent estrus after 40-42 days, we identified: silent (quiet) estrus, anestrus and embryonic mortality. Quiet estrus was diagnosed in 30 (48.38%) sows, anestrus in 15 (24.19%) sows and embryonic mortality in 17 (27.43%) sows.

From the 265 sows studied for reproductive disorders 127 (47.92%) females have been recovered. The rest of 138 (52.08%) sows were eliminated and slaughtered later.

The recovered 127 sows were further studied from the prolificity point of view: the number of piglets obtained from each sow.

The total number of piglets obtained from the 127 sows was of 1320, which represents an average of 10,39 per sow.

Out of 1320 piglets, 1211 were liveborn (9,53 piglets per sow) and 109 piglets were stillborn (0,86 piglets/sow). During the lactation period, 62 piglets were lost (0,49 piglets/sow) and 1149 piglets were weaned (9,04 piglets/sow).

The hormonal investigations aimed to explain aspects regarding the correlation between the metabolic parameters and the main index of sow reproduction in a reproduction sector (chapter V).

The biochemical blood parameters from 21 sows with reccurent estrus (after 21 days) were determined and studied.

The first analyzed parameter was the alanine transaminase (ALT), in order to evaluate the hepatic normal function. We observed an ALT average value of 56,40 U/L, within a range of 31,9 U/L - 118,9 U/L.

Comparing the results to the reference values offered by the specific litterature (21,7 – 46,5 U/L), it can be observed that the ALT values we obtained are over the higher limit. The modification of the hepatic parameters were attributed to the thermal, dietary and crowding stress, because the further determinations did not show again elevated values of the enzyme.

The average value of urea determined from the studied sows was 43,25 mg/dl, within a range of 23,78 mg/dl şi 68,38 mg/dl. It is evident that the average of this parameter excedes the higher limit of the reference range, which is 8,2-24,6 mg/dl. A high value of urea is characteristic for nephritis (especially acute nephritis), nephrosis, dehidration, shock, hyperproteic diet, increased proteic catabolism, acute infections and fever.

An important parameter to establish the metabolic profile of sows is represented by total protein. The average value of total protein obtained from the studied sows was 8,45 g/dl, within a range of 7,0 g/dl - 12,8 g/dl. This value is also higher than the reference values :5,8 g/dl - 8,3 g/dl for swine and 7,7 g/dl for reproductive sows (Pârvu Gh., 1992, Bîrţoiu A., 1999).

The increase of the normal total protein values is characteristic for chronical infections ( by gammaglobulinic fraction rise).

The albumin average was 4,31 g/dl, within a range of 3,5 g/dl - 5,0 g/dl blood. The results excede the higher limit of the reference values which are 2,4-4,0 g/dl (Pârvu Gh., 1992, Bîrţoiu A., 1999).

The conclusion is that the origin of the reproductive disorders is represented by defficitary nutrition regarding the protein levels.

The calcium value was 10,92 mg/dl blood, within a range of 7,06-25,2 mg/dl blood.

The average calcium value is close to the maximum reference value which is 9,3 mg/dl – 11,5 mg/dl, (Pârvu Gh., 1992). The iron average value was 141,03 mg/dl, within a range of 84,83 mg/dl - 295,13 mg/dl. The reference value range is 75-150 mg/dl, so the results are within normal limits, tending to the upper limit.

The average phosphorus value was 8,93 mg/dl, within a range of 4,4 mg/dl - 11,7 mg/dl. The results tend to the upper limit of the reference values for sows: 5,5 mg/dl-9,3 mg/dl sânge, (Pârvu Gh., 1992, Bîrțoiu A., 1999). Higher phosphorus levels are determined by exceding diet (urolithiasis), osteofibrosis, decalcifications due to paratiroydian hyperfunction, renal insufficiency, chronic acidosis, leading to osteomalacia, rachitism.

In order to establish the plasmatic concentration of estrogenus and progesterone ELISA has been used for the quantitative determination (chapter VI).

The progesterone determinations were used in order to establish the time of ovulation and to characterize the defects of the luteal phase. Other indications are: progesterone therapy scrrening and the evaluation of early pregnancy.

The estrogenes are ovarian hormones synthesized by two types of cells: in the tecal cells, the cholesterol is transformed in androstenedione and testosteron which are further converted in estrone and estradiole by the aromatizing complex of granulosa cells.

Because the specific reference values for preogsterone and estradiole are different for each breed, the hormon levels were determined for each study group. 4 females have been selected: 2 adult sows and 2 young sows, clinically healthy, in which the evolution of the sexual cycle was screened with the intention to evaluate the ovarian structures during the sexual cycle.

Day 0 of the sexual cycle was determined by echographic scan and with the help of heat-detecting boars.

The preogesterone level increased rapidly after two days of estrus and in the 6th day of the sexual cycle, the average value was higher than 24 ng/ml. The maximum level of 28-48 ng/ml was observed during the period 7th day-13th days, after that it remained constant for 2-3 days. The decrease to 3 ng/ml happened during 2-3 days in a young sow. The decrease lasted 5 days: it decreased to 8 ng/ml after 2 days and after that, to 1 ng/ml till the estrus reappeared (sexual cycle: 24 days).

The plasmatic concentrations of estrogenes increased rapidly only when the progesterone concentration started to decrease, this phenomenon being present at each animal. Every female

presented an estrogen peak durin days 6-8, which shows an increase of the follicular activity, a volume augmentation of the follicles in the first 8 days of the sexual cycle, without noticeable changes of the follicular structures until the next cycle.

The progesterone levels of the 4 sows did not reach a peak until the 12th of the sexual cycle, its level being 2/3 from the maximum value of the 6th-8th day of the sexual cycle. The progesterone quantity indentified in day 0 suggests the absence of a preovulatory release.

The estrogenes levels had an average of 10-30 pg/ml during the sexual cycle, except the days before estrus, when there was an increase until 60-70 pg/ml. During the sexual cycle there have been increases of the estrogenes plasmatic titers to 20-30 pg/ml in days 4-6, after which the titter decreased to 10 pg/ml until the days 14-15, when the level started to rise slowly until estrus. Two days before estrus the estrogenes level increased suddenly and in the first day of estrus, it decreased. The peak of estrogenes was observed in 3 out of 4 sows with variations between 12-86 pg/ml.

The presentation of the main sow reproductive disorders that can be diagnosed by echographic scan was done in chapter VII.

By echographic scan, the transcutaneous technique, was determined the time of ovulation and were identified the ovarian cysts (single cyst, multiple cysts).

Out of 89 sows that have been echographically scanned, 12 sows (13.48%) presented ovarian inactivity and anestrus. The 12 females were treated with the product PG600. At 8 sows, the ovarian activity was reestablished and the time of ovulation was 6 days after the hormonal product administration.

5 sows out of 89 studied (5.61%) presented a single cyst on the right ovary; the cyst spontaneously involuted, without interfering the sexual cycle.

The 89 sows (40%) that presented multiple cysts were treated with Hcg product, different dosages. Following the treatment, the sows that showed normal ovarian activity, in approximately 26 days, were innoculated with 1500 U Hcg.

The diagnostic was based on the several clinical examinations performed on the sows, and the echographic aspects will be discussed as follows.

At 12 sows with ovarian inactivity, by echographic scan, were detected multiple follicles with diameters of 3-5 cm. After 7 days the echographic exam was repeated and the same characteristics were observed, including the absence of corpus luteum.

At the same time with the second echographic scan, the product PG600 was administered to sows. 4 days after the administration, the ovarian activity was established. On the ovarian surface

were present follicles with diameters of 6-8 nm. The confirmation of the therapeutic success using PG600 was made upon the presence of the corpus luteum which certifies the follicular dehiscence.

The second component was represented by the pregnancy diagnostic. The echographic exam was done starting with the 18th day after mating/insamination by checking the presence of liquid in the uterus.

The accuracy of the echographic exam was 70% in the 17yh-18th day and 96% after 21 days.

In chapter VIII were presented the main ovarian gross and histological modifications which are the causes to sow infertility.

During necropsy after slaughtering, more than 1000 sows presented inactive ovaries (sows before puberty), cystic ovaries. In order to complete the clinical diagnosis, 80 ovaries have been harvested from reformed sows. 21 ovaries have been used to obtain histological sections.

In the impubere sows the topohistological aspect of the ovarian bursa and the the relation between them was studies. In the ovaries of the reformed sows were identified the following modifications: cyst of the corpus luteum, the histological structure of corpus luteum, the histological structure of the cavitary region of corpus luteum, the histological structure of the periferic region of the cyst of corpus luteum, active secretory luteinic cells with hyperemiated blood vessels, with big secretion accumulations in the center of the cyst, luteinic cells' intense secretory activity, the alternation of the luteinic cell cords and the hyperemiated blood vessels, the degenerative proccess of the ovocyte, follicular cyst limitrophe to a cavitary follicle that tends to become a cyst, multiple ovarian follicles, details of the corpus luteum, corpus luteum and multiple ovarian follicles, the development of the glandular teritory in the cytogenic chorion under ovarian influence, active uterine gland close to epithelium, multiple active glands in the endometrial stroma, corpus luteum with the proliferation of the connective tissue limitrophe to the blood clot, altered cavitary follicle, dehiscent cavitary follicle, luteinizing process.