The Sperm Inspection of Friesian Stallions

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Photo by Sherri Fair ©. Approved stallion Tsjerk328 and his sire Feitse 254 Preferent in January 2005. Owned by Family Toonen.

The examination of his sperm is a required part of the complete evaluation route a potential stud must go through. The KFPS has appointed two organizations that carry out these sperm examinations: the Faculteit Diergeneeskunde (The Veterinary Faculty) in Utrecht or the GD, Gezondheidsdienst voor Dieren (Animal Health Service) in Deventer. The GD uses the facilities of the Equine Veterinary Clinic in Wolvega. The sperm examination is thus in the hands of two independently operating, nonpartisan organizations.

These two organizations guarantee a uniformly comparable procedure by exchanging and evaluating a number of sperm specimens. Before we make the decision to present a stallion at the KFPS Stallion Show, we need to consider a few important details. When and where do I present my stallion for the sperm examination? What do I need to do to prepare my stallion for this examination?

For two reasons it is important that the stallion has bred at least once in his own familiar surroundings before the examination. In the first place it will make the official sperm examination a lot easier. When a stallion has never bred before, he often doesn't understand what he is supposed to do with the phantom mare or the estrous mount mare (the "bokmerrie" in Dutch). It may take hours before he gets the meaning of it. In the second place it may save money. If it turns out that the stallion doesn't produce enough sperm cells - and this is quite common in young Friesian horses - it doesn't make much sense to present the stallion for a sperm examination. Furthermore, the owner can use his own veterinarian to examine the external sexual apparatus of the stallion. For instance, the KFPS requires that the scrotum of the stallion contain two testicles of comparable size. The size of the testicles is also an indicator for the production capacity - the larger the testicles, the more sperm cells can be produced.

SPERM PRODUCTION

Sperm cells are produced in the testes and stored in the epididymis. When the sperm cells are transported from the testicles to the epididymis, they are not quite ready yet to fertilize the egg cells. First, an important maturation (ripening process) must take place in the epididymis. Besides the testes, the sex organs of the stallion also consist of accessory sex glands (gonads), including the prostate, ampullae and seminal vesicles. These accessory sex glands produce the seminal plasma that protects the sperm cells during their stay in the female sex organs. If the sperm cells mix with urine or blood, there will be quite a negative effect on the sperm cell viability.

The entire process of the sperm production in the testicles all the way through the maturation in the epididymis takes about nine weeks. The quality and quantity of the sperm are influenced by such (external) factors as breed, age, development of the testicles, servicing frequency, servicing methods, nutrition, and treatment with medicines, or (internal) factors such as disease (for instance fever). When a stallion is ill, the quality of the sperm can decrease substantially almost over night. Because all the stages of the sperm production can be affected, it may take up to nine weeks following the end of the illness before the quality of the sperm is entirely restored.

Each normal sperm cell has three parts: a head, middle piece (body) and tail. An acrosome (a cap-like structure) at the head tip produces enzymes that help penetrate the female ovum (egg). During conception, chromosomes (genetic material) in the nucleus (cell control center) join with chromosomes in the ovum. The middle piece contains mitochondria, structures that provide energy for the sperm. The mitochondria are tightly spiraled around the axial filaments (contractile portion) of the flagellum (tail). Centrioles form the tail, which moves the sperm toward the ovum. However, the number of motile sperm cells that move forward quickly is very variable and differs from one stallion to another. This is important information. Only normally moving sperm cells are able to reach and penetrate the egg cell.

SPERM EXAMINATION IN REALITY

Let's suppose the following: a stallion owner presents his stallion at the Reproduction Facility of the Veterinary Faculty in Utrecht. First of all, the complete passport and studbook data of the horse will be documented on site. After the necessary papers have been filled in and the identity of the stallion has been verified by reading his chip number, the health status of the stallion is documented. A recent illness or the use of medicines can have a negative effect on the quality of the sperm or the prognosis for the future. The owner will also be asked if and when the stallion has bred before.

The breeding history of the stallion can also have a significant effect on the quality of the sperm in question. Finally, the owner is given the choice to present his stallion for "inspection at the owner's request" or for "inspection with a direct report to the KFPS."

If the stallion owner has no idea about the quality of the sperm of the stallion, it would be well advised to conduct an "inspection at the owner's request" first. Then, when the sperm quality is satisfactory, this information can still be reported to the KFPS studbook at that time.

A complete sperm inspection consists of two mounts, with an interval of one to one and a half hours. In addition to the quality of the sperm, the libido and the breeding technique of the stallion is inspected and recorded. Theoretically, the Studbook can reject a stallion if he refuses to cover the phantom or the estrous mare (kept in estrous artificially), even if sperm has been collected during this inconvenience.

Immediately after one of the mounts the external sex organs of the stallion are inspected. Does the stallion have two testicles of similar size that have descended completely into the scrotum? According to the norms of the Studbook, the testicles cannot differ more than 50 percent from each other in volume (length x width x height). A stallion with only one descended testicle will not be approved as stud because there seems to be a hereditary component involved. An unusually late descent of one or both testicles can result in a small and/or soft testicle and may be the reason for rejection of the stallion as a stud, because the difference in size between the two testicles is too large. The average testicle of a three-year-old Friesian stallion is about 8 to 10 centimeters long and 5 to 6 centimeters wide (3.15 to 3.93 inches long and 1.96 to 2.36 inches wide).

The sperm is collected after the stallion has ejaculated in the phantom mare, using an artificial vagina filled with water of about 50 degrees Celsius (122 degrees Fahrenheit). This water temperature makes the final temperature within the artificial vagina about 45 degrees Celsius (113 degrees Fahrenheit), which is necessary to stimulate the stallion to completely finish his ejaculation. Actually, this temperature is a little high for sperm cells, and it is important that the sperm doesn't stay in the artificial vagina too long.

In the laboratory the sperm will be filtered through a piece of gauze to dispose of dirt. Then the ejaculate gets a serial number which will identify all specimens indisputably, but makes it impossible for laboratory technicians to identify a sperm specimen with an individual stallion or stallion owner. Not until all the inspections have been conducted, will the computer connect the stallion and the stallion owner to the serial number again, and the sperm report can be completed.

The sperm is evaluated on the next five criteria:

COLOR

The color is mostly gray to white.

VOLUME

With three-year-old Friesian stallions, the volume of an ejaculate is between 30 and 100 milliliter. However, remember that the volume of the produced sperm is no guarantee for a high sperm cell production.

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SPERM INSPECTION, Cont.

CONCENTRATION OF THE SPERM CELLS

The concentration of the sperm (the number of sperm cells - spermatozoids) is measured with the help of a spectrophotometer. This machine measures the amount of light that passes through a sample and calculates the concentration of cells that the density reflects. For a stallion that has never bred before, or hasn't bred for a very long time, his first ejaculation (and even a number of ejaculations after that) can be very concentrated and contain a large amount of dead sperm cells. These dead sperm cells lead to a significant lower percentage of motile and normally structured sperm cells. For a stallion that balances on the edge of the sperm inspection requirements, this can be the difference between a positive and a negative advice concerning the quality of the sperm. By letting your stallion perform a test breeding at home, it can give a better outcome for mobility and morphology of the sperm cells at the official sperm inspection.

PERCENTAGE OF MOTILE SPERM CELLS - MOTILITY

To determine the motility, put a drop of semen on a warm slide, cover it with a cover slip and then estimate the percentage of normal progressively motile spermatozoa in the microscope viewfinder. Two different people will conduct this test independently. They will evaluate the percentage of progressively motile spermatozoa (sperm cells). To be accepted by the KFPS this motility must be an average of at least 50 percent of the two ejaculates.

PERCENTAGE OF NORMALLY STRUCTURED SPERM CELLS (MORPHOLOGY)

Sperm morphology can be determined by microscopic evaluation of stained smears or, preferably, phase-contrast microscopy. The specimen will be sent to a different laboratory for additional morphological inspection. The coloring (staining) of the sperm cells has two functions. Firstly, dead and living sperm cells can be distinguished, because the dead cells color red and the living cells color white. Secondly, the coloring agents make it easier to evaluate the structure of the sperm cells. For the evaluation, the laboratory technicians use a fixed code that contains all the normal deviations. One part of the chart contains acceptable deviations and the other part contains deviations that are classified as unacceptable. Every part of the sperm cells, i.e. the acrosomal cap, the form of the head, the form of the connecting piece and the tail, are evaluated. The KFPS requires that at least 50 percent of the living sperm cells (consisting of the average of both ejaculations) have a normal structure.

THE SPERM REPORT

Lastly the total production of normal sperm cells of the stallion is calculated in the form of one number - the TNB number. TNB stands for "Totaal aantal levende Normaal gebouwde en Bewegende zaadcellen," (Total number of living Normally structured sperm cells) in millions and is the product of volume x concentration x % motile sperm cells x % normally structured sperm cells. The KFPS requires that a three-year-old stallion has a minimum of 600 TNB (the average of two ejaculations). Older stallions must have at least 1000 TNB. The reason for the difference is that the young stallion hasn't completely matured to reach his maximum sperm production. The testicles of a stallion, and thus his production capacity, will increase until he is about 6 to 8 years old. To give an indication, the average sperm production of three-year-old Friesian stallions is about 1500 TNB.

The sperm report gives us the average of the two ejaculations and consists of three important criteria:

1. The average percentage of motile sperm cells.
2. The average percentage of normally structured sperm cells.
3. The TNB number.

The sperm report will be sent to the Studbook. Depending on the results, the Studbook (NOT the Veterinary Faculty or the Animal Health Service) will decide if the sperm quality of the stallion is sufficient for registration as a stud. The Studbook will contact the owner about the decision. In case of a negative decision, the relevant authority (the Veterinary Faculty or the Animal Health Service) can give an advice if it is worthwhile to present the stallion for a second sperm examination. They can also advise the stallion owner about the preparation of the stallion for a second sperm examination, so the stallion will have the optimal chance for a satisfactory sperm report. In reality, about 50 percent of the Friesian stallions that are presented for a first sperm inspection are rejected due to insufficient sperm quality. (Remember the sperm report is only ONE criteria in the road toward actual stallion approval).

IN CONCLUSION

What does a stallion owner have to do to prepare his stallion for an optimal sperm examination? Of course the stallion must be in optimal condition; not too skinny and not too rich (fat). We recommend that the stallion breed several times in his familiar surroundings so that possible dead sperm cells are removed. Give your stallion a few days rest from his breeding schedule prior to the sperm examination so he can build up a maximum supply of living sperm cells. Of course, it is a bad sign when the "test breedings" at home point to a low sperm count, or no sperm count at all.

How can we safeguard a satisfactory sperm quality? An optimum diet and keeping the stallion fit and healthy are about the most important things we can do in preparation of a sperm examination. Keeping your stallion stress free is also important. Can we improve the maximum sperm production with medication? No. Unfortunately, there are no medicines at this moment in time that have been proven to improve sperm production or sperm quality, even though there have been hints to that effect in the equine press.

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VETERINARIAN EXAMS, CONT.

This exam starts with walking up and down in hand. The veterinarians check the movement of the lower legs; too much toeing out or toeing in is not desirable. A Friesian also needs to move the legs correctly, forwards and backwards. Next, the trot in movement on a hard surface in a straight line is judged. This gives the veterinarian the chance to check for bottom narrowness or excess bottom width. Experience has shown much variation in trotting movement.

ADVICE

The complete results of the exam are noted on paper and given to the registry. The veterinarian judgment will count as a recommendation. The final judgment will be given by the registry (the stallion judging committee). This exam as discussed in this article takes place immediately after the first round, and in the same location. The report will be taken along to the second round by the stallion judging committee, after which a second veterinarian exam will be done. Because each judging is a moment in time and many factors can play a role, it is a good idea for the stallions to be seen several times by the veterinarians. This way the stallions get a real chance and are given a fair report, from the veterinarians' viewpoint. Besides the first veterinarian test after the first round, x-rays are made and checked, as well as the semen inspection. The second round is only possible when all exams turn out positive. When the stallions get joint and bone exams, another veterinarian exam takes place. The emphasis in that exam will be on the movement apparatus. During this exam, the registry wants to see the build of the potential stallions. The movement exam is geared for that. During the movement exam, the stallions will be checked twice by a veterinarian. Any defects that were noted during earlier exams will probably show up at this time. This procedure makes it clear that a breeding stallion goes through an exhaustive veterinarian check up before he gets the coveted license to breed.

WARNING

During the whole time of the selection process, it is possible that one or more of the potential stallions will be checked for illegal drugs. The owner of the stallion is always responsible for the illegal drugs found in a stallion. So be careful which medicines are administered to your stallion during veterinarian examinations and when they were administered. Ask your veterinarian how long a medicine stays in the system. If you cannot get a clear answer, consult with experts in this field. In extreme cases, ask for a veterinarian statement and consult with the registry.

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Given that the Friesian horse, compared to other breeds, matures rather late, it is worthwhile to give it a try again the following year if the sperm of the three-year-old doesn't meet the requirements the first time around. By then, when the stallion has had a chance to mature for another year, the sperm production has often increased and the sperm quality may have improved as well. But note: the improvement in the percentage of motile sperm cells or the improvement of the structure of the sperm cells is most often small and it is unrealistic to expect an improvement of substantially more than five percent, unless the stallion was ill at the time of, or in the two months prior to, the inspection. Remember that a satisfactory sperm report is no guarantee for a good fertility. The fact of the matter is that a sperm cell needs to have a large number of qualifications to be able to fertilize an egg cell. We test only for a (relatively small) number of these qualifications, whereas deviations in the untested qualifications may cause infertility as well.

On the other hand it is a fact that the stallion with an unsatisfactory sperm report will mostly have a poor fertility potential. That is why it is, and will always be, important to carry out sperm examinations of our future Friesian studbook stallions.