

Natural choice of foal gender in horse-breeding

Knabstrupper Breeding Study regarding the pre- and post-conception dietary influence on the birth/sex ratio (7th Jan. 2012)

The team:

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Foreword: The aim of this Study is to confirm and fine-tune the results of the New Zealand Study with easy-to-follow guidance rules for small breeders to reach the aim of a specific sex which of the next foal and eventually thus get a broader breeding basis of this still endangered domestic horse race.

It shall be performed as an „**Open-Source-Study**“ with participation of the breeders during each phase and with maximum possible access for everybody to the accumulated data base.

History: 2008 the Schimmerwald Stud decided to produce a foal from the Knabstrupper mare Stute Lille. At the same time Mrs. Jördens showed us the findings of the New Zealand study. These findings I found very plausible as a means of fine tuning the answer of the species Horse to nature's pressures, so I decided to do a little pre-study (**Phase I**).

Lille Ged was put on a reduction-diet 4 weeks before the first covering, and this diet was prolonged until some weeks after the ultrasound confirmation of pregnancy.

The outcome of these 3 years lasting Schimmerwald-Study with a diet of approx -30% calories, beginning 42 days before conception until at least 3 weeks after US-confirmation was 3 fillies, whereas Lille had had only colts before!

Now the author comes out of his closet to try and reach as many Knabstrupper breeders as possible, to get a broad basis for validating his findings.

Phase II for the covering season 2011 will be retrospective, with breeders, who didn't know about the diet.

Phase III. The main study will start with the covering season 2012: A prospective study, under the simple circumstances and with all the unreliabilities we small breeders have to keep our horses with.

The partaking breeders will try out a diet regimen to their own liking: Those with a big urge for a specific result and with low anxiety to harm foal/mare will try a stronger and longer reduction/fattening diet than others: so my path will be the same in the future with a -30% diet for about 80 days, (until others regimens have proved to be equally successful) to produce at least in our stud as many fillies as possible.

Others again might favour a slow increase in the diet: beginning with -5% 40 days before, increasing to -20% 14 days before, maybe reducing to -10% as early as directly after the covering and to only -5 % from the 20th to 40th day after. This might be practical esp. for breeders with a bigger herd: singling out a mare for 2 – 4 weeks might not be that hard!

Caution: The study will be seen as much more reliable, if breeders tell me their specifics *before* the sex of the foal is known (i.e. before birth of the planned foal; best in autumn before)!

The other research categories:

A. Source 4 implies the Observation not only of the body condition but also of the the horse's psyche. Therefore we find it useful to ask you after that, too,

Example Lille Ged: By her pre-owner she was described as maintaining a low status in the herd, which we found happening in our own female herd, too.

After the permanent change to Paco's paddock she got to be „first (only) lady“. This social elevation could have meant a step towards producing a colt; but maybe the reduction-diet has been too heavy to let this mechanism express itself?

As it means only one more category to answer, we'll introduce following question:

Social Status of the mare: 1 (high), 2 (middle), 3 (low); recent change of status upwards: yes/no; recent change of status downwards: yes/no

B. With early abortions through limited contact to home male horses after covering in a foreign stable the czech study shows an increase in EAs in mares with contact only through box grids or over the fence (54% !) to those getting in the same space with the males again after returning home (22% EAs).

Not clear is the reason for these 22% early abortions: Should it be the above mentioned „typical EA-Scenario“ through change from reduction- to fattening diet, our diet regime would be sufficient to lower these 22% to nearly zero.

Should these EAs occur partly through the contact with home males, we should try out to create a sufficient distance, say 50m, 100m or total visual blocking or even hearing blocking, too for weeks after the mare's returning home.

(Possibly through this study we might also find out where a not interfering distance from homecoming mare to home male horses begins?)

Appendix:

Some recent researches:

1.NZ wild horse study reveals how to breed for a filly:

<http://beheco.oxfordjournals.org/cgi/content/full/10/5/472>

2.Promiscuous behavior disrupts pregnancy block in domestic horse mares

3.The maternal dominance hypothesis: questioning Trivers and Willard

Is a reduction-diet bad for the foal?

As is widely known now, an overfeeding during adolescence often leads to inappropriate growth

with all its consecutive problems, as there are: chips in the joints, weak ligaments and lying the ground for later laminitis, etc.

If one wants a robust, enduring horse, resistant to climate and capable of hard work one should avoid this too fast growth. The old „genuine“ Lipizzaner horses from Lipica were sought after so much not at least because of their having been raised on the hard, steep ground and poor grazing in those hills.

For many of us the likening of our horses to men is a big problem: seeing them at minus 27°C not even shivering without a cover, we always are amazed; very often we better should step back from our impulse to do them „something good“. The insulin-resistance for example is produced in horses, (similar to the diabetes in man), through over- and misfeeding: sadly also with people it is still not seen as a sign of love, when parents shorten the food-intake of children !

I think at least it doesn't hurt to put the mare on a reduction-diet (and remember: one goal of this study is to determine better the rate and the duration of this diet!); helpful surely will be to maintain the amount of minerals and vitamins additionally given in pregnancy(this helps the mare mostly).

Naturally a prolonged reduction-diet forbids itself in mares with a body condition score lower than 4!

This also approximates the natural wild horse feeding cyclus: during the winter always a grave loss of fat occurs in the then highly pregnant mare.

Those breeders not convinced could take part in the study nevertheless through acting as control group without or with a shortened or a less severe diet.

It will not be easy to gauge the grade of a diet in your horses: 24hours on a fat pasture a horse might gain as much as 4% of its body weight within one week without any additional feeding!

And many horses react to restriction of the feeding hours with massively increased intake per hour!

Solutions might be: 1. a greazing muzzle or 2. the temporarily off-sectioning of parts of the pasture or 3. much more work for the mare, or a combination of all these measures. You should regard every little additional food: everything tasty has got calories: bananas, apples, sweets, carrots, and so on.

In case of the necessity of additional food, one could select low-calorie mixes, possibly something advertised for laminitis-endangered horses. It is even possible to measure the calories of your hay!

Is a fattening diet bad for the mare?

We all fear the laminitis through overfeeding, occurring after years long intake of too many calories, which results in obese horses and might lead in predisposed horses to a loosening of the hoof walls.

The wild horse underlies a natural feeding cyclus of in taking far too much food in summer to be prepared for hard and long fasting periods. This results in an unsuppressible urge for the horse to eat all available food (even if it far exceeds the momentarily needed amount)(as people unfortunately behave, too).

For its health and well-being ideal would be a body score of 4 to 6. Therefore breeders/riders always have to carefully regulate the food intake, be it by giving the horse the same portions throughout the year or else by imitating the wild horse feeding cyclus: fattening in summer by grazing and reducing the weight in winter through diet, cold weather and training.

With desire for a colt and trying to avoid laminitis, one should keep the horse on a reduction-diet for weeks in advance of the (for colt producing necessary) fattening diet prior and after impregnation, especially in mares with a body score higher than 5 (especially when obesity has existed for years!).

Confidentiality of data:

All data will be anonymized.

Our mare Lille Ged gets the number 1, serving as example in the table of data.

Knowing his data, every breeder will easily identify his mare by looking at the table.

Participating breeders have the right to decide about an appearance of their name on the head of the study.

In this study researched mechanisms of selection in wild horses

I: In times of a food shortage the risk of a very hard hunger period is increased; in times of food abundance this risk is low. If horses are dying during a hunger period, the ratio dead mares/dead stallions would be approximately 1:1.

As stallions can't get foals, the limiting factor for increasing the number of horses in a bettered food situation is the count of mares in the population. Therefore it will be important during a crisis to produce much more fillies than colts for the species to be prepared to quick start the growing of the population in the race against other competing species in better times.

If afterwards the food supply increases in abundance, it will be useful again for the species Horse to produce many stallions and have many small families, wherein even weaker, unhealthy mares could play the first violin (i.e.: having the most protected place in winter or during danger, being he first at the best grazing places, watering holes and so on). Then even these mares will get the chance to produce a foal (and many times it will be a healthy, strong one, a plus for the species, without stealing the fittest the means to develop), also even a weak horse feeds on grass that otherwise would strengthen a competing species; so here counts: **„mass instead of class!“**

Diminishes the supply of food again, the weak fights against the strong ones, mares and stallions alike, and some won't get to propagate („Survival of the Fittest“) :i.e.: **„class instead of mass“**.

Thus within a group of horses for example it would happen as follows: During the bad month May conceiving mainly of fillies, during the food abundant June more colts, whereas in the moderate July the ratio would be about 1:1 and the overall balance might be 1:1.

But following a complete hunger year there will be borne many more fillies than colts, even nearly up to the maximum of 32:1 (97% fillies).

So the individual mare functions as a tiny predicting instrument, the whole number of mares during a whole year as a gigantic statistical computing machine of the species Horse! For this it is also very useful that the mares get into heat at different times of the year.

II: Within the population this leads to the selection of the best: The last mare having to switch to filly production will be the „first lady“ of the „first family“: this leading mare always selects the best, most tasty and safest grounds of the whole region for herself, under the protection of the strongest and wisest stallion of the region. That means the weakest mares with the weak stallions produce nearly always (at least outside very, very food rich years) fillies, so their offspring has only

the maximum capacity for one foal. The higher in rank, the chance of a 1:1 ratio of fillies to colts or even a 4:1 ratio occurs. This again can be seen as a mighty and infallible computer out of living animals, this time for computing evenly for every individual the right for multiplication of their genes and also in the same step attributing it to them!

III. This mechanism would also be perfect for the adaption to longer evolving climate changes: the mare which lets herself be impregnated during a food raise (fattening diet) has got the best chances to build enough milk for next years foal and having enough gras to fatten up the foal as preparation for the winter. Her multiplier is thus be smaller getting impregnated during a hunger time. If the food situation changes to, say, a peak in April instead of May, over decades the main timing of the mares' heat will thus adapt.

III.a Into this picture one could well place the study regarding the early abortion of female embryos during sharp increase of food: Nature would thus correct its wrong decision (namely an impregnation during a food shortage) in the event of the very opposite situation, this would ensure again the long-term-climate-adapting of the species Horse!

Possibly this reaction is the reason for some of the early abortions in the Czech study. This would then be **the typical „Early-Abortion-Scenario after foreign covering“**: the mare at the new stable gets nervous, uses more calories on the new paddock with foreign horses, possibly her unusual food tastes bad, while she is not finding the calm to digest properly, even the local feeding master might have his own ideas about a sufficient portion..(All in all a reduction-diet!).

Back home, she is seen as pregnant und the food will be raised, or maybe it's just the time of the starting grazing season on a fat pasture (=fattening diet!). If the hypothesis in IIIa is right, she will now get an early abortion! Now at home she is on a fattening diet and on the next stay in the (now not so foreign) stable she knows, the duration will be short and not harmful and she is calmly greeting „old acquaintances“, getting into the established pecking order without problems, and gets the now known food. This second time in the foreign-stallion stable in not catastrophe, but more a vacation to her, and the fattening diet from back home won't be interrupted: this leads to a 80% chance of producing a colt and also there won't be another early abortion, because back in the home stable she receives again the raised food as a pregnant mare!

Is this scenario right, in case of the wish for a colt it could be the better way to get the stallion to the mare's stable and so avoid an early abortion or to let the mare adapt slowly with more time in the foreign stable before covering.

On the other hand, in case of a wish for a filly, the stress in a foreign stable would be a (welcome?) increase of the reduction-diet, but then back home this diet should be kept on for as long as an EA is possible.

One should assume that in case of a change from fattening to reduction-diet an EA of the colt embryo follows, too, but this would be much rarer, I think.

Possible physiologic mechanism

Conceivable would be a lever through the fat or glucose in the uterus.

Some breeders have normal birth/sex ratios in all but one or two mares, which produce nearly always colts.

My pet-theory at the moment suggests a correlation with the insulin or glucose levels. Possibly we can find in solely colt-producing mares hyperinsulinism (similar to diabetes mellitus type II in humans)? My theory would then be expanded to the claim, that the (otherwise very

harmful) genes for DM II/Hyperinsulinism are preventing a season completely of fillies (as sort of an emergency-break mechanism).

Means and methods:

1. Body Score Index
2. Question Sheets
3. Data-analysis with SPSS for Windows