Will the Arabian Horse become a product of the laboratory, or will it remain a masterpiece of nature and tradition?

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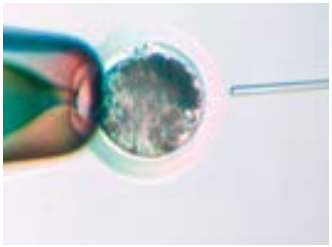
The Arabian Horse stands as a testament to the power of centuries of selective breeding, shaped by nature and by the Bedouins' unwavering dedication to traits like courage, resilience, functionality and loyalty. Its purity and refinement are unmatched, a living legacy of tradition. Yet, the last century has introduced **frozen semen**, **assisted reproduction technologies** (ART)**—artificial insemination** (AI), **embryo transfer** (ET), in the 21th century were added **intracytoplasmic sperm injection** (ICSI), **in-vitro fertilisation (IVF), cloning** and even **CRISPR gene editing** — these advances are reshaping the breed's future and they offer unprecedented opportunities for the Big Pharma and Big Tech industries to capitalise on the horse industry, but for horse breeders and their horses around the world, they pose increasing existential risks. I want to emphasize that horse welfare always must weigh more heavily than purely commercial interests. We need a clear ethical compass instead of the technical assistance for speed breeding.



Intracytoplasmic sperm injection performed on an equine oocyte.

Horse reproduction, mating, foaling and rearing are natural processes, not illnesses that need to be monitored and treated using highly technological veterinary medicine. Even ultrasound scans to determine a mare's oestrus were, in the vast majority of cases, unnecessary in the last century. Anyone familiar with the behaviour of stallions and mares knew when a mare was ready to be covered. Healthy mares were covered in hand or inseminated with fresh semen. Mares that showed no signs of oestrus after 18 days were considered to be in foal. Anyone wishing to call a vet to be on the safe side paid just for a scan. Rarely we had a mare that failed to conceive during the entire breeding season. Hormonal treatments such as prostaglandins, HCG, Regumate and antibiotics – which are now an indispensable part of vets' protocols for successful mating – have only been available since we replaced natural processes with reproductive technologies.

In Arabian horse breeding in the USA – which was still our opinion leader in the last century – the term 'horse industry' was used. This term sent a shiver down the spines of breeders in Europe, as it was reminiscent of animal production in the food industry, whose methods we Arabian breeders rejected outright. This was no problem for the pharmaceutical and biotech industries. Where there is no need, one is created and credibly propagated through a narrative suggesting that the modern Arabian breeder will only have a future through easier access to globalised markets and their technological innovations. However, the 'industrialisation of broodmares' meant that elite mares were often turned into 'embryo factories'. Due to intensive hormone treatments and constant uterine flushing to produce several foals a year, many mares suffer from premature 'reproductive burnout'.

Had it not been for the export boom of Arabian horses to Arab countries beginning 30 years ago, we would hardly have given in; yet demand from the East turned the small-scale Arabian breeding operations in rural areas of the US and Europe into a profitable enterprise. Horse breeding is an expensive undertaking, and the prospect of speeding up production through technological innovations – to bypass the slowness of natural reproduction – was tempting for many.

The first groundbreaking tool that decisively changed the lives of stallions and mares was the invention of frozen semen. Promoted as a transport alternative to enable the global

commercialisation of famous stallions via semen shipping, it enjoyed enormous success. Yes, it was now possible to order and dispatch semen from other continents. A new profession emerged: that of the **equine gynaecologist** – a vet with specialist skills and equipped with expensive technology, as the production of frozen semen is complex and costly.

The **cryopreservation industry** provided specialised containers for the shipment of frozen semen. Insemination of the mare no longer took place on the farm but, in accordance with the law, at an accredited veterinary clinic or a specially equipped breeding station. The use of ultrasound became indispensable for monitoring ovulation and ensuring insemination took place within the correct time window.

Scientists worldwide were working on ever-improving techniques to gain total control over reproduction and to shift this process away from the horses and into international biotech laboratories. Time and again, the scientific community announced a new 'breakthrough'. Following **ICSI (intracytoplasmic sperm injection)** – which involves using a special microscope for oocyte retrieval which may pose certain risks to foals – the new method is an innovation designed to improve and simplify **'in-vitro fertilisation' (IVF)**, i.e. reproduction outside the uterus. Apparently, researchers have succeeded in encouraging stallions' sperm to fertilise an oocyte – that is, an egg cell from the mare – in a Petri dish without manual intervention. This reduces the risks and costs associated with ICSI.

Research centres will claim that this method will 'democratise' speed breeding, as it is available to everyone. Whilst ICSI was extremely expensive, IVF could be a further step towards mass, less expensive speed breeding. As the 'icing on the cake', there is also the possibility of **determining the sex in advance**. We will then have a glut of mares whose market value will crash just as the colts did before.

Apparently, there are already breeding stations in the Gulf States where hundreds of embryos – often full siblings – are floating in liquid nitrogen inside containers, awaiting sale at auction and implantation into a mare to carry the foal to term. Not many of the very few foals that survive this process turn out to be what the breeders expect. But with 20 full siblings, there's bound to be a future champion among them, isn't there? The other 19 end up on the leisure market, practically as a giveaway.

Although very few breeders in Europe use in-vitro reproduction, many foals from 'intensive breeding' programmes or embryo transfers are on the market here, ensuring that hardly any breeder dares to have their mares covered anymore. The costs of covering and rearing the foals probably exceed the income from their sale, as there are simply too many horses on the market. **ART has set an inflationary mechanism in motion** and, due to the globalisation of the market, no region in the world can feel safe from ET foals produced through in-vitro fertilisation.

I do not wish to romanticise the past of Arabian breeding in rural areas; there were problems too, particularly with marketing the offspring or transporting mares to the stallion, but today we are grappling with the side effects of ART and all its costly refinements. The problem is also that there are hardly any legal alternatives for freeing oneself from the industry's grip.

The promised benefits – internationalisation, greater certainty for breeders regarding laboratory-based

WAHO'S INTERNATIONALLY ACCEPTED MANDATORY RULES, WHICH HAVE BEEN REPEATEDLY PASSED BY VOTE OF THE DELEGATES TO THE GENERAL MEETINGS.

RULE 20: CLONING

1. It is a mandatory WAHO rule that any Arabian of any age produced by cloning must not be registered under any circumstances.
2. It is a mandatory WAHO rule that the foals of any Arabian which was produced by cloning cannot be registered.

RULE 21: EXTERNAL FERTILISATION OF OOCYTES FOR EMBRYO TRANSFER

Effective from 1st January 2013.
1. It is a mandatory WAHO rule that any Arabian of any age produced by the post-mortem collection of oocytes must not be registered under any circumstances.
2. It is a mandatory WAHO rule that any Arabian of any age produced by any method of In Vitro Fertilisation (IVF) must not be registered under any circumstances.

RULE 22: GENETIC MODIFICATION INCLUDING GENE EDITING AND GENE DOPING

Effective from 8 February 2019.
1. It is a mandatory WAHO rule that any Arabian horse of any age which has been subject to any form of genetic modification at the embryo stage or later must not be registered under any circumstances.
2. It is a mandatory WAHO rule that the progeny of any Arabian horse which was subject to any form of genetic modification at the embryo stage or later must not be registered under any circumstances.
3. It is a mandatory WAHO rule that any Arabian horse of any age which has been conceived using genetically modified gametes must not be registered under any circumstances.
4. It is a mandatory WAHO rule that the progeny of any Arabian horse which was conceived using genetically modified gametes must not be registered under any circumstances.

reproduction, and the health and welfare of the horses themselves – in fact relate to problems and risks that have only arisen because of the use of ART.

A few examples:

- **It is said that biotechnology has saved many bloodlines from extinction through the long-term preservation of stallion semen and embryos.**

On the contrary, thanks to these technologies, state studs should have invested in the genetic conservation of the older, less commercial bloodlines so that they could serve as a healthy source within the breed. Yet this possibility was not considered, and the decision on breeding was left to the market – that is, to private breeders – who, however, only invest where they expect to make a profit from their own selection breeding the best of the best. Even at the historic El Zahraa State Stud in Cairo, the cradle of authentic, pure Egyptian lines, genetic purity was abandoned in the last years in favour of using modern show stallions.

The result: ART has encouraged the 'Popular Sire Syndrome', thereby reducing the breed's genetic diversity. The consequence is an increase in inbreeding and, consequently, the occurrence of hereditary diseases. One of the most common symptoms of inbreeding depression is a decline in fertility in stallions and mares.

- **It is said that ART is ideal for sub-fertile stallions and mares, as in-vitro fertilisation bypasses nature whilst still enabling the production of offspring.**

In this context, ART is actually counterproductive, as in natural breeding, the less fertile animals do not pass on their genes and these lines die out in favour of the healthy and stronger ones - 'the winner mates'. We, however, artificially preserve these lines through ART and thereby produce foals carrying pathological genetic traits. Why, exactly? It's all about money in the here and now. Famous horses of the past and their offspring are branded; it's all about the names and the pedigrees, which will continue to play a role in the vanity market of the future.

After all, all ART methods make use of embryo transfer (ET) to transform the produced embryos into Arabian foals. There's a catch, however, as the surrogate mare is not the biological mother. She usually comes from a gentle, fertile warmblood or even a coldblood mare of substantial build, as opposed to a delicate Arabian mare. A uterus that is too large, far too much milk, a lack of Arabian charm in her nature, and certainly the mother's different gaits influence the embryo for 11 months and then the foal for a further 6 months until weaning.

This is where **epigenetics** comes into our breeding management. The term is a combination of the words **genetics** and **epigenesis**, i.e. the **development of a living organism**. Epigenetics is regarded as the link between environmental influences and genes. However, it is not limited to maternal socialisation: epigenetics also refers to heritable changes in gene function without any alteration to the DNA sequence. In horses, training, feeding, stress, husbandry and breeding methods are all factors that can influence epigenetic patterns. Many breeders therefore do not include ET foals in their breeding programmes. This already highlights a clash between tradition and breed purity on the one hand, and laboratory technology and market orientation on the other.

It is high noon for the traditionally run Arabian studs, which have formed the backbone of quality breeding throughout the world.

Yet we are not giving up hope. WAHO's resolute stance on strictly prohibiting cloning, any form of in-vitro fertilisation, and genetic modification is our strongest line of defence. Whilst international commercial pressure from biotech firms is pushing for the unrestricted deregulation of these laboratory techniques, WAHO's decision ensures that Arabian horses and their original genetics have a right to welfare and protection.

In the interests of the horses and the breeders, the Registries should communicate the relevant rules more effectively, as most breeders are unaware that foals produced through any method of in-vitro fertilisation (IVF), genetic modification or

cloning cannot be registered in their country's stud book. **It should be mentioned that WAHO Rules refer to the non-registration of the resulting foals, and their future offspring, not the procedures themselves.** Obviously, it is very difficult to ‹police› these rules, and that WAHO Registering Authority Members do face difficulties in enforcing them, as they cannot easily verify the methods used to create the foals when registration is applied for.

To help their Member Registries to be more effective, WAHO has asked them all to ensure that any veterinary centres in their country offering these procedures are aware of the rules.

There is one lever that everyone can pull: drastically reducing the number of foals registered per mare per year. After all, the industrial-scale mass production of foals can only function if there is no limit on the registration of ET foals. Egypt has shown how things can be done better. From 2026, only one foal per mare per year may be registered there, regardless of whether it is produced via ET or naturally. Applause for this courageous decision. Poland, too, is already a good step ahead of most member countries: a maximum of one natural and one ET foal per mare may be registered each year. And in addition: The recipient mare must be an Arabian mare to combat the epigenetic effect. Czech Republic, France, Jordan and Sweden followed the Polish Idea of 1+1.

The welfare of the horses must take precedence over purely commercial interests. An ethical compass for the conservation of the Arabian horse breed will have a positive long-term impact for everyone. This is the only way we can prevent the majority of Arabian horses in the future from being the product of laboratory technology.

Monika Savier has been breeding Arabian horses in Italy for 35 years. Since 2015 her farm operates a certified European stallion station. She has an MA in Social and Educational Science and also works as an equestrian journalist for *Desert Heritage* and other Arabian horse magazines.