BAHRAIN:
The WAHO Conference 2017

Text and Photos:
Monika Savier

Editing and Condensation of the talks:
Bettina Borst

Graphic Design:
Mario Brunetti

Part Two: The WAHO World Registrar Meeting, Talks and Results from the Conference.

Photo: Ali Alawadhi

The Kingdom of Bahrain, "The Pearl of the Gulf", had invited the WORLD ARABIAN HORSE ORGANIZATION (WAHO) for their 22nd General Assembly in Manama. From the breathtaking ancient history and fascinating traditions to the modern times, impressive architecture and important Arabian horse breeding, there was much to see and to do in Bahrain for over 200 guests from all over the world. The Conference Patron was H.M. King Hamad Bin Isa Al Khalifa and it was hosted by his grandson H.H. Sheikh Isa Bin Salman Al Khalifa, chairman of the High Organizing committee. The Conference was officially opened by H.R.H. Sheikh Salman Bin Hamad Al Khalifa, Deputy to the King and Crown Prince, at the Ritz Carlton Hotel.

WHAT IS WAHO?

Arabian Horses are unique, as for centuries now, they have not only been found in the Arabian countries but are citizens of the world, living and reproducing in almost a hundred countries all over Earth. With that enormous globalization, this horse breed evolved from the war horse of greater Arabia to a favorite animal for a great number of people of all classes and ages all over the world. With their world-wide prevalence that also served to spread the history of the Arabian culture they are connected to, they created a bridge and bond of understanding and friendship between people of many countries. WAHO, then, is the formal frame for all of them, the microcosmos that serves to anchor the history of individual horses and their offspring and to commit all of that history to writing in an aggregate studbook. In WAHO, all horses are equal. WAHO is the umbrella organization of the national "local residents' registration offices", so it's WAHO that regulates the guidelines and rules for the international trade relations between breeders and owners of Arabian horses in more than 80 member states, also harmonizing them wherever possible. This is not an easy task, and coordination is only possible using perception, instinct, and geopolitical know-how. More often than not, the studs in the various member states are subject to highly differing laws and regulations as to animal welfare, (embryo) transport rules, and methods of registration and identification of horses – all of which are necessary to make international transfers possible at all. For the globalized market, the WAHO registered purebred Arabians equipped with a uniform document of identification are an enormous benefit.

In part 1 of our report on the WAHO conference, TUTTO ARABI informed you on the history and today of Arabian horses in the island nation of Bahrain in the Arabian Gulf. In the current issue of TUTTO ARABI, read about the decision-making processes and the debates on the topic of horse registrations and management within the world-wide umbrella organization for Arabian horses that is WAHO, as well as short versions of the up-to-date lectures offered by international experts there.

However, WAHO's goal is not just "to promote uniformity in terminology, definitions and procedures relative to the breed of Arabian horses", as the fundamental cornerstone of the organization is the definition of the breed, "to preserve, improve and maintain the purity of the blood of horses of the Arabian breed and to promote public interest in the science of the breeding of the Arabian Horse." Owing to the application of selection criteria, which was followed by the studbook being closed in 2004, Arabian horses as defined by WAHO were acknowledged as an international breed. Consequently, WAHO was able to state: "A purebred Arabian horse is one which appears in any purebred Arabian horse stud book or register listed by WAHO as acceptable."
In many Arabian countries, the purebred Arabians are meanwhile called "WAHO Arabians".
To put it differently: a purebred Arabian can only be called that if he is registered in a WAHO acknowledged studbook. At the same time, if somebody sells an Arabian with a WAHO passport, exporting him from his own country into another country, that person is entitled to have that Arabian, without any fuss, registered and acknowledged in the WAHO studbook of his new country.

Photo: Ali Alawadhi

Photo: Ali Alawadhi

The event was carried into effect by Dr. Khalid Hassan, Director of the Royal Stables, and Mr. Jehangir Rustomjee, registrar of the Arabian studbook of Bahrain. Assisted by their teams and by Katrina Murray, WAHO's Executive Secretary, they made this conference into a total success.

WAHO controls the procedures and specifies them for the member states. With the conferences every two years, the organization has created a platform for the representatives of the national associations (the registrars, for example) to meet in order to discuss any pending procedures, taking part in the decision-making. The chair then makes the proposals from the registrar meeting into resolutions (for example: cloning is not permitted) or recommendations (for example: such as not to register more than two embryos per mare per year).

WAHO has succeeded in making a positive connection between the cultures of the East and the West. This is a success that needs to be accredited to the Arabian horses, too. By way of the conferences and the experts' talks given there, WAHO supports information and ongoing education of her members and delegates. Usually, the excursions that can be taken to experience the hosting countries are an unforgettable highlight.

2017 WAHO WORLD REGISTRARS' MEETING

Within the frame of the WAHO World Conference in Bahrain, 31 national studbook registrars of member countries held their meeting on February 8. They were supplemented by two Observers, from applying members China and Cuba. Xavier Guibert, the Chairman of the registrars' meeting, reported several important decisions to the General Assembly.

Xavier Guibert, Chairman of the registrars' meeting

Compulsory Central Database for Animal Breeding Organizations

With the latest EU regulations concerning identification, zootechnics, and medication, Xavier reported, establishing a central equine database is now compulsory for each member state of the European Union and needs yet to be implemented in some WAHO member states. There are concerns that State Veterinary Departments in some countries would like to bar individual studbooks from including the identification certificates issued by them in horse passports. Instead, identification documents issued by the vets could be separated from the pedigree and certificate of origin issued by the Members, to make two separate documents, which many registries strongly oppose.
Mr. Guibert suggested lobbying with the EU for

this topic as well as for the matter of preserving the UELN (the Universal Equine Life Number) instead of having it replaced by a microchip, as two EU countries are requesting. After all, WAHO has 16 countries which do not apply microchipping but do apply the UELN.

No Consent on Temporary Stay Procedures

Some countries have a lot of purebred Arabians imported for endurance or racing which are never registered in their database, nor are they recorded. The Registrars were presented a proposal from the WAHO office, prepared with the help of some stud books, updating the former WAHO In Transit Rules which are no longer in force. The proposal contains a set of minimum requirements asking for identification by passport plus DNA plus an owner declaration.
Several stud books would have liked to have the full normal export procedure for breeding animals, particularly the stallions, applied to the "temporary stay" situation, but not all were in agreement. Another proposal, namely to issue a full export certificate, and to make free the procedure of re-importation, does not solve the main problem and does not refund the effort required for re-importation. As a satisfying proposal could not be found, it was concluded that WAHO should contact the FEI, and WAHO Member Registries should contact their own National Federations, in order to ensure that imported horses would not be accepted to compete without being recorded. In the European Union, studbooks should conform to EU legislation, which in any case makes the recording of imported or introduced horses into the central database compulsory. "The stud books can be the point of entering the horse into their national database", Guibert stated, "so it gives them the chance to record them at that time."

Covering Certificates to be Issued in English, too

With mares exported in foal and semen exported for breeding, there is an increase in covering certificates crossing borders, as there is a mandatory WAHO rule for registries to be given the certificate of covering before issuing the passport of any foals. This makes for language problems,

of course. It would be a good solution, the registrars agreed, to have the respective designation (name / label) of the different boxes / fields of the covering certificate also printed in English on the national forms, like it is done in the European passport.

WAHO Central Database Project

This item was first brought up more than 20 years ago, as it would permit to solve a lot of problems of communications between the studbooks. The USA studbooks give free access to their DataSource to all studbooks but only a few use it. To build a central WAHO database would require, Guibert reported, that each stud book would produce, at least once a year, a copy of its own data to the WAHO database, as it is done for Thoroughbreds at Lexington. An alternative approach would be to have all studbook databases online and open to each other

and to searching via a Hub such as has been developed by and for the WBFSH (World Breeding Federation for Sport Horses). As apparently most of the stud books are or will be online, this approach looks promising. The studbooks would first have to study what should be done to find online all the information they need to manage the registration business.

Naming Foals and Changing Names

With naming horses, "the main goal is to enable breeders and studbooks to follow the career of their horses all along their life and all around the world", as Guibert put it simply. There are ISBC (International Stud Book Committee), FEI (Federation Equestre International) and WAHO rules for that, and most of the member countries observe the existing WAHO rules 24 and 25, he specified. Several member countries made a proposal to add some words to WAHO rule 25, making it possible to change a horse's name, for very serious reasons submitted to the studbook committee of the country, and only if the horse has never competed in any official show, race or sport event and has no offspring at that time. The breeder of the horse in question would normally also be required to give their consent, and the passport should be amended or a new passport needs to be produced. The registrars' meeting had a vote with 1 abstention, 7 against and 19 countries in favour of changing some words in the existing rule.

The proposal for that change was presented to the Executive Committee during the Conference, but the committee required a more precise wording. It was decided that Mr Guibert should manage a very small group of Executive Committee Members for putting down the exact wording for approval. So at present, the current rule is still valid. However, now the Executive Committee has the power to change the rules due to the new Constitution. So the national Registrars will receive the proposed wording, there will be a consultation by email, and within 6 months after receiving the proposal, a decision will be made by the Executive Committee.

Registration of Genetically Manipulated Horses

After a thorough debate, the registrars agreed to propose to WAHO to start preparing a new rule. Most member countries wish to restrict the use of genetic manipulations – cloning is already prohibited by WAHO, but new techniques get implemented at a quick rate, and some studbooks accept them all. USA, for example, accept all techniques, and they register any foal having a sire and a dam, so they are among the few studbooks that are very open to new techniques, except maybe strict genetic manipulation. Cloning was discussed as well as OPU (ovum pick-up), ICSI (intracytoplasmic sperm injection) and other techniques. As it is difficult to determine where genetic manipulation starts, it was proposed that WAHO should start on preparing a new rule, with the clear definition of genetic manipulation at the beginning. Each country present reported on their do-

mestic rules on genetic testing of breeding stock and/or foals in the process of registration, as a general aid to information sharing.

Combining Meetings

At present, WAHO, IFAHR (International Federation of Arabian Horse Racing Authorities) and ECAHO (European Conference of Arab Horse Organizations) all have their own Registrars meetings. A suggestion was made to retain the World Registrars Meeting during the WAHO General Assembly every two years, and perhaps have a combined meeting in the intervening year, which will be further discussed to see if this is either practical or useful to the Registrars. They approve of having the ECAHO Registrars' meeting every two years in between the General Assemblies, Guibert reported. It probably remains to be seen whether the groups targeted by ECAHO, IFAHR, and WAHO respectively are actually compatible enough to work on common goals during common conferences.

Thanking Xavier Guibert for his report, WAHO President Peter Pond expressed his great pleasure in the fact that WAHO has incorporated the Registrars Meetings. When the Membership grew, "it was important that WAHO arrange for the registrars to have their own meeting to discuss the world rules and regulations", which has become "a really important function for WAHO and the registrars", Pond said.

NEW PROCEDURES IN WAHO: CONSULTANTS TO THE WAHO EXECUTIVE COMMITTEE

By introducing a new voting system for Consultants to the Executive Committee (EC), WAHO hopes to achieve, over time, an EC comprised of individuals who have all been initially elected as Consultants by the Voting Delegates at a WAHO General Meeting. Consultants generally progress to full EC Membership in due course. WAHO has always had EC members and Consultants from a wide range of regions, who can offer a broad spectrum of expertise in both general equine and Arabian-specific matters to help achieve the aims of WAHO, and this will continue.

A protocol for the nomination of Consultants was presented to the delegates at the WAHO General Meeting in Bahrain in February 2017, for action at the following WAHO Conference in 2019. From a list of candidates, four will be chosen by the General Meeting.

A list of criteria for an individual to be eligible to be elected as a Consultant to the WAHO Executive Committee has been detailed, as well as criteria for an individual NOT to be eligible. One candidate per country (as represented by their WAHO Registering Authority), an outstanding horse person and WAHO member in good standing, can be nominated by their country's registering authority and needs to be supported by another member of that body. Consultants will have duties that are not refunded, are expected to take part in all EC meetings, and are eligible for internal election by the EC to full EC membership.

CHINA APPLIES FOR THE STATUS OF REGISTERING AUTHORITY MEMBER OF WAHO.

Gaofeng Yue and the team of the Chinese Studbook of Arabian horses give their report as follows:

"In the last ten decades many Arabian horses have been imported from different countries into China. Today we estimate that China has a stock of over 200 living Arabian horses, all of them either imported from WAHO approved studbooks, or their direct progeny. Under the guidance of CHIA, the China Arabian Horse Association, besides making great efforts to become a Registering Authority Member of WAHO, will from now on maintain the registry and studbooks, and popularization for Arabian horses in China. Our first task will be to register every living Arabian in our country for inclusion in our first Arabian Studbook in China which, with the help of WAHO and of our Registrar colleagues around the world, we intend to have ready to submit for approval within the next year. China has a splendid horse culture of 5,000 years. Today, nearly 6 million horses still live in our country with its area of 9,600,000 square kilometers. As the world's second largest economy with a population of 1.4 billion, China has more than 1,000 equestrian clubs, stud farms and racetracks included across the

country with over 10 million faithful horse lovers. As a result, the horse industry in China has won unanimous support of the government as well as the public, and its rapid development has attracted attention from all over the world. We strongly believe that the excellent genes and culture of the Arabian horses will be preserved and spread in China, thus making our special contributions to the prosperity of this noble breed".

DEIRDRE HYDE:
RACING ARABIAN HORSES

Deirdre Hyde is an international judge, a much-published author, and an acknowledged pedigree expert. She has done research into many areas of the history of the Arabian horse and has strong interests in all aspects of equine welfare. She moved from the UK to Abu Dhabi in 1992 to work as Stud Manager for the Royal Stables, before going to join HH Sheikh Sultan bin Zayed's W'Rsan Farm where she further developed her interest in racing.

The racing of Arab horses of recognizable type and beauty has been an integral part of Arab culture which can be traced from pre-Islamic times. Balancing the ideals of beauty and speed remains a challenge to this day!
Racing was encouraged by the Prophet Mohammed who saw it as a way to keep horses fit for the wars waged in support of the spread of the new religion. Later, Islamic scholars discussed the organization of racing and whether laying wagers is permissible in Islam. So Al-Dumyati, who was an Egyptian active in 1285 AD, states that races of two distances were recorded, the first for lean, or fit, horses which were run between Al Hafyaa and Thaniay Al Wadaa, about 6 km apart. For the fatter, less fit or younger horses, a distance of 1 km was considered suitable. A particular condition of the races was that racing of unequal horses made a race meaningless! The same applied to fitness and purity of pedigree; like should race with like because else it constitutes a wager which is prohibited. The recent renaissance of interest and enthusiasm for the sport testifies to the fact that people consider it very much part of their Muslim cultural heritage.
The Royal Stud of our host country Bahrain dates back to the late 18th century, with the soundness and usability of their precious local lines considerably enhanced by testing them through racing. Kuhailan Afas, who went to Poland in 1931, and Hamdanieh Rayhaanah, popular during the 1980ies and later sent to the UAE, are two examples of horses that put the Bahraini Arabian on the world map of racing. In 1981 Bahrain's Equestrian and Horse Racing Club established its modern race track in Sakhir, and all racing activity was moved there.The Arabian race, restricted to pure Bahraini horses, is always the most popular.

Until the First World War, from 800 to over 1000 horses left the Gulf ports annually for India's racetracks, amont them Dwarka, foaled in 1892 and bred by the Anazeh Bedouins. As the sire of Aldebaran, known as Aldebar in USA, and as the grandsire of Algol, he appears in many modern pedigrees, particularly through Dargee.
Another stallion found in modern performance pedigrees is Mootrub, born in 1887, a Seglawi Jedran from the Nejd. He was a race winner in India as well as a winner of numerous championships when he was brought back to England. Mootrub was the sire of Shahzada, exported to Australia and after whom the famous endurance race is named.
There are many Arabians who served as racehorses and chargers and were noted for their soundness and the consistency with which they appeared week after week through the racing season. 11 out of the 110 horses registered in Volume 1 of the Arab Horse Society Stud book fall into that category.

A SHORT GALLOP THROUGH THE STORY OF ARABIAN RACING

The Start
Beersheba 1940

Mounted Villagers who took part in racing
Gaza1943

In Britain in 1884, Wilfrid Blunt eventually managed to persuade the British Jockey Club to hold a race for Arabian horses. The Blunts rode many of their purchases on their Middle Eastern travels, including the famous Mesaoud who was purchased and raced in Cairo. Mesaoud has been one of the most important influences on modern pedigrees through descendants such as Daoud, Astraled, Feluka and Risala. By the early 20th century, Russia and Poland had developed systems of racing to test the stock they bred, and of course by the latter part of the 20th century Tersk Stud in Russia and the great State Studs of Poland such as Janów Podlaski were producing outstanding horses and testing them on the race track as an integral part of breeding selection.

The United States in particular have benefited from these horses from Russia and Poland. Formal Arabian racing in the US started in 1959 with exhibition races held at major race tracks. The mighty stallions Sambor, Orzel, Wiking and his son Monarch AH may serve as examples for understanding the influence this blood has had in USA.

Unfortunately, the colonial powers of Britain and France left behind their own horses when they left the Asian regions after WW1, putting at risk the purity of the Arabian horse. By the 1930ies it had become obvious that the danger was not only the purity, but the possible extinction of the Arabian horse in its homeland, and steps were taken in a few countries to preserve and record the precious remaining horses in line with western stud book principles. The Egyptian EAO was to become one of the most important sources of purebred Arabians in the 20th century, one of the most influential among them being Nazeer, with his descendants still a source of speed in breeding all over the world. Arabians in Egypt are still assessed and raced according to height, not an unreasonable concept in our very variable breed! Also, an old Arab belief relates that when a horse is galloping fast, the lad riding him should be hidden by the neck from the front and the tail should hide him if seen from behind. This is a feature noticeably absent in many of the modern Arabian racehorses and it is the lack of such features of classic type which remain a major cause for people to question the purity of such horses.

If we care about preserving not only the genetic breadth of the breed but also the whole unique identity of the classic Arab horse, the racing of all our horses should be encouraged, mainly for the joy of seeing beauty that can perform. If care is not taken we will be left only with pieces of paper, the original classic horse will have been lost or transformed into something completely different.

(This is a summary of Deirdre Hyde's talk)

THE WAHO GUESTS AT THE RACE TRACK OF BAHRAIN, HOSTED BY THE RASHID EQUESTRIAN & HORSERACING CLUB

Race Meeting with the Featured WAHO Cup Race and Traditional Race.

Photos by Ali Alawadhi


100

DR. SAMANTHA BROOKS: "HOW SCIENCE IS HELPING US TO HELP OUR HORSES: NEW FINDINGS ON LAMINITIS SUSCEPTIBILITY AND EQUINE METABOLIC SYNDROME IN ARABIAN HORSES"

A lifelong horse woman, Dr. Samantha Brooks started out with a Bachelor of Science degree in Agricultural Biotechnology but switched to Veterinary Science, earning her PhD in equine genetics. She was awarded a fellowship to study the expression of inflammatory genes in horses affected with laminitis. Her research programme at the University of Florida explores a variety of topics relevant to horse health, ranging from gene expression studies to mapping of genetic disorders in the horse.

As one mission of WAHO is to address concerns of horse welfare, laminitis would be among some of the high priorities. In laminitis, the lamellae that are responsible for holding and supporting the coffin bone within the hoof capsule get inflamed. With inflammation and swelling within the confines of the hoof capsule, there is additional damage in loss of circulation. The accumulative damage to those tissues releases the coffin bone from the hoof wall, eventually progressing to the bone resting just on top of the sole internally, which is excruciatingly painful for the horse.

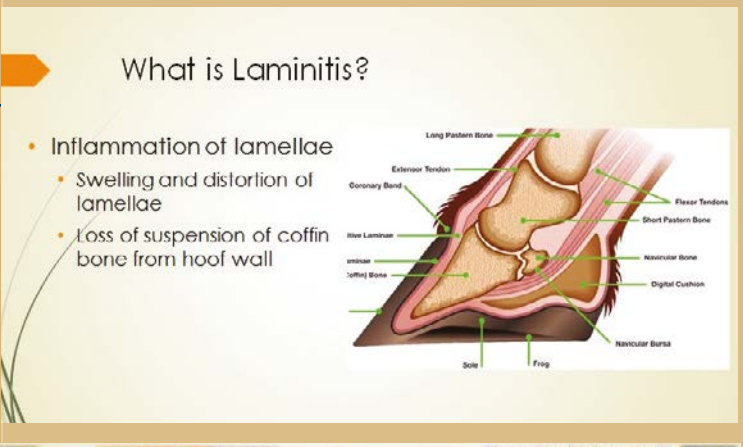
Remarkably, laminitis has remained an incredibly frustrating condition to treat in the horse and a fairly poorly understood medical problem. Our treatment options are not very varied or effective. Cooling the hoof maybe the only effective first-aid intervention for the damage to the hoof caused by laminitis, as the cold may interfere with some of the enzymes involved in generating inflammation there. So today, cryotherapy is used, with ice applied to hooves for 4 to 6 hours, or hooves kept at cold temperatures for 24 to 48 hours.

My research focus is on laminitis associated with pasture or with dysregulation of the endocrine system, which comprise the majority of cases that are seen in the developed world. What we don't understand is the underlying cause of this condition, but we can see a vicious cycle of sorts, starting in many cases with obesity that may through some unknown mechanism trigger a bout of laminitis, maybe through insulin resistance. So how does this cycle begin and where might we be able to intervene?

Among individuals who are not in hard work,

surveys have shown that as many as half of those horses are by strict definition obese. We tend to see two types of obesity, horses who have fat evenly distributed across their bodies, and others displaying a regional deposition of fat, including on the crest of the neck. The cluster of symptoms including the latter is called Equine Metabolic Syndrome (EMS).

The obesity may lead to, or may be caused, by Insulin Resistance. So as the horse produces insulin to help to move glucose - the fuel for the muscles - from the blood stream into the muscles and other tissues, the tissues simply don't respond. The result is that the levels of insulin circulating in the horse with this condition will continue to rise. These horses also have high blood lipids, cholesterol, and triglycerides, and a variety of other endocrine issues with the most notable being elevated leptin. Leptin is one of the hormones that help to regulate formation of fat.



They also have high blood pressure, but that is difficult to measure in the horse.

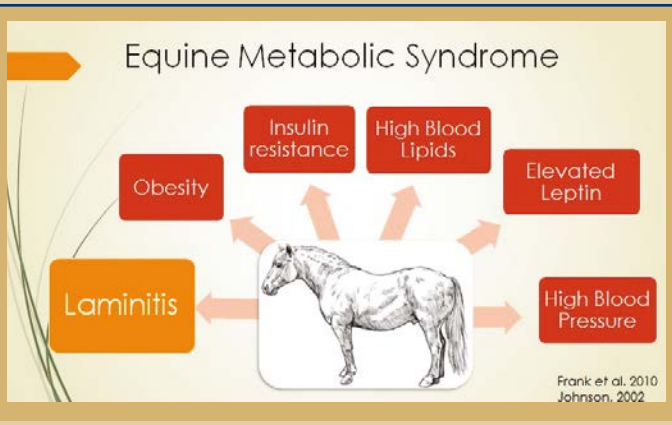
There is a correlated human condition, Human Metabolic Syndrome, which is also characterised by obesity and insulin resistance, high blood lipids and high blood pressure, and the hormone leptin can also be elevated. But in humans, as we don't have hooves, the most serious secondary concerns are cardiovascular disease, hardening of the arteries and heart attack. In women you can see Polycystic Ovarian Syndrome, and there are a few reports that suggest there could be reproductive consequences for a mare with equine metabolic syndrome as well. Uniquely in people this condition will progress to type II diabetes, where individuals will lose the ability to produce insulin. This is particularly a striking difference to the horse because the horse's pancreas can continue to produce high levels of insulin almost throughout the life of the animal. Very few horses lose the ability to produce insulin.

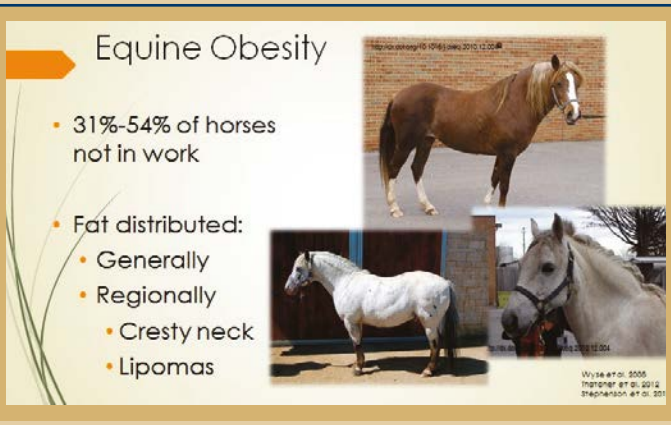
In the horse, the most severe consequence of this cluster of signs is laminitis itself. In a pilot study, we targeted the Arabian breed as a model for a breed that has a particular concern with Metabolic Syndrome and an advantageous genetic background for our studies. One of the interesting findings was that regardless of the body condition of their horses, owners and trainers underestimated their weight by about 10%. In contrast, our "heart girth by height" measure of obesity, something that is popular in the use of weight tapes, was fairly consistent and very objective. However: "what is normal?", and particularly for an aged Arabian horse? We found that there was a remarkably large number of animals displaying signs consistent with very early Cushings Disease, and that despite having made our best attempt to remove horses with Cushings Disease from this population, they were simply too numerous to discard them all. This suggests there is something else going on generating these elevated ACTH values and needs to be examined further.

We found very strong breed tendencies for susceptibility to EMS, indicating there should be a strong genetic component. It is thought the Arabian may be more susceptible to this condition because they evolved with adaptations to survive in a challenging environment. You can certainly consider that for a desert horse the ability to quickly lay on fat and to save those nutritional resources for lean times was an enormous advantage for survival. So it is only with the advent of improved pastures and modern balanced diets that this unique skill has become a liability and a resulting disease.

So we begun the search for laminitis genes, utilising a "gene chip". A glass microscope slide holds different stripes of chemically prepared material, providing enough assays to determine the genotype or genetic marker at about 70,000 different sites. We now have chips that will do half a million sites for every horse.

The results of an initial study with 60 horses can be summed up in a graph showing particular genetic markers along the entire range of chromosomes (the genome). The tallest point on this graph lies on chromosome 14 and comprises 3 markers. Among those 3 markers there is only a single gene. In our study horses, we found that this gene site itself confers a ninefold elevated risk for laminitis. These animals also have elevated insulin as we might expect





because they should have concurrent obesity and Metabolic Syndrome. The only previous study we have on this gene suggested that it is important for regulating the movement of cholesterol in and out of the cell, which is necessary for maintaining body condition and energy homeostasis. To date, most studies on metabolic syndrome have focused on insulin and sugars, more or less ignoring the cholesterol. This study suggests that we need to reconsider how we examine the disease. It could also potentially suggest some therapeutic interventions. Modulation of fat in the equine diet is already particularly popular today, especially in athletes as a way to provide increased energy for horses in work without increasing sugars that might bring on issues with insulin homeostasis. There is quite a variety of drugs available to address high cholesterol in people, some of which may prove promising for administering to horses. So we now have a new project looking into "metabolites", which are small molecules or chemicals found in the circulation. They are by-products of metabolic processes in the horse, including those of his gut microbes, and can be chemically assayed. Insulin and glucose have a habit of rising and falling often throughout the day and if we could find a more precise and stable metabolite biomarker for EMS and laminitis it could enable precise and predictive diagnostics, as well as more targeted management to help to maintain that horse in a healthy state.

Some metabolites might be related to inborn differences in metabolism, and probably change as horses age. Ultimately we want to know how they might be useful as diagnostics. What we hope to do, as part of the project that we are proposing to the Qatar National Research Foundation, is to map certain Metabotypes, such as horses that are easy keepers, to see if we can determine what the underlying genetic variation is creating the Metabotype.

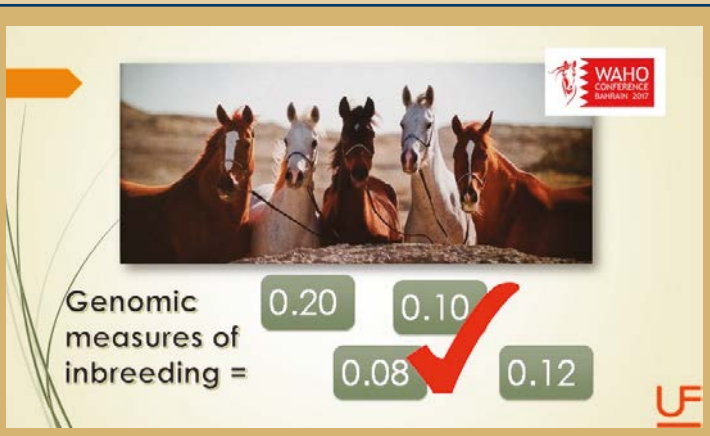
(This is a summary of Dr Brook's talk)

DR. SAMANTHA BROOKS: 'GENOMICS - THE DOOR TO THE FUTURE: ANALYSING THE POPULATION STRUCTURE AND ANCESTRY OF THE ARABIAN HORSE.'

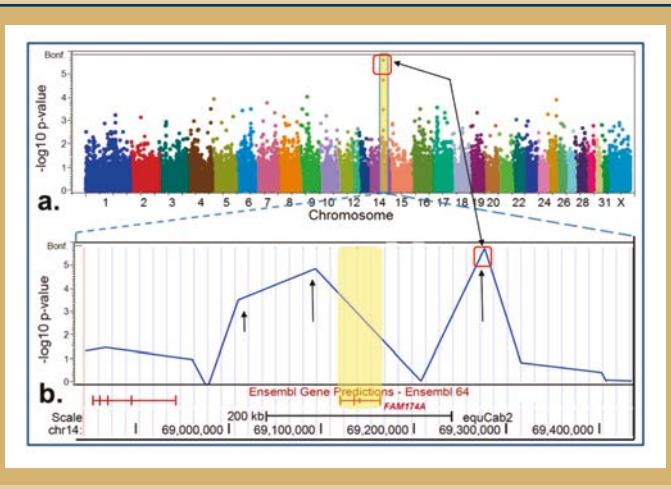
With a grant from the Qatar National Research Foundation, we began building genomic tools for three important hoof stock species, namely the Arabian horse, the dromedary camel, and the Arabian Oryx antelope. A reference genome was already completed for the horse in 2008, so we had a head start here, to better understand the population structure of the Arabian horse and examine its genetic history.

We have produced at least nine Arabian horses genomes. For a full genome we have to sequence 2.7 billion individual base pairs of DNA. For the first reference genome, this required about $25 million dollars' worth of research investments, while today the costs is about $2500 dollars for a good quality analysis. In our population work we are going to use a gene chip to assess more than 550 Arabian horses at more than half a million markers within the genome. A full genome is about 2.7 billion base pairs, with the gene chip we read about half million of then, and to put that into

context: a DNA analysis for parentage verification uses just 17 markers.
In one study, we looked specifically at the genomic analyses of around 60 Arabian horses. In the case of an example Arabian horse, he can attribute about 50% of his ancestry to the population coded blue for our purposes, perhaps 25% of his ancestry to the yellow population and perhaps 25% to the red population. Now the number of sub-groups or populations inferred in this ancestry is determined statistically, so we are letting the genome tell us what's gotten into the mix.
We can use the same process to decide what group a horse belongs to: for example, among those animals submitted to us as Polish there is a predominance of a group of genes coded yellow in our research, and if we look at those that were submitted to us as Egyptian there is a predominance of the "red" group. This enables us to see the contributions of each group to the ancestry of a particular horse.
There are other applications of these technologies. A breeder of Arabian horses can decide to have the genomes of a group of his horses analysed. In an example of four full sisters from a typical closed herd where the breeder had established a programme and developed a type, I asked the computer to only consider variation within that family, and the computer told us that the most significant way to divide the relevant influences on this family was into groups of five.
The further application: a breeder has an elderly foundation mare in his programme and is hoping to select a mare or two that might best continue her legacy. I chose an example where these four offspring have fairly uniform pedigrees. Let's say that the foundation mare is the cornerstone of the "blue" sub-group within your family and so her genome is strongly blue. If we then look at the genomes of the four possible replacement mares we will see, of course, the influence of the blue genome, but we will also see some other colours coming in, perhaps from the sire lines, and also due to that random chance of what they might inherit from each parent. In the mare with a larger proportion of blue than her sisters, the genome most closely resembles the original genome of the foundation mare, and therefore in her offspring she will contribute a genetic complement which is most similar to what you might have gotten from the original mare.



Signatures of Selection
Breeders from the very beginning of our relationship with the horse have carefully selected Arabians for the traits they have deemed valuable: stamina, strength and speed, docility, and conformation. Each time these changes are made to the original wild stock through the action of breeders, there is a complementary change of the genome of that horse.
When we are looking at genomes we call that a 'signature of selection'. Within the genome somewhere there will be a little characteristic pattern that will identify the variation, such as one that is important for athletic ability, or another one that is important for disease resistance.
There is natural selection present in relevant geographical sub-groups of horses, for example



of horses adapted to an arid environment, or to an ice age cold environment. That also leaves a 'signature of selection' in the genome that we can examine.

Another important approach we do is finding out when in time a genetic change happened. Understanding whether something is relevant often relies on putting it into the historical context. Is this something that happened yesterday when my neighbour's stallion jumped the fence? Or is this something that happened thousands of years ago, perhaps even before domestication?

On a different subject, there is a signature of selection that caught our eye. On chromosome 22, there is a gene that codes the production of Latherin, a protein that makes up about 80% of the protein in equine sweat. The Arabian horse sequence we already had displayed far more copies of the Latherin gene than we expected – humans just have two copies of it, and we would expect other mammals to have just two copies, too. Instead, when analysing the genome sequences of different breeds, we found athletic animals such as racing Arabians and Thoroughbreds to have four copies. In the genomes that had just two or three copies, we found less athletic animals that are from a cooler geographical region historically, such as some pony and draft horse breeds.

One of the other signatures of selection that we are quite interested in has to do with the unique nature of the relationship between horses and humans. A pre-requisite for most modern breeders is that your horse is not dangerous. So we are examining genes that are important in cognition and brain development, to better understand how horses have learned to adapt to work with us and not against us. In a "spook test", a mechanical umbrella is opened and in most horses this fairly reliably induces a spook. Such behaviour to a new object could be a problem, and we hope to find out where it is located on the genes.

The Genome – Useful for Breeders?

One use of the knowledge about genomes is to preserve bloodlines and maintain the genomic diversity and the resulting health of our animals.

Inbreeding has been a cornerstone tool for the breeder of both horses and plants for many hundreds of years. Like any powerful tool, this sword has two edges and we have to be mindful that inbreeding can also result in some less than desirable options. What lies behind this is a tendency for a loss of diversity in closed populations, we call that genetic drift, as well as some challenges in being able to actually assess how much inbreeding is occurring.

If you take a pair of full siblings, on average they share about 50% of their genomes. In reality the distribution of shared ancestry between full siblings takes the form of a natural curve. This means that although in general, crossing or breeding of relatives increases homozygosity, not all crosses between the same relationships will results in the same degree of loss in genetic diversity, and therefore in increased homozygosity.

One limitation of using pedigrees to try to estimate the genetic diversity, is that they are limited only to history known to us. If we consider several more generations, genetics can tell us much more. For example, the Arabian Oryx antelope went through a severe bottleneck where they nearly went extinct. They have recovered population numbers fairly successfully, but at a cost: worldwide we can count about 11 individuals from whom we have derived most of the existing oryx genomes today. In a pedigree going back ten generations, you can glimpse that, but if you consider just the five generations of Oryx in the normal, shorter pedigree, the cost of going through such a genetic bottleneck is not accurately represented to you. The consequence of that is still being paid by living individuals today, but it is well beyond the reach of written history. The genome, on the other hand, still has the data.

To demonstrate the differences between the pedigree-estimated inbreeding value and the inbreeding values derived directly from the genome, there are examples where the pedigree provided a gross underestimation of inbreeding and genetic diversity, and as well as where a gross overestimation of genomic inbreeding was derived from the pedigree. When both examples were calculated via the genome, this became apparent.

If we suppose these four potential replacement fillies we talked about earlier are full siblings, they will have entirely equivalent inbreeding values based on their pedigrees. Analyzed by genomics, they are no longer equivalent. We now have very precise measures that tell us exactly how much genetic diversity is continuing to be passed on through those fillies. It may be preferable to keep the most genomically diverse mare, so in the short term the offspring of this mare will on average be healthier, a bit larger and tend to be better conformed than offspring of mares with higher inbreeding values. But I encourage you to think a bit more in the long term, in that by maintaining genetic diversity today you are putting an investment in the bank so that future generations have more alleles on which to draw, and are likely to be sustainable going into the future. This is the concept that is beginning to gain real momentum in the conservation of endangered and vulnerable species.

One of the unfortunate consequences of the loss of genetic diversity is that individuals tend to be more homozygous across their genomes, meaning they are more likely to develop diseases that are inherited in a recessive manner. If we can identify the genetic mutation, we can begin to sweep these problems right out of our population.

To name one such disease: we are working on finding a genetic solution to Juvenile Idiopathic Epilepsy (JIE), where foals have seizures and often incur injuries or even death from them. At any rate, they suffer considerably – even if the condition tends to resolve with age. We are currently working on this condition and I am very hopeful that it will be resolved very soon.

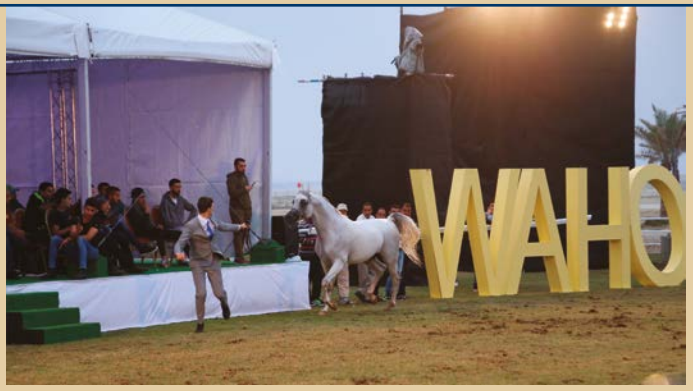
If we were to immediately ban any and every single carrier horse of recessive diseases, we can lose genetic diversity. Many of these diseases are caused by just one out of 20,000 genes in a genome. Consider the costs versus the benefit of how quickly you can effectively begin to try to reduce those alleles in your population. Especially so in some sub-groups where wholesale elimination of bloodlines would mean that their representation was entirely lost in the living population today. Over a few generations, you can work to reduce or eliminate these alleles while maintaining those valuable genes.

In our research on Juvenile Idiopathic Epilepsy, sending us hair samples with the follicles included, of affected animals, would help us refine and prove that we have the right genetic markers. It does require a USDA import permit since it is an agricultural product, but because it is used for research there are no customs charges.

Interested Arabian owners can contact the Brooks Equine Genetics Laboratory, Department of Animal Sciences, PO Box 110910, Gainesville, Florida 32611, U.S.A., email: equinegenetics@ifas.ufl.edu for more information on participating in this study.

(This is a summary of Dr Brook's talk)

GOODBYE BAHRAIN


WAHO


WAHO


There are currently 20 desert family strains
preserved within the Royal Stud

PETER POND'S CLOSING SPEECH

"At every WAHO Conference it has become something of a tradition for us to report to you on what your Executive Committee has been doing since we last met, (…) and also to outline some of our plans for the next year or two." This his how Peter Pond, WAHO chairman, started his closing speech on the last day of the Bahrain Conference. He went on to say that he would like to remind his audience "... of some of WAHO's main objectives, as laid down in our Constitution." WAHO is a registered charity in the United Kingdom, and its constitution has various objectives including to promote and distribute knowledge in all countries about the history, care and treatment of Arabian horses; to co-operate with people and organizations around the world to promote the uniformity and terminology, definitions, procedures relative to the breed of Arabian horses; and to relieve sick or injured horses needing care and attention. "Through the work done by the WAHO Office and the work done at these Conferences, we are fulfilling many of these objectives", Pond said. "We do this principally through the exceptional talks from many of our distinguished guest speakers (...)", whereby "... the issue of equine welfare in its many and varied aspects has become increasingly important to all at WAHO."

Actions to be Taken After Shocking Deaths of Endurance Horses

Pond was visibly moved when he reminded the conference participants that "...our Arabian horses are suffering and indeed dying in the name of sport. I refer of course to what has been happening in some areas in endurance competitions (…). Just in the last few weeks at least nine horses have been reported as fatally injured in certain endurance races, (...). In our opinion this rate of attrition rates as serious abuse of all the horses taking part. (…) It is deeply shocking and it simply cannot be allowed to continue without our voices being raised in defence of these horses. (...) Arabian horses have tremendous heart, tremendous courage and tremendous bravery, which is why they are the chosen breed for endurance. To stay silent and effectively abandon them to the fate would be to go against our core values and objectives."

"I can now assure you that the Executive Committee will be writing a strong letter to the F.E.I. very soon to put pressure on them to find a solution and quickly. (…) The ruling bodies of this sport which in most countries is run under the National rules and International FEI rules must find a way to resolve this issue as fast as possible." Mr. Pond made it clear that the WAHO Executive Committee ,,...would strongly encourage each of you to write in a similar vein both to your own National endurance or equestrian Federations and to the FEI as well. The more we can show a united front and allow our core voices, speaking up in unison for our horses as a cohesive and strong global Arabian horse community, the more likely it is that those with the power to enforce suitable rule changes will take notice."

He was strongly applauded for his committed words, just as was HH Sheikh Sultan Bin Zayed Al Nahayan for his Boudtheib initiative in Abu Dhabi, setting up a new set of rules very much designed to protect the horses. In Peter Pond's words, "This has shown in a very short space of time how a few changes can make a dramatic difference to the welfare of the horses."

Internal WAHO Matters:

Pond reported that the previously promised revision of the WAHO Constitution had been completed, and that "... with the unanimous vote of the General Assembly two days ago to accept all of the recommended changes, we can now move forward with a stronger and better Constitution." Another addition was a provision for voting for new Consultants to the Executive Committee, which Pond hoped "... will be seen as a more democratic way of finding new people to serve on the Executive Committee in the future."

He also mentioned that it remained WAHO's long term goal to eventually purchase a suitable property in the UK, to be the organization's permanent Headquarters. As he said, "Owning a property would obviously be a sensible thing to do from a financial point of view, (…) probably a lot safer than leaving our reserves earning minimal interest in the bank."

Last not least Pond emphasized that while the EC will continue to deal with any problems brought to them by member countries, they will also "… not be pressured by any group to change our rules and procedures in any way (…). WAHO is a totally non-political organisation, every Registry regardless of size and regardless of country is equal (…). We have always tried, and will always try in future, to resolve all of these issues the best way that we can, as and when they arise, in the best interest of WAHO, of our Members and of the purebred Arabian horse."

For more than ten years now, the WAHO conferences took place in Arabian countries, without exceptions. All of them were excellently organized - by enormously generous hosts who made it possible to obtain deep insights into the history, presence, and future of horse breeding in the Arabian countries. With Australia hosting the 2019 Conference, this"Arabian era" is coming to an end. A continent characterized by Western influences is going to show us their studs as well as a whole number of further highlights connected to horse breeding and horse sports with Arabians. Everybody can become a member and come and visit Australia. A chance to be used!

ARRIVEDERCI IN AUSTRALIA!