# Horse and Pony
KS4 Monday
Science

What is selective breeding?

Selective breeding involves selecting parents that have characteristics of interest in the hope that their offspring inherit those desirable characteristics.

Humans have selectively bred plants and animals for thousands of years including:

● crop plants with better yields
● ornamental plants with particular flower shapes and colours
● farm animals that produce more, better quality meat or wool
● dogs with particular physiques and temperaments, suited to do jobs like herd sheep or collect pheasants.

Selective breeding aims to adapt an organism's characteristics in a way that is desirable to the humans that breed them. Humans domesticated horses over 5000 years ago. At the time horses were small, stocky and had a common light brown colour that allowed them to blend
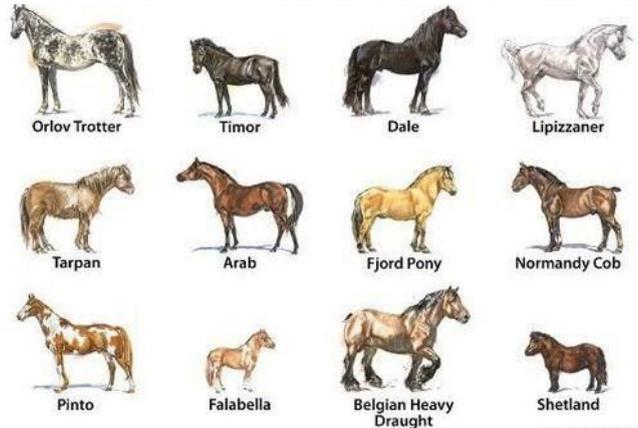

into their surroundings better. The closest horse to the original wild horse is the Prezalski "wild" horse of Mongolia. Since then we have used selective breeding to create hundreds of different breeds of horses and colour variations. This has enabled breeds to develop with defining characteristics such as being the faster, stronger, better at jumping, calmer, smaller and bigger.

How does selective breeding work?

An organism's characteristics are partly determined by the combination of gene variants that are passed on from one generation to the next. We can take advantage of this to selectively breed horses, choosing parents with particular characteristics to produce offspring that have those characteristics.

For example, to develop the shire horse breed, we bred tall parents together and excluded shorter horses from breeding. The offspring inherited "tall" gene variants that made them tall. Some of the offspring were even be taller than both of their parents, because they inherited a combination of different "tall" gene variants from each parent. With repeated selective breeding over multiple generations the horses became taller. As a result the tallest horse in the world is a shire horse.
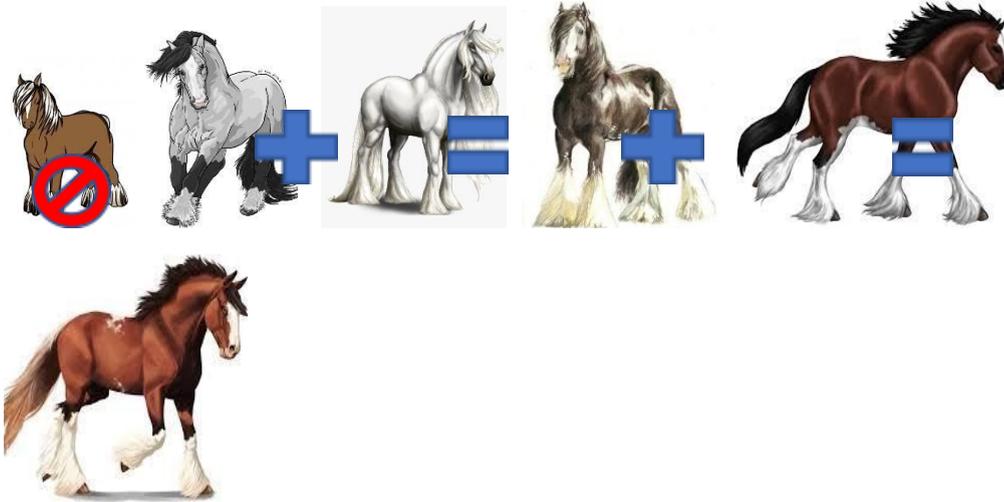
Types of selective breeding

Inbreeding

If we want to establish a population of organisms with predictable characteristics we tend to "inbreed".

Inbreeding is when the animals bred are very close relatives, such as siblings.

Continued inbreeding results in offspring that are very genetically alike.

After many generations of inbreeding, the offspring will be almost genetically identical, and will produce identical offspring. When this happens, an organism is described as inbred or purebred.

The Rocky Mountain breed was started by breeding a chocolate pony to a horse then inbreeding for several generations to get the chocolate color. ... There are some very nice ones, and most of them have a very nice gait, but the genetic pool they used to

start the breed was more than just a little bit lacking.

Linebreeding

Linebreeding is a type of inbreeding.

It involves breeding together more distant relatives, such as cousins.

This reduces the rate at which the breed becomes 'purebred', reducing the risk of ill-health that can sometimes be seen with purebred individuals.

All the racehorses you see on TV are thoroughbreds. Parents are carefully selected to pass on their high speed to their offspring. It is possible to find the same individual appearing multiple time in a racehorce's breeding history.
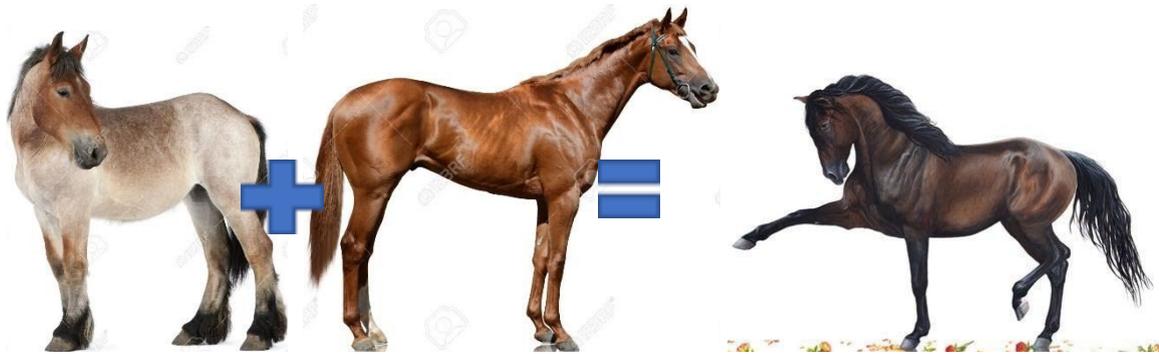
Crossbreeding

Crossbreeding involves breeding two unrelated individuals.

This is often used to produce offspring with desirable characteristics from two different individuals.

Crossbreeding two purebred organisms will produce offspring that display the characteristics of interest.

For example, cob horses (which are shorter stocky strong breeds referred to as "cold blood" due to being slow and calm) are crossed with thoroughbreds (referred to as "hot blooded" due to being very reactive and sensitive) to combine a cob's strong legs and calm, trainable temperament with the thoroughbred's sped and athleticism. The resulting 'warmblood' is a strong and steady sports horse that excel in jumping and dressage.

Crossbreeding non-purebred parents will have less predictable outcomes.

Problems with selective breeding

Selective breeding often results in a population of animals or plants with very similar genetics.

Similar genetics means that the population will have the same strengths but also the same weaknesses.

Infectious diseases are more likely to spread through genetically similar populations because they are vulnerable to the same diseases.

Selective breeding often involves breeding individuals that are closely related, known as inbreeding.

Inbred populations are more likely to suffer from genetic conditions caused by recessive gene variants because they are more likely to inherit two copies of the recessive variants, one from each parent. Among thoroughbreds it is common for them to have difficult and reactive temperaments and week hooves as these characteristics have accidentally been exaggerated along with the ability to run fast.

The oldest known breed of horse is the Arabian. It is characterised by having fine, slender limbs, large wide set eyes and a dished face. Intensive inbreeding has caused this to become exaggerated as shown in the photograph of a young horse. This exaggerated dished profile actually restricts the horse's ability to breathe, especially when running.

Activity

Can you identify a breed of animal or plant you know and describe how selective breeding has been used to refine the main characteristics? This could be a specific behaviour, appearance or other quality that has become iconic to the breed but is not found in it's "wild" origins eg Shetland pony's diminutive small size, which was used to pull carts in coal mines as they were small enough to go through the tunnels.

Chosen Breed _____

Breed Characteristic _____

Select a breeding male and female that _____ and not bread from individuals that _____. Of the offspring produced only breed the most _____ so that they pass on the genes for _____ _____. Repeat this over _____ generations.

The result is a _____. Positive characteristics are _____ _____. Negative characteristics are _____.

Big Jake, the biggest living horse in the world meets Thumbelina, the smallest living horse.