

Date: Spring 2010  
Teacher: Roxanne Boardman

Unit Theme: Genetics  
Title Of Lesson: Selective Breeding  
Number of Learners: 20  
Grade Level: Freshman 9<sup>th</sup> grade  
Time Needed: Approx 30 minutes

#### Lesson Plan - Selective Breeding

Background: The students have been working on a unit on Genetics and Pedigrees. This lesson is a wrap up to the unit to show the students how genetics information is relevant to the real world. This will also lead into a unit on Evolution.

#### Objectives:

- 1) The students will use what they have learned in genetics and apply it to what they see as examples on line
- 2) learn how selective breeding applies to animals and the passing on of both positive and negative traits to the offspring.
- 3) The students will witness negative diseases carried from parents to offspring and physical deformities that may result
- 4) The students will view a website on pedigrees of horses, to see an example of line breeding.

Resources Needed: Book the computer lab for on-line access of websites

#### Procedures:

The students will access their on-line accounts at school, and be directed to the following websites:

A) [www.horse-genetic.com](http://www.horse-genetic.com)

Life story of Impressive

HYPP - Hyperkalemic Periodic Paralysis

Controlled by medication and low-potassium diet

Affects the sodium channels, and overloads the system with potassium, causing muscle twitching, hind quarter paralysis, yawning and paralysis of the muscles of the hearts and/or lungs, causing heart attack or suffocation.

Molecular genetics research identified the gene and now a test has been developed to test for carriers. This test is helping to eliminate HYPP altogether through selective breeding.

\$25,000 Stud Fee

Sired 2250 Foals

By 93 he had over 55,000 descendants,

Today over 100,000

H/H = Homozygous for HYPP  
N/H = Heterozygous for HYPP - Carrier  
N/N = Has 2 healthy genes

HYPP is a dominant gene disease!

Why is it important to have mandatory testing for HYPP?  
What implications does the outcome have for the industry?

B) [www.youtube.com](http://www.youtube.com)

Search for horses with HYPP to see a video of an afflicted horse.

B) [www.allbreedpedigree.com](http://www.allbreedpedigree.com)

Lets look at Impressive's pedigree

In the upper Left corner type in Impressive

Click on the Quarter Horse 1969

Notice a name that pops up over and over (Three Bars, on top and bottom)

Now go back to the search and put in Cloudy Review

She is not related to Impressive, nor her foals

Yet she produced HYPP in her foals, She was also heavily linebred: Skipper W x3, Slipalong We scamp x 4, Santa

Maria 2x, Nick S x 4, Starduster x2

Why are pedigrees important?

How does this help us make decisions in the animals we may buy?

How does pedigrees help in genetic research?

C) <http://www.lethalwhites.com/merle/blue.html>

Click on Double Merle?

Click on Eye Photos

These are pictures of dogs that were bred that each parent had a dominant merle gene. The offspring can have small, misshapen eyes, and be blind, they can have small, or no ears at all, and are deaf.

How can we avoid creating puppies with these issues?

You can also click on the link for lethal whites in horses near the bottom of the page. [www.apha.com](http://www.apha.com) is one with a picture, and information regarding what happens to the foal. This

is a Lethal Dominant gene inheritance pattern, as it takes an Overo x Overo, to produce 25% of the time a homozygous offspring with Lethal white syndrome. The foal will die a painful death within 48 hours, as the colon is non-functioning.

So let's Punnet Square this application:

Merle x Merle (Mm x Mm) = 25% MM (Double Merle),  
50% Mm (Merle),  
25% mm (non-merle).

If we take and cross Merle x Non-Merle (Mm x mm) = 50% Merle (Mm)  
50% Non-Merle (mm)  
With no lethal genes ☺

So ask yourself an ethical question as a breeder: You still get 50% merle genes in both scenarios, but in the latter scenario you are eliminating a possible lethal offspring, which should be the best way to go.

D) Quagga Project:

[www.quaggaproject.org](http://www.quaggaproject.org)

So we have reviewed quite a few scenarios of negative outcomes of breeding in genetics, the next 2 scenarios will be more positive. The Quagga project is using selective breeding to recreate an extinct species. The scientists have done genetic testing on the zebra's of South Africa, to find those with the largest amount of DNA material that would lead them to the extinct Quaggas. They then take those zebras, and breed them together to create offspring with the combined gene material to have even more than their parents. They will continue to breed successive generations to come as close as possible to recreating this species.

List some positive and negative consequences of this project?

Is this any different than the line breeding we saw under Impressive? How?

E) Schwarzenegger Cows:

Google Belgian Blue Cow (Cattle) to see pics

These cows were produced from a natural genetic mutation. Myostatin is a protein that counteracts muscle growth. These cows have dysfunctional myostatin that results in accelerated lean muscle growth or double muscling. This breeds defect is maintained through line breeding.

Pros: Lean muscle meat - leaner than chicken

Healthier product

More muscle available

More profit

Cons: Unable to give birth naturally - require c-sections 89.5% of the time

Macroglossia - enlarged tongue - interferes with nursing

Although their muscles are larger, their bones, and joints are not - what issues do you foresee here?

Prose for consumers/producers, harmful to the animals?

Closure: How far do we go to alter natural order to ensure profit?  
Any other examples where humans have interfered in genetics?  
Historically? Slave Trade, Germany

Assessment: Minute Paper - Take the last 5 minutes of class and write a brief essay on what you found most interesting, or what you did not like about today's lesson.