

Sample Descriptions of Candidate Phenomena: Genetics and Heredity (LS-3-HS)

<p>Phenomenon (Italics summary should be in student language)</p>	<p><i>Most adults around the globe can't drink milk without getting an upset stomach.</i> For most adults around the world, drinking milk can cause an upset stomach. That's because they can't digest sugars in milk. Some humans have developed lactase persistence, however, meaning they keep the protein needed to breakdown sugars working into adulthood. This mutation is adaptive only in environments and cultures where humans have access to domesticated dairy animals.</p>
<p>Student Driving Question</p>	<p><i>Why can't most adults around the world drink milk without getting a stomach ache?</i></p>
<p>A full and complete explanation (response to question), with PEs that this allows students to investigate to develop the explanation</p>	<p>Lactase persistence arose out of a random mutation (HS-LS-3-2), which scientists identified by looking for evidence of mutations that existed in lactose-tolerant individuals but not lactose intolerant people (HS-LS-3-3). To test for selective advantage, they looked for genes that were adjacent to the lactose persistence mutation (potential HS-LS-3-1 connection) that got "swept along" or "hitchhiked" along with the mutation, and found evidence of that indicating that the mutation was found in dairying populations (HS-LS-4-3, HS-LS-4-4).</p> <p>Source: http://evolution.berkeley.edu/evolibrary/news/070401_lactose</p>
<p>Colorado Academic Standards</p>	<p>SC09-GR.HS-S.2-GLE.7: Organisms' physical and behavioral characteristics are influenced to varying degrees by heritable genes, many of which encode instructions for protein production. SC09-GR.HS-S.2-GLE.9: Evolution occurs as populations' heritable characteristics change across generations and can lead populations to become better adapted to their environments.</p>

<p>Phenomenon (Italics summary should be in student language)</p>	<p><i>The likelihood that your friends will be friends with each other is a heritable trait that varies in the population.</i></p> <p>Studies comparing same-sex monozygotic (MZ) twins and same-sex dizygotic (DZ) twins show that MZ twins are more similar to one another than DZ twins on some social network characteristics, suggesting the heritability of characteristics such as transitivity, or the likelihood that one's friends know each other. The number of times one is named as a friend is heritable, but the number of friends one names is not. .</p>
<p>Student Driving Question</p>	<p><i>How could whether my friends know each other be something I inherited from my parents?</i></p>
<p>A full and complete explanation (response to question), with PEs that this allows students to investigate to develop the explanation</p>	<p>Evidence of heritability is determined by comparing the similarity of DZ and MZ distributions of traits. The finding here is that there are different distributions of individuals across these two populations of twins with respect to the probability that their friends know each other, as well as popularity (number of people who name them as friends) (LS-HS-3-3). Scientists who have simulated network data find that models that assume variation in (1) attractiveness of individuals to others as friends and (2) likelihood of people to introduce friends to each other fit actual social networks. Scientists are still exploring causal pathways, such as a role played by serotonin, which has been found to be linked to popularity (LS-HS-3-1).</p> <p>Source: http://www.pnas.org/content/106/6/1720.short http://scan.oxfordjournals.org/content/4/4/399.short</p>
<p>Colorado Academic Standards</p>	<p>SC09-GR.HS-S.2-GLE.7: Organisms' physical and behavioral characteristics are influenced to varying degrees by heritable genes, many of which encode instructions for protein production.</p>

<p>Phenomenon (Italics summary should be in student language)</p>	<p><i>Aggression in coyotes along the front range has become of increasing concern for communities sharing space with them. Often aggression seems to be isolated to a specific group of coyotes in a city, rather than all the coyotes in the city on a whole.</i> The Denver Urban Coyote Project is seeking to understand the hormonal and genetic factors that are correlated with boldness, tolerance, or aggression. http://www.dailycamera.com/news/boulder/ci_29420620/coyote-study-consider-genetic-evidence-behavioral-traits</p>
<p>Student Driving Question</p>	<p><i>Can genetics be predictive of aggressive behavior in coyotes?</i></p>
<p>A full and complete explanation (response to question), with PEs that this allows students to investigate to develop the explanation</p>	<p>Behavior, such as aggression, can be learned, inherited, or some combination of the two. If it is an inherited trait (HS-LS3-1), the distribution and probability of this trait variation would be reflected in the population (HS-LS3-3). A deeper understanding of inheritance and the variation and distribution of these traits; along-side an understanding of learned traits could work as two hypothesis for students to explore.</p>
<p>Colorado Academic Standards</p>	<p>SC09-GR.HS-S.2-GLE.7: Organisms' physical and behavioral characteristics are influenced to varying degrees by heritable genes, many of which encode instructions for protein production. SC09-GR.HS-S.2-GLE.9: Evolution occurs as populations' heritable characteristics change across generations and can lead populations to become better adapted to their environments.</p>

<p>Phenomenon (Italics summary should be in student language)</p>	<p><i>Antibiotics kill bacteria, but the bacteria develop resistance. Once you start treating them with a new drug, they find ways of surviving. As long as new prescription drugs are created to treat these evolving bacteria, we have no problem. However there has not been a new class of antibiotics since the 80's.</i></p> <p>Antibiotic resistance is a growing global problem, leading us to the possibility that we may one day reach a post-antibiotic world, in which a simple cut could be left to chance leading toward life or death. In New Dehli, Metallo-beta-lactamase-1 (NDM-1) resistance is thought to have emerged as a result of poor sanitation and antibiotic use, however due to international travel, cases have also been found around the world including the UK.</p> <p>http://www.bbc.com/news/health-21702647</p>
<p>Student Driving Question</p>	<p><i>How does antibiotic resistance develop?</i></p>
<p>A full and complete explanation (response to question), with PEs that this allows students to investigate to develop the explanation</p>	<p>Bacteria can be observed as a quickly evolving organism, not due to their abilities, as much as the rapid generations we can observe within a limited time. As antibiotics are widely used, the bacteria are able to develop resistance (not of any will of their own) but due to the mutations that occur HS-LS3-2 and that are inherited HS-LS3-1. These bacteria can then be passed from individual to individual, having the resistance towards our antibiotics, leading to an increase of resistance globally.</p>
<p>Colorado Academic Standards</p>	<p>SC09-GR.HS-S.2-GLE.7: Organisms' physical and behavioral characteristics are influenced to varying degrees by heritable genes, many of which encode instructions for protein production.</p> <p>SC09-GR.HS-S.2-GLE.9: Evolution occurs as populations' heritable characteristics change across generations and can lead populations to become better adapted to their environments.</p>