Name: _____   Date: _____

# Improved Metabolic Response Explanation

Part 1:

A group of researchers wanted to see if there were genetic connections between other physiological strategies found in Tibetan populations. Researchers were interested in learning more about Tibetans' improved metabolic response at high altitudes. To do this, they collected data from lowlanders and sherpas. Lowlanders are people born and live below 1,000m in elevation. Sherpas are descendants of high-altitude-dwelling Tibetan populations. These researchers began looking at genes that affect metabolism, specifically how our body uses oxygen in tissue like muscles. One of the many genes that is involved in the processing of oxygen in our tissues is PPARA. Researchers first had to determine if there was evidence to see if the expression of this gene was different in Tibetan populations in comparison to Lowlander populations. Use the following graphs to answer the following questions.
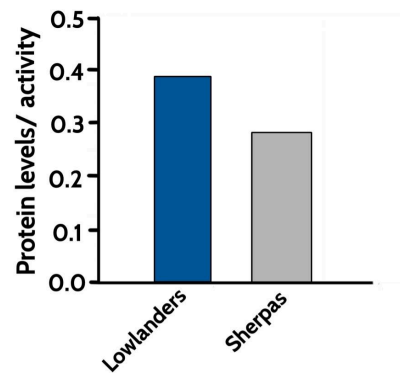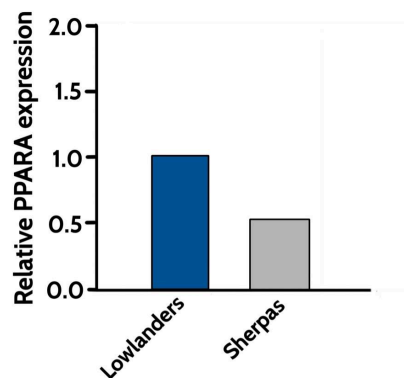
1. The PPARA gene is one of several genes involved in the processing of oxygen. How is the individual expression of the PPARA gene similar and different from the Protein Levels and Activity?

2. Using both graphs, describe how the trait associated with the PPARA gene is different in the Sherpa population from the Lowlander population?

Part 2:

There are 139 different locations on the PPARA gene where researchers have found variation between individuals. Researchers use these locations, called SNPs, to see if they can find patterns within a population connecting each individual's phenotype to each genotype at specific SNPs. While researchers looked at many different SNPs, the graph below focuses just on two different SNPs from the PPARA gene that were studied.. Each chart shows the different number of individuals within the study that had the possible genotypes listed. Use these charts to answer the questions below.
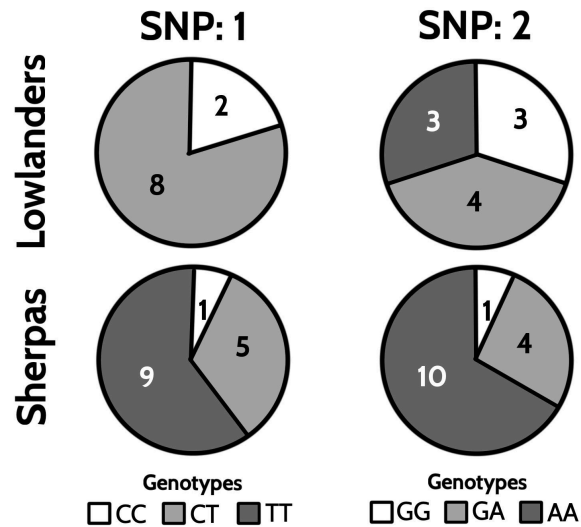
3. Which of the following comparisons (differences between Lowlanders and Sherpas in SNP:1 or differences between the populations in SNP:2) best explains the differences observed in the graphs in Part 1 between the Sherpa and the Lowlander populations?

4. Using data from these graphs and pie charts combined with other patterns in data you identified in this lesson, **Explain which genotype is most likely responsible for the trait difference found in the Sherpa population?**
   - **In your explanation, describe what is physically happening differently inside the body of Individuals visiting locations at high altitude who have this PPARA genotype.**
   - **Also explain what is happening inside the body of individuals visiting locations at high altitude who have a *different* genotype than the one you selected.**

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References

Horscroft, J. A., Kotwica, A. O., Laner, V., West, J. A., Hennis, P. J., Levett, D. Z., Howard, D. J., Fernandez, B. O., Burgess, S. L., Ament, Z., Gilbert-Kawai, E. T., Vercueil, A., Landis, B. D., Mitchell, K., Mythen, M. G., Branco, C., Johnson, R. S., Feelisch, M., Montgomery, H. E., … Murray, A. J. (2017). Metabolic basis to Sherpa altitude adaptation. _Proceedings of the National Academy of Sciences_, _114_(24), 6382–6387. https://doi.org/10.1073/pnas.1700527114