# PCSK9 Enzyme and LDL

Researchers interested in genetic factors affecting susceptibility to cardiovascular disease examined the DNA of 15,000 individuals. They found that 3% of the individuals had a mutation that inactivated one copy of the gene for PCSK9 (Proprotein convertase subtilisin/kexin type 9), a liver enzyme. Because mutations that increase the activity of PCSK9 are known to increase levels of LDL cholesterol in the blood, the researchers hypothesized that inactivating mutations in this gene would lower LDL levels.

1. [SP 1] a) Describe a mutation.

b) Describe LDL and its purpose.

c) Provide an explanation for the link between LDL and heart disease.

Researchers measured LDL cholesterol levels in the blood plasma of 85 individuals with one copy of the PCSK9 gene inactivated and from 3,278 individuals with two functional copies of the gene.

2. [SP 3] Identify the study (or experimental) group and the control group in this experiment.

Individuals with an inactivating mutation in one copy of PCSK9 gene (study group)
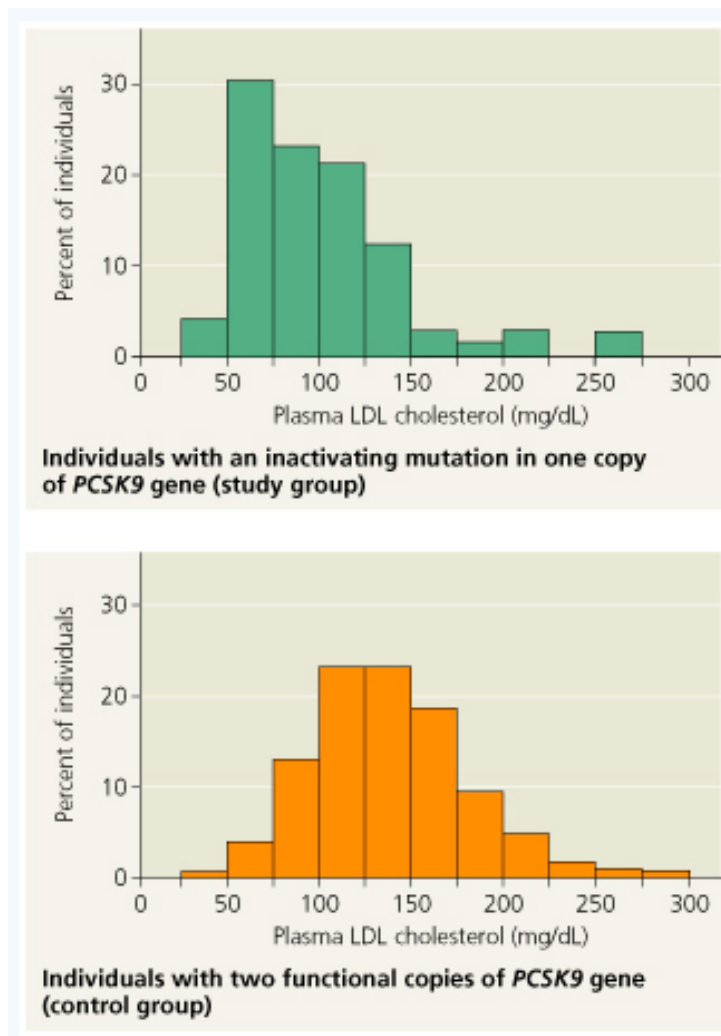
The results are shown in the histograms. In a histogram, the variable on the X-axis is grouped into ranges. The height of each bar in the histograms shows the percentage of individuals that fall into a range.

3. [SP 4, SP 5] a) Calculate the percentage of individuals in the study group that had an LDL level below 100 mg/dL.

b) Calculate the percentage of individuals in the control group that had an LDL level below 100 mg/dL.

Individuals with two functional copies of PCSK9 gene (control group)

4. [SP 5, SP 6] Provide reasoning to support or refute the claim that the data in the two histograms support the researchers' hypothesis.

5. [SP 1] Provide a reason that the two histograms overlap as much as they do.

6. [SP 6] Imagine instead of making histograms, the researchers had simply compared the range of LDL found in the two groups. Describe how their conclusion would have been different. Provide reasoning to support your response.

7. [SP 4, SP 6] Make a claim about the risk of cardiovascular disease in the study group compared to the control group.

8. [SP 1, SP 6] a) Consider two individuals with a plasma LDL level of 160 mg/dL, one from the study group and one from the control group. Make a prediction about their relative risk of cardiovascular disease Justify your prediction.

b) Identify a factor that might affect the LDL level of a person.