MIGHTY MICE

IN SPACE

LESSON 2: GRAPHING & DATA INTERPRETATION

Dr. Se-Jin Lee from The Jackson Laboratory sent his mice into space in order to study the effects of microgravity on muscle and bone loss. Both the Mighty Mice lacking the myostatin gene (called Mstn -/- mice) as well as non-engineered mice (called wildtype mice) spent one month in space aboard the International Space Station (ISS). The mice have returned to Earth, and now Dr. Lee invites you to be a part of his research team and help him analyze a portion of the data from these experiments.

PART 1: MUSCLE MASS

Dr. Lee's research team measured the muscle mass of non-engineered mice (wildtype) and mice lacking the myostatin gene (*Mstn* -/-) before their journey to the ISS. The tables below show the data Dr. Lee's team of scientists collected from the mice.

Calculate the average for each group of mice, and graph the muscle mass data. Label the title, each genotype, and the x and y axes of your graph.

Condition	**Animal**	**Muscle mass (g)**	**Average (g)**
Before stay on ISS	wildtype 1	11.8	
	wildtype 2	12.3	
	wildtype 3	13.1	
	wildtype 4	11.5	
	wildtype 5	14.0	
	wildtype 6	13.7	
	wildtype 7	13.7	
	wildtype 8	12.0	

Condition	**Animal**	**Muscle mass (g)**	**Average (g)**
Before stay on ISS	*Mstn* -/- 1	17.9	
	Mstn -/- 2	15.7	
	Mstn -/- 3	20.0	
	Mstn -/- 4	17.4	
	Mstn -/- 5	17.1	
	Mstn -/- 6	15.8	
	Mstn -/- 7	17.0	
	Mstn -/- 8	18.5	

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PART 2: ANALYSIS

Interpret your results by answering the following questions.

1. Why do different animals with the same genotype have different muscle masses? Why calculate the average muscle mass for each group?

2. Compare the muscle mass between the wildtype mice and *Mstn* -/- mice before their stay on the ISS. Are they different? Provide an explanation for the results you have observed.

3. Was the difference in muscle mass between wildtype and *Mstn* -/- mice what you expected? Were you expecting a larger change, a smaller change, or something else?

PART 3: DISCUSSION

In Lesson 1, you learned about myostatin, Dr. Lee's Mighty Mice, and how loss of muscle mass can occur both in space and on Earth. You also made predictions about the results of the Mice in Space experiment. Now that you have analyzed some of the real data from the Mice in Space experiment, summarize the work that has been done and think about the significance of these studies and the impact of this research on human health.

1. In your own words, describe the genetic and phenotypic differences between the two genotypes of mice used in the Mice in Space experiment.

2. What was the purpose of sending these mice into space?

3. State one hypothesis from the Mice in Space experiment.

4. Do your original predictions from Lesson 1 match your observations and analysis of the experimental data from Lesson 2? Explain.

5. Dr. Lee's research team will analyze the muscle mass of the wildtype mice after their stay on the ISS. Do you predict the muscle mass will be the same or different from the pre-flight muscle mass you calculated for the wildtype mice? Provide an explanation for your prediction.

6. Dr. Lee's research team will analyze the muscle mass of the *Mstn -/-* mice after their stay on the ISS. Do you predict the muscle mass will be the same or different from the pre-flight muscle mass you calculated for the *Mstn -/-* mice? Provide an explanation for your prediction.

7. Dr. Lee's research team will next compare the muscle mass of the wildtype mice and *Mstn -/-* mice after their stay on the ISS. Do you predict the muscle mass will be different between the two groups? Provide an explanation for the result you have observed.

8. Imagine you are a scientist researching methods to combat loss of muscle mass and bone density. Given the results from the Mice in Space experiment, what could you do to help astronauts traveling in outer space avoid losing muscle mass and bone density?

9. Imagine you are a physician treating patients with weakened muscles and bones due to disuse. Given the results from the Mice in Space experiment, what could you do to help patients who experience muscle and bone loss?