When Mutations Matter

Use survival evidence to evaluate genetic changes

L.8.2C.2 "Construct scientific arguments from evidence to support claims about the potentially harmful, beneficial, or neutral effects of genetic mutations on organisms."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each claim about a mutation's effect, and circle the survival results that support or limit that claim.

Two Mutations, Two Tests

1. In a model study of coastal beetles, an inherited DNA change called mutation R changes a protein that an insecticide normally binds to. A beetle with R may respond differently when the farm is sprayed. Another inherited change, mutation N, alters one DNA letter but leaves the protein's amino acid sequence unchanged. That alone cannot prove N has no effect, since DNA changes can sometimes alter how much protein a cell makes. To examine effects, researchers compare beetles raised in the same conditions, except for the mutation being tested.

2. In the sprayed trial, 16 of 20 beetles with R survived for a week, while 4 of 20 beetles without R survived. In a separate trial without spray, 8 of 20 beetles with R survived, compared with 14 of 20 beetles without R. Each group started with the same number of beetles, and all groups were observed for one week. A mutation can affect survival differently when conditions change. These trials measure survival, not how many eggs the surviving beetles later lay.

3. The researchers also tested N in beetles that did not have R. Without spray, 12 of 20 beetles with N and 12 of 20 beetles without N survived for a week. With spray, 6 of 20 with N and 6 of 20 without N survived. The equal results offer no evidence that N changes survival in either tested setting. However, the trials do not measure egg production or survival through winter. A claim that N is neutral in every setting would go beyond these results.

2 ANSWER WITH EVIDENCE

Use the passage

1. What claim can you make about mutation R when the farm is sprayed? Support it with survival evidence.

2. A student claims, “Mutation R always helps beetles survive.” Does the evidence support this claim? Explain.

3. What claim about mutation N's effect on one-week survival is supported by the tests? Use evidence from both settings.

4. Why would it go beyond the evidence to claim that mutation N has no effect on the beetles at all?

3 YOUR TURN

Your own words

In a new model study, 15 of 20 moths with a pale-color mutation and 8 of 20 dark moths survive one day with birds on light bark. On dark bark, 5 of 20 pale moths and 14 of 20 dark moths survive. Write one paragraph arguing how the mutation's effect depends on bark color. Use both comparisons and name one limit of this evidence.

ANSWER KEY

When Mutations Matter

GRADE 8 · L.8.2C.2

PART 1 · READ AND MARK

Underline each claim about a mutation's effect, and circle the survival results that support or limit that claim. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What claim can you make about mutation R when the farm is sprayed? Support it with survival evidence.	**R appears beneficial for one-week survival with spray: 16 of 20 beetles with R survived, compared with 4 of 20 without R.**
2	A student claims, "Mutation R always helps beetles survive." Does the evidence support this claim? Explain.	**No. Without spray, 8 of 20 beetles with R survived, compared with 14 of 20 without R, so R was linked to lower survival in that setting.**
3	What claim about mutation N's effect on one-week survival is supported by the tests? Use evidence from both settings.	**There is no evidence that N changed one-week survival in these tests. Survival was 12 of 20 in both groups without spray and 6 of 20 in both groups with spray.**
4	Why would it go beyond the evidence to claim that mutation N has no effect on the beetles at all?	**The tests measured one-week survival in two settings. They did not measure effects on egg production, winter survival, or other traits.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The pale-color mutation appears beneficial for moths on light bark but harmful on dark bark. On light bark, 15 of 20 pale moths survived, compared with 8 of 20 dark moths. On dark bark, only 5 of 20 pale moths survived, compared with 14 of 20 dark moths. The mutation's effect on survival depends on the bark color in these tests. Because the moths were observed for only one day, the results do not show whether the mutation affects their survival over a longer time.

Accept claims that specify the tested setting and use the matching group comparison. Equal survival in the N tests supports no detected effect on one-week survival, not proof that N is always neutral.