



Tardigrade Protein: A Breakthrough in Radiation Protection for Cancer Patients

Description

Tardigrades are tiny animals that can survive a lot of radiation. They can take doses that would kill most other living things. Scientists are studying how tardigrades can help protect healthy cells during cancer treatment.

A team led by researchers from Harvard Medical School and the University of Iowa found that a special type of messenger RNA can help protect cells from radiation. This RNA tells cells to make a protein called Dsup, which helps keep DNA safe.

Cancer treatment can hurt healthy cells, not just the tumor. This can cause mouth sores and other painful problems. Dr. James Byrne from the University of Iowa said that treatment can make it hard for people to eat.

The researchers injected Dsup mRNA into mice and then exposed them to radiation. The mice that received the mRNA had fewer DNA breaks than those that did not receive it. This study shows promise for protecting healthy cells during cancer treatment.

In the future, Dsup RNA could help protect cells from damage caused by radiation from space or nuclear sources.

This research was published in the journal *Nature Biomedical Engineering*.

Vocabulary List:

1. **Tardigrades** /'tɑːdɪˌɡreɪdz/ (noun): Tiny animals known for their ability to survive extreme conditions including high radiation.
2. **Radiation** /ˌreɪdɪ'eɪʃən/ (noun): Energy emitted in the form of waves or particles.
3. **Messenger** /'mɛs.ɪn.dʒər/ (noun): A molecule that carries a message in this context referring to RNA that conveys genetic information.
4. **Protect** /prə'tekt/ (verb): To keep safe from harm or injury.
5. **DNA** /di:'ɛn.eɪ/ (noun): Deoxyribonucleic acid the molecule that carries genetic information in living organisms.
6. **Tumor** /'tuː.mər/ (noun): An abnormal growth of tissue which can be benign or malignant (cancerous).

Comprehension Questions



Multiple Choice

1. What are tardigrades?

- Option: Tiny animals that can survive a lot of radiation
- Option: Large mammals found in the Arctic
- Option: Marine creatures living in deep oceans
- Option: Insects resistant to chemicals

2. What is the name of the protein that helps keep DNA safe in cells?

- Option: Dsup
- Option: DnaRep
- Option: RnaProt
- Option: CellGuard

3. What did researchers inject into mice to protect them from DNA damage by radiation?

- Option: DnaRep protein
- Option: CellGuard RNA
- Option: Dsup RNA
- Option: RnaProt messenger

4. Where could Dsup RNA potentially help protect cells from damage in the future?

- Option: From excessive heat
- Option: From dehydration
- Option: From radiation in space or nuclear sources
- Option: From microbial infections

5. What can cancer treatment do to healthy cells?

- Option: Enhance their growth
- Option: Cause mouth sores and painful problems
- Option: Induce resistance to treatment
- Option: Promote cell division

6. In which journal was this research published?

- Option: Nature Biomedicine
- Option: Journal of Cell Biology
- Option: Medical Science Reports
- Option: Nature Biomedical Engineering



True-False

7. Tardigrades are large mammals that can survive radiation.
8. The messenger RNA injected into mice was found to have no effect on DNA breaks caused by radiation.
9. Dr. James Byrne is affiliated with Harvard Medical School.
10. Dsup RNA may potentially protect cells from radiation damage in space.
11. Cancer treatment can make it difficult for people to eat.
12. The research team was from the University of Iowa and Stanford University.

Gap-Fill

13. Tardigrades are tiny animals that can survive a lot of _____.
14. Dr. James Byrne is associated with the University of _____.
15. Dsup RNA has the potential to protect cells from radiation damage in _____ or nuclear sources.
16. The special type of messenger RNA produced a protein called _____ which helps protect DNA.
17. Researchers found that the mice injected with Dsup mRNA had fewer DNA breaks than those that did not receive _____.
18. The study conducted by the research team showed promise for protecting healthy cells during _____ treatment.

Answer

Multiple Choice: 1. Tiny animals that can survive a lot of radiation 2. Dsup 3. Dsup RNA 4. From radiation in space or nuclear sources



5. Cause mouth sores and painful problems 6. Nature Biomedical Engineering

True-False: 7. False 8. False 9. False 10. True 11. True 12. False

Gap-Fill: 13. radiation 14. Iowa 15. space 16. Dsup 17. it 18. cancer

Vocabulary quizzes

Multiple Choice (Select the Correct answer for each question.)

1. What are known to be the most resilient animals on Earth?

Option: Tardigrades

Option: Radiation

Option: DNA

Option: Hormones

2. What drives animals to perform certain behaviors without prior experience?

Option: Behavior

Option: Automatic

Option: Instinct

Option: Responsive

3. What can lead to harmful effects when one is in contact with chemicals or radiation?

Option: Exposure

Option: Preference

Option: Leak

Option: Tumor

4. Which field of physics deals with the behavior of subatomic particles?

Option: Mechanics

Option: Quantum

Option: Chemicals

Option: Research

5. What state is characterized by illness or poor health?

Option: Response

Option: Recovery

Option: Oxygen

Option: Sick

6. Which term describes items designed to be thrown away after use?

Option: Hormones

Option: Disposable



Option: Microwaving

Option: DNA

7. What system regulates oxygen levels in tissues to maintain homeostasis?

Option: Tumor

Option: HypoxyStat

Option: Chemicals

Option: Messenger

8. What activity involves the systematic investigation to discover new knowledge?

Option: Tissues

Option: Research

Option: Expand

Option: Messenger

9. What do certain mechanisms in the body do to ensure the safety of cells?

Option: Protect

Option: Expand

Option: Container

Option: Chemicals

10. What term describes the ability to react quickly and positively to something?

Option: Sick

Option: Responsive

Option: Recovery

Option: Radiation

Gap-Fill (Fill in the blanks with the correct word from the vocabulary list.)

11. The process of breathing is mostly controlled by the _____ nervous system.

12. A _____ is an abnormal growth of cells that serves no purpose.

13. Humans need _____ to survive as it is vital for cellular respiration.

14. The study of how _____ react with each other is important in chemistry.

15. Hormones act as _____ molecules in the body to signal various responses.

16. Cells _____ in size as they absorb nutrients and grow.

17. The cell membrane acts as a _____ holding the cell together and keeping its



contents within.

18. A _____ in the blood-brain barrier can have serious consequences.

19. Animals may show a _____ for certain food types over others.

20. Excessive sun exposure can be _____ to the skin.

Matching Sentences (Match each definition to the correct word from the vocabulary list.)

21. Genetic information is stored in molecules within the cell.
22. The way an individual acts or conducts oneself is termed .
23. Activities controlled by the brain without awareness are considered .
24. The group of scientists conducting a study are called .
25. When an individual is unwell or diseased they are said to be .
26. The period of returning to a normal state of health after an illness is known as .
27. The process of cooking or heating food rapidly using a microwave oven is called .
28. Being reactive or quick to respond describes a individual.
29. Substances with a specific chemical composition are termed .
30. Having a greater liking for one thing over another is known as a .

Answer

Multiple Choice: 1. Tardigrades 2. Instinct 3. Exposure 4. Quantum 5. Sick 6. Disposable 7. HypoxyStat 8. Research 9. Protect 10. Responsive

Gap-Fill: 11. Automatic 12. Tumor 13. Oxygen 14. Chemicals 15. Messenger 16. Expand 17. Container 18. Leak 19. Preference 20. Harmful

Matching sentence: 1. DNA 2. Behavior 3. Unconscious 4. Researchers 5. Sick 6. Recovery 7. Microwaving 8. Responsive 9. Chemicals 10. Preference

CATEGORY

1. Health - LEVEL1



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