How Tumours Evaded the Immune System for Years

Description

Researchers have found a way pancreatic cancer cells evade immune detection, potentially paving the way for new treatments. This cancer, particularly aggressive, is known for its ability to grow quickly without triggering a response from the body’s immune system.

An international team led by the University of Würzburg has discovered what they call a "molecular invisibility switch." The team’s study reveals that a protein called MYC, known for promoting cell growth, can also suppress immune signaling. This finding was published in the journal Cell.

Typically, MYC drives cell division by binding to DNA. However, under stress, it switches function, moving from DNA to RNA. In this state, it forms clusters around RNA-DNA hybrids, which are structures known as R-loops.

The study highlights that MYC has several RNA-binding regions. One region, RBRIII, plays a crucial role by attracting an RNA-degrading complex to break down abnormal RNA, preventing immune system activation.

Normally, RNA-DNA hybrids can trigger immune responses through pathways involving receptors like TLR3. The researchers found that MYC, via RBRIII, prevents such pathways, stopping the immune system from recognizing the cancer.

In experiments on mice, only tumors with fully functional MYC continued to grow substantially. Mutations in the RBRIII region led to tumor shrinkage, but only in mice with working immune systems.

These findings suggest that while MYC's role in cell growth is intact, its ability to hide tumors from the immune system can be disrupted. This could enable treatments that expose cancers to immune attack without damaging other MYC functions.

Vocabulary List:

1. **Evade** /ɪˈveɪd/ (verb): To escape or avoid something especially by cleverness or trickery.
2. **Aggressive** /əˈgrɛsɪv/ (adjective): Quick to act; ready to attack; characterized by a strong tendency to increase or advance.
3. **Suppress** /səˈprɛs/ (verb): To put an end to the activities of or to prevent from being expressed.
4. **Activation** /ˌæktɪˈveɪʃən/ (noun): The process of making something active or operative.
5. **Complex** /ˈkɒmplɛks/ (noun): A group of related parts or elements working together.
6. **Pathways** /ˈpæθweɪz/ (noun): Routes taken by signals or processes within a biological system.

Comprehension Questions

Multiple Choice

1. What is the role of the protein MYC?

   Option: Promoting immune response
   Option: Promoting cell growth
   Option: Breaking down RNA
   Option: None of the above

2. What does MYC suppress?

   Option: Cell growth
   Option: Immune signaling
   Option: RNA synthesis
   Option: DNA binding

3. Which structure is formed by MYC when under stress?

   Option: DNA-DNA hybrids
   Option: RNA-RNA hybrids
   Option: RNA-DNA hybrids
   Option: Protein clusters

4. What is the function of the RBRIII region of MYC?

   Option: Attract immune cells
   Option: Prevent RNA degradation
   Option: Attract an RNA-degrading complex
   Option: Promote cell division

5. In which publication was the study about MYC and pancreatic cancer cells published?

   Option: Nature
   Option: Cell
   Option: The Lancet
   Option: Cancer Research

6. What happens to tumors when there are mutations in the RBRIII region?

   Option: They grow larger

Option: They shrink
Option: They remain the same
Option: They become immune to treatment

True-False

7. Pancreatic cancer cells can evade immune detection.

8. MYC only functions to promote immune signaling.

9. The University of Würzburg led the research on pancreatic cancer cells.

10. RNA-DNA hybrids can trigger immune responses.

11. MYC functions to promote both cell growth and immune system activation.

12. Only tumors with dysfunctional MYC continue to grow substantially in mice.

Gap-Fill

13. MYC is known for promoting cell growth and also _____ immune signaling.

14. The research reveals a 'molecular invisibility switch' that allows tumors to evade

_____.

15. MYC can switch from DNA to _____ under stress.

16. The study found that RBRIII attracts an _____ complex.

17. Only tumors with fully functional MYC showed substantial _____.

18. In mice with working immune systems, mutations in RBRIII led to tumor _____.

Answer

Multiple Choice: 1. Promoting cell growth 2. Immune signaling 3. RNA-DNA hybrids 4. Attract an RNA-degrading complex 5. Cell 6. They shrink
True-False: 7. True 8. False 9. True 10. True 11. False 12. False
Gap-Fill: 13. suppressing

14. immune detection 15. RNA 16. RNA-degrading 17. growth 18. shrinkage

Vocabulary quizzes

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

1. What is the primary function of ionocaloric cooling?

   Option: To heat substances
   Option: To cool substances using ions
   Option: To increase pressure
   Option: To evaporate liquids

2. Which of the following are commonly used as refrigerants?

   Option: Dichloromethane
   Option: Hydrofluorocarbons
   Option: Ethanol
   Option: Acetone

3. What does the melting point refer to?

   Option: Point where a substance starts boiling
   Option: Temperature at which a solid becomes a liquid
   Option: Temperature at which a liquid becomes a gas
   Option: Temperature at which gases condense

4. What is it called when prices for goods and services rise?

   Option: Deflation
   Option: Recession
   Option: Inflation
   Option: Stagnation

5. What type of diet emphasizes fruits vegetables and olive oil?

   Option: Ketogenic diet
   Option: Paleo diet
   Option: Mediterranean diet
   Option: Vegetarian diet

6. What is a common cause of an outbreak in a population?

Option: Vaccination
Option: Infection
Option: Hygiene practices
Option: Contamination

7. What is essential for effective disease outbreak detection?

Option: Vigilance
Option: Ambiguity
Option: Fatigue
Option: Indifference

8. What system helps reduce transmission of airborne diseases?

Option: Insulation
Option: Ventilation
Option: Heating
Option: Cooling

9. What term describes contact with harmful substances?

Option: Withdrawal
Option: Exposure
Option: Defense
Option: Immune response

10. Which hormone regulates sleep-wake cycles?

Option: Cortisol
Option: Adrenaline
Option: Melatonin
Option: Serotonin

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

11. The _____ effect can be used to cool materials rapidly.

12. _____ are often considered more environmentally friendly alternatives to older refrigerants.

13. The _____ diet is known for its heart-healthy benefits.

14. The _____ of ice is 0 degrees Celsius.

15. The _____ of diseases can be significantly reduced with good hygiene.

16. Adequate _____ in buildings helps improve air quality.

17. Prolonged _____ to pollutants can lead to serious health issues.

18. Food _____ can arise from improper handling and storage practices.

19. Chronic _____ can be a response to long-term exposure to irritants.

20. The _____ effects of stress can impact overall health.

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

21. Ionocaloric cooling is an innovative technology leveraging ion movement for efficient temperature control.
22. Hydrofluorocarbons are synthetic compounds used as refrigerants that are considered less harmful to the ozone layer.
23. The Mediterranean diet emphasizes the consumption of healthy fats like olive oil and fresh produce.
24. The melting point of a substance is the specific temperature at which it changes from solid to liquid.
25. Transmission of pathogens can occur through various routes such as airborne direct contact or waterborne.
26. Good ventilation in indoor spaces helps to reduce the concentration of airborne contaminants.
27. Exposure to high levels of pollution can lead to respiratory problems over time.
28. Food contamination can lead to serious illnesses if not addressed promptly.
29. Inflammation is a natural response of the body to injury or infection helping to initiate healing.
30. Cumulative effects of exposure to toxins can lead to chronic health issues over time.

Answer

Multiple Choice: 1. To cool substances using ions 2. Hydrofluorocarbons 3. Temperature at which a solid becomes a liquid 4. Inflation 5. Mediterranean diet 6. Infection 7. Vigilance 8. Ventilation 9. Exposure 10. Melatonin

Gap-Fill: 11. ionocaloric 12. Hydrofluorocarbons 13. Mediterranean 14. melting point 15. transmission 16. ventilation 17. exposure 18. contamination 19. inflammation 20. cumulative
Matching sentence: 1. ionocaloric 2. hydrofluorocarbons 3. Mediterranean 4. melting point 5. transmission 6. ventilation 7. exposure 8. contamination 9. inflammation 10. cumulative

CATEGORY

1. Health - LEVEL4

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1. B2
2. ESL learning
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4. Immune System
5. L4
6. Level 4
7. The Hidden Tumor Trick

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