Study Reveals Cannabis Use Triggers Epigenetic Changes

Description

A recent investigation involving over 1,000 adults indicates that cannabis consumption may lead to alterations within the human epigenome. The epigenome acts as a regulatory system, modulating the expression of genes and thereby influencing physiological functions.

“We identified correlations between the cumulative use of marijuana and various epigenetic markers over time,” noted Lifang Hou, an epidemiologist at Northwestern University, upon the publication of the research in 2023.

According to Hou and her colleagues, cannabis is a prevalent substance in the United States, with 49% of the population having experimented with it at least once, as documented in their published study.

While numerous states and countries have legalized cannabis, its comprehensive effects on health remain inadequately understood.

Researchers recruited approximately 1,000 adults who had previously participated in an extensive study spanning 20 years, during which their cannabis use was documented.

Blood samples were collected from participants at two intervals, specifically the 15-year and 20-year marks, with initial ages ranging from 18 to 30 at baseline.

Analyzing these samples, the research focused on changes in epigenetic markers, particularly DNA methylation levels, among individuals with varying histories of cannabis use.

DNA methylation, one of the most scrutinized epigenetic modifications, alters gene activity without changing the underlying genomic sequence, complicating the cellular access to genetic instructions.

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Diagram showing structure of our genetic molecules from chromosome to DNA including methylation The recruitment of methyl groups by epigenetic factors, sourced from genetic or environmental stimuli, modulates gene expression. (ttsz/iStock/Getty Images)

Environmental and lifestyle influences can instigate these methylation shifts, which have the potential to be inherited by subsequent generations, with blood biomarkers revealing both recent and historical exposures.

“Our prior research indicated links between marijuana use and the aging process as reflected in DNA methylation patterns,” Hou explained.

“We sought to delve deeper into whether specific epigenetic factors were correlated with marijuana use and how these changes might be linked to health outcomes.”

A family of humans

Image not found or type unknown
Lifestyle and environmental factors can induce methylation changes, which may be transmitted to future generations. (Monkey Business Images/Canva)

This methodical analysis of participants' cannabis use enabled researchers to evaluate cumulative patterns over time and juxtapose them with DNA methylation markers for thorough analysis.

In their findings, the researchers identified a plethora of DNA methylation markers in the 15-year blood samples: 22 linked to recent use and 31 to cumulative cannabis exposure. The 20-year samples revealed a staggering 132 markers associated with recent usage and 16 with cumulative use.

Cannabis plant with its purple flowers

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The buds of the cannabis plant are renowned for containing the highest concentrations of cannabinoids. (Esteban López/Unsplash)

“Notably, we consistently observed a specific marker previously linked to tobacco use,” Hou commented, “indicating possible shared epigenetic mechanisms between the usage of tobacco and marijuana.”

Numerous epigenetic alterations associated with cannabis use have been previously connected to various phenomena, including cell proliferation, hormonal signaling, and a range of neurological and psychological disorders, such as substance use disorders.

However, it is imperative to underscore that this study does not establish a direct causative link between cannabis use and these health alterations.

“This research offers novel perspectives on the relationship between marijuana consumption and epigenetic alterations,” stated Drew Nannini, an epidemiologist from Northwestern University.

“Further investigations are essential to ascertain if these associations are consistently observable across diverse populations. Additionally, studies focused on the impact of marijuana on age-related health outcomes could yield deeper insights into its long-term health effects.”

The findings of this study have been published in *Molecular Psychiatry*.

An earlier version of this article was released in July 2023.

Vocabulary List:

1. **Epigenome** /ˌɛpɪˈdʒɛnəʊm/ (noun): The complete set of epigenetic modifications on the genetic material of a cell.
2. **Cannabis** /ˈkæn.ə.bɪs/ (noun): A plant whose products are used for medicinal recreational and industrial purposes.
3. **Methylation** /ˌmɛθɪˈleɪʃən/ (noun): A biochemical process that involves the addition of a methyl group to DNA affecting gene expression.
4. **Correlations** /ˌkɔːrəˈleɪʃənz/ (noun): A mutual relationship or connection between two or more things.
5. **Proliferation** /prəʊˌlɪf.ərˈeɪ.ʃən/ (noun): The rapid increase in the number or amount of something.
6. **Phenomena** /fəˈnɒmɪnə/ (noun): Observable events or occurrences especially those that can be studied scientifically.

Comprehension Questions

Multiple Choice

1. What is the primary focus of the recent investigation involving over 1,000 adults?

   Option: The impact of cannabis on mental health
   Option: The relationship between cannabis use and epigenetic changes
   Option: The effects of cannabis on physical health
   Option: The correlation between cannabis use and substance abuse

2. How many DNA methylation markers were identified in the 15-year blood samples in the study?

   Option: 22 linked to recent use and 31 linked to cumulative use
   Option: 8 linked to recent use and 16 linked to cumulative use
   Option: 45 linked to recent use and 20 linked to cumulative use
   Option: 30 linked to recent use and 10 linked to cumulative use

3. What did researchers focus on analyzing in the collected blood samples?

Option: Lipid levels
Option: Hormone production
Option: DNA methylation levels
Option: Blood cell counts

4. What potential do methylation shifts have according to the investigation?

Option: They can lead to altered genomic sequences
Option: They can be reversed by lifestyle changes
Option: They can be inherited by future generations
Option: They have no impact on gene expression

5. What percentage of the population in the United States has experimented with cannabis at least once?

Option: 15%
Option: 26%
Option: 41%
Option: 49%

6. Which age group did the initial participants in the study belong to?

Option: 12-18
Option: 18-30
Option: 30-45
Option: 45-60

True-False

7. The study conclusively establishes a direct causative link between cannabis use and health alterations.

8. DNA methylation alters gene activity without affecting the underlying genomic sequence.

9. The findings of the study suggest a shared epigenetic mechanism between tobacco and marijuana use.

10. The study participants had their blood samples collected at five-year intervals.

11. Epigenetic alterations associated with cannabis use have no connection to neurological and psychological disorders.

12. The study emphasizes the need for further investigation to understand the impact of marijuana on age-

related health outcomes.

Gap-Fill

13. The cumulative use of marijuana was correlated with the identification of _____ DNA methylation markers in the 15-year blood samples.

14. The researchers focused on changes in _____ levels among individuals with varying histories of cannabis use.

15. According to the article, _____ acts as a regulatory system, modulating the expression of genes.

16. Methylation shifts instigated by environmental and lifestyle influences have the potential to be inherited by _____ generations.

17. The study participants were initially between the ages of _____ at baseline.

18. The _____ of the human epigenome influences physiological functions by modulating gene expression.

Answer

Multiple Choice: 1. The relationship between cannabis use and epigenetic changes 2. 22 linked to recent use and 31 linked to cumulative use 3. DNA methylation levels 4. They can be inherited by future generations 5. 49% 6. 18-30
True-False: 7. False 8. True 9. True 10. False 11. False 12. True
Gap-Fill: 13. 22 linked to recent use and 31 linked to cumulative use 14. DNA methylation 15. The epigenome 16. subsequent 17. 18 to 30 18. regulatory system

Vocabulary quizzes

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

1. What is a term used to describe something mysterious or puzzling?

   Option: Secret code
   Option: Electrophysiological
   Option: Resilience
   Option: Indulgences

2. Which plant is known for its medicinal and recreational uses?

   Option: Fungi
   Option: Cannabis
   Option: Correlations
   Option: Resilience

3. What is the term for taking action to reduce the severity or risk of something?

   Option: Inclusive
   Option: Mitigate
   Option: Proliferation
   Option: Susceptibility

4. Which term refers to the ability of an individual or entity to govern itself independently?

   Option: Potent
   Option: Autonomy
   Option: Chronic
   Option: Epidemiology

5. What is the collection of chemical compounds that guide the functioning of our genes?

   Option: Causation
   Option: Enhancing
   Option: Epigenome
   Option: Propensity

6. Which term describes the rising again or renewal of an activity after a period of dormancy?

   Option: Transiently
   Option: Impairments
   Option: Resurgence
   Option: Propagation

7. What does the term "propensity" refer to?

   Option: Identification
   Option: Enhancing
   Option: Resilience

Option: Propensity

8. What are acts of satisfying desires without restraint called?

Option: Phenomena
Option: Correlations
Option: Indulgences
Option: Mitigate

9. Which term refers to a group of organisms that includes mushrooms yeasts and molds?

Option: Enigma
Option: Transients
Option: Fungi
Option: Telophase

10. Which term means to improve or increase the quality value or extent of something?

Option: Enhancing
Option: Propagation
Option: Susceptibility
Option: Identification

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

11. The _____ of the novel won numerous awards for their captivating storytelling.

12. The study focused on the _____ responses of the brain to different stimuli.

13. Prolonged stress can lead to various _____ health conditions.

14. The team analyzed the genetic factors influencing _____ to certain diseases.

15. The scientist studied natural _____ to understand underlying principles.

16. Effective _____ measures can reduce the impact of environmental disasters.

17. Water _____ in the region serve as crucial sources for agriculture.

18. The report outlined strategies for the rapid _____ of renewable energy sources.

19. The forensic team used DNA _____ to determine the victim of the crime.

20. The study established strong _____ between diet and overall health.

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

21. The research project aims to develop a new generation of medical implants using living cells and organic materials.
22. The community showed great in rebuilding after the natural disaster.
23. The policy was designed to be of all members of society regardless of background or status.
24. The new drug demonstrated a effect in treating the rare disease.
25. Long-term smoking can lead to respiratory diseases.
26. The migratory birds were considered in the region only staying for a short period each year.
27. Public health officials relied on data to track the spread of the contagious disease.
28. The rapid of rumors led to widespread misinformation within the community.
29. Individuals with weakened immune systems have increased to infections.
30. In times of stress people often seek as a form of comfort and escape.

Answer

Multiple Choice: 1. Secret code 2. Cannabis 3. Mitigate 4. Autonomy 5. Epigenome 6. Resurgence 7. Propensity 8. Indulgences 9. Fungi 10. Enhancing
Gap-Fill: 11. Author 12. Electrophysiological 13. Chronic 14. Susceptibility 15. Phenomena 16. Mitigation 17. Reservoirs 18. Propagation 19. Identification 20. Correlations
Matching sentence: 1. Biohybrid 2. Resilience 3. Inclusive 4. Potent 5. Chronic 6. Transients 7. Epidemiology 8. Propagation 9. Susceptibility 10. Indulgences

CATEGORY

1. Sci/Tech - LEVEL5

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Author
aimeeyoung99