

query intent: knowledge

epigenetics in disease prevention

According to the CDC, epigenetics can play a role in disease prevention by influencing gene expression through environmental factors and behaviors. Epigenetic changes are reversible and do not alter the DNA sequence itself but can affect how genes are turned "on" or "off". These changes can be influenced by factors such as diet, exercise, and exposure to substances like tobacco smoke.

For example:

- Smoking:** The CDC explains that smoking can lead to epigenetic changes, such as alterations in DNA methylation. Studies have shown that smokers may have decreased DNA methylation at certain gene regions compared to non-smokers. However, after quitting smoking, former smokers can experience increased DNA methylation^[1] levels that may eventually become similar to those of non-smokers (1).
- Colorectal cancer:** Abnormal DNA methylation near certain genes^[1] has been observed in colorectal cancers. Some commercial screening tests use stool samples to^[1] detect abnormal DNA methylation levels^[1] as an indication of potential colorectal cancer. It's important to note that a positive or abnormal test result should be followed up with a colonoscopy for proper screening (1).
- Famine exposure:** Researchers have found that individuals whose mothers were pregnant with them during^[1] a famine have shown altered methylation levels at specific genes. This exposure during early development has been associated with an increased risk of diseases such as heart disease^[1], schizophrenia, and type 2 diabetes^[1] in adulthood (1).

These examples highlight the role of epigenetics in disease prevention. By understanding how our behaviors and environment can influence epigenetic changes, we can potentially make choices that promote better health outcomes. However, it is important to consult with healthcare professionals and further research to fully understand the impact of epigenetics in disease prevention.

Sources (13)

Add

Selected Sources (1) ^

[1] What is Epigenetics? | CDC



cdc.gov/genomics/disease/epigenetics.htm

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Candidate Sources (12) ▾

Follow Up Suggestions

How exactly does DNA methylation affect gene expression?

Are there other environmental factors besides diet, exercise, and tobacco smoke that can influence epigenetic changes?

Can you provide more examples of diseases or conditions where epigenetic changes play a role in disease prevention?

Are there any specific actions or interventions that can be taken to promote positive epigenetic changes for disease prevention?

Are there any limitations or challenges in studying the impact of epigenetics on disease prevention?

Is there ongoing research in the field of epigenetics that may provide further insights into disease prevention?

How long does it typically take for epigenetic changes to occur after modifying behaviors such as quitting smoking?

Is there a way to test or monitor a person's epigenetic changes to assess their disease prevention strategies?

Are there any specific guidelines or recommendations on how people can modify their behaviors to positively influence epigenetic changes for disease prevention?

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How exactly does DNA methylation affect gene expression?



According to the CDC, DNA methylation is one of the epigenetic changes that can affect gene expression^[1]. DNA methylation involves adding a chemical group^[1] called a methyl group to specific places on the DNA^[1] molecule, which can block the proteins that attach to DNA to^[1] "read" the gene. This addition of the methyl group can turn the genes "off" and prevent them from being expressed.

Conversely, demethylation, the removal of the methyl group, can turn the genes "on" and allow for their expression (1).

The process of DNA methylation and demethylation plays a crucial role in the regulation of gene expression. It affects various cellular processes, including development, differentiation, and disease. Abnormal DNA methylation patterns have been associated with several diseases, including cancer, cardiovascular disease, and neurological disorders (1).

For example, in colorectal cancers, abnormal DNA methylation^[1] occurs near certain genes^[1], leading to changes in their expression. This can contribute to the development of cancer by disrupting normal cellular processes (1).

Unfortunately, the specific mechanism by which DNA methylation affects gene expression is not explained in detail in the given CDC text. For a more in-depth understanding of the molecular mechanisms involved, it is recommended to consult further scientific literature on epigenetics and gene regulation.



Sources (1)

Add

Selected Sources (1) ^

[1] What is Epigenetics? | CDC



cdc.gov/genomics/disease/epigenetics.htm

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Follow Up Suggestions

Can you provide more examples of diseases that are associated with abnormal DNA methylation patterns?

Are there any known factors or triggers that can cause abnormal DNA methylation?

Is DNA methylation a reversible process? If so, what factors are involved in demethylation?

How does abnormal DNA methylation near certain genes contribute to the development of cancer?

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Are there any known factors or triggers that can cause abnormal DNA methylation?



There are several known factors and triggers that can cause abnormal DNA methylation. Environmental factors, such as exposure to chemicals, pollutants, toxins, and radiation, have been associated with changes in DNA methylation patterns^[2]. Genetic factors, including mutations in genes involved in the DNA

Sources (7)

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Selected Sources (6) ^

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[1] DNA methylation in human diseases



ncbi.nlm.nih.gov/pmc/articles/PMC61



methylation process^[4], can also lead to dysregulation of methylation patterns. Lifestyle choices, such as diet, exercise, and substance use, can impact DNA methylation. For example, inadequate intake of important nutrients like folate and vitamin B12^[5] can lead to abnormal methylation patterns. Additionally, aging and disease status can also influence DNA^[2] methylation. Overall, factors such as environmental exposures, genetic variations, lifestyle choices, and disease can all contribute to abnormal DNA methylation patterns. However, it's important to note that our understanding of the specific triggers and mechanisms involved is still evolving, and more research is needed to fully elucidate the factors influencing DNA methylation.



Follow Up Suggestions

Can you provide some examples of environmental chemicals or pollutants that have been linked to changes in DNA methylation patterns?

Are there specific genes that are commonly mutated and result in dysregulation of methylation patterns?

How does inadequate intake of folate and vitamin B12 lead to abnormal DNA methylation patterns?

Can you provide some examples of diseases or conditions that have been shown to influence DNA methylation?



[2] DNA methylation - Wikipedia
en.wikipedia.org/wik/DNA_methylation

[Remove](#)

[3] Methylation: Definition, Research, Testing, and Support Methods
healthline.com/health/methylation



[Remove](#)

[4] How Dietary Factors Affect DNA Methylation: Lesson from Epidemiological Studies
ncbi.nlm.nih.gov/pmc/articles/PMC7466216/

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[5] DNA hypermethylation in disease: mechanisms and clinical relevance
pubmed.ncbi.nlm.nih.gov/31284823/



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[6] Roles and causes of abnormal DNA methylation in gastrointestinal cancers
pubmed.ncbi.nlm.nih.gov/16839207/



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Sources (6) [Add](#)

Selected Sources (3) [^](#)

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[1] DNA methylation in human diseases
ncbi.nlm.nih.gov/pmc/articles/PMC6147084/



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[2] Methylation: Definition, Research, Testing, and Support Methods
healthline.com/health/methylation



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[3] Roles and causes of abnormal DNA methylation in gastrointestinal cancers
pubmed.ncbi.nlm.nih.gov/16839207/



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query intent: knowledge How does inadequate intake of folate and vitamin B12 lead to abnormal DNA methylation patterns? [Edit](#)

Inadequate intake of folate and vitamin B12^[2] can lead to abnormal DNA methylation patterns^[2]. Folate and vitamin B12 are essential nutrients involved in the one-carbon metabolism pathway, which is crucial for DNA methylation. Folate serves as a coenzyme in the conversion of homocysteine to methionine, a precursor for S-adenosylmethionine (SAM), the primary methyl donor for DNA methylation reactions. Vitamin B12 is required for the activation of folate and the synthesis of SAM. Inadequate intake of folate and vitamin B12 can result in decreased levels of SAM, impaired DNA methylation, and abnormal gene expression patterns. This disruption in DNA methylation has been associated with various health conditions, including cancer, cardiovascular disease, and neurological disorders. However, further research is needed to fully understand the mechanisms and implications of this relationship. It is recommended to consult with healthcare professionals for personalized and comprehensive dietary advice regarding folate and vitamin B12 intake.



Follow Up Suggestions

What are some consequences of impaired DNA methylation?

Can you explain the role of homocysteine in one-carbon metabolism pathway in more detail?

Are there any specific dietary sources that are rich in folate and vitamin B12?

How much folate and vitamin B12 is considered an adequate intake?

Sources (6) [Add](#)

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[1] DNA methylation in human diseases
ncbi.nlm.nih.gov/pmc/articles/PMC6147084/



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[2] Methylation: Definition, Research, Testing, and Support Methods
healthline.com/health/methylation



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[3] Roles and causes of abnormal DNA methylation in gastrointestinal cancers
pubmed.ncbi.nlm.nih.gov/16839207/



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query intent: knowledge How much folate and vitamin B12 is considered an adequate intake? [Edit](#)

According to the National Institutes of Health and Healthline, the recommended daily allowances (RDAs) for folate and vitamin B12^[1] vary depending on age, gender, and life stage. Here are the general recommendations:

For folate:

- Infants 0-6 months: 65-80 micrograms (mcg)
- Infants 7-12 months: 80 mcg</p></p><p><p>Children
- Children 1-3 years: 150 mcg</p></p><p><p>Children
- Children 4-8 years: 200 mcg</p></p><p><p>Children
- Children 9-13 years: 300 mcg
- Adolescents 14-18 years: 400 mcg
- Adults 19 years and older: 400 mcg

For vitamin B12^[1]:

- Infants 0-6 months: 0.4 micrograms (mcg)
- Infants 7-12 months: 0.5 mcg</p></p><p><p>Children
- Children 1-3 years: 0.9 mcg</p></p><p><p>Children
- Children 4-8 years: 1.2 mcg</p></p><p><p>Children
- Children 9-13 years: 1.8 mcg
- Adolescents 14-18 years: 2.4 mcg
- Adults 19 years and older: 2.4 mcg

It's important to note that these are general recommendations and individual needs may vary based on factors such as overall health, pregnancy, and specific medical conditions. It is advised to consult a healthcare professional or registered dietitian for personalized guidance on adequate intake of folate and vitamin B12^[1].



Sources (3) [Add](#)

Selected Sources (2) [^](#)

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[1] Methylation: Definition, Research, Testing, and Support Methods
healthline.com/health/methylation



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[2] Roles and causes of abnormal DNA methylation in gastrointestinal cancers
pubmed.ncbi.nlm.nih.gov/16839207/



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Follow Up Suggestions

- Can you provide examples of specific medical conditions that may affect the individual needs for folate and vitamin B12?
- Are there any food sources that are particularly high in folate and vitamin B12?
- How do the recommended daily allowances for folate and vitamin B12 change during pregnancy?
- Is there a risk of consuming too much folate or vitamin B12? If so, what are the potential side effects?
- Are there any supplements or fortified foods that can help meet the recommended intake for folate and vitamin B12?

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Is there a risk of consuming too much folate or vitamin B12? If so, what are the potential side effects?



According to the referenced article on [Healthline](#), there is little risk associated with consuming too much folate or vitamin B12 through food sources or normal dietary supplements. Both nutrients are water-soluble, meaning that any excess amounts are usually excreted in the urine. However, it's important to note that high-dose supplementation of these nutrients can have potential side effects.

Regarding folate, excessive intake from supplements or fortified foods is generally not a concern. The [National Institutes of Health](#) states that there is no upper intake level (UL) for folate from natural sources, but the UL for folic acid (the synthetic form of folate) from supplements and fortified foods for adults is set at 1,000 micrograms (mcg) per day. Consuming very high levels of synthetic folic acid could potentially mask vitamin B12 deficiency symptoms, which can lead to nerve damage if not addressed (1).

As for vitamin B12, it is also considered safe for most people when taken in appropriate doses. The [National Institutes of Health](#) reports that there is no known toxicity associated with excessive intake of vitamin B12 from food or supplements (2).

However, it's important to follow the recommended dietary guidelines and consult with a healthcare professional before starting any high-dose supplementation regimen, especially if you have underlying health conditions or concerns about excessive nutrient intake.



Follow Up Suggestions

- What are some examples of fortified foods that contain folic acid?
- Is there a difference between natural folate and synthetic folic acid in terms of absorption and health effects?
- Are there any groups of people who may be at a higher risk of folate or vitamin B12 deficiency?
- How can I ensure that I am getting enough folate and vitamin B12 from natural food sources?
- Can you provide examples of high-dose supplementation for folate and vitamin B12?

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Can you provide examples of high-dose supplementation for folate and vitamin B12?



Examples of high-dose supplementation for folate and vitamin B12^[2] are not explicitly provided in the sources. The information emphasizes the importance of medical supervision and guidance when considering high-dose supplementation for these nutrients, as excessive intake can have potential side effects^[2]. It is recommended to consult with a healthcare professional who can assess individual needs, medical conditions, and determine if higher doses are necessary for specific deficiencies or conditions.



Follow Up Suggestions

- Why is medical supervision important when considering high-dose supplementation for folate and vitamin B12?
- What kind of potential side effects can occur with excessive intake of folate and vitamin B12?
- What factors should be taken into account when determining if higher doses are necessary for specific deficiencies or conditions?
- Is it risky to self-administer high-dose supplementation of folate and vitamin B12 without medical guidance?

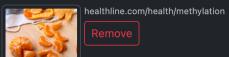
Sources (2)

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Selected Sources (1)

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[1] Methylolation: Definition, Research, Testing, and Support Methods



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Sources (5)

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[1] Folic Acid Dosage Guide + Max Dose, Adjustments



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[2] 4 Potential Side Effects of Too Much Folic Acid



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Ask a follow up

