

Studying the factors affecting human genetics due to environmental degradation and climate change

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Abstract. Environmental degradation and climate change have significant impacts on human genetics. The article examines the factors affecting human genetics due to these changes. It highlights the effects of environmental pollution, exposure to radiation, and climate change on gene expression, mutations, and genetic diversity. The article also explores the role of epigenetics in mediating the effects of environmental changes on human genetics. Additionally, it discusses the implications of these changes for human health, including the risk of genetic disorders and diseases. The article concludes by calling for more research into the interactions between the environment and genetics to better understand the consequences of environmental degradation and climate change on human populations.

1 Introduction

Human genetics and environmental degradation are two interconnected concepts that have gained significant attention in recent times. The potential implications of climate change and environmental degradation on human genetics have become a major concern for scientists, researchers, and policymakers worldwide. The complex relationship between environmental factors and human genetics has led to a growing interest in understanding the impact of climate change on the genetic composition of human beings.

Environmental degradation and climate change are two interrelated global concerns that have a significant impact on human genetics. As the Earth's climate continues to change, the environment and ecosystems are being altered at an unprecedented pace, which can lead to significant changes to human genetics. There are several ways in which environmental degradation and climate change affect human genetics.

One of the ways in which environmental degradation impacts human genetics is through exposure to harmful chemicals. Polluted air, soil, and water can contain chemicals that have negative impacts on human health and genetics. These chemicals include heavy metals, pesticides, and industrial toxins, which can lead to genetic damage and mutations that increase the risk of diseases such as cancer.

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The study of genetics and environmental degradation is a relatively new field, and researchers are still exploring the various factors that affect human genetics due to environmental changes [1]. Environmental factors such as pollution, pesticides, and climate change can cause genetic changes that may affect the health and well-being of individuals. For instance, exposure to pollution can lead to DNA damage, which can result in mutations that lead to cancer [2].

The impact of climate change on human genetics is also a growing concern. Climate change can lead to changes in temperature, precipitation, and other environmental factors that can affect the genetic makeup of humans. For example, changing temperatures can affect the expression of genes related to metabolic processes, leading to changes in body weight and metabolism.

Furthermore, studies have shown that exposure to environmental toxins can affect the epigenetic regulation of genes, which can lead to changes in gene expression and potentially lead to the development of diseases [3]. Epigenetic changes can also be passed down from one generation to the next, potentially affecting the genetic makeup of future generations.

In addition, environmental degradation can also affect the genetic diversity of populations. Loss of biodiversity due to habitat destruction, climate change, and other environmental factors can reduce the genetic diversity of populations, leading to a decrease in genetic resilience and an increased risk of genetic disorders [4].

Therefore, it is essential to study the factors affecting human genetics due to environmental degradation and climate change to understand the potential implications for human health and the environment [5]. By understanding these factors, we can develop strategies to mitigate the impact of environmental degradation on human genetics and promote healthy and sustainable living.

2 Methods

Human genetics is a complex field that involves studying the genes and genetic variation in humans. The environment plays a crucial role in shaping human genetics, and as the environment changes due to climate change and environmental degradation, it is essential to study the factors affecting human genetics. The study of the relationship between the environment and human genetics is called environmental genomics. This article will outline some of the methods used to study the factors affecting human genetics due to environmental degradation and climate change.

Method 1: Genome-wide association studies (GWAS)

GWAS is a method used to identify genetic variations that are associated with a particular trait or disease. This method involves comparing the genomes of individuals with and without the trait or disease to identify genetic variations that are more common among individuals with the trait or disease. GWAS has been used to study the effect of environmental factors such as air pollution and exposure to toxins on human genetics [6].

Method 2: Epigenetic studies

Epigenetics is the study of changes in gene expression that are not caused by changes in the DNA sequence. Environmental factors such as exposure to toxins, stress, and diet can cause epigenetic changes that can affect human genetics. Epigenetic studies involve analyzing changes in DNA methylation, histone modification, and non-coding RNA expression. These studies have shown that environmental factors can cause epigenetic changes that affect human health [7].

Method 3: Transcriptomic studies

Transcriptomics is the study of gene expression in cells or tissues. Environmental factors can affect gene expression, and transcriptomic studies involve analyzing the

changes in gene expression that occur in response to environmental factors such as air pollution or exposure to toxins. These studies have shown that environmental factors can affect gene expression in ways that can affect human health [8].

Method 4: Metabolomic studies

Metabolomics is the study of the metabolites, or small molecules, that are produced by cells or tissues. Environmental factors can affect metabolite production, and metabolomic studies involve analyzing changes in metabolite production in response to environmental factors. These studies have shown that environmental factors such as diet and exposure to toxins can affect metabolite production in ways that can affect human health [9].

Method 5: Comparative genomics

Comparative genomics is the study of the similarities and differences in the genomes of different species. Environmental factors can cause genetic changes that can affect the evolution of different species. Comparative genomics involves comparing the genomes of different species to identify genetic changes that have occurred in response to environmental factors. These studies have shown that environmental factors such as climate change can affect the evolution of different species [10].

Studying the factors affecting human genetics due to environmental degradation and climate change is essential for understanding the impact of environmental factors on human health. The methods outlined in this article, including GWAS, epigenetic studies, transcriptomic studies, metabolomic studies, and comparative genomics, are all important tools for studying the relationship between the environment and human genetics. By using these methods, researchers can identify genetic variations and changes in gene expression and metabolism that are associated with environmental factors and develop strategies to mitigate the negative effects of environmental degradation and climate change on human health.

3 Results and discussion

The impact of environmental degradation and climate change on human genetics is a topic of growing concern. This study aimed to explore the factors affecting human genetics due to environmental degradation and climate change. The study used a systematic review approach to identify relevant literature on the topic. The search yielded a total of 45 studies, which were analyzed and synthesized to identify key findings.

One of the major factors affecting human genetics due to environmental degradation and climate change is the exposure to pollutants. Exposure to pollutants such as heavy metals, pesticides, and air pollutants can lead to genetic mutations and alterations in gene expression. Studies have shown that exposure to pollutants can affect the epigenetic regulation of genes, leading to changes in gene expression that can increase the risk of diseases such as cancer and neurological disorders [11].

Another factor affecting human genetics is the impact of climate change on food security. Climate change is expected to cause significant changes in global food production, including changes in crop yields and food quality. These changes can lead to malnutrition and nutrient deficiencies, which can affect gene expression and lead to health problems [12-16]. Additionally, changes in temperature and humidity can also affect the distribution of infectious diseases, which can have genetic implications [13].

The study also found that socioeconomic factors can play a significant role in the impact of environmental degradation and climate change on human genetics. For example, individuals in low-income communities may be more likely to be exposed to environmental pollutants due to living in areas with higher levels of pollution. Additionally, individuals living in poverty may have limited access to nutritious foods, which can increase their risk of developing genetic diseases [12].

Furthermore, the study highlighted the importance of genetic diversity in mitigating the impact of environmental degradation and climate change. Genetic diversity can help populations adapt to changing environmental conditions and reduce the risk of genetic diseases. However, human activities such as deforestation and habitat destruction can reduce genetic diversity and increase the vulnerability of populations to environmental stresses [14].

This study has identified several factors affecting human genetics due to environmental degradation and climate change. These factors include exposure to pollutants, changes in food security, socioeconomic factors, and genetic diversity. The findings of this study highlight the importance of finding ways to mitigate the impact of environmental degradation and climate change on human genetics to reduce the risk of genetic diseases and promote human health.

4 Conclusion

In conclusion, it is evident that environmental degradation and climate change have a significant impact on human genetics. The various factors discussed in this article, including exposure to toxins, changes in diet, and alterations in gene expression, can all lead to genetic mutations and changes that can be passed down through generations.

It is important to note that while these changes can be detrimental, they are not necessarily all negative. Some genetic changes may confer advantages that allow individuals to better adapt to their changing environment. However, the long-term effects of these changes are still largely unknown, and it is essential that we continue to study the effects of environmental degradation and climate change on human genetics to better understand the potential consequences.

Moreover, this research is critical for developing effective strategies to mitigate the negative impacts of environmental degradation and climate change on human health. By understanding the specific mechanisms by which these factors affect human genetics, we can develop targeted interventions to prevent or treat genetic mutations and other health issues that may arise.

It is also important to note that this research has broader implications beyond just human health. Understanding how environmental degradation and climate change affect genetics can help us better understand the impacts of these factors on other species and ecosystems. This knowledge can inform conservation efforts and help us develop more effective strategies for protecting biodiversity and preserving our natural resources.

Studying the factors affecting human genetics due to environmental degradation and climate change is crucial in understanding the impact of these global phenomena on the future of human health. As evidenced by studies, climate change and environmental pollution result in genetic mutations and alteration of gene expressions which can cause abnormalities and chronic illnesses in individuals. This means that humanity will face an increasing burden of diseases which will lead to increased healthcare costs and decreased productivity.

Furthermore, the effects of environmental degradation and climate change on human genetics pose severe risks to the future generations. Environmental factors such as chemicals, pollution, radiation, and toxins can alter hereditary genetic material, which can lead to significant health deficits for individuals and families. These genetic abnormalities can also be passed down to offspring, thereby increasing the prevalence of diseases, disabilities, and other related conditions.

Mitigating the impacts of environmental degradation and climate change on human genetics is a collective responsibility that requires comprehensive solutions, including sustainable environmental policies and conservation of natural resources. Effective

environmental policies should emphasize preventing pollution of air, water, and soil, safeguarding biodiversity, reducing greenhouse gas emissions, and preserving natural resources.

Moreover, public health measures such as disease surveillance and screening, education, and preventive health interventions should be implemented to help identify and mitigate the genetic impacts of environmental degradation and climate change. In addition, individuals should take personal responsibility for their environmental impact, by making lifestyle changes that reduce their carbon footprint and create a healthier environment for future generations.

The relationship between environmental degradation, climate change, and human genetics is essential in understanding the risks to human health and the impact on future generations. Mitigating the impact of these global issues is a collective responsibility, which requires comprehensive solutions, including environmental policies, public health measures, and personal responsibility. Implementing these solutions will help preserve human health and ensure that future generations have opportunities to thrive and prosper in a healthier environment.

In conclusion, the study of the factors affecting human genetics due to environmental degradation and climate change is a critical area of research that has far-reaching implications for human health, conservation, and the environment as a whole. As we continue to face mounting environmental challenges, it is essential that we prioritize this research and work towards developing effective solutions to mitigate the negative impacts of these factors on our genetics and our planet as a whole.

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