

Ocean Acidification: Environmental Issues and Health Effects on Humans

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DESCRIPTION

Ocean acidification refers to the ongoing decrease in pH levels of the Earth's oceans, caused by the absorption of CO₂ from the atmosphere. Since the Industrial Revolution, human activities such as burning fossil fuels, deforestation, and cement production have exponentially increased the concentration of CO₂. The oceans absorb about 30% of this CO₂, where it reacts with seawater to form carbonic acid. This acid then dissociates into bicarbonate and hydrogen ions, the latter of which decreases the pH and increases the acidity of the ocean.

Ecological impact

The increasing acidity of ocean waters poses significant threats to marine life, particularly organisms that rely on calcium carbonate for their skeletal structures, such as corals, mollusks, and some plankton species. Coral reefs, often called the rainforests of the sea, are especially vulnerable. These ecosystems, which provide habitat and protection for a vast array of marine species, are at risk of dissolution as acidic conditions weaken their calcium carbonate structures.

The impact extends beyond corals. Mollusks such as oysters, clams, and scallops experience reduced shell growth in more acidic conditions, making them more susceptible to predation and less likely to reach maturity. Plankton, the foundational element of the marine food web, also face challenges, with some species struggling to maintain their calcium carbonate shells. This disruption at the base of the food web can cascade through the ecosystem, affecting fish populations and the larger predators that rely on them, including humans.

The economic implications of ocean acidification are equally alarming. Many coastal communities depend heavily on marine resources for their livelihoods. The fishing and aquaculture industries, in particular, are vulnerable. Shellfish farming, for instance, is already witnessing the effects of acidification, with hatcheries reporting significant losses in larval production. A decline in fish populations due to disrupted food webs can lead to reduced catches, impacting both commercial and subsistence fisheries.

Human health and food security

Ocean acidification has direct and indirect consequences for human health and food security. Seafood is a primary source of protein for over a billion people worldwide. Declines in fish and shellfish populations can lead to nutritional deficiencies, particularly in developing countries where alternative protein sources may be limited.

Moreover, the collapse of fisheries can drive economic instability, leading to increased poverty and potential conflict over dwindling resources. The loss of biodiversity in marine environments can also have unknown repercussions on the discovery of new medicines, many of which are derived from marine organisms. Strategies such as protecting and restoring marine ecosystems, including seagrass beds and mangroves, can enhance the resilience of marine environments. These ecosystems act as natural carbon sinks, absorbing CO₂ and helping to buffer against acidification.

Research and monitoring are important for understanding the complexities of ocean acidification and developing adaptive strategies. Enhanced monitoring of ocean pH levels and the health of marine species can provide valuable data to guide policy and management decisions. Investing in research to develop acidification-resistant aquaculture species and to explore geoengineering solutions, such as alkalinity enhancement, could also offer potential avenues for mitigation.

CONCLUSION

Ocean acidification is an insidious and far-reaching consequence of human activities that threatens marine biodiversity, economic stability, and food security. Its impacts are already being felt and are projected to intensify if current trends continue. Combating this issue requires an urgent, coordinated global effort to reduce CO₂ emissions, protect and restore marine ecosystems, and raise public awareness. The health of our oceans is inextricably linked to the health of our planet and our future. By acting decisively and collectively, we can safeguard the marine environments that sustain life on Earth.

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