

The Integration of Microplastics into the Diet of Phytoplankton in the Hudson River Estuary



(This image comes from the video, Plankton munching microplastics, the green particles surrounding the phytoplankton and inside it are microplastics.)

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Abstract

The rationale of this project is to discover how severe the integration of microplastics are into the diet of phytoplankton by determining the ratio of microplastics to phytoplankton in the Hudson River Estuary. Many animals depend on phytoplankton as a food source, if phytoplankton are consuming high amounts of microplastics; it means that microplastics will make their way up the food chain. There are many possible ways that this experiment can be conducted, although no data has been formally collected through the reading of 4-peer review journal (listed in the bibliography) it can be hypothesized that due to an increasing number of plastics being disposed into the Hudson River, microplastics are becoming integrated into the diet of phytoplankton.

Introduction

Plastics are detrimental to aquatic life through complications with entanglement, consumption and a decrease in water quality. Phytoplankton are a keystone species meaning that if they are removed, the ecosystem would change drastically, Many animals depend on phytoplankton for survival, phytoplankton play an important part in the food web. Phytoplankton are also an indicator species meaning they serve as indicators of an ecosystem's health. The Hudson River is one

of the most polluted rivers in America; the health of the Hudson River has decreased tremendously over the course of a decade. Evidence of Microplastics is becoming more and more evident in the Hudson River estuary and in other bodies of water around the world. Microplastics accumulate primarily through runoff and the weathering of plastic debris however they also accumulate through improperly disposed cosmetic products. When plastics become integrated into phytoplankton diet, the plastics slowly make their way up the food web until humans consume them, this is a process known bio magnification. Although no formal data has been collected through the analyzation of preliminary results it can be hypothesized that because of already un-healthy waters and an increasing number of plastics being used by humans, high amounts of microplastics are being introduced into the diet of phytoplankton.

Background

Phytoplanktons play a key role in maintaining a healthy ecosystem, phytoplankton make up a huge portion of other species food. Phytoplankton are Autotrophic meaning they are able synthesize their own food from inorganic substances using light or chemical energy. Since sunlight plays such a crucial part in phytoplankton food cycle, phytoplanktons tend to rise close to the surface during the day and sink during the night. Plastics have many harmful chemicals, which are known to cause severe health problems. According to

<http://www.ewg.org/research/dishonorable-discharge/50-most-polluted-rivers-country> the Hudson River is the 33rd most polluted river in the United States with an estimated 1,729,084 Total pounds of direct toxic Discharges in it. These toxic discharges are slowly making there way into the diet of microorganisms in the Hudson River Estuary. Increasing amounts of plastics are being disposed in our oceans; this is causing microplastics to become integrated into the food chain, if bio magnification continues; all organic life will be consuming microplastics.

Hypothesis

Due to an abundance of plastic waste being produced by humans, high amounts of microplastics are becoming integrated into the diet of phytoplankton. This will lead to phytoplankton containing high amounts of microplastics, which will cause plastics to move up the food chain.

Future studies

If the phytoplankton to plastic ratio can be obtained it will open the door for people to find just how polluted our oceans are. This will allow for a very broad continuation of the experiment, which could possibly lead too many crucially, discovery's resulting the health of the Hudson River Estuary as well as the amount of microplastics that are integrated into the diet of phytoplankton. Using the results from this experiment will enable people to look more in depth into the effects

microplastics have on phytoplankton. One future study that could be conducted using the data obtained will be to analyze the effects microplastics have on health of phytoplankton. A possible hypothesis to this question is, *If* high amounts of microplastics are found in phytoplankton *then* the general health of the phytoplankton will decrease in the form of increased mortality rates and a higher frequency of birth defects *because* Plastics have many harmful chemicals which are proven to cause severe health problems in humans. This is only one of the many possible studies that can be conducted pending the results of this experiment

Discussion

Discovering the amount of microplastics that are ingested by phytoplankton and the ratio of phytoplankton to microplastics in the Hudson River Estuary is essential. Because phytoplankton are an indicator species If this data can be obtained, people can then begin to estimate the severity of microplastics in the Hudson River and other bodies of water around the world. Due to the fact that no formal data has been collected, our hypothesis can be supported through only the collection of preliminary results and the reading of 4-peer review journal articles (listed in bibliography). Plastics are becoming more and more integrated into our everyday lifestyles; the amount of plastic waste humans are producing is growing at a rapid rate. Through water samples taken from the Hudson River during Harbor Seals (look at figure 1) it can be inferred that due to the presence of microplastics in the Hudson River Estuary phytoplankton are ingesting microplastics. The water samples collected showing microplastics in the Hudson River support the

hypothesis that microplastics are becoming integrated into the diet of phytoplankton.





(Figure 1, these 3 images are from a water sample collected from the Hudson River off Governors Island. The black particles in each of the given images are microplastics)

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