

# Biological magnification essay sample

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This article's introduction may be too long for its overall length. Please help by moving some material from it into the body of the article. For more information please read the layout guide and Wikipedia's lead section guidelines. (February 2011) | Biomagnification, also known as bioamplification or biological magnification, is the increase in concentration of a substance that occurs in a food chain as a consequence of: \* Persistence (can't be broken down by environmental processes) \* Food chain energetics

\* Low (or nonexistent) rate of internal degradation/excretion of the substance (often due to water-insolubility) The following is an example showing how biomagnification takes place in nature: An anchovy eats zooplankton that have tiny amounts of mercury that the zooplankton has picked up from the water throughout the anchovie's lifespan. A tuna eats many of these anchovies over its life, accumulating the mercury in each of those anchovies into its body. If the mercury stunts the growth of the anchovies, that tuna is required to eat more little fish to stay alive. Because there are more little fish being eaten, the mercury content is magnified.

Biological magnification often refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans. The substances become concentrated in tissues or internal organs as they move up the chain.

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Bioaccumulants are substances that increase in concentration in living organisms as they take in contaminated air, water, or food because the substances are very slowly metabolized or excreted. Although sometimes used interchangeably with 'bioaccumulation,' an important distinction is drawn between the two, and with bioconcentration. It is also important to distinguish between sustainable development and overexploitation in biomagnification. \* Bioaccumulation occurs within a trophic level, and is the increase in concentration of a substance in certain tissues of organisms' bodies due to absorption from food and the environment. \* Bioconcentration is defined as occurring when uptake from the water is greater than excretion (Landrum and Fisher, 1999)

Thus bioconcentration and bioaccumulation occur within an organism, and biomagnification occurs across trophic (food chain) levels. Biodilution is also a process that occurs to all trophic levels in an aquatic environment; it is the opposite of biomagnification, thus a pollutant gets smaller in concentration as it progresses up a food web. Lipid, (lipophilic) or fat soluble substances cannot be diluted, broken down, or excreted in urine, a water-based medium, and so accumulate in fatty tissues of an organism if the organism lacks enzymes to degrade them. When eaten by another organism, fats are absorbed in the gut, carrying the substance, which then accumulates in the fats of the predator. Since at each level of the food chain there is a lot of energy loss, a predator must consume many prey, including all of their lipophilic substances.

For example, though mercury is only present in small amounts in seawater, it is absorbed by algae (generally as methylmercury). It is efficiently absorbed, <https://assignbuster.com/biological-magnification-essay-sample/>

but only very slowly excreted by organisms (Croteau et al., 2005).

Bioaccumulation and bioconcentration result in buildup in the adipose tissue of successive trophic levels: zooplankton, small nekton, larger fish etc.

Anything which eats these fish also consumes the higher level of mercury the fish have accumulated. This process explains why predatory fish such as swordfish and sharks or birds like osprey and eagles have higher concentrations of mercury in their tissue than could be accounted for by direct exposure alone. For example, herring contains mercury at approximately 0.01 ppm and shark contains mercury at greater than 1 ppm (EPA 1997). Contents[hide] \* 1 Current status \* 2 Substances that biomagnify \* 2. 1 Novel organic substances \* 2. 2 Inorganic substances \* 3 See also \* 4 References| [edit] Current status

In a review of a large number of studies, Suedel et al. (1994) concluded that although biomagnification is probably more limited in occurrence than previously thought, there is good evidence that DDT, DDE, PCBs, toxaphene, and the organic forms of mercury and arsenic do biomagnify in nature. For other contaminants, bioconcentration and bioaccumulation account for their high concentrations in organism tissues. More recently, Gray (2002) reached a similar conclusion. Substances remaining in the organisms and not being diluted to non-threatening concentrations. The success of top predatory-bird recovery (bald eagles, peregrine falcons) in North America following the ban on DDT use in agriculture is testament to the importance of biomagnification.

Substances that biomagnify

There are two main groups of substances that biomagnify. Both are lipophilic and not easily degraded. Novel organic substances are not easily degraded  
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because organisms lack previous exposure and have thus not evolved specific detoxification and excretion mechanisms, as there has been no selection pressure from them. These substances are consequently known as 'persistent organic pollutants' or POPs. Metals are not degradable because they are elements. Organisms, particularly those subject to naturally high levels of exposure to metals, have mechanisms to sequester and excrete metals. Problems arise when organisms are exposed to higher concentrations than usual, which they cannot excrete rapidly enough to prevent damage. Some persistent Heavy metals are especially harmful to the organism's reproductive system.