Phosphates Encyclopedia Article

Phosphates

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Pure phosphorus is rare in nature. It usually combines with oxygen to form phosphate ions or groups (PO_4^{3-}). Phosphates are considered organic when phosphate groups attach to carbon atoms or inorganic when phosphate ions associate with minerals such as calcium. Organic phosphates provide the energy for most chemical reactions in living cells.

The weathering of rocks releases inorganic phosphorus into the soil, and plants take this up and convert it to organic phosphate in their tissue. Humans and animals eat the plants, and when they die, phosphorus is returned to the soil by the action of bacteria and then again taken up by plants. This is the so-called phosphorus cycle.

Phosphates are normally a limiting factor for aquatic plant growth. When large amounts of phosphorus enter water, for instance, from farm runoff containing fertilizer, plants can grow out of control. Concentrations as low as 0.01 milligrams per liter (mg/L) can greatly impact a stream. This overfeeding is called eutrophication and may cause an algae bloom. The algae eventually die and sink to the bottom. Bacteria feeding on the algae remove oxygen from the water for respiration. As oxygen levels become lower, animals that need high oxygen levels such as fish will die. This is especially a problem at night when no photosynthesis occurs to replenish the oxygen.

If organic oxygen levels drop sufficiently, aerobic organisms can no longer survive and anaerobic bacteria take over. The end products of anaerobic respiration may smell like rotten eggs, fishy, or wormy.

Internet Resource

University of Maryland. "Impact of Phosphorus on Aquatic Life." Available from http://www.agnr.umd.edu/users.