439 - 447

26 Water Pollution and Bioremediation by Microalgae

Absorption and Adsorption of Heavy Metals by Microalgae

Drora Kaplan

26.1 Introduction

From a chemical point of view, the majority of the elements in the periodic table are metals and metalloids. Only H, B, C, N, P, O, S, halogens, and noble gases are not included in this category. Metal ions are further grouped into type-A, type-B and transition metal cations (Morgan & Stumm, 1991). From the biological point of view, metals and metal ions can be sorted according to their environmental impact or toxicity. Metallic elements of densities greater than $5\,g\,cm^{-3}$ are called *heavy*. Since these elements exert toxic effects on living organisms they are termed *toxic heavy metals*. Some of the heavy metals, such as copper, nickel, and zinc are, at very low concentrations, essential for life because they play important roles in metabolic processes taking place in living cells (Gadd, 1993). However, elevated levels of these metal ions are toxic to most prokaryotic and eukaryotic organisms. Other heavy metals such as cadmium, lead, and mercury are nonessential and are known to cause severe damage in organisms even at very low concentrations. Metals occur in different forms: as ions dissolved in water, as vapors, or as salts or minerals in rocks, sand, and soils. They can also be bound in organic or inorganic molecules, or attached to particles in the air (Raspor, 1991; Wedepohl, 1991). Metal toxicity is often dependent on its chemical form (metal speciation). It is generally accepted that for most metals the free ion is the species most toxic to aquatic life (Sunda & Guillard, 1976; Anderson & Morel, 1978). Some organic forms such as methyl-mercury are taken up very efficiently by living organisms. It is more toxic than other mercury species (George, 1991). Industrial processes and intensive agricultural practices, often result in the release of various heavy metals into terrestrial and aquatic

Handbook of Microalgal Culture: Biotechnology and Applied Phycology

Edited by

Amos Richmond

Blackwell
Science