

Biological and therapeutic effects of ortho-silicic acid and some ortho-silicic acid-releasing compounds: New perspectives for therapy

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Abstract

Silicon (Si) is the most abundant element present in the Earth's crust besides oxygen. However, the exact biological roles of silicon remain unknown. Moreover, the ortho-silicic acid (H₄SiO₄), as a major form of bioavailable silicon for both humans and animals, has not been given adequate attention so far. Silicon has already been associated with bone mineralization, collagen synthesis, skin, hair and nails health atherosclerosis, Alzheimer disease, immune system enhancement, and with some other disorders or pharmacological effects. Beside the ortho-silicic acid and its stabilized formulations such as choline chloride-stabilized ortho-silicic acid and sodium or potassium silicates (e.g. M₂SiO₃; M= Na,K), the most important sources that release ortho-silicic acid as a bioavailable form of silicon are: colloidal silicic acid (hydrated silica gel), silica gel (amorphous silicon dioxide), and zeolites. Although all these compounds are characterized by substantial water insolubility, they release small, but significant, equilibrium concentration of ortho-silicic acid (H₄SiO₄) in contact with water and physiological fluids. Even though certain pharmacological effects of these compounds might be attributed to specific structural characteristics that result in profound adsorption and absorption properties, they all exhibit similar pharmacological profiles readily comparable to ortho-silicic acid effects. The most unusual ortho-silicic acid-releasing agents are certain types of zeolites, a class of aluminosilicates with well described ion(cation)-exchange properties. Numerous biological activities of some types of zeolites documented so far might probably be attributable to the ortho-silicic acid-releasing property. In this review, we therefore discuss biological and potential therapeutic effects of ortho-silicic acid and ortho-silicic acid -releasing silicon compounds as its major natural sources.