GEOPHARMACY: TEACHING MEDICAL GEOLOGY IN PHARMACEUTICAL SCIENCES

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Since 1850 in the Spanish Pharmacy Faculties the students learn a subject called Applied Geology to the Pharmacy (Geopharmacy) in which they can study: a) Principles of crystallography, with emphasis on the formation of crystals, including the crystallization of biological macromolecules, and the study of polymorphism of pharmaceutical products (mineral or not). b) Properties of minerals that affect the pharmaceutical use of crystalline substances. c) Minerals used in Pharmacy as active ingredients and/or excipients, with emphasis on the study of the phyllosilicates (clay minerals). d) Toxic effects of minerals, mainly those with asbestiform morphology, being common contaminants of phyllosilicates with use in Pharmacy. e) Human biomineralization, focusing on bones, teeth and lithiasis. f) Suitability of minerals for pharmaceutical and cosmetic use, according to the Pharmacopoeia. Undoubtedly, Geopharmacy is a scientific field belonging to Medical Geology. Geopharmacy knowledge contributes significantly to the professional development of future pharmacist. For example, crystal formation is a major activity in the pharmaceutical industry, since most of the products are crystalline. Furthermore, the physicochemical conditions of crystal formation can induce precipitation of the different polymorphs. The pharmaceutical polymorphism (broader in concept, that purely crystallographic) has a strong interest in Pharmacy from the point of view of therapeutic actions and economic level, where patents may be different if it is different polymorphs. About the crystallization of biological macromolecules, we can say that the majority of recent Nobel prizes in Biochemistry and even in Medicine are related to research involving the study of macromolecular crystals and the use of advanced crystallographic techniques has allowed discovering for example, reaction mechanisms in the process of genetic transcription and operation of ribosomes. However, Geopharmacy has disappeared as a compulsory subject in the Spanish Universities to the adaptation of curricula to the European Higher Education Space (Bologna Process) and only in some Pharmacy Faculties (for example, Granada) will be taught as optional.

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