VitaCrystallography: Old Approach to New Challenges

Lev Mourokh

Queens College of CUNY, 65-30 Kissena Blvd, Queens, USA

In the XX century, X-ray diffraction crystallography facilitated a major breakthrough in material sciences allowing the determination of the electron density and, hence, the atomic positions by the angle and intensity of the X-ray scattering. Later, in *biocrystallography*, this approach was extended to biological molecules. After their crystallization, an electron density map can be constructed from the X-ray diffraction patterns, and the molecular structure can be resolved.

In this presentation, I will examine the further extension of the X-ray diffraction approach, which we call VitaCrystallography. It deals with the X-ray scattering on whole living tissues without crystallization. The extracellular matrix (ECM) is not crystalline per se. Still, it contains many elements exhibiting the structural periodicities that can contribute to the X-ray diffraction patterns, such as collagen, keratin, glycoproteins, and adipose.

We will also discuss the perspectives of VitaCrystallography for monitoring the ECM status. ECM plays critical regulatory roles in morphogenesis since it orchestrates cell signaling, functions, properties, and morphology. The ECM structure is constantly being remodeled and altered as a response to various external and internal factors. In this sense, revealing the pathology-induced and, especially, the pathology-causing aberrations in the ECM is crucial. I will present our results on animal and human samples, including nails (keratin) and mammal glands (collagen and adipose), and show that VitaCrystallography leads to very early cancer diagnostics.