

The major role of vitamin D in the organism is to regulate calcium-phosphate homeostasis, to prevent rickets and osteoporosis. Vitamin D is produced by the human body from cholesterol and its effective concentration is strictly regulated by feedback mechanisms. Vitamin D is produced from 7-dehydrocholesterol in human skin, when exposed to UV-light, and needs further metabolic activation in liver and in kidneys. The first who discovered that exposure to sun could prevent rickets (later related to vitamin D deficiency) was Polish scientist, J. Drzewiński, at the Medical-Surgical Academy of Vilnius as early as 1822. In many regions, including Poland, there is not enough sunshine in a winter-time, thus people become vitamin D deficient and need supplementation with food. Recently, some other roles of vitamin D became apparent. Regulation of immune responses is one of them. It has been documented that vitamin D deficiency correlates with an increased risk of autoimmune diseases and with an increased risk of some cancers.

Vitamin A is a name given to the group of compounds called retinoids. Human diet is a source of vitamin A in forms of retinyl palmitate and provitamin A carotenoids, which are later metabolically converted to biologically active compounds. The classical role of retinoids is to support proper vision and proper functions of epithelia. Recent data show that retinoids are very important for immune functions. One particular form of vitamin A, all-*trans*-retinoic acid (ATRA), has revolutionized the therapy of acute promyelocytic leukemia by converting it from a fatal disease to a curable one. This finding documented that ATRA is very important for proper maturation and differentiation of blood cells.

Since all immune and all blood cells originate from the hematopoietic stem cells in the bone marrow, the roles of vitamins A and D for these cells and for their progeny seem to be significant. There are specific proteins inside cells, named nuclear receptors, which are responsible for biological activities of these vitamins. Our recent research documented that in the cells of acute myeloid leukemias, nuclear vitamin A and D receptors strictly cooperate and regulate each other. The roles of nuclear vitamin A and D receptors and molecular mechanisms of their cooperation in the process of formation of normal blood elements from hematopoietic stem cells will be investigated in this project.