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Misinsertion and mispair extension by human immunodeficiency virus type 1 reverse transcriptase (HIV-1RT) as a mechanism of development of mutations in the viral DNA

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The unique properties of human immunodeficiency virus type 1 reverse trancriptase (HIV-1 RT) include its high propensity for misinsertion and misincorporation of deoxyribonucleotide triphosphate (dNTP) in the growing chain's 3' terminus during proviral cDNA synthesis. It was envisaged that the interaction of the side chain of K154 in HIV-1RT with the penultimate nucleotide of the template may be crucial in determination of fidelity of proviral DNA synthesis. This hypothesis was tested by steady-state kinetic studies using wild-type HIV-1 RT and five K154 mutants. These mutants contained replacement of positively charged side chain of lysine with two amino acids' hydrophobic and two amino acids' negatively charged side chains. In one of the mutants, the positive charge of Lysine was retained but the side chain was enlarged by one carbon atom while replacing it with arginine. The results indicated variations in their respective activities, extent of formation of binary and ternary complexes as well as in misinsertion and mispair extension of nucleotides in the growing chain of DNA. All of these mutants when tested for their response to 3TC, an approved antiHIV-RT agent, displayed significant resistance to this nucleotide analog when compared to wild type enzyme. The error prone DNA synthesis by HIV-1RT and the development of the antiHIV-1RT drugs resistance may be explained in the light of the three dimensional crystal structure of the enzyme.

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Valorization of microalgal biomass

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The use of microalgae for high value applications such as food ingredients, feed proteins, cosmetics, pharma and nutraceuticals represents a promising way of increasing the cost competitiveness and diminishing the pressure on land resources. The laboratory of Phycobiotechnology of the Institute of Microbiology and Biotechnology of the Academy of Sciences of Moldova has developed a series of innovative technologies for the cultivation of microalgae, separation of the chemical components present in biomass and their valorization into high added value applications. Based on an ecological approach, these technologies concern the production of antioxidants and pigments (β-carotene, astaxanthin, phycocyanin, phycoerythrin), proteins and essential amino acids, polysaccharides, lipids and unsaturated fatty acids, bio components and bio additives, etc., using new strains of *Arthrospira (Spirulina) platensis, Nostoc linckia, Dunaliella salina, Haematococcus pluvialis* and *Porphyridium cruentum*. The studies include optimization of the cultivation, separation, extraction and purification process and evaluation of the bioactive properties in view of their application. Moreover, our recent studies have focused on the use of microalgae cultures to synthesize nanoparticles as an alternative to chemical approach.

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