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Amiloidi: biohemija, biotehnologija i medicina

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Nativni proteini podležu konformacionim promenama koje vode do pogrešnog uvijanja polipeptida, agregiranja i inaktivacije čak i prilikom čuvanja u blagim uslovima. Amiloidni fibrili predstavljaju najstabilniju strukturu polipeptida i perspektivni su kandidati za upotrebu u biotehnologiji (kao biomaterijali, adsorbenti, potencijalni katalizatori itd.). Depoziti amiloida su detektovani u tkivima i učestvuju u razvoju mnogih neurodegenerativnih i sistemskih oboljenja, kao što su: Alchajmerova i Parkinsonova bolest, šećerna bolest tip 2, reumatoidni artritis itd.
Tokom ovog predavanja biće objašnjeni principi na kojima počiva ravnoteža između uvijenih, razvijenih i pogrešno uvijenih polipeptida (termodinamička hipoteza, mehanizam uvijanja, teorija energetskog reljefa). Biće diskutovane strategije destabilizovanja nativnih proteina i dobijanja amiloidnih fibrila na primerima ovalbumina i lizozima. Biće prikazane metode koje se koriste za praćenje formiranja amiloida sa posebnim akcentom na infracrvenu spektroskopiju. Na kraju, biće prikazani rezultati upotrebe amiloidnih vlakana kao adsorbenata teških metala i niskomolekulskih zagađivača iz životne sredine.

Ovaj rad je finanijski potpomognut od strane Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije u okviru projekta 172049.

Amyloids: biochemistry, biotechnology and medicine

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Native proteins are marginally stable, so even if stored in mild conditions, they undergo structural rearrangements that subsequently lead to their misfolding, aggregation and inactivation. Amyloid fibrils are the most stable form of polypeptides and are promising candidates for use in biotechnology (as biomaterials, adsorbents, potential catalysts etc.). Amyloid deposits are main or contributing cause to many neurodegenerative disorders and systemic diseases, such as Alzheimer's and Parkinson's diseases, diabetes mellitus type 2, rheumatoid arthritis etc.
In this lecture, an overview of principles underlying protein folding-unfolding-misfolding equilibria will be given (thermodynamic hypothesis and energy landscapes theory). As examples of amyloid fibril formation, destabilization of ovalbumin and lysozyme will be discussed. Details of methodologies used for monitoring of amyloid fibrillation will be provided with the emphasis on infrared spectroscopy. Finally, results of amyloid fibrils usage in the removal of heavy metal pollutants and low molecular weight contaminants from environmental water will be presented.

This work has been supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, Grant No. 172049.