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Mining value-added products from extremophiles – with a case study of recombinant cloning of a novel keratin degrading bacterial protease

Abstract:

Microbial secondary metabolites from extreme environments like hydrothermal vents are a promising source for food industrial applications of genes and their products. To provide an example we purified and characterized a novel extracellular protease SLSP-k from a extremophilic shallow HV inhabiting bacterium associated with hydrothermal vents having a molecular weight of 38 kDa. The particular objectives of this study were: (1) to amplify the gene for the novel SLSP-k, (2) to purify and characterize this protease enzyme, and (3) to explore the applications of this protease in research and value-added product synthesis. The novel SLSP-k showed stability in anionic, non-anionic detergents, and solvents. Blastn analysis showed gene similarity with both serine protease and keratinase. Mass spectrometry analysis and structure analog prediction confirmed that the protein belongs to the subtilisin family of peptidases and has a similarity with keratinases. Hydrolysis activity was confirmed with casein as a substrate and keratinase activity with feather and human hair degradation as observed by SEM. The novel SLSP-k protease is stable at a wide range of temperature, pH, solvents, and detergents. This protein has, therefore, potential applications in commercial product making such as the production of detergents and in peptide synthesis research. This holds for enzymatic hair degradation in surgical and cosmetic applications. The ability to degrade keratin in chicken feather and hair indicates that this enzyme is suitable for the degradation of poultry waste without the loss of nutritionally essential amino acids which degrade otherwise during hydrothermal processing. Therefore, the proteinase is efficient in environmental friendly bioconversion of organic waste into value added fertilizers or value added products.

Biography

Dr. Hans-Uwe Dahms is a professor at Kaohsiung Medical University and is interested in environmental health as it affects human public health at different integration levels. He advised more than 25 Ph.D. students and was writing and publishing more than 300 SCI papers. He is a reviewer of more than 86 SCI journals and editorial board member of 16 scientific journals, academic editor for Environmental and Public Health of PLoS ONE, and specialty chief editor at FMARS [FRONTIERS].