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Low-dosed lyophilized plant tissue bearing VLPs of HBV small surface antigen as an oral booster vaccine against hepatitis B

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The continued HBV high prevalence coupled with deficiencies in vaccination programs stimulate research on a new type of vaccines. Potential orally administered plant-based vaccine is highly attractive regarding efficacy, cost-effectiveness and availability of mass hepatitis B prevention. Freeze-dried oral formulations facilitate elimination of complex purification steps, size reduction and better stability during storage, as well as ensure controlled administration regime in minimized medical facilities. The aim of presented study was to develop a lyophilization protocol facilitating successful processing of lettuce leaf tissue containing S-HBsAg formed into VLPs (Virus-Like Particles). Several drying profiles and excipients as well as effects of freezing rate and post-process residual moisture were analyzed. The profile of 20 °C for 20 hours for primary and 22 °C for 2 hours for secondary drying as well as sucrose proved the most efficient stabilization of S-HBsAg during freeze-drying. The process was highly reproducible (86-97%) and provided a product with VLP content up to 200 µg per g DW. Atmosphere of nitrogen proved to preserve S-HBsAg VLPs for minimum one year at temperatures up to 37 °C. Animal trials confirmed immunogenicity of processed tissue powder with S-HBsAg, used as an oral booster vaccine. Low-dosed (5-200 ng) preparation elicited anti-HBs response at level of commercial injection vaccine (around 1000 mIU/ml), together with growth population of specific B and T lymphocytes and only slightly increased population of Tregs. As a result, a plant-derived semi-product with good long-term stability and immunogenicity of S-HBsAg was obtained for the definite formulation of oral booster vaccine against HBV.

Biography

Tomasz Pniewski has completed his PhD from the Institute of Bioorganic Chemistry PAS and Postdoctoral studies from Thomas Jefferson University, USA. He has worked in the Institute of Plant Genetics PAS since 2003. He is the Head of Biotechnology Department and for two years also worked in the Wielkopolska Centre of Advanced Technologies as an Expert for organization and equipment. He has published more than 25 papers in reputed journals and has gained 6 patents on plant-derived vaccines.

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