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Conjugate based on the OmpC epitope – a new perspective in the prevention of shigellosis

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Shigellosis (bacterial dysentery) is an infectious disease caused by Shigella bacteria, primarily S. flexneri, leading to acute and often bloody diarrhea. It remains a significant public health issue in low- and middle-income countries, with an estimated 200,000 deaths annually, mostly among children under the age of five. Despite ongoing intensive research, no approved vaccine is currently available. Our study focuses on developing a vaccine candidate based on a unique peptide sequence derived from the outer loop of the

S. flexneri 3a outer membrane protein OmpC. Due to its small size and haptenic nature, the peptide was conjugated to a larger carrier protein to enhance its immunogenicity.

To enable conjugation of the peptide's sulfhydryl group to the carrier protein, bromoacetylation was performed. This involved modifying the primary amino - groups of the carrier protein using bromoacetyl

N-hydroxysuccinimide ester in a carbonate buffer, followed by coupling with the peptide.Among the carrier proteins tested, human serum albumin (HSA) allowed conjugation of 35 peptide molecules, whereas bovine serum albumin (BSA) accommodated only 3. The resulting vaccine prototype was evaluated for immunoreactivity using cord blood sera containing anti-OmpC antibodies.

Immunoreactivity was assessed using dot-blot and ELISA methods using polyclonal cord blood sera as well as monoclonal antibodies specific for the RYDERY epitope. The results confirmed the high immunological reactivity of HSA–peptide conjugates. Moreover, the incorporation of the GGGGG linker increased the recognition of the peptide by antibodies.These findings suggest that a synthetic OmpC-based peptide, when properly conjugated to an immunogenic carrier, represents a promising approach for further vaccine candidate.

Biography

Karina Krasna Hirszfeld completed her engineering degree in Biotechnology in 2020 and her master's degree in Environmental Biotechnology in 2022 at Wroclaw University of Science and Technology. Since 2022, she has been working at the Institute of Immunology and Experimental Therapy of the Polish Academy of Sciences in Wroclaw. She is the main contractor of the NCBR Lider XIII project, which is also the basis of her doctoral work. She is also involved in research projects led by Dr. Eng. Anna Jarząb, including the NCN Miniatura 7 project on the anti-cancer effects of hyperthermia and its link to infectious fever, as well as the NCN Sonata Bis 13 project. Her research focuses on immunoreactivity in infectious diseases and on finding potential biomarkers to improve their diagnosis and treatment.

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