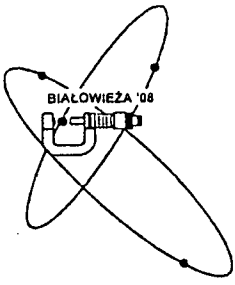


Nanci Nascimento  
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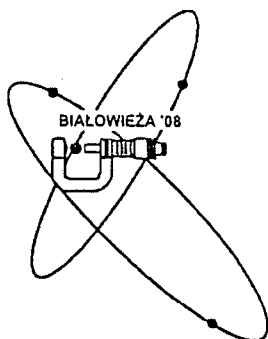


# RECENT DEVELOPMENTS AND APPLICATIONS OF NUCLEAR TECHNOLOGIES

## Conference Abstracts



Białowieża, Poland  
Żubrówka Hotel  
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*International Conference on*

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## IMMUNOLOGICAL PROPERTIES OF $^{60}\text{Co}$ GAMMA RAYS IRRADIATED BOTHROPSTOXIN-I

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Promising results were obtained when crude animal venoms, as well as isolated toxins, were treated with gamma rays, yielding toxoids with good immunogenicity. These toxins, when submitted to a gamma radiation, in aqueous solution, presented structural modifications. This occurs due to reactions with radiolysis products of water. Some scavenger substances, such as  $\text{NaNO}_3$  and t-butanol, remove selectively the water radiolysis products. Ionizing radiation has proven to be a powerful tool to attenuate snake venoms toxicity without affecting and even increasing their immunogenic properties. However, the immune mechanisms involved in recognition, processing and presentation of irradiated antigens are yet unclear. In the present work, we investigated the immunological behavior of bothropstoxin-I (BTHX-1), before and after irradiation, in the presence of selective scavengers. Structural modifications of the toxin were investigated by SDS-PAGE. Isogenic mice were immunized with either the native or the irradiated toxin, either with or without scavengers. After three immunizations, serum samples were collected and the antibody titers and isotypes were determined by Enzyme-linked Immunosorbent Assay (ELISA). Expression of murine cytokines was analyzed by real-time PCR. According to our data, irradiation promoted structural modifications in the toxin, characterized by higher molecular weight forms of the protein (aggregates and oligomers). The BTHX-1 irradiated in the presence of  $\text{NaNO}_3$ , had its structure preserved, a fact which demonstrated the effectiveness of this "scavenger". The results of ELISA showed that both forms of proteins induced detectable amounts of antibodies. We could also observe that animals' plasma immunized with native BTHX-1 had high IgG1 titers, indicating the predominance of a Th2 type response. Also, our data indicate that the irradiated protein induced high titers of IgG2b, suggesting that Th1 cells were predominantly involved in the immune response. Our results indicate that the BTHX-1 irradiated with the  $\text{NaNO}_3$ , showed higher titers of IgG2b when compared to its native form, indicating the predominance of a Th1 response. In contrast, when the toxin was irradiated with t-butanol, there was a slight decrease in the production of IgG2b antibodies, indicating a possible modulator role of the hydroxyl radical ( $\text{OH}\cdot$ ) in producing the same and, to the toxicity of protein. The results obtained for IL-2 and IL-4 gene expression by real-time PCR showed that both the IL-2 as for IL4 was more expression from the cells of the animals immunized with BTHX-1 irradiated and stimulated in vitro with the native toxin. These results indicate that irradiation of proteins leads to significant structural modifications, and also to a modulation of the immunological response.

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