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Structural and Immunological studies on Acetaldehyde modified human Immunoglobulin G: Implications of anti-Acetaldehyde-IgG in pathogenesis of oral cancer

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Statement of Problem: Acetaldehyde associated with the consumption of alcoholic beverages is classified by the International Agency for Research on Cancer (IARC) as a Group 1 human carcinogen. It has potential to interact with different biomolecules such as protein and nucleic acids in various tissues causing structural and functional modifications that may lead to severe complications progressing to cancer. The objective of this study is to analyze any structural and immunological changes in human IgG modified with varying concentrations of acetaldehyde and its possible involvement in carcinogenesis.

Materials and Methods: Native and acetaldehyde modified IgG (AA-IgG) was subjected to various physicochemical techniques such as UV, Fluorescence, CD and FT-IR spectrometry, Gel electrophoresis, MALDI-MS, scanning and transmission electron microscopy. Protein oxidation and total thiol groups were also estimated. Binding characteristics and specificity of cancer antibodies towards native and modified IgG were screened by Enzyme-Linked Immunosorbent Assay (ELISA). Formation of immune complexes was visualized by band shift assay. Various oxidative stress and inflammatory biomarkers were further assessed to see their role in etiopathogenesis of oral cancer.

Findings: Acetaldehyde-modified IgG exhibited 51.6% hyperchromicity in UV-absorbance studies. CD and FT-IR studies showed loss in β-structure of the protein. MALDI-MS studies revealed an increase in the mass of modified IgG. Morphological changes incurred upon modification were evident by the appearance of fibrillar structure by scanning electron microscopy. Crosslinking of Lys-Lys residues were confirmed by transmission electron microscopy. It was observed that preferential binding of cancer antibodies to AA-IgG in comparison to native IgG. Band shift assay further substantiated the enhanced recognition of AA-IgG by cancer antibodies.

Conclusion & Significance: The findings indicate structural perturbation in secondary and tertiary structure of IgG molecule that may result in induction of neo-epitopes in IgG molecule.

Biography

Sana Waris is currently pursuing PhD at Department of Biochemistry, Jawaharlal Nehru Medical College, Aligarh Muslim University, India. Her area of expertise is protein immunology. For four years she has been working on biophysical characterization of acetaldehyde modified IgG molecule and trying to induce antibodies in rabbits which can further be used as a diagnostic biomarker in oral cancer.

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