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Radioimmunoassay: A Sensitive, Specific and Cost-Effective Method for Measuring Antigens

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Commentary

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DESCRIPTION

A Radioimmunoassay (RIA) is an immunoassay that forms immune complexes step by step using radiolabelled substances. A RIA is a highly accurate *in vitro* test technique that assesses substance concentrations by using antibodies to evaluate antigen concentrations (for instance, hormone levels in the blood). The RIA approach is still one of the least expensive ways to carry out such tests despite being exceedingly sensitive, extremely specific, and needing specialised equipment. Since radioactive materials are used, it necessitates special safeguards and licencing. An Immune Radiometric Assay (IRMA), on the other hand, employs radiolabelled molecules immediately rather than incrementally. An illustration of a Radioallergosorbent Test (RAST) is one. It is used to identify the allergen that causes an allergy.

A known quantity of an antigen is traditionally rendered radioactive before being used in a radioimmunoassay, typically by labelling it with tritium bound to tyrosine or gamma-radioactive isotopes of iodine, such as 125-I. After being combined with a specified quantity of the corresponding antibody, the radiolabelled antigen forms a particular bond with the antibody. Then, a patient serum sample is added that contains an undetermined amount of the same antigen. As a result, the radiolabelled antigen and the unlabelled antigen from the serum compete for the same antibody binding sites. The ratio of antibody-bound radiolabelled antigen to free radiolabelled antigen decreases when the concentration of "cold" antigen rises because more of it attaches to the antibody, dislodging the radiolabelled version.

In theory, this technique can be applied to any biological molecule; serum antigens are not a requirement, nor is it necessary to measure the free antigen indirectly rather than directly using the trapped antigen. If two separate antibodies that recognize the target are available and the target is large enough (such a protein) to show numerous epitopes to the antibodies, an RIA can be performed, for instance, if radiolabeling the antigen or target molecule of interest is impractical. While the other antibody would not be altered, one would be radiolabelled as described above. The "cold" unlabelled antibody would first interact with and bind to the target molecule in solution during the initial phase of the RIA.

Applications of radioimmunoassay

- Radioimmunoassay (RIA) is a sensitive method for measuring very small amounts of antigen, antibody, or antigen-antibody complex in the blood.
- The radio immuno assay technique, as the name implies, achieves sensitivity through the use of radionuclides and specificity that is uniquely associated with immunochemical reaction.
- Involvement of the processes of extraction, purification and concentration of the specimen under investigation.
- Heat treatment of the specimen resulted invariably in degradation destruction of the substances.
- Detection of narcotic drugs; Heroin and Morphine can be detected in hair with the use of Radio Immuno Assay (RIA)
- The RIA method is capable of estimating the above the drug within a range of 2.5 to 20 ng/ml using the standard 100 µl plasma sample.

Disadvantages

- Substantially diluted reagent was utilized as a result of the lengthy reaction time.
- Potential health risks resulting from radioisotope handling.
- Between analyte concentration and signal response, there is no straight linear relationship.