**Radiolabelling of biomolecules**

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Labelling of biomolecules with the radioisotopes is known as radiolabelling. Radioisotopes such as 32P, 35S, 3H, 125I &131I and 14C are being used to label DNA, RNA, proteins and biomolecules. Radiolabeled nucleotides are commonly employed for detection of specific nucleic acid sequences whereas radiolabeled proteins are used as tracers for biological & medical studies and radiolabelled biomolecules are used in physiological studies.

Radiolabeled nucleotides are typically incorporated enzymatically or chemically into DNA and RNA sequences for detection and analysis. Labeled nucleotides may be incorporated by a variety of enzymatic or chemical methods. . The resulting labeled probes may then be used in applications such as in situ hybridization, microarray analysis, DNA sequencing, southern blotting and northern blotting. The advantages of radiolabeling with tritium are the internal isotopic label does not alter the chemical nature of the oligonucleotide. Second, because this technique does not involve phosphate backbone, no synthetic modifications to this region, can be introduced to improve stability or uptake of an antisense oligomer, do not reduce efficiency of labeling. Third, since the label is incorporated by a chemically benign procedure after completion of oligonucleotide synthesis, labeling is compatible with most modified oligonucleotides. Finally, the relatively long half-life of 3H (12.33 years) compared to either 35S (80 days) or 32P (14 days) produces a stable, labeled molecule.

Radioiodination is conveniently producing tracers especially in case of proteins. These radioactive isotopes of iodine have proven to be very useful for labeling both large and small molecules. The factors like nuclear properties, physical half-life, production factors, available imaging device and the effective half-life of the labeled radiopharmaceutical illustrate the choice of radionuclide. Even though gamma emitting radioisotopes of iodine, 125I and 131I available, 125I, with its 60 days half-life, has been the radionuclide of choice for producing labeled compounds for in vitroassays. A number of radioiodination methods have been reported in the literature. They differ in terms of the amino acids that have been labeled, the reaction conditions that are used and in the nature of the oxidizing agent for converting 125I- into reactive species 125I2 or 125I+**.** The radiolabeled proteins can be used in development of *in vitro* assays such as radioimmunoassay and immunoradiometric assay for hormones.

We have developed indigenous RIA/IRMA kits for quantification of human Insulin(1 kit) and Human C-peptide(2 kits). Work on the production of kits for quantification of Rat C-peptide , Melatonin and C-reactive proteins is in progress.

Radioactively labelled biomolecules have revealed the speed and complexity of metabolic pathways. In these studies, the distribution of the label in various tissues, cells, organelles and ultimately, different molecules can be followed chemically by identifying the marker or physically assaying for radioactivity. Amounts as small as 10-17 mol can be detected, as the chemical properties of radioactive atoms are virtually indistinguishable from those of their stable isotope radioactively labelled substances acts in a pathway almost exactly like the un labelled one. Radiolabelled compounds are used in intestinal absorption studies, to understand metabolic pathways, utilization of nutrients etc. Urea breath test using 14C labelled urea is routinely done in CARRT laboratory.

Proposed to discuss developing 131I filtering from urine and faces of treated patients using nanofibers.

**Environmental Radioactivity**

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The presence of naturally occurring radionuclides belonging to 238U and 232Th series and singly occurring radionuclide 40K is common in all living and non-living frameworks, which are part of our environment. Even activities like medicinal and industrial uses of radioisotopes, nuclear weapon tests, and nuclear accidents may cause radiological pollution in the environment. Radon-222 is a daughter product of 238U, which is widely distributed throughout the Earth's crust. With a half-life of 3.8 days, 222Rn has time to escape from soil and enter buildings before decaying into 218Po, a radioactive particle (solid). It is 218Po, with a half-life of three minutes, and some of its solid decay products (such as 214Pb, 214Bi, and 214Po) that present the greatest risk to human health. 222Rn and its daughter products contribute about 75% of the annual effective dose received by an individual from terrestrial sources. The estimation of background radiation level and concentration of naturally occurring and artificially produced radionuclides in the environmental matrices may not only become a reference for routine releases from nuclear installations or accidental radiation releases, but also a basis of impact due to non-nuclear activities such as the use of phosphate fertilizer in agriculture and mining activities. Thus, there is a need to formulate environmentally secure and economically equitable common regulations at both national and international levels endorsed by radiological, economical, and social jurisdictions.

The detailed presentation of results of studies conducted on environmental radioactivity, including 222Rn by our group will be presented this talk.