MEETING REPORT

EZACBICON*

Clinical biochemistry continues to be one of the most rapidly advancing areas of laboratory and clinical medicine. Due to the introduction of new technologies and analytical techniques, dramatic impact has been made in the practice of clinical biochemistry. In addition, with the healthcare system changing fast, there is increased emphasis on improving the quality of patient care, overall cost-effectiveness and total quality management. Moreover, point-of-care-testing (POCT) is also at the forefront of healthcare practice and has brought forth both challenges and opportunities to clinical biochemists. Presently, more than ever before, clinical biochemists need to be concerned with basic aspects of disease correlations, interpretations, problem-solving, quality assurance (both internal and external) and cost-effectiveness.

Krishnajyoti Goswami (Vivekandana Institute of Medical Sciences (VIMS), Kolkata), the organizing secretary of the conference, stated in his inaugural address that the work of clinical biochemists contributes in part to the total uncertainty of an analytical result. Evaluation of a standard process for minimization of this uncertainty factor is necessary. This will only be possible by rationalization of uniform methodology in laboratory practice, and if a system of mutual quality control programme is established among different groups like the government and private medical colleges, hospital laboratories, etc. according to Goswami.

In symposium I, K. Taranath Shetty (NIMHANS, Bangalore) spoke on 'Inborn metabolic disorders: What can be done in India'. Inborn metabolic disorders or IMDs, according to the speaker, are a heterogeneous group of disorders with an underlying genetic etiology affecting one or the other metabolic pathways. Though treatment for the disorders under this category is rather disappointing, the much talked about gene therapy is a far destination to reach. Early detection can lead to conventional medical interventions like dietary manipulation/vitamin supplementation/detoxification/genetic counselling. The speaker highlighted that in the year 2004, ICMR and the Association of Clinical Biochemists of India (ACBI) had set up training for professionals in screening of urine for metabolites of diagnostic significance, quantification of total amino acids, mucopolysaccharides and enzyme activity by spectrophotometric/spectrofluorimetric analysis. He also discussed the challenges and opportunities that will have to be faced by scientists in the coming years.

Sanjay Misra (NRS Medical College and Hospital, Kolkata) spoke on 'Prenatal diagnosis of thalassaemias and other haemoglobinopathies'. Haemoglobinopathies are a class of hereditary disorders characterized by either reduced or no production of one or more globin chains of haemoglobin or synthesis of a structurally abnormal globin unit. Most of the prenatal diagnosis is based on genetic study using molecular biology techniques. He appraised the audience that analysis of foetal cells from maternal circulation, and pre-implantation genetic diagnosis, which are the newer methods of antenatal studies are far superior to the conventional methods of foetal DNA studies.

In symposium II, A. Raizada (Escorts Heart Institute and Research Centre, New Delhi) delivered a talk on 'Modern trends in laboratory diagnosis of cardiovascular disease'. Inflammation is involved in the initiation and progression of atherosclerosis and development of atherosclerotic events. Understanding the molecular bases of inflammation has led to the identification of markers that may be important new targets in atherotrombotic disease. Inflammatory markers, such as cytokines and highly sensitive CRP have been shown to predict future cardiovascular events in individuals with or without established disease, he added.

In symposium IV, D. N. Rao (AIIMS, New Delhi) spoke on 'Inducing systemic and mucosal immune response to B-T construct of F1antigen of *Y. pestis* in microsphere delivery'. Most viral and some of the bacterial infections are acquired through respiratory, gastrointestinal or genital tract. For developing an effective immunogen, both mucosal and systemic immune response should be activated to produce IgG, IgA in sera and washes respectively. During mucosal immunization, the antigen has to be protected from degradation. Hence there is a requirement of entrapping the antigen in micro particles for its slow release and also to avoid its degradation. One of the major requirements of a subunit vaccine is the identification of protective B and T cell epitopes on a protein antigen. The importance of an alternative approach for plague vaccine using protective epitopes in microsphere delivery was also highlighted.

In symposium V, Thuppil Venkatesh (St. John's Medical College, Bangalore) gave a talk on 'Lead and you'. Biochemists have a great role to play in evaluating the causes and prognosis of any health-related disorder. Women and children are vulnerable to lead-induced health problems. He lamented the lack of knowledge amongst lead-based industrial workers, especially in the developing countries. Gasoline is the main source and over 53% of children below 12 years of age are found to be suffering from lead poisoning in the metros of the country. He noted that India has the capability to produce herbal and Oriental medicines that can counteract this poisoning.

In symposium VII, Souvik Banerjee (Ramakrishna Mission Seva Pratishthan and VIMS, Kolkata) spoke on 'Oxidative stress and antioxidants in ophthalmology'. In the body, a whole arsenal of systems are present to balance the generation of reactive oxygen species. These antioxidant defences consisted of enzymes, water and lipid-soluble substances and could be endogenously or exogenously supplied. They differ in their activity, tissue/cell/organelle specificity, toxicity profile and route of administration. He depicted the mechanism by which they act like lysing and inactivating free radicals, separating free radicals from susceptible molecules, rapidly repairing the damage done by the free radicals and so on. Banerjee added that endogenous antioxidant mechanisms

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can adjust their activity in relation to the changes in oxidative stress.

In the symposium VIII, Pravin Sharma (S.M.S. Medical College and Hospital, Jaipur) gave a talk on 'Laboratory analysis in diagnosis and management of diabetes mellitus'. The speaker informed the audience that diabetes in Indians under different set ups suggests that the prevalence of the disease has grown ten-fold during the last 30 years from 1971 to 2001, much higher compared to any other ethnic group. By the year 2025, out of every 15 subjects with diabetes, there will be three Indians. This increase in prevalence of diabetes is due to metabolic and life-habit risk factors. The Diabetes Control and Complications Trial and UK Prospective Diabetes Study have demonstrated that optimization of glycaemic control reduces the risk of microvascular complications.

About 28 participants attended the conference. An exhibition was also organized along with the conference.

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RESEARCH NEWS

Natural radioactivity: Extant and extinct

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Two recent articles – one in *Nature* by Araki *et al.*[1] and the other in *Science* by Boyet and Carlson[2], are landmark contributions on the natural radioactivity of the earth – a phenomenon recognized shortly after the discovery of radioactivity of uranium ores in 1896 by Henri Becquerel. The *Nature* article with nearly 100 authors, is the first report on the present concentration of uranium and thorium in the entire earth, based on the detection of antineutrinos produced by the radioactive decay of these elements. The *Science* article is on a subtle isotopic signal left in the rock record by the fossil or extinct samarium isotope, ^{146}Sm and its implication for a profound chemical differentiation in the earth's silicate mantle within 30 million years (my) of solar system formation.

The two articles build on the following key assumptions. The specific mix of stable and unstable (radioactive) isotopes in the nebular cloud destined to form the solar system must reflect contributions from many different types of stars, including 'last minute' injections of short-lived nuclides (^{26}Al, ^{129}I, ^{146}Sm, etc.) from nearby supernovae. The uniform isotopic composition of many elements (not involved in nuclear transmutations) in terrestrial and extraterrestrial samples requires that different stellar components were thoroughly mixed in the nebular cloud before its condensation into the first formed solid objects (planetesimals) of the solar system. Primitive meteorites known as chondrites best represent the raw materials condensed from the solar nebula. The earth's overall chemical make-up at the time of its formation reflects that of chondrites, especially in elements refractory enough not to boil-off the planet during a possible high temperature phase very early on.

Of the numerous radioactive isotopes inherited by the earth at its formation, only six pertain to the two papers. They are listed in Table 1 together with their decay scheme-products-energy and half life (in my), where α, β, $\bar{\nu}$ are alpha, beta and antineutrino particles respectively.

The decay energy per nuclide in units of Mev is large in the nuclear scale, but extremely small in the human scale. One Mev (1.6×10^{-13} J) is less than a thoudsandth of the kinetic energy of a small ant crawling at a speed of about 2 mm/s. With the half-lives of ^{146}Sm and ^{235}U being much shorter than the age of the earth (approximately 4500 my), the former became extinct in the first 200–300 my of the earth's formation, while the latter has become nearly extinct now with a residual presence of only 0.7%. One wonders whether nuclear reactors and atomic bombs would have been possible had the half-life of ^{235}U been about 50% shorter. ^{146}Sm and ^{147}Sm decay by alpha emission directly to two stable isotopes of neodymium, ^{142}Nd and ^{143}Nd respectively. ^{40}K decays mostly and directly to stable ^{40}Ca, emitting a beta particle (electron) and an antineutrino in the process. Unlike alpha and beta particles, antineutrinos and their counterpart neutrinos have no electrical charge, almost no mass and interact exceedingly rarely with matter and hence are extremely difficult to detect. U and Th nuclides do not decay directly to the three stable isotopes of lead (Pb), but through a chain of intermediate radioactive daughter isotopes to produce a number of alphas, betas and antineutrinos, and much higher decay energy.

A particular combination of decay products, energy and half-life is unique to each radionuclide as mediated by extremely short-range nuclear forces. Hence it is remarkable that they seem to be purpose-created for both priming and timing the physical and chemical processes in the earth on all spatial and temporal scales. The daughter nuclide with a genetic line-

Table 1. Radioactive isotopes relevant to the two papers

^{146}Sm $\rightarrow$ ^{142}Nd + α	(2.55 Mev, 103)
^{147}Sm $\rightarrow$ ^{143}Nd + α	(2.31 Mev, 106000)
^{40}K $\rightarrow$ ^{40}Ca + β + $\bar{\nu}$	(2.31 Mev, 1250)
^{238}U $\rightarrow$ ^{206}Pb + 8α + 6β + 6$\bar{\nu}$	(47.4 Mev, 4468)
^{235}U $\rightarrow$ ^{207}Pb + 7α + 4β + 4$\bar{\nu}$	(45.2 Mev, 704)
^{232}Th $\rightarrow$ ^{208}Pb + 6α + 4β + 4$\bar{\nu}$	(39.2 Mev, 14010)