

# RESEARCH HIGHLIGHTS

## 1. COMMUNITY STUDIES

### 1.1 NNMB second tribal repeat surveys: Diet and nutritional status of tribal population in India time trends

It was observed that there was no significant change in the dietary patterns of tribal population in the last three decades. However, consumption of income-elastic foods like pulses, GLVs, Sugar and Jaggery has marginally gone up. Prevalence of severe undernutrition has significantly come down from 19.7% in 1985-87 to 7.9% in 2007-08 among both the rural and tribal communities. However, there was a notable shift from moderate to mild malnutrition indicating betterment of nutritional status. Nutritional status of tribes of MP, Maharashtra and Orissa were poor compared to those in the other states.

### 1.2 Evaluation of Bio-effect of ultra rice on iron status of beneficiaries of mid day meal (MDM) programme – A study in a primary school of Ranga Reddy District, Andhra Pradesh

It was found that the rice fortified with iron when given in the mid-day meal to the school children for over a year, resulted in a significant improvement in their haemoglobin levels and iron stores. However, it was also observed that the children in control group who did not receive ultra rice but got supervised meal as per the norms of MDM Programme also showed Hb improvements with no change in iron status.

### 1.3 Nutritional status of <3 year children and infant & young child feeding practices among mothers in Medak, Andhra Pradesh: A situational analysis of Sankalp Programme

Government of Andhra Pradesh in collaboration with UNICEF initiated developmental programme “**Sankalp**” in Medak district of Andhra Pradesh. A situational analysis of infant and young child feeding practices and care giving practices among 805 mothers of <3 years children, indicated a significant association between nutritional status and different socioeconomic & demographic variables such as literacy and occupation of parents and presence of sanitary latrine with underweight and stunting, use of LPG and presence of electricity with underweight and wasting.

### 1.4 Study on relationship between Body Mass Index (BMI) and percent body fat in urban adults

Studies on relationship between Body Mass Index and percent body fat in urban adults indicated that cut-off levels of BMI to indicate Overweight/Obesity, derived based on 25% body fat among men and 30% among women using ROC (receiver operating characteristic) curves, were found to be similar to the cut-off values for Asian Indians suggested by WHO ( $BMI \geq 23 \text{kg/m}^2$ ).

## 2. MICROBIOLOGY AND IMMUNOLOGY

### 2.1 Allergenicity evaluation of a Bio-preservative skimmed milk fermentate (SMF)

NDDB in association with National Dairy Research Institute (NDRI) Karnal has developed skimmed Milk Fermentate (SMF-Bact) a Bio Preservative, which can be used to increase



shelf life of milk products. Allergenicity evaluation of SMF suggested that it had no allergenicity potential in the concentration tested.

## **2.2 Immune status of WNIN mutant obese rats with reference to leptin and obesity**

It was observed that there were altered T cell subsets and B cells in both the sexes of the strains of mutant rats studied. However, the splenic proliferative response to mitogen decreased in male rats of one strain.

## **3. BASIC STUDIES**

### **3.1 Isolation and characterization of human milk factor that enhances iron absorption: An exploratory study**

In yet another study, enzyme Ferric Reductase activity has been demonstrated in human milk fraction which explains the reason why iron is better absorbed through human milk.

### **3.2 Studies on mechanism of cytoprotective effect of zinc in Caco-2 cell intestinal model**

Results indicated that Zinc inhibits oxygen induced iron uptake and signaling and thus elicits its cytoprotective effects. This also explains the inhibitive effect of zinc on iron absorption.

### **3.4 Metabolic programming of insulin resistance: Role of maternal and peri/postnatal chromium status in the offspring – Adiposity, glucose and lipid metabolism**

Chronic maternal chromium deficiency increased body fat, especially central adiposity in offspring. It altered adipocyte cytokine levels in circulation. It altered lipid metabolism with increased circulating triglycerides and free fatty acid levels. However, it did not alter gene expression. It caused impaired glucose tolerance and increased insulin secretion. Rehabilitation could partially correct these changes.

### **3.5 Health beneficial effects of plant foods commonly consumed in India: nuts and oil seeds**

Very strong correlation was observed between the phenolic content and FRAP and DPPH scavenging activities indicate that phenolics were significant contributors to the anti-oxidant activity of nuts and oilseeds commonly consumed in India.

### **3.6 Importance of $\gamma$ -crystallin heteropolymer in the eye lens: Oligomeric size, polydispersity and stability**

Chaperone-like activity (CLA) of the small heat shock protein  $\gamma$ -crystallin is essential for the maintenance of eye lens transparency. The eye lens  $\gamma$ -crystallin is a heteropolymer, composed of two homologous subunits, A and B. In most vertebrates the ratio of A to B in heteropolymer is 3:1. However, the physiological significance of 3:1 heteropolymer is not known. The current studies have shown that under normal conditions B-homopolymer exhibits higher CLA than A-homopolymer. In contrast, under stress conditions 3:1 heteropolymer displayed greater CLA. It was further demonstrated that B-crystallin homopolymer is not only less stable and contributes to light scattering due to aggregation, but it could also be involved in coaggregation of other lens proteins in the absence of A-crystallin. Thus, existence of A and B in 3:1 ratio in lens might have evolved as an advantageous combination to preserve eye lens transparency under diverse conditions to prevent cataract.

### **3.7 Expression of $\alpha$ -crystallins under hyperglycemic conditions: Role of oxidative stress, transcription factors and dietary anti-oxidants**

Expression of small heat shock proteins,  $\alpha$ A- and  $\alpha$ B-crystallins has been shown to be elevated under various stress and pathological conditions. Diabetes is known to be associated with various metabolic stresses including oxidative stress. For the first time, it has been reported that hyperglycemia induced stress leads to increased expression of  $\alpha$ B-crystallin in lens, heart, muscle and brain and  $\alpha$ A in retina. Further, it was shown that transcription factor HSF1 could be responsible for up regulation of  $\alpha$ -crystallins under hyperglycemic conditions. While increased oxidative stress appears to be a major stimulus for the enhanced expression of  $\alpha$ B-crystallin in tissues of diabetic rats, feeding of a dietary antioxidant (curcumin) to diabetic rats attenuated the enhanced expression of  $\alpha$ B-crystallin.

### **3.8 Characterization and significance of a novel fatty acid elongase, ELOVL4, of the eye**

ELOVL4 (Elongation of Very Long Chain Fatty Acid 4) is a novel member of human fatty acid elongases whose functional role is currently not known. ELOVL4 gene is expressed in the photoreceptor cells of the retina in a number of species and a mutation (5-bp deletion) in ELOVL4 gene can cause a particular form of macular degeneration. The current studies have shown that expression of this novel elongase is higher in retina compared to lens in many vertebrate species. A comparison of fatty acid profile between lens and retina of given species has enabled us to cling on to the elongation reaction of ELOVL4 that it might be involved in the elongation of fatty acids with a chain length greater than C28. Studies also indicated that expression of ELOVL4 in retina is positively modulated by dietary long-chain polyunsaturated fatty acids, which in turn is associated with the maintenance of integrity of retinal morphology.

## **4. EXTENSION AND TRAINING**

### **4.1 A study on approaches to nutrition communication**

Case studies on approaches taken by various organizations for nutrition communication in different sectors (Government, NGO and R&D) indicated that Nutrition communication activities lack proper planning, monitoring and evaluation components. This makes it difficult to attribute any change in behaviour to a particular communication process.

The selection of specific communication approaches is not primarily based on normative value of the approach but purely based on institutional factors and expectations including organisation's goals, bureaucratic dynamics and budgetary constraints

### **4.2 A study on coverage of nutrition related topics in print media**

The study revealed that the vernacular (Telugu) dailies covered more number of nutrition related articles than the English newspapers and most of these were more on conventional foods rich in nutrients. English dailies published more articles on lifestyle foods like chocolates, beverages, ice-creams etc.

## **5. FOOD AND DRUG TOXICOLOGY**

### **5.1 Microbiological risk assessment of street foods with special reference to poultry products**

The study indicated that 50-70% of samples of poultry foods were found to be contaminated with disease carrying bacteria like *Bacillus cereus* and *Staphylococcus aureus*. The vegetable salads were found to be contaminated with *Salmonella* due to improper handling.

## **5.2 In vitro chelating potential of thiamine with lead**

Earlier studies indicated that thiamine can chelate and thus reduce the uptake of lead in intestines. This was confirmed using in vitro human intestinal cell lines. Therefore correcting thiamine deficiency itself would reduce the risk of lead toxicity in populations at risk.

## **6. PRE-CLINICAL TOXICOLOGICAL STUDIES**

### **6.1 Safety evaluation of AB-FN-02 having potential anti-osteoarthritic activity**

Safety evaluation of a polyherbal drug, AB-FN-02 having potential anti-osteoarthritic activity indicated that it was non-toxic when administered in traditional method with milk and was found toxic when administered as a drug otherwise.

## **7. NATIONAL CENTRE FOR LABORATORY ANIMAL SCIENCES**

The first phase of the Indo-US project to find out the nature of mutation in the obese rats developed in the center was completed, with the crossing of WNIN/Ob rats with that of Fischer 344 rats and the preparation of DNA samples from Fo, F1 parents and F2 progenies.

## **8. OTHERS**

Total number of publications by scientists in national and international journals was over 40 with an average impact factor of 2.5.