The Council continues to adopt multi-pronged and multi-disciplined approach for advancement of nutrition research in the country. Specifically, pragmatic approaches were evolved by integrating laboratory and hospital based research with community participation in tackling nutritional problems confronted by different regions of the country. Salient features of various programmes undertaken by the Council in the area of nutrition during the year 2011-12 are summarized below.

**Intramural Research**

**NATIONAL INSTITUTE OF NUTRITION, HYDERABAD**

**COMMUNITY STUDIES**

Creating enabling environment in schools for promoting physical activity, consumption of healthy foods and lifestyles by employing a multi-component health and nutrition intervention targeted not only at school children, but also their teachers, school managements and district educational officers, resulted in a significant increase in the health and nutrition knowledge of the adolescents. In addition, there were favourable changes in their nutritional status, with lesser number of children moving from overweight to obese category and more number of children from overweight category becoming normal as compared to the control group (fig. 1).

Responding to a request from the state administration of Madhya Pradesh, a study was undertaken to assess the district-wise mapping of under-nutrition among 22,907 <5 year children and their mothers in all the 50 districts. The study revealed that only half of them (48%) were using iodized salt, where iodine content was adequate (≥15 ppm). About 79% deliveries were institutional and the prevalence of low birth weight (LBW) was 19%. Majority of the mothers (91.9%) fed colostrums to their newborns. About 26% of mothers initiated breastfeeding within 1 hour. Only one fourth of mothers initiated complementary feeding at 6 months of age for infants. Majority of children (84.2%) were completely immunized. District-wise mapping was done to know high, medium and low prevalence of underweight districts. Red, green and brown colours indicate high, medium and low prevalence of undernutrition. The study highlights the need to impart...
health and nutrition education to the pregnant and lactating mothers on infant and young child feeding practices and strengthening of ongoing national nutrition programmes.

Fig. 2. Map of Madhya Pradesh showing districts-wise prevalence of underweight.

A study was carried out to assess the nutritional and health status of 260 street children (8-17 years) in Hyderabad. About 41% were aware of HIV/AIDS, of which 88% were aware of at least one route of transmission of HIV. The overall prevalence of thinness was about 25%. However, it was higher among younger (8-12 years) children (35%) compared to older (15-18 years) children (26%). The overall prevalence of stunting was about 47%. Half of the street children were suffering from various grades of anaemia. The study concluded that the prevalence of under-nutrition and anaemia among street children was more or less similar to rural and tribal children in India.

CLINICAL STUDIES

A study was conducted among two cohorts (from a previous study), in collaboration with London School of Hygiene and Tropical Medicine, UK. It aimed to examine the effect of nutritional shortage/supplementation in early life and adulthood on the amount and distribution of body fat, and the development of type-2 diabetes and coronary diseases. Preliminary analysis of the data has shown that modest protein-calorie supplementation in early life was not associated with higher lean body mass.

MICROBIOLOGY AND IMMUNOLOGY

A study was carried out on molecular characterization of reshuffled bile salt hydrolase (Bsh) and effect of dietary inclusion of Bsh+ and Bsh- indigenous probiotic - Lactobacillus plantarum strains of human origin on cholesterol metabolism of rats. Bsh active (Bsh+) L. plantarum strain 21 reduced serum total cholesterol, LDL, VLDL and triglyceride levels in comparison to Bsh inactive L. plantarum strain 37. Bsh + strain 21 colonized successfully into the cecum and large intestine of the respective animal groups. Bile salt hydrolase activity helped the lactobacilli to colonize in rat gut and hence can be considered as a probiotic marker. Strains 37 and 83 exhibited negligible Bsh activity compared to 21 while no significant difference was observed among their acid and bile tolerance abilities.

A study that looked in to the immune status of WNIN mutant obese rats with reference to leptin and obesity, found that in euglycemic WNIN/Ob rat, cell mediated immune response to hepatitis B vaccine was impaired in obese animals. Though leptin receptor expression was intact in both the obese and lean animals, leptin signalling (JAK2 protein expression) was impaired in obese animals. In impaired glucose tolerant WNIN/GR-Ob model too the cell mediated immune response to hepatitis B vaccine was impaired in obese animals, whereas, the leptin receptor expression is impaired in obese animals.

A study that aimed to assess the role of probiotics on growth and morbidity in children found that after supplementation of probiotics for nine months there was a gradual reduction in the incidence of diarrhoea in the groups supplemented with L.paracasei and B.lactis as compared to the placebo group. There was no difference in the prevalence of respiratory tract infections in all the three groups even after supplementation. There was consistent weight gain and linear growth.

BASIC STUDIES

Micronutrient Research Group

Results of the study on folic acid, vitamin B12 status and its association with anthropometric indices of adiposity and leptin among urban adolescent boys belonging to low and middle income group of Hyderabad showed vitamin B12 deficiency among 39% and folic acid deficiency among 17% among urban adolescent boys of low and middle income groups. It was found that there was an influence
of folic acid deficiency in overall body weight increment and vitamin B12 deficiency in increased fat deposition among adolescents which need to be further probed.

A sensitive and rapid method of detection of dialyzable iron was developed using a combination of fluorescent probe Phen Green and a 6 well plate. This method was validated against the $^{59}$Fe tracer and the conventional colorimetric methods. Both the isotopic and florescent probe methods seem to be promising for rapid screening of dialyzable iron for selecting foods for dietary diversification. The sensitivity of detection using fluorescent probe was about 14 pico moles with inter and intra assay variability of less than 10%.

**Endocrinology and Metabolism**

A study that examined the role of peri/postnatal manganese (Mn) status and high fat feeding in later life has demonstrated, for the first time, that maternal Mn restriction transiently altered the body composition of male and female rat offspring and predisposes the offspring to increased central adiposity, fat deposition in liver, induction of a pro-inflammatory state and altered glucose tolerance.

The effect of different methods of cooking on phenolic content and antioxidant activities of pulses and legumes commonly consumed in India were studied. Nine out of 11 legumes samples showed a maximum of 20% increase or decrease in their total phenolic content (TPC) during different types of cooking. Interestingly however, during conventional and pressure cooking, whole Bengal gram and Rajmah showed 27 and 54% increase in their TPC respectively.

**Stem Cell Research**

A study to explore the feasibility of using umbilical cord blood serum (UCBS) as a potential source for the growth and maintenance of pancreatic culture rat islets and assessment of their marker functions in comparison to foetal calf serum (FCS) - *in vivo* and *in vitro* was explored. It was found that hUCBS could be explored as an alternate serum supplement for FCS, making it more feasible in cell systems of human derived origin and can also find its application for the human transplantation programmes.

Pancreatic exocrine tissue as a source of progenitors/stem cells to generate insulin secreting cells was examined and the methodology has been standardized for acinar cultures. Pyridoxalphosphate (PLP) addition was protective to acinar cells and demonstrated antioxidant effects with the addition of H2O2. PLP modulated the regulation of the transcriptional factors such as Ngn3. PDX-1, which are the master regulators for acinar lineage to beta cell formation.

**Lipid Chemistry**

A study on exploration of basal glucocorticoid levels and their possible role in obesity and insulin resistance using WNIN/Ob and WNIN/GR-Ob rat models was completed. The results suggest that 11$\beta$-HSD1 plays an important role in the development of obesity, dyslipidemia and insulin resistance in WNIN/Ob obese rats. Further, this study supported the hypothesis that inhibition of 11$\beta$-HSD1 is a key strategy to treat metabolic syndrome. This perhaps is the first study to link 11$\beta$-HSD1 to adipose tissue fibrosis and tissue glycogen content under obese condition. Feeding of diet rich in vitamin A decreased 11$\beta$-HSD1 activity in visceral fat and liver of WNIN/Ob obese rats, which is also associated with decreased adiposity. Feeding of diet-rich in n-6 polyunsaturated fatty acids decreased hepatic 11$\beta$-HSD1 activity and increased enzyme activity in adipose tissue of WNIN/Ob lean rats.

**Ocular Biochemistry**

*Molecular studies on vitamin-B$_{12}$ deficiency and diabetic retinopathy*

Diabetic retinopathy (DR) is one of the most common micro-vascular complications of diabetes. Based on a hospital based case-control study, it was previously reported that vitamin-B12 deficiency could be an independent risk factor for DR as there was an association between deficiency of plasma vitamin-B12 and DR. This year, an animal experiment was conducted to understand the role of vitamin-B12 in the development of DR. The results indicate a role for vitamin-B12 in retinal structure and function both in neuronal and vascular component, particularly under hyperglycemic conditions. Further, supplementation of vitamin B$_{12}$ has resulted in beneficial outcomes in normalizing neuronal,
MAJOR ICMR RESEARCH PROJECTS IN NUTRITION
vascular and inflammatory mediators under hyperglycemic conditions in the retina (Fig. 3).

Accumulation of advanced glycation end products (AGE) due to non-enzymatic glycation has been implicated in diabetic complications. Studies have demonstrated the antiglycating potential and mechanism of action of two such molecules, ellagic acid (EA) and rutin using various protein glycation systems. The results suggest that while the antiglycating action of EA seems to involve predominantly inhibition of Nε-(carboxyethyl) lysine (CEL) through scavenging of dicarbonyl compounds, rutin scavenges free radicals directly and also chelates the metals ions by forming complexes with them. Inhibition of glycosylated Hb formation in human blood under high glucose conditions signifies the physiological anti-glycating potential of EA. These findings establish the antiglycating potential of these flavonoids and their in vivo utility for controlling AGE-mediated diabetic pathologies (Fig. 4).

Previously, retinal degeneration in a spontaneously developed novel obese rat model was reported, while WNIN/Ob rats develop retinal degeneration progressively. Studies during the current year have shown that supplementation of 26-52 mg/kg diet vitamin A alleviated the obesity-associated retinal changes in WNIN/Ob rat model, which may have implications for treatment of retinal degeneration associated with obesity (Fig. 5).

**Extension & Training**

A project that assessed the intra and extra individual factors on food consumption pattern among rural population in Tamil Nadu using a diagnostic model approach, was carried out in two phases. In phase-I, the factors affecting food habits and food intakes in the village population were identified and education materials were developed accordingly. In phase-II, PG students from a local university were trained to educate and measure the changes among women. The study concluded that continuous and repeated exposure to nutrition communication, clubbed with inter-personal communication/group discussions have brought about a positive modification in the dietary practices of rural. In order to ensure sustainability of such programmes, collaboration with Social Work and Women Studies departments in universities can be helpful.
When the influence of mass media advertisements on family food purchasing patterns and efficacy of behaviour change intervention, were studied, it was observed that the time spent on television viewing by women and children certainly have an influence on their food purchasing pattern and snacking habits. A total of 1602 food advertisements appeared during the study period in television channels, popular among the study groups. Advertisements on chocolates and confectionary products were highest in number followed by health drinks and grain-based products/snacks. Advertisements of chocolates/sweets, biscuits and snacks were mostly telecast on children’s channels. Advertisements on health drinks depicted these drinks as inevitable for child growth and were perhaps targeted at parents. Therefore, a majority (63%) of them were seen on other channels and not children’s channels.

The institute has produced a wide range of nutrition education material like posters and films as part of different research studies. A book on the History of NIN and the revised version of Diet and Diabetes were released during ICMR centenary year celebration. An educational film on Dietary Guidelines produced earlier in English was translated into three Indian languages. Several nutrition awareness programmes were conducted and popular radio talks were delivered.

The third batch of MSc (Applied Nutrition) programme affiliated to NTR University of Health Sciences, Andhra Pradesh was commenced and 16 students have been admitted. In addition, 13 participants were trained in the short-term PG Certificate Course in Nutrition.

**FOOD AND DRUG TOXICOLOGY RESEARCH CENTRE**

When the consumption of processed and non-processed foods in India was assessed it was found that the consumption of different foodstuffs and nutrients among various age groups were below the recommended levels of ICMR. The consumption of processed foods was also considerably higher in some of the regions like West and South. The prevalence of under-nutrition was higher among rural pre-school children as compared to urban children. The prevalence of overweight and obesity and non-communicable diseases was higher among urban adults compared to rural. The prevalence of cardio-metabolic risk factors was higher among urban adults compared to rural.

A study was conducted to understand the interaction of calcium and fluoride in biological system in terms of nutritional status and skeletal metabolism as well as to study the effect of rehabilitation (providing normal calcium diet and fluoride free water) on reversal of fluorosis. Nutritional status of low calcium and fluoride treated group was poor (in terms of body weight gain and body composition parameters) at the end of phase-I. Observations indicated disturbance of calcium homeostasis in presence of fluoride in low as well as normal calcium treated rats. There was increased bone formation in presence of fluoride but quality of bone was poor in low calcium and fluoride treated group. Studies on effect of reversibility indicated that the nutritional status and calcium homeostasis of rats normalized to some extent after providing normal Ca diet and fluoride free water for three months. There was no improvement in bone strength in animals given normal calcium diet and fluoride free water for three months.

The study on kidney and bone disease – role of silica, strontium and fluoride study in guinea pig was undertaken to investigate whether silica and Sr (with and without F) increases bone density secondary to kidney damage. The results showed that diet intake and weight gain was reduced significantly in Sr, Si + Sr, F + Sr and F+Si+Sr groups from 120 day to 180 day compared to control, Si and F. There was significantly low mineral apposition rate (MAR) and bone formation rate (BFR) in F+Sr group compared to control. Sr and Sr+F treatment affected food intake and weight gain along with body composition and organ pathology. However, Sr+F group was more affected than Sr alone.

Considering that food labelling is one of the important population-based approaches that can help consumers make healthy food choices by providing the necessary nutrition information on the pack, a consumer study was conducted in Hyderabad and Delhi to assess how many consumers among various age groups were using food labels. It was observed that only about 1/3rd of the consumers checked nutrition information
and list of ingredients. The reason cited for not checking the nutrient information was that the information was ‘too technical to understand’ and some of the respondents in the qualitative study informed that the lack of nutrition knowledge as an important reason for not checking the nutrition information on labels. However, it was observed in the FGDs that women and adolescent girls who were concerned with ‘fat’ and ‘sugar’ intake were in the habit of checking the nutrition facts. A significantly greater number of consumers with higher education qualifications were checking the nutrition information. Only about 60% of the respondents checked the quality symbols. In the quantitative data more number of elderly (than the other groups) reported to have checked the quality symbols.

Assessment of allergenicity potential of novel proteins expressed in genetically modified (GM) plants under varying conditions of digestion and thermal treatments looked into the digestive stability to pepsin in SGF at varying pH and pepsin activity levels and heat stability. Insect bioassay of heat treated Cry1Fa1 recombinant protein showed that at a temperature of 95°C the mortality among target insects fed was zero indicating heat lability of the recombinant protein at this temperature. The mortality at 10% target protein conc. was 65%. SDS-PAGE analysis showed that the band intensity of protein sample heated at 95°C was less than the untreated control at 10% conc.

A study was carried out to isolate, identify and characterize enteric pathogens in pediatric population and factors associated with their occurrence. Of a total of 502 stool samples collected from children (6 months-5 years of age), 73% of them were harbouring one or more of the seven major bacterial pathogens, i.e., *Escherichia coli* (36.2%), *V.cholerae* (14.5%), *V.parahaemolyticus* (0.9%), *Salmonella* spp. (18%), *Shigella* (8.3%), *Campylobacter* spp. (14.2%) and *Yersinia* (3.3%). A total of 81 stool samples were analysed for *Rotavirus*. About 27 (33.3%) samples were positive for *Rotavirus*. Among 229 strains of *E.coli*, 61 were characterized. The enteropathogenic *E.coli* (EPEC) accounted for 41%, enterotoxigenic *E.coli* (ETEC) 13.1%, *Shigella* toxigenic *E.coli* (STEC) 34.4% and most importantly a considerable percentage (27.8%) of *E.coli* 0157:H7 were isolated.

Study on determination of levels of aflatoxins in stored paddy and rice of PAU 201 variety collected from 6 districts of Punjab is based on an investigation that was carried out by ICMR on the fungal and aflatoxin contamination of PAU-201 rice variety developed by Punjab Agricultural University, Ludhiana from various districts in Punjab in 2010. The PAU 201 variety rice was not permitted for milling and subsequent distribution due to presence of damaged grains at levels exceeding the regulatory norms. As a result 30,000 tonnes of rice was held up in storage in rice mills and FCI warehouses. An emergency survey was undertaken by ICMR at the request of Ministry of Health to assess the extent of fungal and aflatoxin contamination in PAU 201 rice and to assess hazard from the presence of damaged grains and presence of iron in discoloured rice grains. The results of aflatoxin analysis of rice samples indicated that majority of the samples had levels <15 µg/kg and none exceeded the Food Safety and Standards Regulations, 2011 tolerance limit of 30 µg/kg. The proportion of damaged grains exceeding the limit of 5% was observed in 85.7% of the samples. The results indicated that there was no food safety concern from the stored rice samples. The study helped the GOI in releasing >30,000 tonnes of stored rice for milling and subsequent public distribution.

**NATIONAL CENTRE FOR LABORATORY ANImAL SCIENCES**

**Estimation of Body Composition of Laboratory Animals – Non-invasive and Conventional Methods – Advantages and Limitations**

Progressive changes in the body composition of six commonly used rat strains in nutritional research viz., WNIN, SD, F-344N, WKY, CFY and Holtzman, were analyzed by TOBEC initially and compared with chemical method. Subsequently animal models like Syrian hamsters, guinea pigs (NIH white and colour strains), Newzealand white rabbits were evaluated for their body composition using TOBEC and DXA and were compared with chemical method and parameters like lean body mass, fat, fat %, fat free mass were determined. It was observed that the TOBEC analysis correlated well with the carcass analysis in rats. But for hamsters, guinea pigs and rabbits DXA analysis found to be more appropriate. These findings
equivocally showed that for body composition analysis of lab animals like hamsters, guinea pigs and rabbits DXA is superior to all methods. While for rats, TOBEC could match that carcass analysis, this was not true for other two species - in hamsters, the TOBEC gave negative values, and it overestimated among guinea pigs.

Localization and cloning of the gene associated with obesity in WNIN obese mutant rats using positional cloning technique has been attempted. For this, WNIN/Ob mutant rats were crossed with Fisher – 344 rats and F2 generation were raised to localize the point of mutation on a specific locus using over 200 microsatellite markers. Such a genetic analysis was done both for parents and F2 progeny. Using such an approach, the gene responsible for the obesity in the WNIN rat was located on chromosome number 5. This is localized on exon genomic region of leptin receptor gene (Ob-R) which is lying on chromosome no. 5. This polymorphic region has been sequenced and the identified SNP seems to be unique. The identified sequence positioned in LepR gene was validated with known / reported SNP using bio-informatics tools and through this approach, the WNIN/Ob rat specific mutation was identified. The located coding sequence of 2679bp was found to be unique, which is a heterozygous SNP with zero degeneracy. Due to change in the A/R the coding amino acid is changed from acidic to base. The study also noticed that a specific SNP in WNIN/Ob lean Lepr gene positioned in an intron G / S had changed and this also is heterozygous. The bioinformatics validation of identified SNP is completed but it is difficult to probe this in the phenotypes as it is lacking in restriction sites. Hence, the genomic region on which SNP is localized is amplified by designing primers. This is now being checked for the presence of SNP in F2 population as well as in parental strains using SSCP and sequencing.

Preclinical Toxicology

Mah yco has developed Bt okra containing Cry 1Ac gene for insect tolerant trait. Its safety evaluated in WNIN rats by oral feeding for 90 days showed that there were no significant effects on body weight, serum immunoglobulins, clinical chemistry profile, hematology and histopathology due to transgenic okra. GCSF (Granulocyte colony stimulating factor) was produced using recombinant DNA technology. Its safety was tested in Swiss albino mice and New Zealand white rabbits at three dose levels namely therapeutic dose, average dose and high dose. In subchronic toxicity 5% mortality was observed in Swiss albino mice but not in rabbits. No other significant toxic effect was observed.

Red gram (tur dhal) was fortified with ferric ammonium citrate and fed to mice/rats in intended daily dietary intake levels. Acute toxicity tests (14 days) in Swiss albino and Sprague Dawley rats were performed and no adverse effects were observed.

Extramural Research

One of the important activities of the Division of Nutrition is to support individual scientists from different parts of the country. The proposals address varied interesting areas of research like nutrition profile of population of high and low altitude areas, non-alcoholic fatty liver disease, quality of life in patients with liver cirrhosis, etc. Useful scientific contribution is being made by these studies.

A study entitled Nutrition Profile of Population of Kinnaur and Kangra districts of Himachal Pradesh to assess the changes in lifestyle and dietary pattern in two different geographical districts of Himachal Pradesh; one at high altitude (HA) and other at low altitude (LA) was undertaken. The study revealed that mean hemoglobin level was 10.9 g/l and 11.5 g/l in adults residing in LA and HA area respectively. Further, no significant difference was found in mean cholesterol level in adults in LA (165.6 mg/dl) and HA (170.0 mg/dl) respectively. Breast feeding was found to be initiated within 24 hours in 97.3% cases in LA and 94.3% in HA. The practice of giving colostrum was found to be high in both HA (94.6) and LA (95.2%).

Another study in patients with liver cirrhosis revealed that such patients are malnourished and have poor Health Related Quality of Life (HRQOL). The intense dietary intervention improved their nutrition scores and that high protein diet, supplemented with formula feeds provide the best results in patients with advanced liver cirrhosis and severe malnutrition.
A study on usage trends, suitability and toxicological implications of anodized polytetrafluoroethylene coated cookwares found that migrational aspects of leachable components from coating material are dependent upon the pH and temperature of surrounding medium and the storage time.

A study to assess pulmonary function test (PFT) of 10-12 years old school going children and the effect of micronutrient intervention on respiratory profile revealed that after the micronutrient intervention, PFT values increased in both symptomatic and asymptomatic children.

A study which aimed at evaluation of potential of selenium in regulating thyroid functions following lithium therapy, demonstrated that 8 weeks of lithium treatment to rats resulted in alterations in the physiological functions of thyroid, as evidenced by a significant decrease in the uptake $^{131}$I at the time intervals of 2 hours and 24 hours. De-toxification of aflatoxin using potential food grade wild yeast revealed that among the 52 yeasts that were isolated, 38 showed the capacity to bind aflatoxins. Another study that aimed at estimation of trans fatty acid (TFA) content in selected common Indian fast food items revealed that the highest TFA was found in mathari ranging from 4.2 to 14.58 g/100g and in balushahi i.e 0.89 g to 9.4/ 100 g food measured while TFA ranging from 2.2 g to 11.1g/100 g was estimated for bhatura. The lowest TFA was for bread pakora ranging from 0.13 to 1.05 g/100g.

Centre for Promotion of Nutrition Research and Training with Special Focus on North-East, Tribal and Inaccessible Population, New Delhi

The laboratory at the Centre has been carrying out/involved in various activities as per its mandate viz analysis of human biological samples for various micronutrients collected under Task Force studies or under collaborative studies; facilitating researchers/students for their Ph.D, DM, MD, M.Sc degrees; training to students/staff for collection of biological samples, their packaging, labeling, transport and analysis, besides participation in various external quality assurance programmes.

During the year 2011-12, the laboratory at the Centre has carried out the analysis of around 4000 samples collected under a multi-centre study to assess nutrition profile of population of Dhar (M.P.) and under various collaborative research studies with Medical and Home Science colleges in the country. These studies have generated useful biochemical database on the prevalence of deficiencies of various micronutrients. The preliminary analysis of study in Dhar district has revealed that the prevalence of anaemia varied from 71.9 to 82.8% across different age groups; deficiency of ferritin, folie acid and vitamin B12 ranged between 10-50%, 5-14% and 10-30% respectively. Further, the study revealed that 17-25% of adults and elderly population had hypercholesteremia. Similarly, a collaborative study to assess zinc status of low birth weight (<2000 g) infants revealed that 57.3% of low birth weight infants and 42.7% of normal birth weight infants had zinc deficiency at birth. Another study to assess prevalence of cobalamin and folate deficiency in children aged 6 to <60 months of age indicated that 38.38 and 63.22% children in Delhi were deficient in cobalamin (vitamin B12) and folate respectively.

Using the laboratory support, several students have successfully completed their degrees. Currently, the Centre is facilitating three PhD scholars and two DM students working on diverse topics like impact of IFA and vitamin B12 supplementation to combat anaemia; micronutrient load during pregnancy and its correlation with birth outcome; biochemical profile of adult population; prevalence and electrophysiological characteristics of neuropathy in association with various diseases like childhood leukemia and stage V chronic kidney disease.

The laboratory has also enrolled in various external quality assurance programmes like CDC Atlanta and Bio-Rad, India. Under the CDC Atlanta External Quality Assurance Programme for urinary iodine, the laboratory has been awarded 100% performance score for the third consecutive year. In the Bio-Rad Clinical Chemistry Programme, the laboratory has been ranked as 6th out of 401 laboratories in the World, whereas under Bio-Rad Immunoassay Programme, the laboratory has secured 44th rank out of 1253 laboratories in the world and 8th rank out of 248 laboratories in India.

The Centre has been approached by various national and international agencies like WHO, CDC, Atlanta, Society of Applied Sciences, New Delhi and Global
Alliance for Improved Nutrition (GAIN) Geneva, for possible collaborations for biochemical analysis of various micronutrients in human biological samples.

**NATIONAL NUTRITION MONITORING BUREAU (NNMB)**

NNMB completed the third Rural Repeat Survey during 2011 and looked into the diet and nutritional status of rural population and prevalence of hypertension and diabetes among adult population in all the 10 NNMB states. The preliminary results indicate that despite decline in the food and nutrient intakes over a decade, the prevalence of underweight (49 to 42%), stunting (53 to 45%) and wasting (23 to 20%) were declined from 1996-97 to 2010-11. Similarly, the prevalence of chronic energy deficiency (CED) among adults also declined significantly from 46 to 36% in the above period. Hypertension (SBP ≥140 mm Hg and / or DBP≥90 mm Hg) was seen in over 20% of men and women and diabetes was over 7% among rural men and women.