ENVIRONMENTAL AND OCCUPATIONAL HEALTH

During the year 2004-05, Council’s National Institute of Occupational Health (NIOH) at Ahmedabad and its two Regional Centres (ROHC) at Bangalore and Kolkata continued wide range of field and laboratory investigations related to occupational health problems of workers engaged in organised and unorganised sectors of industry. Besides, health risk assessment due to air pollution was carried out in industrial and residential areas of Ahmedabad and Kolkata. The Poison Information Centre is engaged in dissemination of information about toxic compounds and in detecting prevalence of poisoning due to various toxic chemicals.

Respiratory Health Effects in Fire Fighters

Fire fighters are exposed to toxic pollutants like CO, acrolein, hydrogen chloride, benzene, SPM during out-break of fire and inhalation of these pollutants produces toxic effects on their respiratory and cardiovascular systems, heat exposure effects and accidents at work place. Very few reports are available in India for assessing health effects among fire fighters. Hence the study was undertaken in 267 fire fighters of Ahmedabad Fire Brigade (AFB) using clinical examination, recording acute and chronic respiratory symptoms, blood pressure measurement, heat exposure symptoms, accident history at work place and recording spirometry and flow-volume curve. The number of fires attended by each fire fighter was also noted. The fire fighters were grouped into a) Firemen directly exposed to fire and, b) others such as drivers, fire officers etc. in pump trucks, load trucks. The findings were compared between these two groups. The results revealed that obesity based on BMI categorization (BMI>25.0) was seen in 37.3% firemen and 52.4% in other group. The prevalence of acute symptoms i.e. burning eyes was 80.5% in firemen and 63.5% in others, cough was 27% in firemen and 19.2% in others; headache 44.7% in firemen and 30.8% in others; constriction in chest 20.8% in firemen and 9.6% in others revealing higher prevalence among fire men. The prevalence of chronic respiratory symptoms (cough 6.9% in firemen and 8.7% in others; breathlessness 5.7% in firemen and 7.8% in others chest pain 12.6% in firemen and 12.7% in others) were observed (Fig. 1). A total of 14.8% firemen and 19.5% subjects from other group exhibited hypertension. Firemen reported higher prevalence of heat pyrexia (6.3%), heat cramps (8.2%), heat exhaustion (22%) and heat stroke (0.6%). About 27.6% reported accidents in different parts of the body. The major body parts affected during accidents included upper limb, lower limb and trunk.
Health Risk Assessment due to Air Pollutants in Ahmedabad

In this study health risk assessment due to air pollutants was carried out among residents of a residential area, a commercial area and an industrial area of Ahmedabad city. The lung function test (LFT) values were recorded. Results revealed significant impairment in function compared to their predicted normal population. The findings among male residents showed that the LFT impairment was higher in 45 yr age group suggesting the occurrence of both O and R-type of functional abnormalities. Smoking was shown to produce significant induction of airway obstruction. The lung capacity of industrial area residents was found to be significantly lower than that of those living in residential area, demonstrating the presence of R-type abnormality. The findings among female residents indicated the presence of R-type abnormality at younger age (20 to 44 yrs) than in male residents. Undernutrition and low socioeconomic status is associated with significant reduction in lung function. There was no variation in LFT status between different area residents. Overall there was deterioration in lung function among residents of Ahmedabad and this was more prominent in male residents of industrial area.

Health Survey among Salt Workers in Desert Area of Kutch

Epidemiological and intervention studies were carried out among 70 salt workers to study the prevalence of occupational hazards including hypertension among them and to evaluate the efficacy of the protective measures such as gum boots and goggles. The salt workers work at remote sites in the desert of Kutch without primary amenities of drinking water, food and health care and extreme weather conditions. For intervention study pre and post shift samples were collected and medical observations were made. The observation period included 5 days without intervention measures and 10 days with intervention measures. The salt workers showed higher prevalence of eye and skin related morbidity. The prevalence of hypertension was comparable among the salt workers and controls. The intervention measures significantly reduced the systolic and diastolic blood pressure, decreased creatinine and increased sodium excretion in the urine. The protective device although acceptable by workers needs to be subsidized in cost.

Assessment of Health Risk among Spray Painters

Spray painters represent a high-risk population exposed to organic solvents’
vapours and mists and are at risk of developing hepatic and renal function impairment. A study was conducted to assess their hepatic and renal function. Demographic, occupational characteristics and clinical examination was conducted in 25 spray painters. Results of the study indicated no major alterations in liver function, however, blood urea and creatinine levels were found significantly elevated in them (Fig. 2 & 3). The study suggests that spray painters are at risk of developing renal function impairment.

**Assessment of Persistent Organic Pollutants PCDDs and PCDFs in Biological Media**

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzo furans (PCDFs) represent a class of organic environmental pollutants known to cause cancer and damage to the brain and central nervous system. During the period under report, food and human milk samples collected from highly polluted areas of Surat city were analyzed for the presence of residues of dioxins and furans. The total estimated quantities detected in egg (desi), chicken (desi) and human milk were 13.35 pg/g, 7.67 pg/g and 11.55 pg/g respectively.

**Effect of Environmental Chemicals on Human Male Reproductive System**

Disorders of reproduction and associated function have become prominent in recent decades after several reports of adverse effects of chemicals including persistent environmental chemicals on reproductive function. The project was initiated with the objective to find association, if any, between exposure to environmental chemicals and semen quality in 74 subjects. Of them about 23% subjects were occupationally exposed to metals, solvents, pesticides, extreme heat or vapours. The subjects were classified into three groups based on sperm count. Seven cases were azoospermic, 12 had oligospermia whereas 55 had normal
count. Data showed that mean zinc levels were lower in azoospermics followed by oligozoospermic and normozoospermic groups respectively. The results indicated that zinc levels had a positive correlation with sperm count (Fig.4). The study also indicated that there was a positive correlation between the activity of alpha-glucosidase level and sperm count. Mean FSH levels were higher among azoospermics as compared to oligozoospermics and normals. Similar trend was observed in LH values in serum samples. A significant correlation was observed between mean serum FSH and serum LH levels (Fig.5). Mean testosterone concentrations were lower among azoospermics as compared to subjects with normal count.

**Psychosocial and Work related Stress among Policemen**

Study was initiated to examine the impact of job stress (demands, discretion and support) on personality characteristics and prevalence of specific health problems among policemen. So far 103 policemen (inspector, sub-inspector and constable) have been registered. Data analysis revealed that 65% of the policemen were not satisfied with their job. Moderate and severe level of anxiety was found in 60% and 22% policemen respectively. About 76% reported high job stress while 24% reported moderate job stress. Moderate psychoticism was found in 30% subjects, high extrovert personality trait in 43%, moderate extrovert personality trait in 57% and moderate neuroticism in 27% policemen. Seventy three percent policemen suffered stressful life events in last three years of their work and almost half of the subjects reported general health problems.

**Stabilometric Approach for Postural Control Analysis**

Research has been initiated on a new approach of stabilometric analysis for understanding postural control (CoP). The body posture manifests as the outcome of interactions of the visual, vestibular and somatosensory systems and the musculo-skeletal actuators. Study was undertaken with the objective to explore the sensitivity of the stabilometric dimensions (such as the body oscillations and the displacement of centre of pressure of the body) that reflect the position of the centre of gravity of a person in a given postural orientation within a plane.
parallel to the support surface. The preliminary studies include the prevalent computer desk complex, when a person’s postural control is differently challenged. The study will also examine the influence of personal characteristics in terms of gender and body mass on the stabilometric dimensions.

Studies focused on gender and the body characteristics, which appeared to have influence on the range and direction of oscillation of CoP trajectory. Women appeared to have greater CoP displaced compared to those in men, whereas women had consistently less speed of CoP displacement. The study also showed that as the postural modes change, the clusters of pressure points move and overall area of CoP displaced also changes (Fig. 6). The preliminary study reiterates that the stabilometric approach has a high promise in understanding the postural behaviour and control, which have ergonomic implications in workplace design.

Renal Tubular Dysfunction and Oxidative Stress among Electro-plating Workers

A study was carried out at ROHC, Bangalore to evaluate the toxic effects of chromium on functional integrity of renal tubules, liver and oxidative stress in a group of male subjects occupationally exposed to chromium from electroplating process for 16 years. The results revealed increase of total urinary N-acetyl-β-D-glucosaminidase and isoenzymes A and B and in plasma lipid peroxidation and decreased erythrocyte antioxidant levels in workers exposed to chromium. This could be related to high urine chromium concentration of exposed workers.

Exposure Assessment of Benzene and its Health Effects

The study was carried out at ROHC, Bangalore for assessment of benzene exposure in 117 petrol pump workers (managers, cashiers and petrol fillers) and its health effects in them. The petrol fillers were exposed to a higher concentration of benzene compared to managers and cashiers. Similarly, the mean trans-trans-mucanic acid level was significantly high among the petrol fillers compared to the managers and cashiers.

National Environmental Health Profile and Comparative Health Risk Assessment

A study was undertaken by ROHC, Kolkata for assessing the impact of environmental pollution on respiratory system of the exposed population and to compare it with health and economic risks.
Air monitoring was undertaken in three selected sites and analysis was done using standard equipments. PM$_{10}$ concentrations were found to be higher than the specified standard applicable to India. Particle size less than 3.3 µm was also in high concentration. Benzene and toluene levels were found to be appreciably high in the selected sites. Besides respiratory symptoms other important complaints were loss of appetite, loose stools, skin itching, eye irritation and dental caries. In case of children, skin problem, cough, wheezing, diarrohea, passing of worms and dental caries were noted. Restrictive, obstructive and combined type of pulmonary function impairment was observed.

**Energy Cost of Pulling Existing and Redesigned Model of Cycle Rickshaw**

In studies done by ROHC, Kolkata it was reported last year that the model M3 was considered the best model when compared to the existing model M0 (Fig. 7). During this year experiments were carried out with M0 and M3 models. The heart rate of the subjects reduced significantly using M3 model. The working heart rate during 20 minutes was found to be lower in model M3 than M0 model. The average work heart rates were 147.0 and 136.6 beats per minute in case of M0 and M3 models respectively. The energy cost of pulling cycle rickshaw with M3 model was found to be significantly low when compared to that using M0 model (Fig. 8).

The new designed cycle rickshaw (M3) based on ergonomic principle was found to be better designed in respect of physiological cost of work and from the view point of safety and comfort of passengers and drivers. Efforts are being made to register the new designed cycle rickshaw through ICMR.

**Health Status of Workers Exposed to Storage Grain Dust**

India is basically agricultural based country with a large population engaged in handling grains. The workers are exposed to different materials including dust during storage of grains and are a common victim of respiratory ailments. Study is ongoing at ROHC, Kolkata to
monitor the dust levels to measure airborne fungal spore concentration inside the storage godowns and to evaluate the health status and PFT of the exposed workers. The mean respirable dust concentration was found to be higher than the threshold limit value (TLV) in some areas. Mass median diameter of the airborne dust was found to vary between 2.4 µm to 3.49 µm. in two different zones. The main complaints reported were allergic manifestations in the form of redness, itching, watering and foreign body sensation in the eyes. Running, sneezing and stuffiness of the nose were found to be high, so also skin rash. Other complaints mainly related to respiratory system were cough, sputum and breathlessness. The involvement of musculo-skeletal system was found in 10-18% subjects due to carrying heavy load. The results indicated higher prevalence in scheduled castes in all categories of work except load handling. Work posture of subjects was awkward causing pain and discomfort in different body parts. The study on airborne fungal spores revealed high concentration of aspergillus, ascospores, basidiospores, myxomycetes in storage and or ambient air of the godown area.

**Health Hazards of Arsenic Exposed Population of West Bengal**

Nine districts in West Bengal have been affected due to arsenic exposure. Health problems affecting skin and other systems have been reported in the population. Study was undertaken by ROHC, Kolkata for environmental-cum-biological monitoring of the exposed population. Weakness and diarrhoea was reported in exposed category. Breathlessness, chronic bronchitis and rhonchii were more in exposed population compared to control subjects. Cramps, joint and low back pain and neuropathy were appreciably more in exposed group. Anaemia and enlargement of liver was also more in exposed category. Restrictive and combined type of impairments were noticed after PFT in exposed population. Skin pigmentation and keratosis were noted in 32% population while definite arsenicosis was noted in about 7% subjects.

**Epidemiological Survey of Sporotrichosis among Tea Garden Workers in Assam**

In epidemiological survey of superficial fungal infections and sporotrichosis among tea garden workers carried out by RMRC, Dibrugarh in and around Dibrugarh, 24.3% individuals showed positive sporotrichocin skin test. Eighty samples were collected from the skin lesions for isolation and identification of the fungi, of which 16.3% showed growth of dermatophytes namely *Trichophyton rubrum* (23.1%) followed by *T. mentagrophytes* (15.4%) and *Aspergillus spp.* and *Candida* (30.8% each).