National Report for India – May 2013

- **General research activities in India related to EMF health –**

i. **Veerachari SB, Vasan SS., Int J Infertility Fetal Med 2012;3(1):15-21.** The Human semen samples exposed to EMR showed a significant decrease in sperm motility and viability, increase in reactive oxygen species (ROS) and DNA fragmentation index (DFI) compared to unexposed group. We concluded that mobile phones emit electromagnetic waves which lead to oxidative stress in human semen and also cause changes in DNA fragmentation. We extrapolate these findings to speculate that these radiations may negatively affect spermatozoa and impair male fertility.

ii. **Chandran M et al., Int. J. LifeSc. Bt & Pharm. Res. 2012.** The present study has been designed to identify the common diseases prevailing among the people dwelling in different zones near the cell phone tower. Subjects have been divided into two groups as zone I subjects dwelling close proximity up to 50 meters from the cell phone tower whereas zone II subjects 100 meters from the cell phone tower. It is evident from the study that skin disease and hair loss was common among the subjects living in zone II when compared to zone I. It is also evident from the study that diabetic cardiac and respiratory patients were markedly higher in zone I when compared to zone II. Regarding cancer, epileptic and insomnia patients were insignificant in both zone I and zone II.

iii. **Paulraj and Behari, Cell Biochem Biophys (2012) 63:97-102.** This study reveal that chronic exposure of rat to microwave radiation alter the activity of certain enzymes. There was a significant increase in calcium ion efflux and the activity of ODC. On the other hand, there is a significant decrease in PKC activity. Since these enzymes are related to growth any alteration may lead to affect functioning of the brain and its development.

iv. **Kesari et. al., Appl Biochem Biotechnology (2012) 166:379-388.** The study aims to investigate the effect of 2.45 GHz microwave radiation on wistar rates. A significant decrease ($P<0.05$) was recorded in the level of pineal melatonin of exposed group as compared with sham exposed. A significant increase ($P<0.05$) in creatine kinase, caspase 3 and calcium ion concentration was observed in whole brain of exposed group of animals as compared to sham exposed. The alteration in expression of these biomarkers clearly indicate possible health implication of such exposures.

v. **Dhami AK, Environmental Monitoring and Assessment (2012) 184:6507-12.** The present studies were taken to estimate the microwave/RF pollution by measuring radiation power densities near schools and hospitals of Chandigarh city in India. The cell phone radiations were measured using a handheld portable power density meter TES 593 and specific absorption rates were estimated from the measured values. These values of electromagnetic radiation in the environment were compared with the levels at which biological system of humans and animals starts getting affected. The highest measured power density was 11.48 mW/m(2) which is 1,148% of the biological limit. The results indicated that the exposure levels in the city were below the ICNIRP limit, but much above the biological limit.

vi. **Kumar et. al., Clinics (2011)66:1237-1245.** Another study in male Wistar rats concluded that Electromagnetic fields are recognized as hazards that affect testicular function by generating reactive oxygen species ad reduce the bioavailability of androgen to maturing spermatozoa. Thus, microwave exposure adversely affects male fertility.

vii. **Kumar et. al.Toxicology International (2011) 18:70-72.** The Present study was carried out to find the effect of cell phone radiations on various biomolecules in the adult workers of *Apis mellifera L.* Radiation from the cell phone influences honey bees behavior and physiology. There was reduced motor activity of the worker bees on the comb initially, followed by en masse migration and movement toward “talk mode” cell phone. The initial quiet period was characterized by rise in concentration of biomolecules including proteins, carbohydrates and lipids, perhaps due to stimulation of body mechanism to fight the stressful condition created by the radiations. At later stages of exposure, there was slight decline in the concentration of biomolecules probably because the body had adapted to the stimulus.

viii. **Chaturvedi et. al., Electromagnetics Research B (2011) 29: 23-42.** Microwave radiation caused an increase in erythrocyte and leukocyte counts, a significant DNA strand break in brain cells and the loss of spatial memory in mice. This report for the first time provides experimental evidence that continuous exposure to low intensity microwave radiation may have an adverse effect on the brain function by altering circadian system and rate of DNA damage.

ix. **Panda et. al.**, **J Otolaryngol Head neck Surg (2010) 39:5-11.** This study reported long term and intensive mobile phone use may cause inner ear damage.

x. **Kesari et. al.**, **Indian Journal of Experimental Biology (2010) 47:987-992.**. The results indicated significant reduction in testicular size, weight and in sperm counts. The data also indicated that the chronic exposure to Radio Frequency Radiation (RFR) imitated from cell phone causes a significant decrease in protein kinase C and total sperm count along with increase apoptosis in male rat.

xi. **Rekhadevi et. al., Toxicol Int (2009) 16:09-19.** The results of this study indicated that the genetic damage of peripheral lymphocytes and buccal epithelial cells in the mobile telephone user increased significantly, as compared with control.

xii. **Gandhi & Anita, Int J Hum Genet (2007) 11: 99-104.** In this study a correlation between mobile phone use and DNA and chromosomal damage in lymphocytes of individuals was observed which may have long-term consequences in terms of neoplasia and/or age-related changes.

xiii. **Gandhi & Singh, Int J Hum Genet (2005) 5:259-265.** The data revealed increased number of micro nucleated buccal cells and cytological abnormalities in cultured lymphocytes indicating the genotoxic response from mobile phone use. As exposure to radiofrequency radiations has been reported to affect physiological, neurological, cognitive and behavioral changes and to induce, initiate and promote carcinogenesis; threat to human health has been suggested for mobile phone users.

- **New policies and legislations regarding EMF exposure**

The recommendations of the Inter-Ministerial Committee appointed by Dept. of Telecommunication, Ministry of Communication and IT, Govt. of India have been partially implemented w.e.f. 1st Sept., 2012. The exposure limit for the radio frequency field (Base Station Emission) has been lowered to 1/10th of the existing exposure limit as a major recommendation. The other recommendations of the Inter-Ministerial Committee which includes SAR level for mobile handsets and other relevant issues will be implemented w.e.f. 1st Sept, 2013. The detailed report and recommendations of the Inter-Ministerial Committee are available on the website of Ministry of Telecommunication.
http://www.dot.gov.in/miscellaneous/IMC%20Report/IMC%20Report.pdf

- **Areas of public concern and National response**

Both electronic and print media are regularly raising the concern of the people who are living near the cell phone towers. Even various residential welfare associations and number of independent activist have raised the various types of health hazards being faced by the people living near the cell phone towers. In few cases it has been published in the news paper indicating that the incidence of cancer has increased among the people residing near the cell phone towers.

- **New public information activities**

The Dept. of Science and Technology and Dept. of Telecommunication have jointly constituted a Committee of experts where Dr. R. S. Sharma, Scientist from ICMR and from other premier institution of the Country are participating as member of the Committee. The Committee has invited proposals from scientists of the Country to undertake research on impact of electromagnetic field (EMF) on health.

To study the adverse effects of RFR emitted from cell phone on neurological disorders (cognitive behavior, sleep related disorders, depression etc.), reproductive dysfunctions, promote cancer, cardiovascular disorders and otological disorders in Indian population, the ICMR is conducting a prospective cohort study in Delhi & National Capital Region (NCR). Under this study the provision has been made to measure specific absorption rate, power density, wave length and frequency of RFR emitted from various types of cell phones used by the enrolled subjects. The physical characteristics of RFR emitted from various cell phones will be correlated with the clinical & laboratory findings.