

India is among the few developing countries confronted with the so called dual disease burden. While on one hand we have yet to come out of grip of infectious diseases simultaneously due to change in life style we are facing epidemic of non communicable diseases viz. Cancers, Diabetes, Cardiovascular diseases and Obesity. National Institute of Pathology is committed to carry cutting edge research on both communicable and non communicable diseases with attempt to translate the knowledge generated from lab to medical practice. The thrust areas of research include Leishmaniasis, genital chlamydial infection, cancers, environmental toxicology and bioengineering of skin for clinical applications. Institute has made pioneer contributions in understanding disease process, development of preventive interventions, new diagnostic tools and establishment of novel therapeutic strategies.

Leishmaniasis, caused by parasitic protozoa of *Leishmania* species is predominant in tropical and sub tropical regions of the world with 12 million cases. In India, Visceral leishmaniasis (VL) or kala-azar (KA) caused by *Leishmania donovani* is responsible for considerable morbidity and mortality. There is no suitable vaccine and treatment with existing drugs is fraught with serious side effects. In recent years resistance to the first line drug sodium antimony gluconate (SAG) has acquired alarming proportions, affecting 50-65% of cases in hyperendemic regions of Bihar. The areas that need urgent attention include development of diagnostics, drugs and vaccines. Furthermore, 5 to 15% of cured KA patients in India develop a dermatosis termed post kala-azar dermal leishmaniasis (PKDL) which is particularly difficult to diagnose due to low parasite burden. It is well appreciated that recognition and treatment of PKDL is important for KA control program as PKDL provides the sole reservoir of the parasite in India. At National Institute of Pathology we have developed highly sensitive and specific molecular and immunological tests for non invasive diagnosis of both kala-zar and PKDL. We have also identified one virulent gene, centrin, whose knock- out mutants show vaccine potential. Studies on functional characterization on a set of virulence-related genes identified by genomic and proteomic approaches are undergoing for vaccine development and identification of novel targets for drug development.

*Chlamydia trachomatis* causes one of the most prevalent bacterial sexual transmitted infections (STIs) with a huge magnitude of associated morbidity. Ascending infection of the genital tract is frequently asymptomatic in its acute form, but can progress to salpingitis, infertility and pelvic inflammatory disease with chronic or recurrent exposure. A high prevalence

of CT infections, both symptomatic and asymptomatic has also been reported from India .Persistent infection of Chlamydia in the female genital tract increases chances of co-infection with HIV and facilitate human papilloma virus-induced cervical neoplasia At NIP we have developed indigenous diagnostic assays (serovar and species specific) for Chlamydia trachomatis, identified proteins acting as potential candidates for vaccine development and biomarkers for prognosis of women at risk of developing a sequelae to chlamydial infection. Initial studies on chlamydial infection were mainly on genital infection but recently study has been extended to coronary artery disease also. We have identified biomarkers for a risk of developing Coronary Artery Disease due to *C. pneumoniae* infection.

The National Institute of Pathology has made seminal contributions in identifying **risk factors, prognostic and predictive biomarkers, and drug targets** for cancers of national importance. Thrust areas of research have been the breast cancer, urologic malignancies including prostate and urinary bladder cancer, haemotopoitic-lymphoid malignancies and brain tumors with a view to identify genetic factors and molecular mechanism involved in carcinogenesis. More recently, studies on cancers in Northeast region in India have been initiated since this region has reported a very high incidence of several cancers including those known to be associated with use of tobacco and with pesticide exposures. Studies are mainly focused to explain the gene-environment interactions that may be responsible for the high prevalence of certain cancers in this region.

Industrial and Green Revolutions are the two major events in the recent past that have significantly changed both the human life style as well as the environment. Concerns are being raised about the adverse effects of these technical developments on all the four components of environment, viz., atmosphere, lithosphere, hydrosphere and biosphere. The present situation is characterised by significant man-made changes in the biosphere and thus there is a need for quantitative description of biological response to changing levels of pollutants in the environment. While several attempts have been made in past on monitoring of pollutants in physical environment, attempts involving monitoring in human beings have been rather scarce. Over last couple of years we have been attempting to develop a model for Human Environmental Bio-monitoring using placenta as a model. The primary objective is to study biological effects of toxins following exposure to them from natural and anthropogenic sources within a risk assessment framework.

The technique to culture human epidermis for autologous skin transplantation in burns has been standardized and preliminary and clinical trials have been successfully performed. The future therapeutic potential of

human somatic stem cells of the skin using cultured human epidermal keratinocyte stem cells on supportive biopolymer gel scaffold for autologous application in burns patients is underway.

It is a matter of intense gratification that the academic activities at the National Institute of Pathology have increased leaps and bounds during the last decade or so. The academic activities include carrier-building programs for pathologists, biomedical scientist as well as technicians. Institute is running Diplomat of National Board (DNB) course in pathology accredited by National Board of examination with good track record. Institute is also accredited for Ph.D. program by BITS, Pilani, Guru Gobind Singh Indraprastha University (GGSIPS). Delhi. Besides Institute is recognized as Institute of Excellence by Ministry of Health & FW and running courses for short-term training for technicians and pathologists for WHO. Institute of Pathology has state-of-art research facilities and several national and international collaboration to realize the research goals.