FROM DIRECTOR'S DESK
Elimination of Silicosis by 2030

Silicosis still remains an important occupational lung disease of persons employed in mines and other Industries where exposure to dust is an important health risk. Despite legislative provisions and statute a large number of cases of silicosis remain undetected, undiagnosed or misdiagnosed. It is no secret that the number of cases reported to the enforcement authorities reflects only a tip of iceberg. Number of studies conducted by various Institutions and Non Government Organization (NGOs) have shown high prevalence of silicosis in mines and other industries. Non Government Organization (NGOs) have brought to the notice a number of cases of silicosis detected in various areas i.e. Lalkuan in Delhi, Bundelkhand in M P, Jodhpur and Karauli in Rajasthan and many others. The Honorable Supreme Court of India and National Human Rights Commission have taken a serious view of occurrence of silicosis and the status of compensation and rehabilitation of workers affected. It is not out of place to say that the present system of detection, notification and compensation of cases of occupational diseases in general and silicosis in particular has not succeeded. The ILO/WHO Global Programme on Elimination of Silicosis proposes to eliminate silicosis by 2030 as an occupational disease and has suggested that every country should have a national elimination programme. In view of the recommendations of National Human Right Commission, it is necessary that a concerted effort in the form of a national programme for elimination of silicosis is formulated and implemented.

It is also high time that the government takes initiative in formulating a national plan for prevention and control of silicosis in India so that the objective of eliminating silicosis by 2030 is achieved.

Dr. P. K. Sishodiya

SOCIAL DEVELOPMENT PROGRAMME IN COLLABORATION WITH RUSA

In lines with corporate social responsibility and with a view towards betterment of the society, the institute organized on 25th January, 2011 an awareness programme on “First Aid and Nutrition & Personal Hygiene” for about 85 children from the Rural Up-liftment Service Association of India (RUSA). Major Hemat Jakate (Retd.) and Mrs. Sulabha Jakate were the chief guests for this function while Shri B B Pawar, Director, RUSA and Dr. Jyoti Mukhopadhyay, Director, JNARDDC were the guests of honour. Dr. P K Sishodiya, Director, NIMH during his inaugural speech emphasized the essentiality of first aid practice and personal hygiene for school children. Lauding the initiative of NIMH, Dr. J Mukhopadhyay stressed the need of first aid training amongst school children.

In the course of the programme, Dr. S. S. Nandi, Research Officer, NIMH, delivered a lecture on first aid practice to the participants. This was followed by a practical training on first aid application and a drawing competition for the participating children. The programme concluded with a vote of thanks and awards for the winners of the drawing competition. Special awards were also given to the most interactive students observed during this programme.

As a gesture towards the society, NIMH also donated first aid kits and books on administering first aid to RUSA.
REVIEW OF INSTRUMENTS

Historical Dust Sampling Equipment - P.R.U. Hand Pump

The P.R.U. hand pump is a sampler that was in great use during the nascent period of sampling in the history of Industrial Hygiene. This instrument was developed by the Pneumoconiosis Research Unit (PRU) of Great Britain.

It was based on the principle that it produced on a filter paper, a stain whose opaqueness was directly proportional to the quantity of dust collected on it. Evaluation was done by means of a densitometer, with the light absorbed being taken as a function of the dust deposited. Uniformity of the dust being measured was essential, as the instrument was calibrated according to the characteristics of the sampled dust.

However owing to difficulties in calibration and obtaining reliable estimates of the dust collected, instruments working on this principle were largely superseded by more scientific methods for routine mine dust sampling.

-G. S. Ravindra

Noise Pro DLX:

The Noisepro DLX is a DGMS approved personal noise dosimeter. Manufactured by M/s. Quest Technologies, USA, this noise dosimeter is used to measure the noise levels and noise dosage the worker is exposed to during an entire shift. During sampling the dosimeter is attached in such a way that the microphone’s position is near the collar of the worker whose noise exposure levels are being monitored. The Noisepro DLX is capable of measuring Sound Pressure Levels (SPL) in the range from 40 to 140 dB(A) with fast, slow and impulse response. Equipped with exchange rates of 3, 4, 5 and 6 dB, different frequency weightings and a facility for calibration, the Noisepro DLX has nine preserved set-ups, four of which are pre-configured to comply with Occupational Safety and Health Administration (OSHA), Mine Safety and Health Administration (MSHA), American Conference of Governmental Industrial Hygiene (ACGIH) and 2003/10/EC directives of the European Union Noise Dosimetry standards. There is also an additional facility of saving set-ups made as per the requirements of a particular sampling strategy.

Also, in addition to being capable of manual and software operation, the noise dosimeter also comes with a special feature whereby the instrument goes into vibration mode when the worker to which it is attached moves into a high SPL zone. The levels can be fed into the dosimeter as per the relevant guidelines.

-P. D. Zade

Spirometer:

The spirometer is a primary instrument used for lung function tests. Most of the recent spirometers are built with compliance of ATS, OSHA and NIOSH standards. It utilizes the latest technology to simplify lung function tests for screening of restrictive and obstructive impairment. With high resolution patient incentive screens, they also display real time flow volume loops and detailed measurement matrices. Additionally they also have a built in high resolution printer that provides easy-to-read reports.

Most common parameters measured in spirometry are:

Vital capacity (VC) - The amount of air (in liters) moved out of the lung during normal breathing. Here the subject is instructed to breathe in and out normally to attain full expiration. The VC is usually about 80% of the total lung capacity.

Residual Volume (RV) - Because of the elastic nature of the lungs and surrounding thorax, a small volume of air always remains in the lungs after full exhalation. This volume is called the RV.

Forced Vital Capacity (FVC) - It is measured after breathing out normally to full expiration. Here the subject is instructed to breathe in with a maximal effort and then exhale as forcefully and rapidly as possible. The FVC is the volume of air that is expelled into the spirometer following a maximum inhalation effort.

Forced Expiratory Volume (FEV) – It is measured at the start of the FVC maneuver. The spirometer measures the volume of air delivered through the mouthpiece at timed intervals of 0.5, 1.0, 2.0, and 3.0 seconds. The sum of these measurements normally constitutes about 97% of the FVC measurement. The most commonly used FEV measurement is FEV-1, which is the volume of air exhaled into the mouthpiece in one second. The FEV-1 should be at least 70% of the FVC.

Forced Expiratory Flow 25–75% (FEF 25–75) - This is a calculation of the average flow rate over the center portion of the forced expiratory volume recording. It is determined from the time in seconds at which 25% and 75% of the vital capacity is reached. The volume of air exhaled in liters per second between these two times is the FEF 25–75. This value reflects the status of the medium and small sized airways.

-S. C. Narwadiya
**Genotoxicity assessment by Comet Assay:**

Acute and chronic exposure of several toxicants from environment develops health problem in humans. Some of these toxicants affect DNA, which is the carrier of inherited information and any gross change in its structure potentiates serious biological change. Hence newer and more sensitive test have now been introduced for assessing genotoxicity in diseases.

Single cell gel (SCG) electrophoresis or ‘Comet assay’ is a simple, sensitive, reliable, rapid, non-invasive and visual technique for assessing genotoxicity or DNA damage and repair in an individual cell. Currently, this technique has gained more importance in the field of genetic toxicology, molecular epidemiology, environmental biomonitoring, and apoptosis.

It was first introduced by Ostling and Johanson in 1984 as a neutral assay in which the lysis and electrophoresis were done under neutral conditions. Only double strand breaks could be analyzed by this method. This technique was then further modified as highly alkaline version of electrophoresis whereby a comet forms as the broken ends of the negatively charged DNA molecule become free to migrate in electric field towards the anode after electrophoresis. The tail length increases with the damage in DNA and these are measured by the length of different types of comet (DNA damage) by comet software. In few hours results can be obtained as compared to conventional cytogenetic techniques which take considerably more time.

Scientists have used comet assay for diseases such as multiple sclerosis, systemic lupus erythematosus and silicosis. A comet assay can also be performed in order to test the toxicity of mining pollutants as they have been thought to contribute to the general decline in cellular functions that are associated with the genotoxicity.

- R. G. Tumane

**International Developments:**

**MSHA advisory on preventing ignitions and explosions**

Fires and explosions in underground coal mines are preventable. It is vitally important that underground coal mine operators and miners follow proper procedures and well-known preventative measures to ensure that these catastrophic and tragic events do not happen. Proper examinations and maintenance can and do prevent explosions.

The fuel for a fire or an explosion can be the right mixture of flammable gas, a sufficient concentration of coal dust, or a combination of both. The heat to ignite the combustible mixture can come from sparks, electrical arcs, detonation of explosives, or even a stuck belt roller on a conveyor belt which causes friction that, in turn, generates heat. Oxygen sufficient to support combustion is generally present throughout active areas of the mine. Fires and explosions can be prevented by eliminating any one element of the fire triangle.

Float coal dust is a serious explosion hazard if it accumulates on top of the rock dust and the area is not inerted by the application of additional rock dust. The explosion hazards of float coal dust have been studied over many decades by the former U.S. Bureau of Mines and NIOSH.

**R & D projects**

**Ongoing S & T projects**

<table>
<thead>
<tr>
<th>No</th>
<th>Name of the Project</th>
<th>Sponsoring Agency</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>1.</td>
<td>Development of protocol for evaluation of vibration hazard potential of mining equipment. (EMIL - Barabil mines, Fomento Iron Ore Resources)</td>
<td>Ministry of Mines S&amp;T Division, GOI</td>
<td>Field study in progress</td>
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<td>2.</td>
<td>Systematic study of potential biomarkers of occupational diseases in miners. (HINDALCO - Radhanagari &amp; Chandgadh mines)</td>
<td>Ministry of Mines S &amp; T Division, GOI</td>
<td>Field study conducted</td>
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**Ongoing Clientele Projects**

<table>
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<th>No</th>
<th>Name of the Projects</th>
<th>Participating Scientists</th>
<th>Month/Year</th>
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<tbody>
<tr>
<td>1.</td>
<td>Vibration Exposure &amp; Assessment of Health-risk in use of Mining Equipments at Fomento Iron Ore Resources</td>
<td>D. Chatterjee, K. Sarkar</td>
<td>Jan 2011</td>
</tr>
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<td>3.</td>
<td>Airborne respirable dust studies at Limestone mines of M/s. Heidelberg Cement India Ltd</td>
<td>G. S. Ravindra &amp; J. Jayakumar</td>
<td>Feb 2011</td>
</tr>
<tr>
<td>5.</td>
<td>Area and personal dust monitoring study at Jilling and Langlota Iron-Ore mines of Essel Mining and Industries Ltd.</td>
<td>D. Chatterjee, N. Kulkarni and K. Sarkar</td>
<td>Mar 2011</td>
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CONFERENCES/TRAINING/VISITS:

Visit Of Dr. Sunita Hirani for Rotational Training under NIMH-UCSF Educational Programme

Dr. Sunita Hirani, a resident in Occupational Medicine completed a one month Rotational Training programme at NIMH under NIMH-UCSF educational programme signed between the institute and School of Medicine, University of California, San Fransisco, USA.

During the training programme she was familiarized with the working of NIMH, the role and function of DGMS and enforcement of Occupational Health statute in Mines. She visited Kandri Manganese Ore and Kamptee Opencast Coal Mine & PME Center & Regional Hospital.

Seminar on Occupational Health issues in Manganese Mines

A Seminar was organized by the institute in collaboration with MOIL on 19th Jan, 2011 for Managers, Safety Officers, Medical Officers and other officials of manganese mines.

The seminar was inaugurated by Shri K J Singh, Chairman cum Managing Director, MOIL Ltd., The Director, NIMH was the Guest of Honour. The seminar was attended by about 40 delegates. Lectures were delivered on “Occupational Health Issues in Manganese Mines” by Dr. P K Sishodiya, on “Vibration Hazard in use of HEMMs” by Shri B. B. Mandal, and Occupational Health Practice in USA by Dr. Sunita Hirani.

Visit to Stone Mine at Karauli, Rajasthan

The Director NIMH visited stone Mines in Karauli along with officials of ARAVALI on 23rd February 2011 to study the working condition of miners and to plan a social responsibility programme for a study on detection of Silicosis among workers. There are about 1500 to 2000 small mines in the area employing approximately 20,000 workers. Complaints have been received that a number of workers in these stone mines may be suffering from silicosis and silico-tuberculosis.

Conference on Emerging Trends in Preventing Occupational Respiratory Diseases

Dr. P K Sishodiya, Director, NIMH and Dr. S Nandi, Research Officer, Occupational Health, attended the international conference on “Emerging Trends in Preventing Occupational Respiratory Diseases (Silicosis, etc.) & Cancers in the Workplace” held at Maulana Azad Medical Collage, New Delhi from March 22 to 24, 2011. Dr. P K Sishodiya also conducted a workshop on ILO Classification of Radiographs of Pneumoconiosis 2000 for delegates.

Paper Presentation at IAOH Conference, Vadodara

Shri G S Ravindra, Asst Director, NIMH, KGF participated in a national conference of Indian Association of Occupational Health between 16 Feb to 19 Feb 2011 at Vadodara. He presented a paper co-authored by Shri J. Jayakumar and Dr. P. K.Sishodiya titled “A Review of ‘Portal to Portal’ Airborne Respirable Dust Studies in the Underground Mines of Kolar Gold Fields”.

Forthcoming Events:

Our Mission

“Indian Mining & Mineral Industries sans Occupational Diseases”