



**International Scientific
Conference and Workshop on
Occupational Health and Safety
in Formal and Informal Mining**

**22nd to 25th of August 2017
Odense, Denmark**

**Program and
Abstract book**



International Commission on Occupational Health
Scientific Committee on Mining Occupational Safety and Health
MinOSH



**NIVA
Education**

International Scientific Conference and Workshop on Occupational Health and Safety in Formal and Informal Mining
22nd to 25th of August 2017, Odense, Denmark

Program at a glance

Time	Arrival Monday 21 of August	Day 1 Tuesday 22 of August	Day 2 Wednesday 23 of August	Day 3 Thursday 24 of August	Day 4 Friday 25 of August
08:30-09:10		Opening ceremony	Morning keynote 5 Raul Harari Working conditions in small-scale gold mining in Ecuador.	Morning keynote 9 Ulrich Meesmann VISION ZERO: Yes we can! - Prevention in Mining.	8.30-10.30 Practical training in use of NIOSH Web-based tools to improve OHS in mining. Emanuele Cauda
09:10-09:50		Morning keynote 1 TK Joshi The human cost of working in dusty occupations in India.	Morning keynote 6 Pál Weihe Mercury pollution from mining - global effects on human health.	Morning keynote 10 Helmut Ehnes Excellence For Safety & Health In Mining. ISSA Mining . Your Global Partner	
09:50-10:30		Morning keynote 2 Bengt Järholm Prevalence and prevention of silicosis and coalworkers pneumoconiosis.	Morning keynote 7 Peter Appel Mercury free gold mining . how to use alternatives.	Conference closing ceremony and conclusion remarks	
10:30-11:00		Coffee break	Coffee break	Coffee break	Coffee break
11:00-12:00		Oral Session 1 . Lung diseases	Oral Session 5 - Noise, injuries and disasters in mining	11:00-11:30 Start of workshop NIVA Welcome and Introduction	11.00-13.00 Prevention in Artisanal and Small-Scale Mining Raúl Harari and Peter Appel.
12:00-12:45		Poster Session	Oral Session 6 . Other exposures in mining	11:30-13:00 Prevalence and prevention of lung diseases in mining ¿ what to do? Bengt Järholm and David Sherson	Round table discussion
12:45-13:45		Lunch and poster exhibition	Lunch and poster exhibition	Lunch	Lunch
13:45-16:00		13:45-14:30 Oral Session 2 . Small-scale mining, poisonings and prevention 1	13:45-14:45 Special session Minerø experiences with Accidents and Occupational Health and Safety. Rasmus Køster-Rasmussen Mercury Pollution from Small-Scale Gold Mining Can Be Stopped by Implementing the Gravity-Borax Method	14:00-16:00 Prevalence and prevention of lung diseases in mining ¿ what to do? Maria Albin	14:00-15:00 Discussion and general conclusions
		14:30-15:15 Afternoon keynote 3 David Walters Role of worker representation on occupational safety and health in coal mining in different countries	14:45-15:30 Afternoon keynote 8 Emanuele Cauda Web-based tools to improve occupational health and safety in mining.		
		15:15-16:00 Afternoon keynote 4 Maria Albin Fibrous materials naturally occurring in mines, health-related diseases and how this can be adequately monitored	15:30-16:00 Oral Session 7 ¿ Part 1 . Preventive measures		
16:00-16:15	16:00-19:00	Coffee break	Coffee break	Coffee break	
16:15-18:15	Registration to conference and workshop	16:15-17:15 Oral Session 3 - Small-scale mining, poisonings and prevention 2	16:15-17:00 Oral Session 7 ¿ Part 2 . Preventive measures	16:15-18:15 ISSA training VISION ZERO Betina Nickel, Matthias Stenzel and Helmut Ehnes.	
		17:15-18:00 Oral Session 4 - Small-scale mining, poisonings and prevention 3	17:00-18:15 Oral Session 8 . Good practices		
19:00-21:00	Welcome reception at Dalum Landbrugsskole	Hans Christian Andersen Festival Odense City	19:00-23:00 Conference dinner at Dalum Landbrugsskole	Hans Christian Andersen Festival Odense City	15:00 Closing of workshop

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WELCOME Address from Conference Chairs

It is our great pleasure to welcome you to the International Scientific Conference and Workshop on Occupational Health and Safety in Mining on behalf of ICOH's Scientific Committee (SC) on Occupational Safety and Health in Mining (MinOSH) and the Nordic Institute for Cooperation on Advanced Education in Occupational Health (NIVA).

A warm welcome is also given by our collaborators and co-sponsors ISSA-Mining, University of Southern Denmark (SDU), Clinic of Occupational Medicine at Odense University Hospital, Denmark's National Research Centre for the Working Environment (NFA), Danish Society of Occupational Medicine, Dialogos, ICOH SC Industrial Hygiene, ICOH SC Small Scale Enterprises and the Informal Sector, ICOH SC OH and Development, Greenland Center for Health Research, and Work Place Health Without Borders.

In this event, occupational health professionals, technicians and miners are brought together from all over the world to exchange experiences and ideas on how to improve the working environment in mining, one of the most dangerous workplaces globally. We have done our best to attract participants from low-income countries as well by focusing on small-scale mining and by sponsoring a number of participants and keynote speakers from these countries.

As you can see on the following pages, the program is varied with experienced keynote speakers on important issues in mining, and many oral and poster presentations on lung-diseases, accidents, noise, poisonings and preventive measures, among others. We provide an interesting arrangement to continue after the conference with a NIVA workshop where more in-depth practices and discussions with a focus on practical preventive measures will take place.

We have managed to engage many key-players in miners' safety and health, and it is a special pleasure to have ISSA-Mining with us in this event.

We hope that you will enjoy the conference and workshop and that we will have some fruitful time together in Odense. It is our luck that at the same time as this event, a Hans Christian Andersen week is celebrated in Odense, his native town. Here you can enjoy performances based on his world famous fairytales.

See you soon in Odense to welcome you on behalf of the organizers, collaborators and co-sponsors,

Erik Jørs, MD, PhD
Chair MinOSH
Chair Organizing Committee for the Conference

Florencia Harari, MD, PhD
Secretary MinOSH
Chair Scientific Committee for the Conference

WELCOME Address from ICOH

It will be my great pleasure, as Vice President, ICOH, to participate in this conference with you in August in Odense and to welcome the speakers and attendees on behalf of Dr. Jukka Takala, President of the International Commission on Occupational Health. ICOH is the oldest and largest international occupational safety and health professional association (www.ichweb.org). It was formed in 1906 by physicians who gathered at the first international Congress in Milan and agreed to work together to prevent future problems that had caused the large numbers of deaths of workers constructing the tunnels connecting Switzerland and Italy. Today there are about 2,000 professional members in ICOH, from 93 countries. ICOH is an international non-profit, non-political, multidisciplinary scientific organization whose purpose is to foster scientific progress, knowledge and development of occupational health and related subjects on an international basis. ICOH has formal relationships with the World Health Organization (WHO) and the International Labour Organisation (ILO).

The structure of ICOH facilitates experts working together in their specialty areas in 37 different Scientific Committees, as well as working collaboratively. The organizer of the Odense Meeting is SC Mining Occupational Safety and Health, our newest Scientific Committee, welcomed into ICOH in 2015. We are very proud of the substantial accomplishments of SC MinOSH under the leadership of Chair Erik Jørs and Secretary Florencia Harari. Among other things, they have organized this excellent Odense conference, and many members contributed to a current valuable publication summarizing key occupational safety and health risks in mining and practical approaches to prevention. Part 1 of "Safety and Health in Mining" has been published in the Occupational Health Southern Africa Journal in its May/June 2017 issue, available at: <http://www.occhealth.co.za/?/viewArticle/1787>. Parts 2 and 3 will be published in future issues of the same journal. These will also soon be available on the SC MinOSH website (www.ich-minosh.com).

ICOH hosts an International Congress every three years, and most Scientific Committees hold a specialty area conference during each Triennium. The next ICOH Congress, to which we warmly invite you, will be held in Dublin, Ireland April 29 – May 6, 2018. See www.ich2018.org. Mining topics are included. Abstract submissions are welcome until July 16, 2017.

I look forward to meeting you in Odense and in Dublin.

Best regards,

Marilyn Fingerhut
Vice President ICOH

TABLE OF CONTENTS

Scientific committee	8
Organizing committee	8
Keynote speakers	9
Abstract reviewers	9
Venue	10
Practical information	11
Social program	13
Detailed Scientific Program	14
Abstracts: Oral Sessions	19
Abstracts: Poster Sessions	61
List of participants	73

SCIENTIFIC COMMITTEE

Florencia Harari	Dept. Occupational and Environmental Medicine, Gothenburg University / Secretary MinOSH	Sweden
Erik Jørs	Clinic of Occupational Medicine/ Chair MinOSH	Denmark
Vivi Schlüssen	National Research Centre for the Working Environment	Denmark
Rasmus Køster-Rasmussen	Dialogos	Denmark
Marilyn Fingerhut	Consultant NIOSH - Vice President ICOH	USA
David Sherson	Scientific committee lung diseases ICOH	Denmark
Raúl Harari	Occupational and Environmental Clinic, Odense University Hospital IFA - Institute for the Development of Production and the Work Environment	Ecuador
Cas Badenhurst	Group lead: Occupational Health and Hygiene, AngloAmerican	South Africa
Peter Appel	Apelglobal	Denmark
Gert Mulvad	Greenland Center for Health Research, University of Greenland	Greenland
Stephan Bose O'Reilly	University Hospital Munich and Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine	Germany
Claudina Nogueira	Occupational Health Consultant / University of Pretoria	South Africa
Helmut Ehnes	ISSA Mining	Germany
Jane Frølund Thomsen	Department of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen	Denmark
Jesper Bælum	Occupational and Environmental Medicine	Denmark
Ole Carstensen	Research Unit of General Practice Department of Clinical Medicine - Arbejdsmedicinsk klinik, Herning	Denmark

ORGANIZING COMMITTEE

Erik Jørs	Clinic of Occupational Medicine/ Chair MinOSH	Denmark
Florencia Harari	Dept. of Occupational and Environmental Medicine, Gothenburg University / Secretary MinOSH	Sweden
Cecilia Weckman	NIVA	Finland
Marilyn Fingerhut	NIOSH / Vice President ICOH	USA
Claudina Nogueira	Occupational Health Consultant / University of Pretoria	South Africa
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Lene Lysholt	Inspiring Denmark	Denmark
Paul Anker Lund	National Research Centre for the Working Environment	Denmark
Kirsten Jürgensen	National Research Centre for the Working Environment	Denmark

KEYNOTE SPEAKERS

Maria Albin	Occupational Medicine and Institute of Environmental Medicine, Stockholm City Council and Karolinska Institutet, Sweden.
Peter Appel	Apelglobal, Denmark.
Emanuele Cauda	NIOSH, USA.
Helmut Ehnes	ISSA Mining, Germany.
Raúl Harari	IFA - Institute for the Development of Production and the Work Environment. Ecuador.
TK Joshi	Supreme Court commissioner for Silicosis, Government of India for Mining Sector, India.
Bengt Järvholm	Umeå University, Sweden.
Ulrich Meesmann	President of ISSA Mining, Germany.
David Walters	Cardiff Work Environment Research Centre, Cardiff University, UK.
Pál Weihe	Research Associate Professor, Environmental Medicine, University of Southern Denmark, Denmark.

ABSTRACT REVIEWERS

Lena Andersson	Raul Harari
Peter Appel	Tushar Kant Joshi
Casper Johannes Badenhorst	Erik Jørs
Thuthula Balfour	Rasmus Køster-Rasmussen
Lars Barregård	Gert Mulvad
Ole Carstensen	Claudina Nogueira
Helmut Ehnes	Monica Nordberg
Diana Gagliardi	Vivi Schlünssen
Florencia Harari	Jane Frølund Thomsen

VENUE

The conference will be held in Odense, the home town of the famous writer Hans Christian Andersen. Odense is located on the Isle of Funen in the very center of Denmark, with enticing tourist attractions in the most beautiful natural surroundings.

The conference venue will be Dalum Agricultural College (Dalum Landbrugsskole), part of the University of Southern Denmark (SDU).

Address: Dalum Landbrugsskole, Afd. Dalum Landbrugsvej 65, 5260 Odense S.

Website: <http://dalumls.dk/english/>

How to get there: From the train station take city-bus no. 60-62 to Dalum Landbrugsskole or take a taxi.



Dalum Agricultural College is one of Denmark's largest and oldest agricultural colleges – today a modern international college for further agricultural education with proud traditions and a historical atmosphere. Dalum Agricultural College was founded in 1886 as a continuation of the famous principal Christen Kold, who built Dalum High School at the same place in 1862. The original premises of Christen Kold are still being used at the college – together with quite modern educational areas.

Dalum Agricultural College has discreetly preserved the essence of the Danish high school both in the historical buildings but also in the environment of the college, which is influenced by a large accommodation and boarding department.

PRACTICAL INFORMATION

Best Abstract Award and Partial Scholarships

The best abstract submitted to the conference will receive the best abstract award. The awardee will be announced during the conference dinner together with the announcement of the participants from low-income countries who were granted partial scholarships.

Badges

All conference participants receive a name badge when registering for the conference which serves as entrance ticket to the conference and to the conference dinner, lunches, and coffee breaks.

Participants are kindly requested to wear their badges at all times. They will be coded as follows:

Conference delegates: Black

Organizing committee: Red

Currency

The Danish currency is the Danish krone. All major credit cards are known and accepted throughout most establishments in Odense. ATMs are available everywhere in town.

Electricity plugs

230 V/50 Hz

Evaluation

You will receive an evaluation form by e-mail on the following Friday after the conference.

First aid/medical assistance

Should you need first aid/medical assistance, please contact: Venue, Dalum Agricultural College
Majken Helsgaard: +45 6313 2711 (mh@dalumls.dk). Emergency number: +45 112.

Internet access

The venue has free internet access. Participants at the workshop are requested to bring their own laptops to be used during practical trainings.

Oral presentations

Please hand in your PowerPoint-presentation for the sessions at the conference service desk at least two hours before your assigned session begins.

Oral presenters must be present in the room 10 minutes prior to the start of their session.

The duration of the spoken presentation is fifteen (15) minutes, including question and answer time. Presenters show their research and findings based on their accepted abstract in a Power Point presentation. Presentations must be in English.

Poster presentation

Posters must be in place before 12.00 on Tuesday 22nd of August and presenters are expected to be present by their posters at the time for poster presentation according to the program. Posters will remain on exhibition until the end of the conference.

Physical posters will need to be printed in advance and a poster board will be allocated in a designated area of the Conference. Posters should be no larger than portrait A0 (841mm width x 1189mm height). All posters must be produced in English.

Smoking

It is not allowed to smoke on the Venue, Dalum Agricultural School. Smoking is, however, allowed in streets and in open/public areas.

Transport

You will find a map of Odense in your conference bag. Please feel free to contact the conference service desk if you have any questions.

- **Public transportation:** <http://www.odense.dk/borger/trafik-og-veje/transport>
- **Taxi:** <http://www.taxafyn.dk/informationer/priser/takster-odense-taxa>
- **Tourist attractions, Odense:** <http://www.visitodense.com/In-int/odense/visitodense-0>

SOCIAL PROGRAM

21 August, 19:00-21.00

Welcome reception at Dalum Agricultural College (Dalum Landbrugsskole).

Opening speeches

Entertainment and music

22 August, 19:30-22.00 (after dinner)

Excursion, Hans Christian Andersen tour, Odense

Boat trip to Odense

Guided tour (English) in Odense, 20:00-22.00

From Odense city you need to get home by taxi or city-bus

23 August, 08:00-16:00

Bus trip on Funen for accompanying persons

The excursion will be to places on the island Funen, but it is not planned in details yet. You will get information at the registration.

Payment is made on the day. You need to pay the excursion in Euros (notes only, no coins)

23 August, 19:00-23:00

Conference dinner at Dalum Agricultural College (Dalum Landbrugsskole).

Entertainment and music

26 August, 08:00-21:30

Post-conference, boat trip to the island Ærø

A bus will pick you up at the venue and drive you to the harbor in Svendborg where you will take a boat to Ærø. Erik Jørs will show you Ærø (see <http://visitaeroe.dk/>). In the evening you take the boat back to Fünen where the bus will take you back to the venue.

Payment is made on the day. You need to pay the excursion in Euros (notes only, no coins).

DETAILED SCIENTIFIC PROGRAM

Monday 21 August	
16:00-19:00	Registration to conference and workshop
19:00-21:00	Welcome reception at Dalum Agricultural College (Dalum Landbrugsskole)

Day 1	Tuesday 22 August
08:00-08:30	Registration
08:30-09:10	Opening ceremony Erik Jørs, University of Southern Denmark/Odense University Hospital, MinOSH Marilyn Fingerhut, Vice President of ICOH Helmut Ehnes, Secretary, ISSA Mining Peder Jest, Director at the Odense University Hospital Inger Schaumburg, Director at the National Research Centre for the Working Environment
09:10-09:50	Morning keynote 1 The human cost of working in dusty occupations in India. TK Joshi, Supreme Court Commissioner for Silicosis, Government of India for Mining Sector, India
09:50-10:30	Morning keynote 2 Prevalence and prevention of silicosis and coal workers pneumoconiosis Bengt Järholm, Professor, Occupational Medicine, Umeå University, Sweden
10:30-11:00	Coffee break
11:00-12:00	Oral Session 1 Lung diseases Session Chairs: Maria Albin and David Lee Sherson
11:00-11:15	Green Stones processing post-quarrying: asbestos risk exposure and prevention Annalisa Guercio
11:15-11:30	The HRCT Findings Of Chest Radiograph-Confirmed Borderline Pneumoconiosis Youn-Mo Cho
11:30-11:45	Time Trends for Silica Exposure in the Ontario Mining Industry Victoria Arrandale
11:45-12:00	Asbestos-related Disease in Indonesian Workers Exposed To Asbestos Anna Suraya
12:00-12:45	Poster Session
12:45-13:45	Lunch and poster exhibition
13:45-14:30	Oral Session 2 Small-scale mining, poisonings and prevention 1 Session Chairs: Rasmus Køster-Rasmussen and Jinky Lu

13:45-14:00	Ergonomic Risks among Small Scale Miners in the Philippines Jinky Leilanie Lu
14:00-14:15	Working Conditions Of Workers In Mining Occupation In Selected States Of India Promila Sharma
14:15-14:30	Intervention to Address Lead Poisoning Epidemic from Gold Mining in Northern Nigeria Perry Gottesfeld
14:30-15:15	Afternoon keynote 3 Role of worker representation on occupational safety and health in coal mining in different countries. David Walters, Professor, Cardiff Work Environment Research Centre, Cardiff University, UK
15:15-16:00	Afternoon keynote 4 Fibrous materials naturally occurring in mines, health-related diseases and how this can be adequately monitored. Maria Albin, Professor, Occupational and Environmental Medicine, Stockholm City Council and Karolinska Institutet, Sweden
16:00-16:15	Coffee break
16:15-17:15	Oral Session 3 Small-scale mining, poisonings and prevention 2 Session Chairs: Raul Harari and Paul Scheepers
16:15-16:30	PRoMoting health in Small and Artisanal Mining of GOld (PROSAMIGO) . an intervention study of knowledge on mercury and its health effects. Paul T.J. Scheepers
16:30-16:45	Lead intoxicated children in Kabwe / Zambia. Stephan Bose-O'Reilly
16:45-17:00	Silicosis Among Manual Stone Mine Workers of Informal Sector In India. Prahlad Kumar Sishodiya
17:00-17.15	Cyanide and Mercury Concentrations in Drinking and Surface Water in a Large Mining Area in the Philippines Jinky Leilanie Lu
17:15-18:00	Oral Session 4 Small-scale mining, poisonings and prevention 3 Session Chairs: Stephan Bose O'Reilly and Gernelyn Logrosa
17:15-17:30	Enhancing Health and Safety in Informal Mining in the Philippines Gernelyn Logrosa
17:30-17:45	Mercury used for Gold Mining: Quantifying the Burden of Disease to explore its Public Health Dimension Nadine Steckling
17:45-18:00	Mercury Intoxicated Children in Artisanal and Small-scale Gold Mining Stephan Bose-O'Reilly
19:00-21:00	Hans Christian Andersen Festival Odense City

Day 2	Wednesday 23 of August
08:30-09:10	Morning keynote 5 Working conditions in small-scale gold mining in Ecuador Raul Harari, Professor, Institute for the Development of Production and Work Environment, Ecuador
09:10-09:50	Morning keynote 6 Mercury pollution from mining - global effects on human health Pál Weihe, Research Associate Professor, Environmental Medicine, University of Southern Denmark, Denmark
09:50-10:30	Morning keynote 7 Mercury free gold mining . how to use alternatives Peter Appel, Apelglobal, Denmark
10:30-11:00	Coffee break
11:00-12:00	Oral Session 5 Noise, injuries and disasters in mining Session Chairs: Tushar Kant Joshi and Liepollo Ntlhakana
11:00-11:15	Mining Disasters in the Philippines: Need for Policy and Legislative Review Lu Sophia Francesca
11:15-11:30	The Use of CFD Tools for Explosion Risk Assessment in Underground Atmospheres Nicolae Ioan Vlasin
11:30-11:45	The use of hearing protection devices in South Africa: exploring the current status in a gold and a non-ferrous mine Liepollo Ntlhakana
11:45-12:00	Competency Management as a Tool for Occupational Injuries Prevention in Coal Mines Konstantin Todradze
12:00-12:45	Oral Session 6 Other exposures in mining Session Chairs: Marilyn Ann Fingerhut and Paul Musa Obadia
12:00-12:15	Outbreak Preparedness Require A New Collaborative Approach, Lessons Learned During Ebola Francesca Viliani
12:15-12:30	Health Impact Of Living And Attending School Close To An Abandoned Copper Mine in Musoshi, Democratic Republic of Congo Paul Musa Obadia
12:30-12:45	Health Aspects of Mining in Greenland Niels Ebbehøj
12:45-13:45	Lunch and poster exhibition
13:45-14:45	Special session on MinerB experiences with Accidents and Occupational Health and Safety. Session Chairs: Rasmus Køster-Rasmussen and Peter Appel Mercury Pollution from Small-Scale Gold Mining Can Be Stopped by Implementing the Gravity-Borax Method . A Two-Year Follow-Up Study from Two Mining Communities in the Philippines Rasmus Køster-Rasmussen, University of Copenhagen, Denmark.

	Miners from the Philippines and Uganda tell their story and show photos of their working environment.
14:45-15:30	Afternoon keynote 8 Web-based tools to improve occupational health and safety in mining Emanuele Cauda, NIOSH, USA
15:30-16:00	Oral Session 7 - Part 1 Preventive measures Session Chairs: Helmut Ehnes and Derk Henri Brouwer
15:30-15:45	New challenges for the potash mining industry following the TLV discussion for nitrogen oxides. Dirk Dahmann
15:45-16:00	Designing a Prototype of an Evaporative Cooling Garment Apt for Deep Mine Activities Chady Al Sayed
16:00-16:15	Coffee break
16:15-17:00	Oral Session 7 - Part 2 Preventive measures Session Chairs: Helmut Ehnes and Derk Henri Brouwer
16:15-16:30	Constitution of Homogeneous Exposure Groups in South African Mining Industry; A key factor to identify high risk workers. Derk Henri Brouwer
16:30-16:45	A Training Program To Assist The Mines Inspectorate of Ghana to Manage Occupational Health and Safety Issues Associated With Artisanal and Small Scale Mining. Carmel Mary Bofinger
16:45-17:00	Occupational Health Risk Management in Miners: Reinventing ourselves to prevent occupational disease Casper Johannes Badenhorst
17:00-18:15	Oral Session 8 Good practices Session Chairs: Casper Johannes Badenhorst and Mark Holmes
17:00-17:15	Images of the Miners' Profession Carl-Olof Bernsand
17:15-17:30	Good Practice Guidance On Occupational Health Risk Assessment Casper Johannes Badenhorst
17:30-17:45	The Ontario Mining Exposure Database (OMED): A tool for mining research in Ontario, Canada Victoria H Arrandale
17:45-18:00	Occupational Exposure and Disease in the Mining Industry: A program of research from Ontario, Canada Victoria H Arrandale
18:00-18:15	Critical Control Management in the Mining and Metals Industry Mark Holmes
19:00-23:00	Conference dinner at Dalum Agricultural College (Dalum Landbrugsskole)

Day 3	Thursday 24 of August
08:30-09:10	Morning keynote 9 VISION ZERO: Yes we can! - Prevention in Mining Ulrich Meesmann, President of ISSA Mining, Germany
09:10-09:50	Morning keynote 10 Excellence For Safety & Health In Mining. ISSA Mining . Your Global Partner Helmut Ehnes, Secretary General of ISSA Mining, Germany
09:50-10:30	Conference closing ceremony and conclusion remarks

ABSTRACTS

Morning Keynote 1

Tuesday 22 August, 9:10 - 9:50

The Human Cost of Working in Dusty Occupations in India

Tushar Kant Joshi

Indian Supreme Court, India; kantjoshi@gmail.com

Introduction

The Indian State of Rajasthan was unaware of the magnitude of the impact of mining until five years back. The revenue from mining is its main source of income. Only a handful of Pneumoconiosis cases were reported five years back. The number has now risen to 9,000 and continues to rise. Officially, there are 15,275 mining leases employing 238,817 workers who produce 285,493,436 tons of minerals.

The ongoing screening program launched in the state on the direction of the Supreme Court of India led to a massive screening activity. So far 19,000 suspected cases of Pneumoconiosis were screened with 9,000 having confirmed Silicosis, and Silico-tuberculosis. A high prevalence of pulmonary tuberculosis is reported within areas with much mining activity.

Mineral Mining in the State

The state is endowed with rich mineral deposits of sandstone, granite, copper, zinc, marble and several others. The famous Taj Mahal was built with white marble from the state as also the famous Delhi Red Fort made of sand stone. For centuries workers toiled and perished without getting any relief or compensation. However, that is now changing.

The author appointed as the commissioner by the highest court of the country, the Indian Supreme Court, visited mines and evaluated the entire programme. It was found that the Pneumoconiosis boards set up in all districts were regularly screening workers but physicians had no training in occupational health and safety. They had no idea of the exposure situation in the operating mines. They also lacked the basic concepts of prevention. This presentation shares some of the experience and the recommendations made by the author to the highest court in the country to prevent and protect mine works and to compensate those who develop Pneumoconiosis.

Morning Keynote 2

Tuesday, 22 August, 9:50 - 10:30

Prevalence and Prevention of Silicosis and Coal workers Pneumoconiosis

Bengt Järholm

Umeå University, Sweden; bengt.jarvholm@umu.se

Silicosis and coal workers' pneumoconiosis (CWP) are chronic non-treatable diseases of varying severity. The underlying mechanism is fibrosis of the lungs which typically are diagnosed by chest radiography. The prevalence will depend on exposure, but also on diagnostics. The sensitivity and specificity of chest radiographs are varying and in low exposed groups there are several false positives while in heavy exposed groups there are cases who may develop severe disease that are not recognized. Published figures typically come from screening of occupational groups and will depend on exposure, age of those exposed and methodology. At low or modest exposure it takes decades of exposure before silicosis or CWP are diagnosed. Then, the prevalence indicates the risk some decades ago and not the actual risk which should be noticed in comparisons of prevalence between countries or companies. Furthermore, you could not expect the prevalence diagnosed by chest radiographs to be zero when you have decreased the exposure to a safe level as the specificity is not 100 percent. Thus, the prevalence of CWP and silicosis has been an important measure to show the consequences of too high exposure to silica or coal dust in the past leading to measures to decrease exposure. However, it can be questioned whether we should continue to use it as a measure of health impact from such exposure in countries where exposure mostly is low. In areas and countries where there is still a too high exposure it will be an important indicator of insufficient control of exposure. In areas where very high exposure occurs and there is a risk of rapid progressive disease, the prevalence will be a too slow indicator to save the health of those exposed. A much better indicator is exposure measurements.

Oral Session 1: Lung diseases

Tuesday 22 August, 11:00 - 12:00

Session Chairs: Maria Albin and David Lee Sherson

Green Stones processing post-quarrying: asbestos risk exposure and prevention

Annalisa Guercio, Bianca Rimold

INAIL, Italy; a.guercio@inail.it

INAIL (National Institute for Insurance against Accidents at Work) provides tools to monitor employment and accident trends; funds, training and advice in the field of prevention, focused on small and medium size enterprises, carrying out studies on the dynamics of injuries phenomena and professional diseases.

Since 2004, the INAIL office Advisory Department for Risks Assessment and Prevention (CONTARP), that practically put into effects the institutional duties established by Italian laws, with the scientific support of the Milan University – La Bicocca, together with local Authorities and enterprises, carried out extensive monitoring surveys in the “Green Stones” quarrying sites and processing laboratories, located in Central Alps, to assess workers’ exposure to asbestos fibers.

Monitoring surveys were carried out according Italian Legislation following WHO method (1997) with fibers counting in Scanning Electron Microscope (SEM).

The preventive actions were planned, experimented and implemented by enterprises during the synergic collaboration.

Fibers dispersion is lower in quarries than in processing plants where blocks are finished. One of the critical situations of asbestos risk management is the spreading of fibers from quarry, where asbestos veins may be intercepted during wire cutting, to processing plants, where no fibers should be detected. This situation may occur if blocks to process were not checked and mineralized veins were not removed completely before leaving the quarry.

In this item, the authors will describe working activities in “Green Stones” processing plants where workers’ asbestos exposure risk may occur and, in addition, the prevention actions implemented by enterprises as the results of the collaboration, especially for the block suitability check procedure, as a proof of the effectiveness of organizational actions.

Oral Session 1: Lung diseases

The HRCT Findings of Chest Radiograph-Confirmed Borderline Pneumoconiosis

Youn-Mo Cho^{1,2}, Jun-Pyo Myong^{1,2}, Jung-Wan Koo^{1,2}, Seyoung Lee^{1,2}, JiWon Lee^{1,2}, BumSeok Cho^{1,2}

¹Department of Occupational and Environmental Medicine, Seoul St. Mary's Hospital, Republic of Korea;

²Department of Occupational and Environmental Medicine, College of Medicine, The Catholic University of Korea; sanctuary0615@gmail.com

Introduction

In South Korea, assessment of suspected pneumoconiosis is performed by comparing the patient's chest radiograph with ILO standard radiograph by pneumoconiosis review committee. Unfortunately, the probability of discrepant judgement is high in borderline pneumoconiosis because pneumoconiotic nodules are not clear by chest radiograph and the profusion is less than 1/0. The purpose of this study was to investigate the high resolution computed tomography (HRCT) findings of patients who had been recently diagnosed as borderline pneumoconiosis.

Methods

During Jan.1st 2013 to May 25th 2015 the study was carried out with 354 new outpatients who underwent both simple chest radiography and HRCT at the pneumoconiosis clinic in Seoul. We evaluated their diagnosis, occupational histories, social histories and HRCT findings. Multivariate logistic regression analysis was conducted to evaluate the association between HRCT findings and the diagnosis of borderline pneumoconiosis by chest radiograph after adjusting age, sex, and smoking history

Results

As a result of multiple logistic regression after adjusting age, sex, and smoking history, tuberculosis (OR = 2.45 95% CI = 1.17-5.31) emphysema fibrosis (OR = 1.80 95% CI = 1.03-3.15) and bronchiectasis (OR = 1.99 95% CI = 1.20-3.11) were the HRCT findings associated with the diagnosis of borderline pneumoconiosis by chest radiograph. Among 140 subjects who had a previous history of pneumoconiosis diagnosis, only 26 patients were confirmed as having HRCT findings of pneumoconiotic nodules.

Discussion

Comparing the chest radiograph and HRCT diagnosis of 354 patients, 114 out of 140 who were diagnosed with borderline pneumoconiosis previously were confirmed as normal. The other conditions were misdiagnosed as pneumoconiosis. Considering tuberculosis, complicated emphysema fibrosis, and bronchiectasis are the HRCT findings that are easily confused with pneumoconiosis in simple chest radiographs. It is important to distinguish the diseases with pneumoconiosis for the medication aspect as well as compensation itself.

Oral Session 1: Lung diseases

Time Trends for Silica Exposure in the Ontario Mining Industry

Nicola Latoya Blagrove-Hall, Victoria Arrandale

Occupational Cancer Research Centre, Canada; Victoria.Arrandale@occupationalcancer.ca

Purpose

Historical exposure data can be used to examine trends in exposure over time, evaluate the effectiveness of interventions, improve exposure assessment in epidemiology and help target prevention activities. The recently completed Ontario Mining Exposure Database (OMED) contains mining exposure data from the province of Ontario, Canada from 1950-1997. OMED data were used to examine historical exposure to silica, including trends over time, in gold, nickel or uranium mines.

Methods

Full shift, respirable crystalline silica (RCS) measurements were extracted from OMED. Descriptive statistics were used to investigate mean RCS concentrations. Trends over time in RCS concentration were explored using multiple linear regression models. Time trends before and after the introduction of Ontario's occupational health and safety legislation were also examined.

Results

The OMED contains over 140,000 exposure records, approximately 11,000 of which relate to silica. In total 2,598 measurements report on full-shift respirable crystalline silica (RCS) from 1975 to 1991. Of these, 910 (35%) were samples collected in gold, nickel or uranium mines. The arithmetic mean RCS in gold, nickel and uranium mines was 0.13 mg/m³, 0.04 mg/m³ and 0.10 mg/m³ respectively. Linear regression models showed no statistically significant time trend for the period 1975-1991. However, significant trends were observed in pre/post legislation periods. Significant time trends for RCS was observed in gold mines post-legislation where an 11.1% per annum (p=0.01) decrease was found. In uranium mines, RCS decreased by 15.6% (p=0.01) per annum pre-legislation.

Conclusions

Results suggest that, historically, RCS levels were higher in gold and uranium mines compared to nickel mines. While plots of RCS suggested a decrease over time in gold, nickel and uranium mines, this trend was not statistically significant. OMED contains valuable information about historical exposures in the Ontario mining industry that can potentially be used to improve exposure assessment in mining cohort studies.

Oral Session 1: Lung diseases

Asbestos-related Disease in Indonesian Workers Exposed to Asbestos

Anna Suraya^{1,2}, Ade Dwi Lestari²

¹University of Indonesia, Indonesia; ²Binawan Health Science; anna_suraya2005@yahoo.com

Chrysotile asbestos, which is classified as a carcinogen, has been imported to Indonesia since the 1950's. Although it has been used in various industries, occupational asbestos-related diseases were never reported. This study investigated whether asbestos-related disease was present in workers exposed to asbestos in two chrysotile asbestos processing factories in West Java, Indonesia.

A descriptive study was conducted in the two factories. Environmental airborne asbestos exposure measurements were collected from existing factory data. Interviews and health check-ups were carried out on 20 workers who had worked for more than ten years with asbestos, as of October 2016. High-resolution computerized tomography (HRCT) was performed to study asbestos-related disease in the lung.

The airborne asbestos levels in the workplace exceeded the threshold limit value set by the Indonesian Ministry of Manpower (0.1 fibers/cc). Of the twenty workers who worked for more than 10 years with asbestos, 17 were males and 3 were females, ages between 33 and 54 years old. Twelve workers complained of dry cough and four workers complained of dyspnea. Four workers were underweight. Spirometry test showed pulmonary function abnormalities, with eleven mild restrictions and one medium obstruction. From the HRCT data, ten were diagnosed with asbestosis with the following pulmonary abnormalities: fibrosis, pleural thickening, sub-pleural dot-like and honeycombing. Of the 10 workers diagnosed with asbestosis, 6 complained of a dry cough, 3 had dyspnea, 2 had chest pain. Five showed mild restrictions and three were underweight.

These are the first reported asbestosis cases in Indonesia after approximately 65 years of exposures. It is urgent to raise awareness of the health problems caused by asbestos exposure to factory owners, employees, government, medical personnel and other stakeholders. Furthermore, a larger study should be conducted to discover all the adverse health consequences of asbestos exposure in Indonesian workplaces.

Oral Session 2: Small-scale mining, poisonings and prevention 1

Tuesday, 22 August, 13:45 - 14:30

Session Chairs: Rasmus Køster-Rasmussen and Jinky Leilanie Lu

Ergonomic Risks among Small Scale Miners in the Philippines

Jinky Leilanie Lu

Institute of Health Policy and Development Studies, National Institutes of Health, University of the Philippines Manila, Philippines; jinky_lu@yahoo.com

Aim

Worldwide, small-scale mining (SSM) provides employment to about 13 million people and affects the livelihood of 80-100 million. This study investigated the ergonomic and safety hazards of small scale miners in one of the largest small scale mining area in the Philippines which is the area of Itogon, Benguet.

Methods

93 small scale miners were included. The methods consisted of survey questionnaires, health physical examination guide, individual interviews, and work process observation tool.

Results

The results showed that the small-scale miners worked for an average of 10.7 years, and a maximum work year of 40. The most widely employed mining technique was the dog-hole mining consisting of several sub-processes -tunneling, ball milling and gravity concentration, cyanide leaching, and smelting. The ergonomic and safety hazards identified were noise exposure from the dynamite blast, temperature extremes, and exposure to dust from dynamite blasting. The miners experienced prolonged crouching and bending, prolonged handling of tools, and carrying heavy sacks filled with mineral ores. They used improvised protective equipment such as wearing of sleeveless shirts and drinking water for temperature extremes, distancing themselves from the mining blasts during dynamite blasting. In the ball milling and gravity concentration process, machine-related accidents were noted such as experiencing cuts from the crusher. In the cyanide leaching which uses massive amounts of cyanide, the most prevalent hazards were heat, dust, and chemicals such as cyanide fumes. Burn injuries were reported among miners. The most common injury was laceration at 47.8%, followed by methane inhalation, fracture of hand digits, and contusion at 17.4%. The most prevalent health symptom reported by the miners was muscle pain.

Discussion

It is suggested that intervention programs for ergonomics and safety measures be implemented by the local government, and health and safety nets be provided for the small scale miners in Itogon, Benguet.

Oral Session 2: Small-scale mining, poisonings and prevention 1

Working Conditions of Workers in Mining Occupation in Selected States of India

Savahat Ms¹, Promila Sharma²

¹G.B. Pant University of Agriculture and Technology, India; ²3/651 Chakphery University Campus, In Front Sarojini Girls Hostel, Pantnagar Uttarakhand. India; promila34@gmail.com

In India, as in most Asia-Pacific countries, exploitation of land for mineral resources has a long history of abuse and plunder. Mining has been a focal industry in all the Five Year Plans of the country and it could not be perceived as anything but 'development' in demanding people's forfeiture of their lands for 'national prosperity'. Most minerals and mining operations are found in forest regions, which are also the habitat for tribal (indigenous) communities. India being a vast country, the history and status of mining varies from region to region. Starting from rat hole mining, small legal and illegal mining, to large-scale mining mostly by the public sector and since the 90's by the private sector's participation, there are a wide range of problems and conflicts in relation to mining. Especially, the problems of local communities, displaced or affected by mining have had far reaching consequences.

India Jharkhand, West Bengal, Chhattisgarh and Bihar are the common states where coal mining industries are available in large number. Mining are multi-disciplinary industry, drawing on several professions and trades. The workers face hazards commonly observed physical, biological, psychosocial, chemical and ergonomical hazards.

Official estimates show that on every third day, over the past five years, there has been a death in India's mining sector. Accidents of the kind that happened that February and those involving the collapse of the side walls are the top two killers in India's coal mines.

The condition of women displaced and affected by mining was observed. There are three situations of mining—areas proposed for mining (greenfields), existing mines and closed/abandoned mines. People displaced by various projects, is estimated to be 50 million.

Oral Session 2: Small-scale mining, poisonings and prevention 1

Intervention to Address Lead Poisoning Epidemic from Gold Mining in Northern Nigeria

Perry Gottesfeld, Manti Michael Nota

Occupational Knowledge International, United States of America; info@okinternational.org

Introduction

Occupational Knowledge International (OK International) is partnering with Doctors Without Borders/ Médecins Sans Frontières (MSF) to address widespread and severe lead poisoning from small-scale gold mining in areas of Northern Nigeria. Since 2010 MSF has responded to the high infant mortality rate linked to lead poisoning in this area and has treated thousands of poisoned children. OK International is working cooperatively with affected communities to introduce safer work practices in order to reduce lead and silica dust exposures to miners and children.

Methods

We conducted initial assessment of airborne exposures to lead and silica dust in mining and processing areas. We then worked with miners to introduce safer practices through training programs and ongoing outreach. Objectives include reducing lead and silica exposures during mining and processing, reducing take home exposures, and minimizing the potential for recontamination of villages that have been remediated.

Results

Initial pre-intervention exposure monitoring indicated that arithmetic mean airborne lead exposures among miners were below the U.S. Occupational Safety and Health Administration (OSHA) Permissible Exposure Level (PEL) but ore processors had lead exposures approximately 9-fold the PEL. Respirable silica exposures among miners were approximately 4-fold the U.S. PEL and processors exposures were 12-fold the PEL. Converting dry processing to wet milling is a priority to reduce exposures.

Discussion

We have made significant progress in working cooperatively with small-scale gold miners to introduce safer mining practices. We have documented significant exposures to airborne lead and silica that are causing health impacts among miners and the community. We have demonstrated that miners and processors are willing to implement safer practices and invest in reducing exposures to themselves and to protect children's health.

Afternoon keynote 3

Tuesday, 22 August, 14:30 – 15:15

The Role of Worker Representation on Occupational Safety and Health in Coalmining in Different Countries

David Walters

Cardiff University, United Kingdom; waltersd@cardiff.ac.uk

Based on empirical evidence from research findings from a variety of different sectors and countries, it is now widely accepted that arrangements to represent the interests of workers on health and safety make a significant contribution to supporting improved health and safety outcomes. However these arrangements remain little studied in the mining industry, despite its hazardous nature and their comparative long standing the sector.

Using recent comparative research supported by the UK Institution of Occupational Safety and Health (IOSH) on the experience of representing workers on safety and health in coal mines in different countries, this presentation explores its development and present practice in a range of socio-economic conditions. It examines the evidence for the effectiveness of the arrangements for representing the health and safety interests of mineworkers and identifies factors that contribute support to the role of representation in these different settings. It discusses the role of the state, trade unions and employers in providing support for the implementation and operation of the arrangements and comments on global influences such as that of ILO Convention 176, the practices of global mining companies and the activities of the global confederation of mining unions represented by IndustriALL.

Finally, it offers some reflections on the significance of these matters for the future of health and safety practice in coal mining.

Afternoon keynote 4

Tuesday, 22 August, 15:15-16:00

Fibrous Materials Naturally Occurring In Mines: Health-Related Diseases and How This can be Adequately Monitored

Maria Albin

Occupational and Environmental Medicine, Stockholm City Council and Karolinska Institutet, Sweden;
maria.albin@med.lu.se

Exposure to naturally occurring fibrous materials is well described from mining of talc, but also e.g. iron ore. Tremolite, an amphibole asbestos fibre, is such a well-known contaminant. The associated health risks may occur in production as well as in later use, and from tailings.

Both non-malignant and malignant respiratory disease (including mesothelioma) has been described from asbestos contamination occurring in the mining of other minerals.

Primary prevention is challenging, since the fibrous contamination may be highly variable within a mine. Also, monitoring of fibre concentrations in air is often complicated by overload of the filters from other dust.

Recently, more systematic approaches to risk management with regard to contamination with fibrous material in mining have been adapted as national guidelines/policies (e.g. Australia, Finland).

Recent risk assessments (France, Germany, Netherlands) indicates that in order to keep the life-time cancer at an acceptable level (1 per million per exposure year) the time-weighted 8-hour average exposure over a working-life should not exceed 0.01f/ml. There is no evidence for another risk assessment for mining.

Oral Session 3: Small-scale mining, poisonings and prevention 2

Tuesday, 22 August, 16:15 - 17:15

Session Chairs: Raul Harari and Paul Scheepers

PRoMoting health in Small and Artisanal Mining of Gold (PROSAMIGO) – an intervention study of knowledge on mercury and its health effects

Ilse Ottenbros¹, Romilda Z. Boerleider¹, Bianca Jubitana², Jan Quik³, Nel Roeleveld¹, Paul T.J. Scheepers¹

¹Radboud Institute for Health Sciences, Radboudumc, Nijmegen, The Netherlands; ²Medische Zending Primary Health Care, Paramaribo, Suriname; ³Centraal Laboratorium, Bureau voor Gezondheidszorg, Paramaribo, Suriname; paul.scheepers@radboudumc.nl

Introduction

The PROSAMIGO study was performed in 2016 to explore the situation regarding mercury and health in the gold mining areas in the inland of Suriname, South America. The use of mercury in artisanal and small-scale gold mining (ASGM) has a considerable impact on human health and the environment. This study aimed to assess knowledge and awareness on mercury and related health effects, amongst gold miners and local inhabitants living in gold mining areas.

Methods

In a group of 144 gold miners and 1,022 villagers a questionnaire survey was conducted to evaluate the effectiveness of a health education program. Healthcare workers were trained to educate gold miners and local inhabitants by use of posters and animations in different languages. Interviews were taken before and after introduction of this program. About 25% of the participants were included both before and after the program.

Results

Much knowledge on the subject of mercury and health was already available in both groups of gold miners and local inhabitants. The self-rated level of knowledge amongst all participants was higher after following the education program. The program contributed to an improved awareness of health complaints attributable to mercury. An increased understanding was observed concerning the vulnerability for mercury of children, pregnant women, lactating women and kidney patients.

Discussion – The health education program had a positive effect on the levels of knowledge and awareness of mercury and its health effects for both gold miners and local inhabitants. The higher level of awareness resulted in new and more specific questions on health risks of mercury. Healthcare workers will continue the health education program in the gold mining areas in Suriname.

Acknowledgement

PROSAMIGO received funding from the Uitvoeringsorganisatie Twinning Suriname Nederland (UTSN) of the Dutch Ministry of Foreign Affairs.

Oral Session 3: Small-scale mining, poisonings and prevention 2

Lead intoxicated children in Kabwe / Zambia

Stephan Bose-O'Reilly

University Hospital Munich, Germany; stephan.boeseoreilly@med.uni-muenchen.de

Introduction:

Kabwe was an important lead and zinc mining town in Zambia for over 90 years, leaving waste lead contaminated tailings behind. Lead is a well-known serious health hazard, causing anemia, seizures, encephalopathy and death. Soil in Kabwe's housing areas is highly contaminated with lead, especially children from neighboring townships ingest toxic lead dust.

Methods

The environmental assessments and the health data for Kabwe's children were collected and analyzed. Data is available from three different sources: Copperbelt Environment Project; Blacksmith Institute/ Pure Earth and University of Zambia / Hokkaido University in Sapporo/ Japan.

Results

In most housing areas the tolerable soil lead levels of 400 ppm were surpassed. Children's blood lead levels were in the most affected townships in over 95% of children increased ($\geq 10 \mu\text{g/dL}$). Most children did have blood lead levels where urgent action to reduce blood lead levels is required. Exposure to the toxics urgently needs to be reduced. Over $\geq 45 \mu\text{g/dL}$ medical treatment is recommended, in the most affected townships > 50% of the children showed such high levels. The existing data clearly proves the severity of lead exposure in Kabwe.

Conclusion

Large proportions of children are not only highly exposed, but actually have high to extremely high levels of lead in their bodies. According to threshold levels and international recommendation they need to be treated and the exposure must be considerably reduced.

Funding by World Bank (Environment remediation and improvement project (P154683))

Oral Session 3: Small-scale mining, poisonings and prevention 2

Silicosis among Manual Stone Mine Workers of Informal Sector in India

Prahlad Kumar Sishodiya

Labour Department Government of Rajasthan, India; pksishodiya@gmail.com

Introduction

Sand stone quarrying is mostly carried out in informal sector of India. Mining is invariably manual, located in remote areas and working conditions are far from satisfactory. Earlier studies have shown high prevalence of silicosis among stone mine workers.

Material and Method

Medical examination records of 689 persons suffering from respiratory symptoms with history of work in sand stone mines in Karauli district in the state of Rajasthan, India were evaluated for silicosis in accordance with ILO Classification of Radiographs for Pneumoconiosis, 2000. The subjects were classified as silicosis if profusion of small opacities was 1/1 or more and Progressive Massive Fibrosis (PMF) was suspected if large opacity of type A, B or C were present

Results

Evaluation of chest radiographs showed presence of small rounded opacities of 'q' or 'r' type suggestive of silicosis amongst 419 out of 689 subjects. The chest radiographs of 57 workers also showed large opacities of type A, B or C suggestive of Progressive Massive Fibrosis (PMF).

Discussion

Results of the study show that 419 (60.8%) subjects had evidence of silicosis and 57 (13.6%) had developed Progressive Massive Fibrosis. In most cases silicosis developed after 10 years and every worker who had worked for more than 30 years developed silicosis. Further analysis showed that occurrence and profusion of small and large opacities were directly related to number of years of work in stone mines.

Despite overwhelming evidence to the contrary, it is generally believed that manual stone cutting in mines does not cause silicosis as the dust generation potential is considered to be low. The present study confirms that prevalence of silicosis and progressive massive fibrosis is high among manual stone mine workers.

Oral Session 3: Small-scale mining, poisonings and prevention 2

Cyanide and Mercury Concentrations in Drinking and Surface Water in a Large Mining Area in the Philippines

Jinky Leilanie Lu

Institute of Health Policy and Development Studies, National Institutes of Health, University of the Philippines Manila, Philippines; jinky_lu@yahoo.com

Aim

This study aimed to investigate concentrations of cyanide and mercury in water samples in all communities in Benguet which is the largest mining area in the Philippines.

Method

A total of 130 water samples each were collected for mercury and cyanide analysis for a period of 3 years. Atomic Absorption Spectroscopy (AAS) was used in analyzing cyanide and mercury residues in the water samples. Results showed that 91% of the samples subjected for mercury analysis were positive and 87% exceeded the maximum allowable concentration. On the other hand, 98% of the samples subjected for cyanide analysis were positive but none exceeded the MAC. This variance can be accounted by the fact that mercury remains in the environment and could be biomagnified while cyanide readily evaporates. In 7 municipalities, all samples exceeded MAC for mercury. The average of exceeded concentration of mercury was 0.0879ug/l. None of the samples recorded exceeded concentrations of cyanide based on the TLV set by USEPA.

Discussion

The results presented above provide evidences of mercury and cyanide contamination in areas near mining sites. Thus, it is also recommended that there should be mitigation/intervention measures to reduce mercury and cyanide exposure in the environment.

Key Words

Mercury, Cyanide, Water Samples, Health effects of mercury and cyanide, small scale mining

This is done through evidence from concentrations of cyanide and mercury in water samples in all communities in the target area which is Benguet.

Oral Session 4: Small-scale mining, poisonings and prevention 3

Tuesday, 22 August, 17:15 - 18:00

Session Chairs: Stephan Bose O'Reilly and Gernelyn Logrosa

Enhancing Health and Safety in Informal Mining in the Philippines

Gernelyn Logrosa^{1,2}, Carmel Bofinger², Maureen Hassall¹, David Cliff²

¹The University of Queensland, Australia; ²Minerals Industry Safety and Health Centre (MISHC);
g.logrosa@uq.edu.au

Technologies have been designed to eliminate the adverse effects of mercury to human health and the environment. The focus on environmental risk in these technologies has gained global support in the last 20 years. However, little has been done to investigate whether health and safety in artisanal and small-scale mining (ASM) gold processing operations can be improved as a result of the technology being implemented.

A risk-based approach is used to promote health and safety in ASM through technology acceptance in the Philippines. The risks in both the current processes existing in ASM and a new technology were assessed as a case study to provide baseline data and to evaluate improvement. Occupational health and safety risks were investigated through field site visits to 3 different locations in the Philippines. Stakeholder risk perceptions were gathered through interviews and surveys with the key stakeholders currently engaged with these artisanal mining communities.

Based on case study findings, hazards in the ASM workplace ranged from fatigue and manual tasks to entanglement hazards. In addition, analysis of the interview and survey data revealed that health and safety issues are driven by the informality of ASM, poor governance, perceptions of the ASM sector by government, technical experts and advocate groups, as well as increasing poverty levels. Considering the complexity of ASM, it is recommended that a risk-based approach to ASM and the affected communities' health and safety issues is used. Risks can then be managed by employing a multi-stakeholder perspective to create a more enabling environment for ASM operation and to enhance broad scale positive change to community health and safety outcomes.

Oral Session 4: Small-scale mining, poisonings and prevention 3

Mercury used for Gold Mining: Quantifying the Burden of Disease to explore its Public Health Dimension

Nadine Steckling^{1,2}, Stephan Bose-O'Reilly^{1,2}

¹University Hospital Munich, Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine, WHO Collaborating Centre for Occupational Health, Unit Global Environmental Health, Ziemssenstr. 1, D-80336 Munich, Germany; ²UMIT – University for Health Sciences, Medical Informatics and Technology, Department of Public Health, Health Services Research and Health Technology Assessment, Institute of Public Health, Medical Decision Making and Health Technology Assessment, Eduard Wallnoefer Center I, A-6060 Hall i.T., Austria; nadine.steckling@med.uni-muenchen.de

Introduction

Assumed 14 to 19 million miners in the developing world use mercury for gold extraction. Human exposure and negative health effects are confirmed. Less information is available about the corresponding public health dimension. We have summarized the state of the art about the mercury-related burden of disease (BoD).

Methods

The search term [mercury AND "burden of disease" AND "gold mining"] was entered into PubMed, WorldCat and Google Scholar to identify relevant journal papers as well as grey literature. Relevant literature was summarized.

Results

The search strategy resulted in more than 300 hits, categorized as (a) irrelevant (the most hits), (b) research need formulated, (c) referencing relevant literature, and (d) relevant literature (the fewest hits). The most relevant findings are estimates about the BoD of chronic mercury intoxication in gold mining in Zimbabwe and worldwide, a methodological derivation of Disability Weights (a necessary weighting factor for BoD analyses to identify the severity of the health state) for chronic mercury intoxication resulting from gold mining, estimates about the BoD of mild mental retardation due to mercury exposure (e.g., in gold mining areas) and of mercury-caused renal toxicity in toxic waste sites (e.g., in gold mining areas). These first rough quantifications of the BoD provide an insight into the immense public health dimension of the use of mercury in gold mining; however, more comprehensive and reliable data are necessary to improve the estimates.

Discussion

In the last 10 years, the availability of BoD analyses regarding the health relevance of the use of mercury in gold mining is growing. Besides an incomplete data basis and the need to determine assumptions, the available research confirms the need to reduce the mercury-related health burden in gold mining.

Oral Session 4: Small-scale mining, poisonings and prevention 3

Mercury Intoxicated Children in Artisanal and Small-scale Gold Mining

Stephan Bose-O'Reilly

University Hospital Munich, Germany; stephan.boeseoreilly@med.uni-muenchen.de

The price of gold is very high and it is very appealing to mine for gold for many people all over the world. In over 70 countries approx. 10-15 million of miners work depend on artisanal small-scale gold mining (ASGM) as their main way of income to survive. To extract the gold from the ore, mercury (Hg) is widely used in artisanal and small-scale gold mining. The environment is seriously polluted; artisanal and small-scale gold mining is the main global emitter of Hg.

There are a number of publications available that address the issue of Hg as a health hazard in ASGM, showing that the exposure with inorganic Hg vapor is high, and that toxic effects have to be considered. Some key studies including our own research results show that there are several studies in different countries with ASGM, all with the same result: Hg levels in any analyzed biomarker are higher compared to control groups or reference values. In some studies clinical symptoms or negative results for subclinical parameters were identified.

Only few studies exist on the specific health risks of children in ASGM areas. These studies show that the exposure with mercury leads to increased levels of mercury in the human specimens such as urine, blood, hair or breast milk. Several studies indicate that the increased exposure is related to negative health effects, esp. neurological effects.

Chronic exposure with Hg is a specific health risk for children.

Morning keynote 5

Wednesday, 23 August, 8:30-9:10

Working Conditions in Small-Scale Gold Mining in Ecuador

Raul Harari¹, Florencia Harari²

¹Institute for Production and Work Environment, Ecuador; ²Department of Occupational and Environmental Medicine, University of Gothenburg, Gothenburg, Sweden; ifa@ifa.org.ec

INTRODUCTION

Besides mercury exposure during the extraction and processing of gold, small-scale gold miners in Ecuador have precarious working organization and conditions. An overview of the working conditions of this workers in Ecuador will be presented.

METHODS

Different approaches have been used along the last decades to study the working conditions of small-scale gold miners in Ecuador. Some of these have been used to integrally identify and understand the working conditions as well as the living conditions, including exposure and health effects.

RESULTS

Small-scale gold miners are exposed to precarious working conditions including use of toxic chemicals, rudimentary tools and equipment, lack of personal protection, unstable income, lack of social security. All this impacts not only the miner but also his family, not only because of the risks that the miners are exposed to at work but because some of the activities are sometimes performed at home, such as the burning of the mercury-gold amalgam. Thus the miners' work and life environments are close related. Exposure to mercury has been studied and effects in the central nervous system have been found, which in some extent seem to be dependent on polymorphisms in a gene of an enzyme in the glutathione synthesis.

DISCUSSION

Mining working conditions should be studied using a holistic approach. Small-scale gold miners in Ecuador work under precarious working conditions affecting also their families, which are sometimes involved in the activities. Improvements in the working conditions of this occupational group should be done considering changes in the law, the social and working conditions, and also the impacts on the environment and surrounding communities.

Morning Keynote 6

Wednesday, 23 August, 9:10-9:50

Mercury Pollution from Mining - Global Effects on Human Health

Pál Weihe

The Faroese Hospital System, Faroe Islands; pal@health.fo

Effects associated with MeHg exposure have been documented in humans at successively lower exposures and it is clear that the developing brain is the most vulnerable organ system. Prenatal exposure to MeHg has been associated with clear effects on the developing brain. Cohort studies in the Faroe Islands have demonstrated that children exposed to MeHg in utero exhibit decreased motor function, attention span, verbal abilities, memory and other mental functions. Follow-up of these children up to the age of 22 years indicates that these deficits appear to be permanent. Similarly, a study in Nunavik of child development at age 11 showed that Hg exposure was associated with poorer early processing of visual information, lower estimated IQ, poorer comprehension and perceptual reasoning, poorer memory functions, and increased risk of attention problems and ADHD behavior. Some of the adverse effects of MeHg on neurodevelopment may be masked by beneficial effects of seafood nutrients.

Morning Keynote 7

Wednesday, 23 August, 9:50-10:30

Mercury-Free Gold Mining: How to use alternatives

Peter Wiltje Uitterdijk Appel, Leoncio Degay Na-Oy

Emerald Small Scale Miners Multi Purpose Cooperative; pwuappel@yahoo.dk

Small-scale gold mining is the biggest contributor to the global mercury pollution. It is thus of paramount importance to introduce methods of gold extraction for small-scale miners which do not involve use of mercury, but yields same amount or more gold than traditional methods. Such method was introduced about thirty years ago by a small-scale miner in Benguet area, Northern Philippines. The miners in that area welcomed the method and today ca. 25.000 small-scale gold miners use that method. Unfortunately, the method never spread beyond Benguet.

About ten years ago Dialogos (Danish NGO) obtained funding for teaching and training programme for small-scale gold miners in the mercury-free gold extraction method. In Gaang area Northern Benguet ca. 1800 gold miners converted to mercury-free gold extraction. Since then the method has been tested and introduced in other parts of Philippines and in a number of countries including Indonesia, Mongolia, Peru, Sudan, Tanzania and Zimbabwe. During 2017 the mercury-free method will be taught to miners in Uganda and Mozambique. The method has so far worked on all gold ores apart from one gold field in central Kalimantan.

The mercury-free method has the advantage of saving money for buying mercury. In addition, it recovers more gold than the traditional method using mercury for gold extraction without being more time consuming.

Oral Session 5: Noise, injuries and disasters in mining

Wednesday, 23 August. 11:00 - 12:00

Session Chairs: Tushar Kant Joshi and Liepollo Ntlhakana

Mining Disasters in the Philippines: Need for Policy and Legislative Review

Sophia Francesca Lu

College of Arts and Sciences, University of the Philippines Manila, Philippines; sophia_fran@yahoo.com

Aim

This study analyzed the small-scale mining disasters from mining activities in the Philippines and the need for policy and legislative review.

Methods

The data were based on gray literature, peer-reviewed journals, databases, government statistics, and secondary literature on major mining disasters in the Philippines, and the impact of regulation or lack thereof in this industry.

Results

The mining process in small scale mining is very tedious. A tunnel is made, and if it contains gold, ores are collected and crushed in a ball mill. The ores are mixed with nitric acid to separate gold from other minerals such as silver and copper. The waste products are processed further using cyanide or mercury to extract more gold. The study review showed these mining disasters were- there were also symptoms of poisoning due to cyanide include rapid breathing, gasping, tremors, convulsions, headache, dizziness and thyroid enlargement and eventually death, and children ages 17 years old and below experienced cough, wheezing, shortness of breath. Three children had pneumonitis and 2 with pulmonary tuberculosis. In Western Mindanao, workers were found to be exposed to high levels of mercury. Gastrointestinal complaints of the workers were significantly associated with elevated hair methylmercury levels. Despite these, the government has no existing specific regulation and monitoring system for safety and health among small scale miners in the Philippines. Based on the policy reviews, the most important issue is to support and regulate the sector since small scale mining has contributed 14% of the total Gross Domestic Product (GDP) of the country and has a revenue share of about 19 billion pesos.

Discussion

Hazards and risks were shown in small scale mining in the Philippines. However, the laws on small scale mining in the country warrants implementation and monitoring, and provision of social safety nets.

The Use of CFD Tools for Explosion Risk Assessment in Underground Atmospheres

Nicolae Ioan Vlasin, Constantin Lupu, Vlad Mihai Pasculescu, Gheorghe Daniel Florea, Emeric Chiuzan
National Institute for Research and Development in Mine Safety and Protection to Explosion - INSEMEX
Petrosani - ROMANIA, Romania; nicolae.vlasin@insemex.ro

In coal mines, methane is naturally associated with the coal resulted from the mining operation. The risk of occurrence an explosive atmosphere and its consequences are different from one mine to another, depending on the type of mine, mine configuration, extracted coal and the probability of the methane occurrence. Although preventive measures taken, the potential risk of explosion cannot be excluded from firedamp mines, but only reduced as much as possible.

Therefore, where the possibility of forming an explosive atmosphere exists, it is necessary to assess the explosion risk by developing scenarios that consider the availability, in the same location and at the same time, the source of ignition, methane gas and oxygen. Based on the location of initiating explosive mixture, evaluation must include the extension of dangerous area for the worst case of a stoichiometric reactions oxygen-methane. This prediction is difficult, especially where the industrial space is occupied by technological equipment that makes impossible to predict the behavior of the shock wave and flame front. If there is possible to make physical experiments of explosions on simple geometry, in case of large or complex geometry these experiments cannot be performed due to the costs that they imply. For this, CFD techniques can be very useful tools for risk assessors.

This paper presents the way of considering three different scenarios of an air-methane mixture explosion in the same system of underground galleries, with changing the location of the ignition source and monitoring the explosion pressure and flame front behavior for each scenario. The results of the computational simulations are presented both spatial and as graph, allowing a comparative study between the three scenarios.

Oral Session 5: Noise, injuries and disasters in mining

The use of hearing protection devices in South Africa: exploring the current status in a gold and a non-ferrous mine

Liepollo Ntlhakana, Amisha Kanji, Katijah Khoza-Shangase

University of Witwatersrand, South Africa; liepollo.ntlhakana@wits.ac.za

This study investigated mine workers' current use of hearing protection devices (HPDs) in South African gold and non-ferrous mining subsectors. A descriptive study design was employed using structured interviews. Ninety participants were interviewed. Descriptive statistics and the chi-square test were used to analyse data. All participants reported wearing HPDs, with custom-made earplugs being preferred by those with more years of work experience and used by those most at risk to noise exposure. Comfort, design and work-related communication were factors influencing use of HPDs. Relationships between participants' demographic factors and use of HPDs were not statistically significant. Participants seemed reasonably aware of HPD importance which highlights progress. Findings further highlight the importance of occupational audiologists in improving hearing conservation programs (HCPs) in this sector.

Oral Session 5: Noise, injuries and disasters in mining

Competency Management as a Tool for Occupational Injuries Prevention in Coal Mines

Konstantin Todradze

Association of OSH Centers, Ministry of Labour, Russian Federation; konstantine.todradze@gmail.com

What is the National OSH Centers Association of Russian Federation (NACOT)? NACOT is non-profit, voluntary Association of Regional OSH Centers, institutes, societies and companies working on protection of employees' against occupational injuries and diseases in Russia. In 2016, NACOT made a revue of situation with occupational safety and health in industry. We determined that most critical situation arose in mining, construction and agricultural sectors of Russia.

In this connection, the NACOT OSH Center working in Kemerovo, Kuzbass - the main coalfield in Russia, had developed new methodology and principles in OSH training of miners. This report supplemented with short video film gives some conceptions about what was developed and what was applied in Russian coal mines and how this methods made contribution in occupational injuries lowering.

Oral Session 6: Other exposures in mining

Wednesday, 23 August, 12:00 - 12:45

Session Chairs: Marilyn Ann Fingerhut and Paul Musa Obadia

Outbreak Preparedness Require a New Collaborative Approach, Lessons Learned During Ebola

Francesca Viliani^{1,2}

¹International SOS, Denmark; ²Centre on Global Health Security, Chatham House, London, UK;
francesca.viliani@internationalsos.com

As the Ebola outbreak in West Africa demonstrated, outbreaks of infectious diseases pose a significant threat to the extractive industry. In the three most affected countries, the Ebola crisis has led to entire operations being shut down while others have been scaled back considerably. Extractive companies often operate in emerging infectious disease (EID) 'hotspots'. The nature of extractive projects in these hotspots causes greater interaction between animals and humans which in turn, is thought to create a greater risk of infectious outbreaks.

The presentation describe a series of research activities carried out with mining companies active in Africa, and mainly a field testing of planning and audit tools the Katanga province of the Democratic Republic of Congo; a qualitative study to better understand the industry's perception of EID-related risks; and a review of the evidence of collaboration between public and private authorities in case of outbreak.

The research highlighted that although the mining industry recognizes a need for collaborative approaches to managing EID risks, its response remains focused "inside the fence" with an emphasis on limiting contact between humans, wildlife and domestic animals and maintaining hygiene standards. As a result, companies are still vulnerable to disease outbreaks, due to a lack of coordination and engagement with stakeholders "outside the fence". In public health crises such as the recent Ebola outbreak, no single organization has the capacity to deal with global outbreaks on its own.

The Ebola outbreak has highlighted that EID preparedness and response should be considered a core component of each extractive project in order to ensure resilience and business continuity; epidemics and pandemics require new forms of partnerships within the mining sector and between this sector and the public authorities in the country where projects are located as well as the international community at large.

Oral Session 6: Other exposures in mining

Health Impact of Living and Attending School Close To An Abandoned Copper Mine in Musoshi, Democratic Republic of Congo

Paul Musa Obadia^{1,2,3}, Célestin Banza Lubaba Nkulu^{1,2,3}, Tony Kayembe Kitenge^{1,2,3}, David Mfwana Inabanza^{1,4}, Irène Kabange Umba^{1,2}, Abdon Mukalay wa Mukalay⁵, Oscar Luboya Numbi⁶, Erick Smolders⁷, Benoit Nemery⁸

¹University of Malemba-Nkulu, Congo, Democratic Republic of the; ²University of Lubumbashi; ³National Program on Addictions and Toxicants, Ministry of Public Health, Democratic Republic of the Congo; ⁴Department of zootechnics, faculty of Agricultural sciences, university of Lubumbashi, Lubumbashi, DR.Congo; ⁵Clinical epidemiology Unit, Faculty of medicine, University of lubumbashi, Lubumbashi, DR.Congo; ⁶Department of Pediatrics, Faculty of medicine, University of lubumbashi, Lubumbashi,DR.Congo; ⁷Division of Soil and water Management, Departement of Earth and Environment Sciences, KU Leuven, Leuven, Belgium; ⁸Centre for Environment and Health, departement of public Health and primary care, KU Leuven, Leuven, Belgium; musa.p.obadia@gmail.com

Objective

We investigated environmental exposure to trace elements and possible health effects among pupils attending school close to the abandoned copper mine (and tailings) of Musoshi in the Haut Katanga province, a mining area of the Democratic Republic of Congo.

Methods

In a cross-sectional study, conducted in the dry season, we studied a convenience sample of 203 pupils (8 to 12 years) attending school close to the abandoned mine of Musoshi and 203 control pupils of similar age from the capital city Lubumbashi. A respiratory questionnaire was administered, spirometry was performed and oxymetry was also done. Concentrations of 25 metals were measured by inductive coupled plasma mass spectrometry in spot samples of urine from subsamples of 24 exposed children 27 control children.

Results and Discussion

The children of Musoshi tended to have urine lower values corrected for creatinine, except for Li and Sn. With regards to the respiratory questionnaire, pupils from Musoshi reported more nasal, respiratory and eye symptoms than pupils from Lubumbashi: Cough last 3 months: 156/134, OR 1,7 (1,10 – 2,64), Phlegm mixed with blood last 3 months: 14/3, OR 4,93 (1,39 – 17,45), Itchy nose last 3 months: 58/40, OR 1,63 (1,02 – 2,58), runny nose last 3 months: 161/132 OR 2,06 (1,32 – 3,21), epistaxis last 3 months: 78/39 OR 2,62 (1,67 – 4,11), eye symptom last 3 months 68/3 OR 33,58 (10,35 – 108,92). However, the groups did not differ significantly in pulmonary function indices or oxymetry.

Conclusion

Pupils attending school close to the abandoned copper mine of Musoshi reported more nasal, respiratory and eye symptoms, but this was not with significant impairment of pulmonary function.

Oral Session 6: Other exposures in mining

Health Aspects of Mining in Greenland

Niels Ebbenhøj

Bispebjerg University Hospital, Denmark; nebb0001@region.dk

Mining has been conducted in Greenland since the late 18th century and numerous minerals have been explored and exploited. Since virtually any kind of mining comprise some kind of health risk one could expect a number of reports on mining and health issues.

A PubMed search on “mining and health” reveals 9,584 hits, but including “Greenland” in the search limits the number to 4. One paper from 1976 reported elevated blood lead levels in warehouse workers, and 3 papers from the 1990 to 1992 about the disease pattern among employees at the zinc, lead and silver ore mine of Maarmorilik, Greenland.

My contribution to health in the mining industry has been a risk assessment and safety measures related to the use of large amounts of sodium cyanide in the gold-mine in southern Greenland, and guidelines for the treatment of workers exposed to hydrofluoric acid related to the rubies industry.

Special session on Miner's experiences with Accidents and Occupational Health and Safety.

Wednesday, 23 August, 13:45 - 14:45

Session Chairs: Rasmus Køster-Rasmussen and Peter Appel

Mercury Pollution from Small-Scale Gold Mining Can Be Stopped by Implementing the Gravity-Borax Method – A Two-Year Follow-Up Study from Two Mining Communities in the Philippines

Rasmus Køster-Rasmussen, The Research Unit for General Practice, University of Copenhagen,
glr478@sund.ku.dk

Mercury is used globally to extract gold in artisanal and small-scale gold mining. The mercury-free gravity-borax method for gold extraction was introduced in two mining communities using mercury in the provinces Kalinga and Camarines Norte. This presentation describes project activities and changes in mercury consumption. Baseline (2011) and follow-up (2013) data were gathered on mining practices and knowledge about mercury toxicology. Furthermore, Six years follow-up based on the report from the end of project evaluation in June 2017 will be included.

Most miners in Kalinga converted to the gravity-borax method, whereas only a few did so in Camarines Norte. Differences in the nature of the social systems impacted the success of the implementation, and involvement of the tribal organization facilitated the shift in Kalinga. In conclusion, the gravity-borax method is a doable alternative to mercury use in artisanal and small-scale gold mining, but support from the civil society is needed.

Afternoon Keynote 8

Wednesday, 23 August, 14:45-15:30

Web-based Tools to Improve Occupational Health and Safety in Mining

Emanuele Cauda

Pittsburgh Mining Research Division, NIOSH; cuu5@cdc.gov

The Mining program at the U.S. National Institute for Occupational Safety and Health (NIOSH) has the mission of safe mines and healthy miners in the United State and around the world. The goal should be pursued independently if the operation is an extensive mine part of a large company or an informal mine site. Industrial/occupational hygienists and engineers have important roles in achieving this goal respectively by assessing and monitoring the health and safety conditions at mines and by finding solutions for improvements. NIOSH and the Mining program in particular, work through relevant research and impactful solutions - products and tools that can be used in the field. Traditional NIOSH products include publications, best practices, and guidelines released as documents. More recently NIOSH also started the development of digital applications, software, and interactive tools that can be immediately applied in the field by professionals. The new NIOSH Sound Level Meter App is a good example of how this new approach can be effective in the field when conventional tools are not available. Another example is the Helmet-CAM and its software EVADE: this technology allows for the combined use of a small webcam and real-time sensor device to identify high-exposure tasks to different hazards. These freely available tools generally require the use of a tablet or laptop, but they already represent an advancement in accessible solutions that can be implemented without extremely sophisticated instrumentation. The presentation will provide an overview of several NIOSH tools – among others, those that focus on noise monitoring, ergonomics, respirable dust, and crystalline silica.

Oral Session 7: Preventive measures. Part 1

Wednesday, 23 August, 15:30-16:00

Session Chairs: Helmut Ehnes and Derk Henri Brouwer

New challenges for the potash mining industry following the TLV discussion for nitrogen oxides

Dirk Dahmann¹, Rüdiger Triebel², Harald Wellhäußer¹

¹BGRCl, Germany; ²K plus S, Germany; dirk.dahmann@bgrci.de

K plus S group is facing important challenges with respect to compliance with the novel threshold limit values for nitrogen oxides in Germany. In addition, further and lowered TLVs for carbon monoxide and diesel particulates are expected.

In underground potash and rock salt mining, drilling and blasting technologies are the most important technologies for loosening minerals and rock. Roadway preparation, transport of minerals and miners as well as most of the secondary activities are performed by diesel engine driven mobile machinery. The novel threshold limit values of 2 ppm for NO and 0.5 ppm for NO₂ (as shift average values) cannot currently be complied with.

As K plus S is actively trying to reach a status of compliance in future, it was decided to perform all possible efforts in order to fulfill legal requirements for nitrogen oxides within the five-year-period allowed by the current regulation. This was decided to further guarantee health and safety of the miners according to the novel and significantly more severe legal prerequisites. The intended measures in the range of engine technology, ventilation management, blasting technology and occupational medicine will be discussed.

Oral Session 7: Preventive measures. Part 1

Designing a Prototype of an Evaporative Cooling Garment Apt for Deep Mine Activities

Chady Al Sayed, Ludwig Vinches, Stéphane Hallé

École de Technologie Supérieure, Montreal, Canada.; chady.al-sayed.1@ens.etsmtl.ca

The global need for raw materials and their surface rarefaction has led the mining industry to dig deeper and reach depths greater than 2.5 km. With these depths comes severe heat stress that could represent a danger to the health and safety of miners, despite the use of massive ventilation and air conditioning systems. One of the solutions to ease the high temperature and relative humidity encountered by miners is the use of personal cooling garments. Nowadays, even the most effective existing cooling garments (liquid-cooled and phase change garments) become inadequate when used in a very hot and humid work environment. To address this problem, a prototype of a portable cooling garment for deep and ultra-deep mining conditions is being developed.

The prototype will create a microclimate between the body of the miner and the surrounding environment. It would treat the hot and humid air by using an atmospheric discharge of high-pressured carbon dioxide (CO₂) to produce dry ice. This discharge increases the sensible and latent cooling capacities of the ambient air, thus assisting in the evaporation of sweat and cooling the body. Treatment of ambient air using this technique was tested in laboratory conditions and its efficiency has been proven. Depending on the CO₂ flow discharge, it was possible to obtain an air cooling capacity ranging from 142 W to 426 W. While a large flow rate offers limited autonomy, a small injection rate makes it possible to achieve a cooling time of up to two hours while keeping the systems weight under 4 kg.

Once developed, the prototype will improve the thermal comfort of miners, minimize the risk on their health and safety, and increase the productivity of the mining industry.

Oral Session 7: Preventive measures. Part 2

Wednesday, 23 August, 16:15 - 17:00

Session Chairs: Helmut Ehnes and Derk Henri Brouwer

Constitution of Homogeneous Exposure Groups in South African Mining Industry; A key factor to identify high risk workers.

Derk Henri Brouwer

University of the Witwatersrand / WITS UNIVERSITY, South Africa; derk.brouwer@wits.ac.za

Introduction

Current practice in South African Mining Industry (SAMI) to constitute Homogeneous Exposure Groups (HEGs) is based on Activity Areas, e.g. stoping, subdivided into classification bands (% of OEL). Constitution of HEGs is a key factor in the exposure monitoring/surveillance of workers, since HEGs are considered as an exposure entity. Unfortunately, this broad categorization of grouping introduces variances of exposure, which may results in misclassification and masking of high risk jobs/ individuals. The objective of this study was to investigate the feasibility of i) using job titles as additional parameter for grouping of workers according to exposure and ii) the use of exposure determinants to improve prior classification of exposure groups.

Methods

A dataset of 856 eight-hour time weighted average (TWA8h) coal dust data was analyzed using Statistica V13 and EXPOSTATS (<http://www.expostats.ca/>). The measurements were conducted in 2015 and comprised of 49 HEGs and 39 job titles across mines. Box and Quantile-Quantile plots and ANOVA were used to evaluate homogeneity of different groupings. In addition, a targeted literature search was conducted to identify the potential for the development of a Bayesian Belief Network (BBN). A BBN for coal mine exposure which combines exposure determinants would be a backbone for an exposure model and could improve the grouping.

Results

The analysis revealed that introduction of 'job title' improved the homogeneity of the HEGs, thus enabling improved identification/classification according to level of exposure. Furthermore, we were able to identify a number of studies where BBN and the impact of determinants on exposure by so called conditional probability tables could be quantified.

Discussion

Integration of the improved method to constitute HEGs and BBN as building blocks of a Bayesian Framework has potential to improve posterior of exposure estimates, i.e. identification of high risk workers. Follow up research is initiated to develop such a framework.

Oral Session 7: Preventive measures. Part 2

A Training Program to Assist the Mines Inspectorate of Ghana to Manage Occupational Health and Safety Issues Associated With Artisanal and Small Scale Mining

Carmel Mary Bofinger, Danellie Lynas

The University of Queensland, Australia; c.bofinger@uq.edu.au

This training program was developed and delivered to assist the Minerals Commission and Mining Inspectorate of Ghana to better manage identified health and safety issues in the artisanal small scale mining (SSM) sectors. A subsequent workshop was completed for representatives of the small scale mining sector, to capitalize on the understanding and materials developed during the training program.

The five day training program delivered to the Minerals Commission was conducted at the University of Mines and Technology (UMaT) in Tarkwa, located in one of the most significant SSM mining areas in Ghana. The workshop was attended by 38 personnel from the Inspectorate Division of the Minerals Commission – encompassing the Inspectorate Division, Small Scale Mining Department and District Officers from the regional areas of Ghana. The training was conceived as both providing health and safety knowledge and skills to the Commission and Inspectorate and developing skills and materials to allow the information to be presented in a format appropriate for use by the SSM sector.

The one day workshop/forum for Small Scale Miners was extremely well attended by 40 representatives of Small Scale Mining from across all regions of Ghana. The materials developed during the Inspectorate training course were presented to the SSM sector for comments and uptake.

The SSM training materials developed during the first week and trialed during the subsequent SSSM workshop were handed over to the Minerals Commission for further development and continued implementation.

Oral Session 7: Preventive measures. Part 2

Occupational Health Risk Management in Miners: Reinventing ourselves to prevent occupational disease

Casper Johannes Badenhorst

Anglo American plc; cas.badenhorst@angloamerican.com

Introduction

Globally, the mining industry has collected personal exposure data for decades and adopted elaborate schemes to monitor personal exposure, collect hundreds of personal exposure samples annually, and generate large data sets on personal exposures. However, very little is known about the actual sources of exposure or the effectiveness and performance of controls associated with these sources. This gap has hampered the effective control of exposures in the complex and dynamic mining environment.

The current approach to occupational hygiene involves risk assessment to identify the health hazards, followed by programmes of personal exposure monitoring conducted by an occupational hygienist. Although personal exposure monitoring is entrenched in mining, it has not contributed greatly to reducing the risk of occupational exposure to health hazards such as respirable crystalline silica dust and noise.

Discussion

Occupational hygiene is not just about measuring personal exposure as a proxy for controlling the working environment. In order to progress and fully understand workplace health hazards and exposures and to design and implement effective and practical controls, our understanding of “*why workers are exposed*” is important, as opposed to knowing only “*who is exposed*” and to “*how much*”.

This presentation proposes a changed approach to occupational hygiene – a back to basics “with a difference” approach, where the first step is the identification of health hazards, followed by the identification and characterisation of the hazard sources, and their respective critical controls.

Conclusion

Where controls are found to be ineffective, intervention is required and an appropriate improvement and control strategy must be developed and implemented, alongside a system of indicators to monitor control effectiveness and availability. The “residual health risk” is then monitored at a personal exposure level, to inform the system of medical surveillance, and these data, in turn, are used to inform the occupational hygiene programme.

Oral Session 8: Good practices in mining

Wednesday, 23 August, 17:00 - 18:15

Session Chairs: Casper Johannes Badenhorst and Mark Holmes

Images of the Miners' Profession

Carl-Olof Bernsand

Dalarna University, Sweden; cob@du.se

In earlier studies researchers have seen that the knowledge about mining and working mines in Sweden was low among young adults living in Stockholm. The aim of this study was to see how the image of the miners' profession changed over geographic distance.

To determine the miners' image of working in the mines focus group interviews/focus group attractive work was conducted in three different Swedish mines. The next step was to make a survey among 8 th graders in elementary school. The survey was based on the result from the focus group interviews/focus group attractive work. The purpose with the survey was to examine if there was a difference due to the distance. The survey was sent to six schools on three different distances from the mining industry. Interviews were also made with people at the HR department who works with recruiting and managers that recruits.

The result shows that the miners think that their work is attractive and a big part of that is the social relations at work. They work in safe conditions and the automatization of the work makes it less heavy than earlier. They do like to share their knowledge and are proud to be miners. That picture is confirmed by the HR department and managers.

The image of miners' profession has not kept up with progress in the mining industry. The geographical distance matters for the perception. The farther away you go, the less consistent the image is with the one that the miners have.

The conclusion is that the mining industry must become more active and show how much it has developed regarding working methods and the working environment. The mining industry must also show that both men and women are able to work as miners.

Oral Session 8: Good practices in mining

Good Practice Guidance on Occupational Health Risk Assessment

Casper Johannes Badenhorst

International Council on Mining & Metals Industry (ICMM) / Anglo American, South Africa;
cas.badenhorst@angloamerican.com

Introduction

The presentation will provide an overview on the state of occupational health and hygiene in the mining and metals industry and describe the guidance on occupational health risk assessment developed by the International Council on Mining and Metals (ICMM).

Method

In 2009 ICMM developed the *Good Practice Guidance on Occupational Health Risk Assessment* to help site practitioners assess and address the risks posed by health hazards in the mining and metals sector. It provided those practitioners with the information they needed to assess the health and well-being of employees and contractors.

In 2016 a review was undertaken to bring the text and advice up to date with changes in the field of occupational health risk assessment and align this document with the terminology and approaches proposed in ICMM documentation published since the first edition, principally the concept of material unwanted events (MUEs) and the management of those through the use of critical controls.

Results

The guide identifies the occupational health impacts of mining and metals processing, outlines good practices in the identification of hazards and exposed workers, assists practitioners in estimating exposure levels and assessing the effectiveness of controls and explains the importance of quality analysis and reporting

Discussion

Healthy workers are essential to the success of mining and metals companies, and ICMM company members are driven in their protection of the health and well-being of both workers and local communities by the ICMM's Sustainable Development Principle 5: "Pursue continual improvement in health and Safety performance with the ultimate goal of zero harm". Occupational health risk assessment is the foundation of any occupational health programme and will determine the effectiveness of the programme. It is the intention of the ICMM that this publication provides a practical tool to assist companies in protecting the health and well-being of their workforce.

Oral Session 8: Good practices in mining

The Ontario Mining Exposure Database (OMED): A tool for mining research in Ontario, Canada

Colin J Berriault¹, Victoria H Arrandale^{1,2}, Nicola Blagrove-Hall¹, Katherine J. Jardine¹, Paul A Demers^{1,2}

¹Occupational Cancer Research Centre, Cancer Care Ontario, Canada; ²Dalla Lana School of Public Health, University of Toronto; victoria.arrandale@cancercare.on.ca

Background

Many jurisdictions have constructed large exposure databases to examine workplace exposures across occupations and industries. Historical exposure data can be used to examine trends in exposure over time, to evaluate the effectiveness of major historical interventions or to improve exposure assessment in epidemiological studies. In order to better understand potential risks to workers in the mining industry, an electronic database of historical exposure measurements was constructed for the province of Ontario, Canada, a region with a long history of mining. The database is known as the Ontario Mining Exposure Database, or OMED.

Methods

Researchers worked closely with regulators, workers representatives and employer groups to locate and retrieve exposure data. Hard copy data was entered into a secure electronic database. The constructed database is compatible with other existing Canadian exposure databases but incorporates additional mining-specific data such as information on ore type(s), ventilation, personal protective equipment and whether the sample was collected above or underground, for example.

Results

The complete OMED contains 147,236 lines of data representing 884,313 measurements (some data entries are summary measures of multiple samples). In total 165 hazards are included in the exposure data. Measurements were collected between 1950 and 1997 in mines, smelters, refineries as well as gravel and sand pits. The most common exposures present in the database to-date are: dust n.e.c (58.1%), silica (11.1%), radon (6.6%), arsenic (4.2%), and lead (4.2%).

Conclusions

The OMED database is a tool for mining research in Ontario, Canada and beyond. The OMED is currently being used to describe the historical exposures to specific hazards in the Ontario mining industry. Results can be used to determine whether former miners are at risk of cancer or chronic respiratory disease and will also be used for exposure assessment in future epidemiological studies of occupational cancer in the mining industry.

Oral Session 8: Good practices in mining

Occupational Exposure and Disease in the Mining Industry: A program of research from Ontario, Canada

Victoria H Arrandale^{1,2}, Colin J Berriault¹, Jill Hardt¹, Nicola Blagrove-Hall¹, Katherine J Jardine¹, Nancy E Lightfoot³, Paul A Demers^{1,2}

¹Occupational Cancer Research Centre, Cancer Care Ontario, Canada; ²Dalla Lana School of Public Health, University of Toronto; ³School of Rural and Northern Health, Laurentian University, Sudbury ON; victoria.arrandale@cancercare.on.ca

Background

Workers in the mining industry are exposed to complex mixtures including radon, silica, diesel engine exhaust, and various metals. Changes in technology, improvements in research methodologies and the identification of new and relevant carcinogens support the need for continued research.

Methods

The Occupational Cancer Research Centre (OCRC) has a program of research focusing on the mining industry in Ontario, Canada, a region of Canada with long history of mining. The program includes an occupational disease surveillance system, an occupational exposure database, and a hard rock mining cohort study.

Results

The Occupational Disease Surveillance System (ODSS) uses compensation data and administrative health data to examine trends in disease across industry and occupation groups. Preliminary results suggest that metal (HR 1.46, 95%CI 1.34-1.58) and non-metal (HR 1.41 95%CI 1.01-1.99) miners are at increased risk of lung cancer. The Ontario Mining Exposure Database (OMED) contains over 147,236 lines of data representing 884,313 measurements of 165 unique hazards in the Ontario mining industry. Early analysis of OMED suggests there were decreases in silica concentration after the institution of occupational health and safety legislation (12% per year, $p < 0.001$). The Mining Master File (MMF) Cohort was constructed from a medical screening program and includes over 90,000 workers with annualized work history data. The MMF cohort is currently being linked to administrative health data to estimate the risk of cancer and chronic respiratory disease. In future, the OMED data will be used to estimate exposures among the MMF cohort, supporting further epidemiological analyses.

Conclusions

The mining research program at the OCRC seeks to contribute to the prevention of occupational disease in the mining industry. Results from these projects can be used to develop targeted prevention strategies. The data sources that make up the mining research platform are valuable tools for mining research.

Oral Session 8: Good practices in mining

Critical Control Management in the Mining and Metals Industry

Mark Holmes

International Council on Mining and Metals (ICMM), United Kingdom; mark.holmes@icmm.com

Introduction

The presentation will provide an overview on the state of health and safety in the mining and metals industry and describe the guidance on critical risk management developed by the International Council on Mining and Metals (ICMM).

Methods

ICMM undertook a collaborative project on health and safety risk management with the objective of developing guidance for the industry on an end-to-end risk management process that delivers adequate and effective controls. The presentation will touch upon the journey for why and how the guidance was developed, linking it to other material produced by ICMM and the mining and metals industry.

Results

The approach described in the guidance is called critical control management (CCM) and was published in 2015. It provides advice on how to identify and manage critical controls that can either prevent a serious incident occurring in the first place or minimize the consequences if a serious incident were to occur. Under CCM, critical controls should be clearly described, and their required performance and the accountability for implementing the controls should be made explicit. Committed leadership through the active monitoring of CCM across the mining and metals industry is essential for the long-term success of the approach.

Discussion

The work of improving the industries performance of health and safety is driven by the vision of zero harm, with the elimination of fatalities and catastrophic incidents being a crucial step in achieving this. By using a combination of leadership, effective material risk management, and open learning between industry peers, ICMM is in the position to provide guidance on effective risk management that is not predominantly centered on risk assessments but is focused on ensuring the catastrophic incidents simply do not occur. The focus on zero harm is increasingly in reach.

Morning keynote 9

Wednesday, 24 August, 8:30 - 9:10

VISION ZERO: Yes We Can! - Prevention in Mining

Ulrich Meesmann

President ISSA Mining, Germany; Ulrich.Meesmann@bgrci.de

Is the aim of “Zero Harm” not over ambitious? No one severely hurt on the job, no lasting damages to health in any sector of industry?

The address will introduce models proving that “VISION ZERO” is achievable, also in high-risk industries. Which tools help companies to reach the gold standard of “Zero Harm”, and what can be learned from safety and health champions across the world? Proven success factors of the industry and of areas such as aviation and ground traffic will be discussed.

The address also touches the economic effects of prevention including a case study showing that prevention can do more than cutting down costs and downtime – the example demonstrates how profit and productivity can be boosted significantly by the very means of prevention.

Morning Keynote 10

Thursday, 24 August, 9:10 - 9:50

Excellence for Safety & Health in Mining. ISSA Mining – Your Global Partner

Helmut Ehnes

ISSA Mining, Germany; Helmut.Ehnes@bgrci.de

340 million accidents at work happen worldwide every year, only counting those leading to more than four days absence. 360,000 End fatal. Two million people more die every year due to work-related diseases. To sum this up: around 2.4 million people die every year because of work conditions.

Mining operations go along with a variety of hazards. Not only in large operations, as they first come to mind, but also in the manifold small scale mines, with an estimated 13 million labourers worldwide are exposed to all kinds of risks from nature, from machinery and vehicles, from various substances such as dust, mercury and other chemicals, while also dealing with poor ventilation, inadequate space and overexertion.

We can make mining sustainably safer, but we need a successful strategy to do so. A high potential lies in Vision Zero. Vision Zero is a prevention strategy for a safe future without fatal or serious occupational diseases, work accidents and traffic accidents. Vision zero's holistic elements cover technology, workplaces, rules, and people as fields of action. By focusing on severe and fatal accidents, its application increases the level of safety and health overall.

The presentation will discuss well-proven methods and tools to achieve this ambitious, but realistic aim, including the introduction of the "Seven Golden Rules". Developed by Issa Mining and meanwhile adapted by all thirteen prevention sections of the Issa, the "Seven Golden Rules" can help to implement the Vision Zero strategy worldwide.

Some positive examples will show that the Vision Zero strategy is not an illusion but a realistic goal, which can be achieved in mining as well.

Poster Session

Tuesday, 22 August, 12:00 - 12:45

P1

Risk Assessment for Occupational Disease Arising from Exposure to Noise and Vibration in Mining Industry

Andrei Lucian Gireada, Constantin Lupu, Sorin Simion, Daniel Pupazan, Nicolae Ioan Vlasin

National Institute for Research and Development in Mine Safety and Protection to Explosion - INSEMEX
Petrosani - ROMANIA, Romania; andrei.gireada@insemex.ro

Discomfort from exposure to noise and vibration is widely accepted in the contemporary world, having many physiological, psychological and social implications.

Strategically, the issues of noise and vibration are uniformly approached at national level in accordance with European practice, by progressive implementation of regulations and techniques used by Member States, on monitoring noise and vibration emission levels.

The masking effect of voice, sound signals and verbal orders during work processes, leads to tiring attention efforts and decreasing activity efficiency. This favours a decrease in working capacity by the emergence of a state of tension, decreased attention spans, decreased ability for coordination of professional technical movements and ability for critical assessment of situations as a result of work-related stress.

Development of modern technology by increasing machinery power and speed redounds to the diversification of noise and vibration sources, as well as to extensive increase in the number of people exposed.

The technological process of coal extraction involves boring, shooting, discharge by horizontal and vertical transportation, partial and main ventilation, water discharge, air compressing processes and processing and separating coal from the rock mass which use high noise and vibration generating equipment and tools. Besides its harmful effect on the human body, underground noise also has a masking effect that compromises safety at work by covering safety signals.

This paper examines how noise and vibration generated by underground technological processes influences worker's activity.

Poster session

P2

**Research into Occupational Noise Induced Hearing Loss in South African Large Scale Mines:
Access Denied?**

Nomfundo Floweret Moroe, Katijah Khoza-Shangase

University of the Witwatersrand, South Africa; nomfundo.moroe@wits.ac.za

Background

Occupational noise exposure resulting in occupational noise-induced hearing loss (ONIHL) remains a reported concern in the South African mining industry with significant challenges posing as barriers to eliminating ONIHL.

Objectives

The current pilot study aimed to investigate the feasibility of conducting audiological research into ONIHL within the South African mining sector. Specific objectives involved determining ease of identifying focal personnel in charge of hearing conservation programmes (HCP) in the mines; establishing the response time and rate of identified focal personnel for interviews regarding HCPs in their mines; and exploring the focal personnel's willingness to share information regarding HCP in their mines.

Method

A descriptive research design was adopted following a desktop research approach where data was obtained through electronic communication and internet searches. Data was analyzed qualitatively.

Results

The current study revealed that gaining access into the mining sector in order to conduct research on ONIHL and identifying focal persons involved in HCP at various mines is negatively impacted by the following factors: firstly, the contact details of the focal person are not always listed on the website; secondly the prolonged response rate between the initial contact and the time in which the participants respond. Lastly, there seems to be an unwillingness to share information regarding the management of ONIHL in the mining sector and the progress made in the HCP at various mines. Current findings contribute toward evidence regarding possible barriers to effective and successful implementation of application of best practice in HCPs; guided by evidence-base that is contextually relevant.

Poster session

P3

Efficacy of N,N'-bis-(2-mercaptoethyl)isophthalamide on mercury intoxication: A randomized controlled trial

Paul Schutzmeier¹, Anna Koch², Annica Dominicus², Wilson Castillo-Tandazo⁴, Nicolas Focil⁴, Augusto Focil Baquerizo⁴, Stephan Bose-O'Reilly^{1,3}

¹2 Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine, WHO Collaborating Centre for Occupational Health, University Hospital Munich, Munich 80336, Germany; ²Scandinavian Development Services AB, Svärdvägen 23, SE-182 33 Danderyd, Sweden; ³Institute of Public Health, Medical Decision Making and Health Technology Assessment, Department of Public Health, Health Services Research and Health Technology Assessment, UMIT (University for Health Sciences, Medical Informatics and Technology), Hall i.T., Austria; ⁴FOMAT Medical Research, Oxnard, CA. USA;
paul.schutzmeier@med.uni-muenchen.de

Purpose

Chronic mercury intoxication is a severe health issue, especially in gold mining communities. Common chelators used for improving mercury elimination are not everywhere available and challenged by poor cell wall penetration. This study's aim was to examine the efficacy of the chelator N,N'-bis-(2-mercaptoethyl)isophthalamide (NBMI) on mercury intoxication.

Methods

In this three-armed, placebo-controlled randomized trial, miners with elevated mercury urine levels were administered 100mg NBMI, 300mg NBMI or placebo for 14 days. Urine [$\mu\text{g}/\text{l}$ and $\mu\text{g}/\text{g}$ creatinine] as well as plasma levels were analyzed. Therapeutic effect was assessed using the medical intoxication score, fatigue scores, a neuromotoric test battery (CATSYS) and a neurological outcome (Finger to nose test).

Results

Physical fatigue and total fatigue was significantly decreased in the 300mg NBMI group compared to the control. NBMI 300 mg treatment insignificantly decreased sleeping problems and excessive salivation. Mercury concentration in urine following 300mg NBMI treatment was significantly elevated compared to control, however, only without adjustment for creatinine.

Conclusion

NBMI demonstrated promising therapeutic effects in the treatment of mercury intoxication. More comprehensive studies are mandatory to verify the effects of NBMI as a novel tool for treating mercury intoxications.

Poster session

P4

Injurious Working Environment of Manufacturers Desinging Implements/Tools For Different Occupations

Promila Sharma³, Neha Mehra², Kavita Narwal¹

¹G.B. Pant University of Agriculture and Technology, Pantnagar Uttrakhand, India, India; ²Khandelwal Girls College, Barrely, Uttar Pradesh, India; ³Diffence Colony Haldwani, Uttra Khand, India; promila34@gmail.com

Indian economy is governed by multiple occupations where large number of labor force is involved like agriculture, construction, mining, land mining of different materials and many more. The tasks under each involve various types of implements and tools. The majority of forge workers live in poor areas, lack basic health and welfare services and social protection and work in an unhealthy and unsafe working environment. For many of these operators their home and workplace are one and the same place. In order to achieve the objectives of the study, descriptive-cum-experimental research design was selected. On the whole total one twenty blacksmith workers were interviewed for descriptive data and thirty were taken for experimental data.

The major environmental problems in forge smith's work area were poor air circulation, overall poor physical environment and highly noisy area. Percent increase in blood pressure, heart rate; energy expenditure rate and total cardiac cost were maximum in workers i.e. striking operation in bending position and minimum in those who were involved in cooling operation in squatting position. Most of the workers were suffering with burns as the major chronic illness and least common problem found among them was diabetes mellitus. The mechanical hazard faced by most of the workers was awkward posture and repetitive motion during work. The workers were suffering maximum with mechanical hazards also as reported by them.

Majority of the total workers were suffering from physical hazards due to tiring position. Maximum of the physical hazards were faced by workers who were involve in harming followed by workers involve in striking whereas workers involved in cooling were least affected by physical hazards. Certain kinds of PPE (face shield, gloves, ear plugs, hand grip band) were suggested and responses of workers were found to be positive towards the use of PPE.

Poster session

P5

Mercury-Free Small Scale Gold Mining In T'Boli, South Cotabato Province in The Philippines – A Story From A Project Visit

Asta Selloane Sekamane

University of Copenhagen, Denmark; asta.sekamane@gmail.com

Diálogos has together with BanToxics introduced a gravity concentration method in Small Scale Gold Mining areas in the Philippines as a substitute for the mercury amalgamation method. One miner, Sir Nono, was one of the first to receive training and to switch method. Over the last few months, he has been experimenting with a gravity concentration method, and has developed a way to produce gold without adding any chemicals. This gravity concentration method start with milling the ore and then pouring it into a sluice box with added water. The floor of the sluice is lined with felt, which captures the heavy minerals, including gold. The carpet is then washed with soapy water. Soap will reduce the surface tension of the water, thereby facilitating fine gold capture. The mineral concentrate is panned, a manual process in which the heavy gold minerals are separated from the remaining heavy minerals. The last step is to place the gold concentrate on a leaf and cook it in a clay pot until only the gold remains. Sir Nono has evolved this last step, and is now placing the gold concentrate in a clay pot with water, and by use of a hand torch the concentrate is melted in the boiling water. As the water evaporates, left is gold. This method does not use Borax. Many miners are reluctant to stop using mercury and switch to the gravity concentration method, as they believe this is a longer process, Sir Nono demonstrates that it can be economically feasible and time saving to mine gold without the use of mercury.

Poster session

P6

Masoyise iTB Project 2015 /6: TB screening and HIV counselling on all employees, including contractors, among all the companies affiliated to the Chamber of Mines of South Africa for the period 2015 and 2016

Khanyile Baloyi

Chamber of Mines South Africa, South Africa; kbaloyi@chamberofmines.org.za

Acknowledgements

All companies that submitted data to the Chamber of Mines of South Africa and the technical experts and principals that supported the project.

Introduction

The Masoyise iTB Project was established in 2015 to assist the mining industry to screen for TB and offer HCT to all employees annually. The (CoM) Chamber of Mines of South Africa coordinated the establishment of the Masoyise iTB project. The project is planned to be implemented from 2016 till 2018 using 2015 as a baseline. Most stakeholders involved in the fight against TB and HIV in South Africa are represented in the project.

Methods

The member companies were requested to upload data on the electronic reporting system using DMR 164 Template. Data was collected for 2015 and 2016. Analysis and report produced.

Results

The companies that uploaded data on the system represent 332 527 employees compared to 476 625 employees represented in the Regulator's DMR 164 database for. In 2015, 79.1% of employees from Chamber companies were counselled for HIV compared to 62% employees from the Regulator's DMR 164 database. For TB, 94% of employees from Chamber companies were screened for TB as compared to 88.7% in the DMR 164 reporting database. There is annual improvement of % of employees screened for TB and offered HCT.

Poster session

P7

Mindfulness and Its Effect on Performance in the Context of a Simulated Underground Mine

Carolyn E Knight, Tammy Eger, Aaron Langille, Alison Godwin

Centre for Research in Occupational Safety and Health, Laurentian University, Canada;
ce_knight@laurentian.ca

Introduction

Load-haul-dumps (LHDs) are used to transport materials in underground mining. Due to the design of LHDs and the design of the mine drifts, these vehicles are implicated in accidents involving other mining equipment, the mining environment and pedestrians. In 2015, the Ontario Ministry of Labour published the Mining Health, Safety and Prevention Review, which recommended that mobile equipment operators need to have a strong situational awareness.

Mindfulness training can be used to improve an individual's situational awareness and attention. Mindfulness is a trait that naturally varies amongst individuals. However, it is a technique that can be taught and with training and practice, a person's mindfulness levels can improve over time. There has been limited research conducted in the area of mindfulness and the workplace but there is evidence to suggest that mindfulness training may be a method to improve workplace safety.

Methods

This project will measure a person's inherent mindfulness level and correlate it with performance measures obtained from a computer-based virtual reality underground mine simulator. Performance measures will include perception-response time and collision frequency. Mindfulness will be measured using the Mindfulness Attention Awareness Scale.

Results and Discussion

Results and discussion to be processed and presented.

Poster session

P8

Policy and Legislative Review of Large Scale Mining Laws in the Philippines

Lu Sophia Francesca

College of Arts and Sciences, University of the Philippines Manila, Philippines; sophia_fran@yahoo.com

Aim

This study analyzed policy and legislative documents on large scale mining in the Philippines.

Methods

The data were based on gray literature, peer-reviewed journals, databases, government statistics, and secondary literature on major mining disasters in the Philippines, and the impact of regulation or lack thereof in this industry.

Results

The existing standards on mining does not include social safety nets, and comprehensive safety and health programs. Likewise, the system for regulation, monitoring and sale of chemicals particularly mercury and cyanide is not in place and needs to be strengthened. There is no existing standards of measurement of mercury and cyanide content in water and air from mine wastes and effluents. Hence, a collaboration with experts from the fields of environmental science, and medicine is mandatory. In the event of a disaster, a proactive rather than a reactive approach is needed. Reporting system to government bodies only includes injuries and effluents, but not illnesses, and exposure to hazards. The forms are not updated to reflect health cost and burden. On the part of the mining companies, the administrative and engineering aspects of preventing hazards are not in place; the use of personal protective equipment among workers is emphasized rather than the administrative and engineering control measures. The former should be the last line of defense, and supplementary only to measures undertaken by the establishment.

Discussion

There is a need for paradigm shift and mind reorientation that healthy environment, health workplace and healthy miners are all correlated with productivity. Engineering safety and control measures should be more emphasized in the Mining Act. It is also suggested that the main framework of the law be revised/re-oriented, such that it should “nationalize” our resources, meaning it should be used to enrich our own country, to help in nation-building.

Poster session

P9

PROMoting health in Small and Artisanal MINing of GOLD (PROSAMIGO) – a feasibility study for human biological monitoring of mercury exposure

Ilse Ottenbros¹, Romilda Z. Boerleider¹, Bianca Jubitana², Jan Quik³, Nel Roeleveld¹, Paul T.J. Scheepers¹

¹Radboud Institute for Health Sciences, Radboudumc, Nijmegen, The Netherlands; ²Medische Zending Primary Health Care, Paramaribo, Suriname; ³Centraal Laboratorium, Bureau voor Gezondheidszorg, Paramaribo, Suriname; paul.scheepers@radboudumc.nl

Introduction

The use of mercury in artisanal and small-scale gold mining (ASGM) has consequences for human health and the environment. We conducted the PROMoting health in Small and Artisanal MINing of GOLD (PROSAMIGO) study to explore the situation for mercury and health in the gold mining areas in the inland of Suriname, South America. The aim of our project was to study the feasibility of introducing a human biological monitoring (HBM) program to assess mercury exposure for gold miners and local residents, including children.

Methods

A literature study was performed to determine the most suitable biological media for HBM. We also interviewed 30 gold miners and 76 residents to find out about their interest to participate in a HBM program and included questions related to what they could do themselves to reduce the uptake of mercury from the environment.

Results

The literature study resulted in factsheets to support application of HBM to assess exposure of metallic and methyl mercury. We prepared a diagram that can support decision-making, regarding the most suitable biological medium for HBM (blood, urine, hair or exhaled air, see: <http://www.aimspress.com/article/10.3934/environsci.2017.2.251>). Local staff interviewed both villagers and gold miners in their native language. The respondents expressed an interest to know their mercury body burdens and gave their consent to collect such specimen, also from their children. Only a few respondents didn't want to provide samples for HBM.

Discussion

We consider it feasible to prepare a HBM program in the inland of Suriname. For the successful introduction of HBM it is important to carefully report back the lab results to each participant, together with information on possible solutions and adequate care, tailored to the person's situation.

Acknowledgement

PROSAMIGO received funding from the Uitvoeringsorganisatie Twinning Suriname Nederland (UTSN) of the Dutch Ministry of Foreign Affairs.

P10

Challenges of Electrical Accidents in Underground Mines

Ali Mozafari

Research and Training Center for Occupational Safety and Health (CRTOSH), Iran, Islamic Republic of;
ali_mozafari@hotmail.com

Electric shocks kill workers in underground mines every year. Analyses of mining accident reports have revealed that electrical shock is one of the challenges in underground mining safety due to lack of ample supervisory in developing countries. This risk is greater in coal mines due to potential of gas explosion, therefore mine operators should prepare an earthing system in thier mines. According to mining safety regulations such as the mine safety in Iran and ILO code of practice, all earthing grid systems in underground mines should have an engineering design specification, installation procedures and periodically testing results for the continued safe use of the electrical apparatus connected to the grid. In this study, different earthing systems and reasons for using such systems in underground mines have been elaborated by technical information and in this regard the IT earthing system introduced as the mandatory system for underground mines in Iran. Besides, it is cleared that the testing earthing protection system is a specialized field in mining safety services and it is essential that government authorities should make a procedure to organize qualified electrical engineering consultants in order to provide an earthing design and testing services for mine operators. This qualified group of experts is a useful resource in designing earthing systems and testing existing earthing systems to ensure of the safe use of system. The protection superior council accredits the earthing system testing authority to the electrical safety consultants by the Research and Training Center for Occupational Safety and Health (CRTOSH) of Ministry of Cooperatives, Labor and social welfare in Iran. Therefore, all mining operators should use the safety services of these qualified electrical engineers as the consultants in order to testing of the electrical earthing system in their mines every year in order to prevent electric accidents in underground mines.

Poster session

P11

Management of occupational noise induced hearing loss in the South African mining sector: A view from the top

Nomfundo Floweret Moroe, Katijah Khoza-Shangase

University of the Witwatersrand, South Africa; nomfundo.moroe@wits.ac.za

Background

In 2003, the Mine Health and Safety Council (MHSC) of South Africa signed an agreement with the South African mining sector. This agreement had implementation of two imperative milestones as its objective. These milestones were: 1. to eliminate hearing deterioration greater than 10% by December 2008 in individuals exposed to excessive occupational noise; and 2. to minimize the total noise emitted by any equipment to not exceed 110 dBA at any point in the workplace by December 2013. These milestones, however, were subsequently revised due to the mining industry failing to meet the initial targets.

Objectives

This study therefore aimed to explore the factors that contributed to the failure to meet these targets, and to establish the measures adopted to ensure the success of the revised 2014 milestones.

Method

Qualitative, in-depth telephonic and face to face interviews were conducted with the 7 MHSC stakeholders. These stakeholders included representatives from the state, labour and employer representatives. The interviews were transcribed verbatim and thematic analysis was used to analyse the data.

Results

The main contributing factor to the failure of meeting the targets was the MHSC's failure to establish and define the summit action plans prior to implementing the milestones. Lack of collaboration from all stakeholders in the mining sector also negatively affected the success of the milestones. Lastly, the lack of innovative and leading- practice projects aimed at promoting and adopting operations focused on best practice by the mining sector.

Conclusions

Occupational noise induced hearing loss continues to be a public health challenge in the South African mining industry. Efforts at interrogating barriers towards elimination of this challenge need to be increased. Current findings highlight the need for careful, comprehensive and systematic collaborative engagement of all the stakeholders in the mining industry to ensure that targets set are achieved.

Poster session

P12

Paving the Road to Small Scale Mining Advancement

Leoncio Degay Leoncio Na-oy

Emerald Small Scale Miners Multi-Purpose Cooperative, Philippines; naoyleoncio2008@gmail.com

The source of perplexity among the Small Scale Miners on the lack of mechanisms to address their issues and concerns on Financial and Health Security, Occupational Safety and Environmental Degradation need to be addressed. Having worked in this sector for three decades and found similar situations exist among the small scale miners not only in the Philippines but found it largely the same in Tanzania, Indonesia, Mongolia, Bolivia, Peru and Sudan. They are aware of the issues and concerns but have no ideas on how to solve them.

With the principles on cooperatives; I started to introduce cooperatives in 2006 in two small scale mining areas of Baguio City and Benguet Province which served as my experimental sites.

Focused group discussion between small scale miners and lectures were among the strategies I used and gained a positive response from the 2 association, Emerald Explorers Association Inc. and Spanish Empire Miners Association, after 2 years. The Workers Cooperative of Emerald Mountain in Baguio City and Lower Gomok Workers Cooperative in Benguet Province were then registered to the Cooperative Development Authority (a regulatory body for cooperatives). Among the programs catered by the cooperatives were: Social Security System and Phil Health insurance registration, reforestation, risk reduction management council and Continuous implementation of the adoptive program from the Benguet Federation of Small Scale Miners "stop using mercury as gold catcher project" a program was made globally popular and carried us into collaboration projects with the international Non-Government Organizations such as; DIALOGOS, GEUS, PURE EARTH(BLACKSMITH) APPEL GLOBAL, CREEH, IMPLOMEN, IBASHKA, LO/FTF-Philippines, BAN-TOXICS Philippines.

The conversion to Small Scale Mining Cooperative have developed willingness to work together, it invoke equal rights and introduced profit while bending the needs, it formulates policies on responsible mining. Cooperative starts paving the road to small scale mining advancement.

LIST OF PARTICIPANTS

First name	Surname	Organization	Country
Bright	Addae	Rhagan Group	Ghana
Jonas	Adjei	Rhagan Group	Ghana
Josephine	Aguttu	UNACOH	Uganda
Nkematabong Clifford	Akathe	CAPAM	Cameroon
Peter	Akol	UNACOH	Uganda
Chady	Al Sayed	Ecole de technologie supérieure	Canada
Maria	Albin	Occupational Medicine, Institute of Environmental Medicine	Sweden
Abir	Al-Kalemji	Dept. Of Occupational and Environmental Medicine, Hospital of South West Jutland	Denmark
Sakyi Daniel	Amo	Superstar Company	South Africa
Nelly Ortega	Angarita	Junta Regional Calificación Invalidez Magdalena	Colombia
Kenneth	Antwi	University of Pretoria	Ghana
Peter W. U.	Appel	AppelGlobal	Denmark
Savahat	Aqeel	G.B. Pant University of Agriculture and Technology, Pantnagar, UtraKhand India	India
Victoria	Arrandale	Occupational Cancer Research Centre, Cancer Care Ontario	Canada
Cas	Badenhorst	ICMM / Anglo American	South Africa
Khanyile	Baloyi	Chamber of Mines South Africa	South Africa
Carl-Olof	Bernsand	Dalarna University	Sweden
Carmel	Bofinger	The University of Queensland	Australia
Stephan	Bose-O'Reilly	University Hospital Munich	Germany
Lars	Brandt	Dept. of Occupational and Environmental Medicine. Odense University Hospital	Denmark
Derk	Brouwer	University of the Witwatersrand/Wits University	South Africa
Alfred Jeffrey	Baadu	Rhagan Group	Ghana
Emanuele	Cauda	NIOSH	USA
Nan	Chai	Rhagan Group	Ghana

First name	Surname	Organization	Country
Younmo	Cho	Department of Occupational Environmental Medicine, Seoul Saint Mary's Hospital	Republic of Korea
Kembabazi	Clepphasi	UNACOH	Uganda
Dirk	Dahmann	BGRCI	Germany
Vibeke	Dantzer	Dialogos	Denmark
Bainomugish a Deus	Dedit	UNACOH	Uganda
Luke	Deneys	Falck	Australia
Charles	Dhizaala	UNACOH	Uganda
Anara	Doolotova	Kumtor Gold Company	Kyrgyz Republic
Niels	Ebbehøj	Dept. Of Occupational and Environmental Medicine, Bispebjerg Hospital, Copenhagen	Denmark
Helmut	Ehnes	ISSA Mining	Germany
Rohail	Emmanuel	Experient worldwide BPO	Pakistan
Marilyn	Fingerhut	International Commission on Occupational Health	USA
Siegfred	Flaviano	Provincial Government of South Cotabato	Philippines
Jane	Frølund	Dept. Of Occupational and Environmental Medicine, Bispebjerg University Hospital, Copenhagen	Denmark
Solveig	Føreland	Norwegian University of Science and Technology	Norway
Andrei-Lucian	Gireada	National Institute for research and development in mine safety and protection to explosion - INSEMEX	Romania
Perry	Gottesfeld	Occupation Knowledge International	USA
Annalisa	Guercio	INAIL	Italy
Richard	Guitierrez	BAN Toxics	Philippines
Emmanuella	Gyan- foriwaa	University of Pretoria	South Africa
Richard	Hagan	Rhagan Group	Ghana
Martin Rune Hassan	Hansen	Aarhus Universitet	Denmark
Florencia	Harari	Department of Occupational and Environmental Medicine, University of Gothenburg	Sweden
Raúl	Harari	IFA Institute for Development of Production of Work Environment	Ecuador

First name	Surname	Organization	Country
Mark	Holmes	International Council on Mining and Metals (ICMM)	United Kingdom
Olaniran Ekundayo	Jacobs	Akinade Nigeria Limited	Nigeria
Iben Brock	Jacobsen	Dept. Occupational Medicine, Esbjerg Hospital	Denmark
Benjamin	Jaramillo	Peruvian Mining Engineers Institute	Peru
Mark	Jjombwe	UNACOH	Uganda
Tushar	Joshi	Environment Health Appraisal Committee for Mining	India
Bengt	Järvalho	Umeå University	Sweden
Erik	Jørs	Dept. of Occupational and Environmental Medicine. Odense University Hospital	Denmark
Geofrey Nansove	Kamese	NAPE	Uganda
Ivan	Kauma	UNACOH	Uganda
Parham	Khajehpour	Iran Minerals Production and Supply Company	Iran
Muqarab	Khan	Gandahra Institute of Occupational Health	Pakistan
Wajeeha	Khan	LUMHS	Pakistan
Carolyn	Knight	Centre for Research in Occupational Safety and Health (CROSH)	Canada
Jessica	Kogel	NIOSH	USA
Deodat	Kritzinger	Rand Mutual Assurance	South Africa
Rasmus	Køster-Rasmusen	Diálogos	Denmark
Jinky	Leilanie Lu	Institute of Health Policy and Development Studies, National Institutes of Health, University of the Philippines	Manila
Martha	Linero	Junta Regional Calificación Invalidez Magdalena	Colombia
Gernelyn	Logrosa	The University of Queensland	Australia
Sophia Francesca	Lu	University of the Philippines, Manila	Philippines
Jimbea	Lucino	Ban Toxics	Philippines
Constantin	Lupu	National Institute for research and development in mine safety and protection to explosion - INSEMEX	Romania
Milene Torp	Madsen	Dept. of Occupational and Environmental Medicine. Odense University Hospital	Denmark

First name	Surname	Organization	Country
Dieter	Mantwill	RAG AG	Germany
Aristides	Medard	Acacia Mining-North Mara Gold Mine	Tanzania
Ulrich	Meesmann	ISSA Mining	Germany
Bente Elisabeth	Moen	Senter for internasjonal helse, Universitetet i Bergen	Norway
Nomfundo Floweret	Moroe	University of the Witwatersrand/Wits University	South Africa
Ali	Mozafari	Research and Training Center for Occupational Safety and Health	Iran
Andrew	Mugisha	UNACOH	Uganda
Victoria	Mukasa	UNACOH	Uganda
Scovia	Ndagire	UNACOH	Uganda
Bettina	Nickel	Johannes Nickel GmbH & Co. KG	Germany
Douglas	Nkonge	Uganda Ministry of Labour	Uganda
Liepollo	Ntlhakana	University of the Witwatersrand/Wits University	South Africa
Innocent Ifeanyi	Nwoye	Shalom & Emma Consults Nigeria Ltd	Nigeria
Musa	Obadia	University of Melemba Nkulu	Democratic Republic of the Congo
Afolabi Micheal	Ojo	Akinade Nigeria Limited	Nigeria
Sunday Olumide	Olupinla	Hosanna Psychiatry Hospital	Nigeria
Esosa Dennis	Otamere	Shalom & Emma Consults Nigeria Ltd	Nigeria
Ilse	Ottenbros	Radboud university medical center	Netherlands
Leoncio Degay Na	Oy	Emerald Small Scale Miners Multi-Purpose Cooperative	Philippines
Carmina	Perez	Junta Regional Calificación Invalidez De Antioquia	Colombia
Rizalde	Perez	Ban Toxics	Philippines
Anniken	Sandvik	Oslo University Hospital	Norway
Judith Tafur	Santis	Junta Regional Calificación Invalidez Magdalena	Colombia
Inger	Schaumburg	National Research Centre for the Working Environment, Denmark (NFA)	Denmark

First name	Surname	Organization	Country
Paul	Scheepers	Radboudumc	The Netherlands
Vivi	Schlünssen	National Research Center for the Working Environment, Copenhagen	Denmark
Paul	Schutzmeier	University Hospital Munich	Germany
Asta-Sellonane	Sekamene	Diálogos	Denmark
Promila	Sharma	G.B. Pant University of Agriculture and Technology	India
David	Sherson	Odense University Hospital	Denmark
PK	Sishodiya	Building and Other Construction Workers Welfare Board, Government of Rajasthan	India
Søren	Skousgaard	Dept. Of Occupational and Environmental Medicine	Denmark
Margrethe	Smidth	Diálogos	Denmark
Nadine	Steckling	University Hospital Munich	Germany
Matthias	Stenzel	ISSA Mining	Germany
Anna	Suraya	Fit2Work	Indonesia
Konstantin	Todradze	Ministry of Labour	Russian Federation
Ernest Odoom	Turkson	Rhagan Group	Ghana
Satoshi	Umehara	Kyushu University	Japan
Francesca	Viliani	International SOS	Denmark
Nicolae-Ioan	Vlasin	National Institute for research and development in mine safety and protection to explosion - INSEMEX	Romania
David	Walters	Cardiff University	United Kingdom
Cecilia	Weckman	NIVA	Finland
Pál	Weihe	Department of Occupational Medicine and Public Health	Faroe Islands
Klemens	Wüstefeld	BGRCI	Germany
Sandra Eliette	Yepes	Junta Regional Calificación Invalidez De Antioquia	Colombia
Ivan	Zahinos	Medicus Mundi Mediterrània	Spain



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SCIH, SCOHSEIS,
SCOHDev



Workplace Health
Without Borders
(WHWB)



NGO Dialogos



University of
Southern Denmark
(SDU)



Clinic of Occupational
Medicine Odense
University Hospital



International Social
Security Agency
(ISSA)



National Research Centre for
the Working Environment