

SCIENTIFIC SESSION V
Work of the Fellows

1. Congenital Anomaly as an Occupational Disease in Korea *Domyung Paek, South Korea*
2. Why climate change must be the central agenda item of global health *Rokho Kim, Switzerland*
3. Final results of a carcinogenicity bioassay performed on Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field at 1.8 GHz *Daniele Mandrioli, Italy*
4. Local and regional impacts of primary mercury production on environmental health and security in Batken, Kyrgyzstan *Casey Bartrem, USA*
5. Aerotoxic syndrome - current developments *Vyryan Howard, UK*

Congenital Anomaly as an Occupational Disease in Korea

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Background: No case of congenital anomalies among offspring was recognized as occupational in Korea until 2020. Controversies erupted after a cluster of miscarriages and congenital anomalies among offspring had been reported in one of the provincial community hospitals, and epidemiologic study was carried out in 2012 and 2013.

Methods/Approach: The conditions of work were assessed in the area of exposures to x-ray, drugs, infections, shift work, manual handling, and occupational stress. An interview was conducted to assess past medical histories and behaviors, including smoking and drinking. Pregnancy outcomes were ascertained based on maternity or sick leaves. Follow-up was made after the investigation about the management of the reproductive hazards among hospital employees.

Results: Tablet pills dispensed from the pharmacy were crushed before distribution by nurses at the ward until 2010. Based on the prescriptions, the crushed pills included 17 and 37 FDA pregnancy category X and D drugs, respectively. Out of 15 pregnancies in 2010, 5 had ended in miscarriages, and another 4 had resulted in congenital anomalies of cardiovascular system. Among this cohort of pregnant employees, compared to the rate after the stoppage of crushing, the rates of miscarriages and congenital anomalies were 3.3 ($p=0.12$), and 7.0 ($p=0.01$) times higher before the stoppage.

Conclusions: Compensation as an occupational disease was filed for the miscarriages and congenital anomalies soon after. However, only the miscarriage was accepted as occupational by the insurance body (Korea Workers Compensation and Welfare Service), and the congenital anomalies were denied, based on the argument that children are not eligible workers for the insurance coverage. The cases went up to the Supreme Court of Korea, and got recognized finally in 2020, based on the opinion that mother and fetus are one body. This decision has opened the door for the management of reproductive problems of workers in other industries, including semiconductors.

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Domyung Paek is Professor of Occupational and Environmental Medicine at the Seoul National University Graduate School of Public Health, Seoul, Korea.

Why climate change must be the central agenda item of global health

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Background: During the United Nations (UN) General Assembly in September 2019, the Climate Action Summit urged that the pace of climate action must be rapidly accelerated, and the first-ever High-level Meeting on Universal Health Coverage (UHC) recognized the strong links of UHC to climate action.

Methods/Approach: Based on evidence review and lessons from building climate-resilient health systems in countries, this presentation proposes three reasons for global health practitioners to advocate climate change as the central agenda of global health of the 21st century.

Results: Firstly, millions of human lives can be saved every year by tackling the health impacts of climate change, mainly through adaptation, and maximizing health co-benefits of climate action, mainly through mitigation. Mitigation measures to shift from fossil fuels to clean energy can contribute not only to reducing carbon emissions globally but also to improving the air quality and saving a substantial number of lives locally every year. Secondly, health equity can be advanced at global, regional, national and local levels through climate action leaving no one behind. Countries and communities that have contributed the least to anthropogenic climate change are often the most vulnerable and the most severely affected by the consequences of climate change. Climate resilience-building activities in these countries will contribute to improving the global health equity. Thirdly, the return to investment for improving climate resilience is largely profitable in the long-term in health systems as well as vulnerable sectors such as water, sanitation, food systems and disaster risk reduction.

Conclusion: These three reasons provide strong arguments for positioning climate action as the central agenda of global health. Obviously, the targets of UHC are not attainable without building climate-resilient health systems in the most vulnerable countries.

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Kim Rokho

Dr. Rokho Kim is Unit Head of Methods and Standards Team (MST) of the Department of Quality Assurance for Norms and Standards (QNS) of Chief Scientist Office (SCI) of WHO.

Final results of a carcinogenicity bioassay performed on Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field at 1.8 GHz

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Background: In 2011, IARC classified radiofrequency radiation (RFR) as a possible human carcinogen (Group 2B). According to IARC, animal studies, as well as epidemiological studies, showed limited evidence of carcinogenicity. In 2016, the NTP published the first results of its long-term bioassays on near field RFR, reporting increased incidence of malignant glial tumours of the brain and heart Schwannoma in rats exposed to GSM – and CDMA – modulated cell phone RFR. The tumours observed in the NTP study are of the type similar to the ones observed in some epidemiological studies of cell phone users. We previously published preliminary results that showed: a statistically significant increase in the incidence of heart Schwannomas in treated male rats at the highest dose (50 V/m); an increase in the incidence of heart Schwann cells hyperplasia in treated male and female rats at the highest dose (50 V/m), although this was not statistically significant; an increase in the incidence of malignant glial tumours in treated female rats at the highest dose (50 V/m), although not statistically significant.

Methods/Approach: Male and female Sprague-Dawley rats were exposed from prenatal life until natural death to a 1.8 GHz GSM far field of 0, 5, 25, 50 V/m with a whole-body exposure for 19 h/day. We report the final results regarding the observed tumours for all organs and tissues.

Results: All organs and tissues were then examined and the whole study results will be herewith reported.

Conclusion: Previous RI findings on far field exposure to RFR are consistent with and reinforce the results of the NTP study on near field exposure, as both reported an increase in the incidence of glial tumours of the brain and heart in RFR-exposed Sprague-Dawley rats. RFR are included in the priorities of evaluation for IARC Monograph in 2020-2024.

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Daniele Mandrioli, MD, PhD is the Director of the Cesare Maltoni Cancer Research Center of the Ramazzini Institute, Bologna, Italy. He conducts research on environmental toxicants and carcinogens and Evidence Based Toxicology (EBT).

Dr. Mandrioli's research on environmental toxicants and carcinogens includes the design and development of bioassays, investigations on the role of aneuploidy in carcinogenesis and reproductive toxicity, and the analysis of different chemical regulations and their implications for public health.

Local and regional impacts of primary mercury production on environmental health and security in Batken, Kyrgyzstan

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Background: Batken Province, Kyrgyzstan includes a portion of the Fergana Valley, one of central Asia's most agriculturally productive areas. Like much of the region, Batken is also home to dozens of active and abandoned mining sites and waste dumps, many of which date back to the Soviet era. One of the last operational primary mercury mining/processing facilities has recently been revitalized to produce mercury for the global market.

Methods/Approach: The Kyrgyz Ministry of Health (MOH), TerraGraphics International Foundation (TIFO), and Médecins Sans Frontières (Doctors Without Borders, MSF) are collaborating to assess mining-related environmental health risks in the region. In 2019, MOH, TIFO, and MSF conducted environmental sampling as part of a human health risk assessment, collecting over 600 soil, water, air, dust, and food samples in one of the largest environmental sampling efforts successfully completed in the area.

Results: Environmental results are being used to assess risks for residents near the mercury mining/smelting operations, with the goal of developing a locally implemented health intervention program to reduce heavy metal exposures. Risks are not limited to local exposures; transboundary pollution is a concern throughout the Fergana valley. Frequent seismic activity and increasing incidents of flooding and landslides due to climate change may result in the movement of mining wastes into waterways and across national borders, escalating existing border disputes and ethnic tensions.

Conclusions: Like much of Central Asia, Kyrgyz mining communities are undergoing dynamic post-Soviet transitions with challenging and interrelated environmental, economic, and political implications. Implications for environmental security should be considered when analyzing environmental health risks at active and legacy mining sites in the region.

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Casey Bartrem, Ph.D., is Executive Director of TerraGraphics International Foundation, an NGO that provides assistance to mining and recycling communities. Dr. Bartrem has worked on human health risk assessments, environmental health interventions, and remediation projects in Nigeria, Bangladesh, Kyrgyzstan, and the USA. She is a Senior Fellow at Norwich University's Center for Global Resilience and Security, a visiting lecturer at the American University of Armenia, and from 2007-2009 was a Peace Corps Volunteer in Lesotho.

Aerotoxic syndrome - current developments

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Background: The flight safety and health consequences of aircrew and passenger exposure to aircraft cabin air supplies contaminated by engine oils and other working fluids, have remained ongoing. Air monitoring studies identifying a consistent pattern of low-level exposures to a complex mixture including VOCs, OPs and UFPs.

Methods/Approach: Monitoring relevant global scientific publications, governmental, regulatory and airline industry outputs.

Results: Standardisation work for exposure to chemical agents in the cabin air; International civil aviation organisation (ICAO) and airline trade bodies aircraft fumes guidance; European aviation regulator (EASA) /EC cabin air quality and oil pyrolysis studies with further research being planned (1); US Congress cabin air quality bill initiated; FAA (US aviation regulator) Safety alert & Reauthorisation Act -Cabin air quality research (2020-2024); ECHA TCP review (2); in Increasing manufacturer/airline patents related to oil leakage into air supply; limited development of total air filtration & detection systems. Other actions of note include the development of an independent narrative review of the health consequences of fume events and medical protocol (3); a recent significant workers compensation in favour of the injured pilot (4) and aircrew settlements with Boeing (5). Biomarker research for triaryl phosphate exposure is continuing.

Conclusions: There is increasing recognition of exposure to oil and aircraft fluids via the cabin air supply, yet the occupational response remains inadequately acknowledged and addressed.

References

- 1) EASA (2020) EASA Workshop on future Cabin Air Quality Research
- 2) ECHA (2016) Substance evaluation - CoRAP- Tris(methylphenyl) phosphate- TCP
- 3) Practical guideline prepared by the International Fume Events Task Force (chaired by S. Michaelis) with working groups from the DiMoPEX COST-Action* and Collegium Ramazzini
- 4) Myers A (2020) Workers Compensation State Board of Oregon: Claim No. 555232469. opinion and Order.
- 5) Woods v The Boeing Company & Escobedo v The Boeing Company (2019).

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Vyvyan Howard

Vyvyan Howard is a medical toxicologist and is an Emeritus Professor at the University of Ulster. He became involved in investigating Aerotoxic Syndrome in 2005 and has contributed to several published papers adding to our understanding of its aetiology. He is a member of the Irish Delegation to the CEN standards setting group addressing aircraft cabin air quality.

