

## Information Note<sup>1</sup>

- Event:** *Science Needs for Microbial Forensics: Developing an Initial International Roadmap*
- Organizers:** Croatian Academy of Sciences and Arts, US National Academy of Sciences, UK Royal Society, International Union of Microbiological Societies
- Date and venue:** 14-16 October, 2013, Zagreb, Croatia
- Participants:** *States:* Canada, Croatia, Japan, Poland, Republic of Korea (ROK), Singapore, Sweden, UK, US
- International organizations:* 1540 Committee Group of Experts; Biological Weapons Convention Implementation Support Unit (BWC ISU); International Center for Diarrheal Diseases Research (Bangladesh); International Union of Microbiological Societies; World Health Organization (WHO)
- Non-Governmental Organizations, Industry, Academia, and Other Entities:* Beijing Institute of Microbiology and Epidemiology (PRC); Cambridge University (UK); COMSATS Institute of Information Technology (Pakistan); Croatian Academy of Sciences and Arts (Croatia); Gryphon Scientific (US); Indonesian Academy of Sciences (Indonesia); Eijkman Institute for Molecular Biology (Indonesia); Institut de Génétique et Microbiologie UFR des Sciences – Université Paris-Sud 11 (France); Institute of Microbiology Chinese Academy of Sciences (PRC); Karnataka Veterinary, Animal and Fisheries Sciences University (India); Medical School University of Osijek (Croatia); Medical School University of Rijeka (Croatia); National Academy of Sciences (US); National Medical University (Ukraine); Northern Arizona University (US); Pennsylvania State University (US); Polytechnics Zagreb (Croatia); Research Institute of Experimental Medicine (Russian Federation); The Royal Society (UK); Rutgers University (US); Seoul National University (ROK); Signature Sciences, LLC (US); Tulane University (US); Universidad de Valencia (Spain); Université de Versailles Saint Quentin (France); University Hospital Münster (Germany); University Hospital for Infectious Diseases “Fran Mihaljevic” (Croatia); University of New Haven (US); University of North Texas Health Science Center (US); Universidad San Francisco de Quito (Ecuador); University of Split (Croatia); University of Technology Sydney (Australia); Virginia Polytechnic Institute and State University (US).

### 1. Objectives of the workshop

Microbial forensics (bioforensics) is an emerging field devoted to the development of methods to characterize microbial samples for the purpose of comparative analysis in support of investigations into suspected criminal or terrorist acts including illicit trafficking. Nevertheless, bioforensics has other potential applications in intelligence, non-proliferation and verification. Effective bioforensics capabilities are believed to deter, influence or better

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<sup>1</sup> For information –not an official report. The views expressed here do not necessarily represent those of the 1540 Committee or of the organizers or participants in the event.

manage risks associated with biological weapons development, acquisition, and use, thus support the implementation of resolution 1540 (2004) obligations.

The workshop aimed to increase awareness among the international scientific community of the importance of microbial forensics and the need for increased scientific efforts to provide the knowledge that will make microbial forensics an effective tool. This workshop is part of a larger project that has two objectives:

- The *technical* objective is to support the development of the field of microbial forensics by fostering international collaborations on major research challenges among leading scientists in key countries.
- The *policy* objective is to take advantage of existing collaborations among academies of science and scientific organizations to create a greater international understanding of the current capabilities and limitations of microbial forensics to support the non-proliferation objectives and the implementation of BWC and resolution 1540 (2004).

## 2. **Background**

One of the attractions of using biological agents for criminal or terrorist purposes is the possibility of staging a covert attack. Biological weapons have delayed effects and may cause outbreaks that can be hard to distinguish from natural epidemics thus offering the perpetrator the opportunity to cover his/her tracks before a determination is made that a deliberate attack has occurred. However, the emerging field of microbial forensics which employs analytical techniques to determine the genetic, chemical and physical properties of a microorganism or toxin may also provide powerful tools in the process of attribution not only in identifying the perpetrator(s) of an attack but also in identifying the source of biological materials which are illicitly trafficked in order to pursue legal prosecution or, potentially, identify violations of enforcing the domestic control measures mandated by resolution 1540 (account for/secure/physically protect BW including related materials) or the prohibition related to providing any form of support to non-State actors that attempt to develop, acquire, manufacture, possess, transport, transfer or use biological weapons and their means of delivery.

The international workshop on *Science Needs for Microbial Forensics: Developing an Initial International Roadmap* brought together over 60 participants from 20 different countries, representing various government, industry, academia, research and international organizations and other entities.

The workshop created a greater international understanding of the current capabilities and limitations of microbial forensics to support the prevention, deterrence and response to biological weapons proliferation and terrorism threats. Participants also discussed the future needs of microbial forensics field in order to develop it as an effective tool in this regard, addressing basic science, public health, and science policy requirements. A report of the workshop, including conclusions and recommendations will be produced by a committee under the auspices of the US National Academy of Sciences.

## 3. **Highlights**

The workshop was organized in plenary sessions followed by breakout group discussions and a concluding plenary session. A poster session and reception organized by the Croatian Academy of Sciences and Arts allowed participants to discuss their research in an informal setting, and featured welcome remarks by Dr. Pavao Rudan, FCA, Secretary General of the Croatian Academy of Sciences and Arts.

Opening remarks were provided on behalf of the sponsoring organizations (Croatian Academy of Sciences and Arts, US National Academy of Sciences, UK Royal Society, and the International Union of Microbiological Societies).

The workshop also featured plenary sessions on:

- *Microbial Ecology and Diversity—Microbial Forensics in the Context of Population Genetics*, chaired by Dr. Paul Keim, Northern Arizona University (US), with discussions on what is known, in general, about the ecology of pathogens globally and issues on microbial ecology and diversity in the context of microbial forensics;
- *Clinical and Forensic Approaches to Microbial Identification*, chaired by Dr. Dragan Primorac, Pennsylvania State University (US), University of New Haven (US), University of Split (Croatia), University of Osijek (Croatia), which discussed technologies and techniques for forensics and relevant clinical diagnostic practices;
- *Technologies and Approaches for Identifying Microbes in Public Health—The E. coli O104 Case and other relevant cases and perspectives*, chaired by Dr. Munirul Alam, International Center for Diarrheal Diseases Research (Bangladesh);
- *Sampling and Preservation Methods*, addressing public health versus criminal investigation, transportation and storage, and accepted protocols and practices, and the more general question of whether there is a need for standardized methods that are shared internationally; this session was chaired by Dr. Bruce Budowle, University of North Texas Health Science Center (US);
- *Validation and Reference Materials for Microbial Forensics*, which addressed guidelines and components for validation, transportation and storage, test materials, and whether there is a need for internationally accepted standards for validation, chaired by Dr. Cindi Corbett, Public Health Agency of Canada;
- *Bioinformatics and Data*, chaired by Dr. Habib Bukhari, COMSATS Institute of Information Technology (Pakistan), with discussions on the role and importance of bioinformatics and computational genomics in microbial forensics and managing large data sets;
- *Technologies and Approaches for Identifying Microbes for Law Enforcement-*, chaired by Gilles Vergnaud, Institut de Génétique et Microbiologie UFR des Sciences – Université Paris-Sud 11 (France), which discussed the 2001 US anthrax letters case, the anthrax-contaminated heroin in Scotland and Germany, the cases of Hepatitis C caused by anesthesiologist in Spain, and international perspectives: i) inspections for biological weapons capabilities – Dr. Rocco Casagrande (former UN MOVIC Biological Weapons Inspector) and ii) the relevance of microbial forensics to resolution 1540 (2004) by Dr. Dana Perkins, 1540 Committee expert.

Dr. Piers Millet (BWC ISU) discussed the BWC States Parties' agreement at the Seventh Review Conference to include inter alia, in the current intersessional program 2012-2015, the following topics to be addressed under the Standing Agenda Item on review of developments in the field of science and technology related to the Convention: “*new science and technology developments that have potential for uses contrary to the provisions of the Convention*” and “*possible measures for strengthening national biological risk management*” as well as “any potential further measures, as appropriate, relevant for implementation of the Convention” (the latter under the Standing Agenda Item on strengthening national implementation), which are of relevance to the microbial forensics. The topical scientific subject of “*advances in the understanding of pathogenicity, virulence, toxicology, immunology and related issues*” will be considered by States Parties in 2014. The Standing Agenda Items on “*how to strengthen implementation of Article VII, including consideration of detailed procedures and mechanisms for the provision of assistance and cooperation by States Parties*” will be addressed by the BWC States Parties in 2014 and 2015 and may also include microbial forensics considerations.

The 1540 Committee expert noted that microbial forensics (bio-forensics) is an essential element of a national and international biosecurity infrastructure, as a deterrent and support tool, and that, similar to nuclear forensics, it may be used as a tool to detect, prevent and deter acts of terrorism and illicit trafficking or use of biological materials. The potential applications of microbial forensics thus may contribute to strengthening biosecurity in the context of resolution 1540 (2004) and to achieving cooperation and synergy among various international security frameworks. She addressed broad topics such as: the legally binding obligations on all States under resolution 1540 (2004); Security Council definitions for the purpose of resolution 1540 (2004); the 1540 Committee architecture and work process; and the Security Council decision that “Member States shall inform immediately the Security Council of any violation of resolution 1540 (2004)...” per resolution 2118 (2013). The 1540 Committee expert discussed the similarities between BWC and resolution 1540 (2004) – neither have a

verification mechanism in place and differences (there are no similar provisions related to resolution 1540 that are comparable to Articles V, VI and VII of BWC dealing with implementation problems, breaches and violations of the Convention).

The 1540 Committee expert suggested that the development and improvement of technical methods in microbial forensics (bio-forensics) to detect illicit trafficking and biological materials outside of regulatory control, and to prevent and respond to biosecurity events, implicitly strengthen the implementation and enforcement of resolution 1540 (2004). However, unlike the field of nuclear forensics where IAEA plays a leading role, the field of international bio-forensics lacks international leadership. Member States, international organizations, National Academies, professional organizations and academia are all essential actors in this effort of developing the science and technology foundation of microbial forensics and raising awareness on the possible synergies among its different applications.

4. **Additional comments**

For further information, please contact the 1540 Committee's Group of Experts by e-mail at [1540experts@un.org](mailto:1540experts@un.org).