outstretch the resources of a single country or involve several states simultaneously. Through confidential questionnaires and other means, MASH investigated the current response capabilities and planning for chemical and radiological incidents within the EU and also explored, through a number of seminars, developments in information and communications technologies, together with relevant developments in biotechnology which could improve a unified response. Finally, a foresight study has identified a number of areas for improvement and identifies six strategic aims for EU Member States to cope with chemical and radiological mass casualties. This presentation will cover the main findings of the MASH study and consider its wider message for chemical and radiological incidents worldwide.

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(A206) Simulation of an Emergency Situation Caused by Biochemical Incident

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Emergency situations such as biological or chemical incidents require prompt decision making. The problem is that the authorized personnel responsible for conduction the response operations might lack the knowledge about the agent's biological, chemical and epidemiological characteristics that would influence the impact of the incident. Thus the effect of response operations on lives and assets could hardly be anticipated. The paper suggests simulation based approach to provide appropriate decision making support in such situations. The simulation would imitate the development of an emergency situation under various scenarios and help to determine the proper response operations by which the casualties and loss of assets would be minimized. The aim of the paper is to present the simulation of a spread of an agent in an environment and the corresponding impact on population. The simulation is based on a model with incorporated knowledge about environmental and agent characteristics such as weather conditions, transmission, fatality, incubation period combined also with demographic information. The provided simulation forms a part of the proposed non-military decision support framework for emergency response operations during biochemical incidents.

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(A207) Resuscitation of Casualties Following Exposure to Toxic Chemicals: What is New?

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Injury following exposure to toxic chemical agents has potential life–threatening effects, particularly on the respiratory system. Antidotes alone often are not sufficient to reverse this situation, and the need to provide early and effective advanced life support for chemical casualties increasingly has been accepted by emergency services around the world. Although the principles of life support are the same for toxic as for conventional casualties, the requirement for responders to wear personal protective equipment makes airway and ventilation management more difficult. Special training and familiarity with devices and equipment used are essential to ensure effectiveness. Recent studies have indicated both the limitations and the possibilities for resuscitation of casualties in a contaminated environment before decontamination. Ventilation of patients with respiratory failure or arrest requires the use of devices which are able to operate and be used by responders wearing protective equipment. The laryngeal mask airway has been shown to be an easier and viable alternative to intubation in this situation. Portable automatic ventilators have been developed which can be used to provide controlled ventilation in a contaminated zone. The ideal mode of ventilation for potentially damaged lungs, following exposure to agents such as chlorine and phosgene has yet to be established. There may be a case for early application of the protective lung ventilation strategies that are now common in intensive care units. This presentation will review recent human and animal studies related to resuscitation in a contaminated zone and provide illustrations of the practical approaches currently used by emergency medical services.

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(A209) Developing Medical Facility Preparedness for Radiological Hazmat Emergencies: Applying Surge Science

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Introduction: Singapore is considered a prime target for transnational terrorism. Perpetrators may select an explosive radiation dispersal device or "dirty bomb" as their weapon of choice. Additional risks of a local radiological emergency may arise from mishaps involving visiting marine nuclear-powered vessels. Strategies and methods used to enhance preparedness to respond to radiological mass-casualty incidents (MCIs) will be described.
Methods: A core group comprising hospital emergency managers and radiology and emergency department staff spearheaded preparedness efforts. The Ministry of Health Guiding Document on managing radiological MCIs provides the principles and operational concepts to anchor the development of local protocols. Discussion sessions, site visits, drills, and exercises are conducted to improve organization performance. Expert opinion and feedback from various stakeholders and partners help shaped the overall plan.
Results: Preparedness activities focused on improving surge response capability through broad categories include: 1. Staff—Radiation response teams were developed and assigned roles and responsibilities. Training and education programs were created for different staff positions, e.g., on correct usage of electronic personal dosimeters and acute radiation syndrome. 2. Stuff—Material resources such as antidotes, and expendables like

floor covering were procured and stored. 3. System—These areas include: (a) activation procedures; (b) communication plans; (c) safety measures; (d) casualty transfer protocols; and (e) handling radiologically contaminated waste and materials. 4. Space—Potential care areas, such as radiation isolation rooms were designated. An algorithm was devised to guide casualty management.
Conclusions: Facility preparedness for radiological MCIs requires multidisciplinary involvement and the creation of trusting partnerships. More research is needed to identify the metrics to measure success objectively and aid protocol revisions.
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(A210) Chemical Sensor Trial for Nerve Agent Differentiation: Impact of Hydrogen Bonds on Detection

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Chemical warfare agents (CWAs) are a growing concern for many countries. The uses of CWAs as they can be synthesized by simple chemical reactions, and often have an extremely high toxicity. Conventional, analytical techniques for the detection of nerve agents from environmental and biological samples include gas chromatography, liquid chromatography, gas chromatography–mass spectrometry, ion chromatography, atomic emission detection, capillary electrophoresis, etc. These methods have very high sensitivity, reliability, and precision. However, in spite of these advantages, these techniques require expensive instrumentation and highly trained personnel. They also are time-consuming and unsuitable for field analysis. To meet these prerequisites of rapid warning and field deployment, more compact, low-cost instruments are highly desirable for facilitating the task of on-site monitoring of nerve agents. a quartz crystal microbalance (QCM) sensors could be a reliable and promising alternative to routine methods because of their simplicity, ease of use and high sensitivity and selectivity.1,2 In this study, we prepared QCM sensors functionalized with –NH2 and –COOH groups for differentiate diethyl ester phosphonic acid (DEHP) from diethyl phthalate (DEP), which are known as G and VX agent stimulants respectively. Infrared spectroscopy (FT-IR) was performed in order to characterize the surface of the sensor after modification and the detection. Furthermore, impact of hydrogen bonds on detection will be discussed.
References: [1] Hill, H.H., Martin, S.J., Pure Appl. Chem., 74 (2002) 2281–2291. [2] Arshak, K., et al., Sensor Review, 24 (2004) 181–198.
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(A211) Nanosciences and CBRN Threats: Considerations about the Potential Risk of Illicit Use of Nanosystems

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In the history of humankind, any new scientific discovery has shown the risk of a "dual use" for peaceful purposes or for warfare. In regard to non-conventional weapons, the recent exponential development of nanosciences and nanotechnology can provide efficient tools for counteracting these threats, by improving the detection, protection, and decontamination capabilities in the field of CBRN defence. Nevertheless, these disciplines also may offer novel, uncontrolled means of mass destruction, leading to the synthesis of new, intentionally toxic systems. Furthermore, several points of concern are linked to the new concepts of "nanotoxicology" and "nanopathology: If a multidisciplinary approach is needed to study nanosciences and nanotechnologies, a multidisciplinary approach also is needed to have a strict control on potential illegal uses of nanosystems. Experts active in various fields, such as academic, industrial, military, and health protection institutions, must work cooperatively to constantly follow the state of the art, note which kind of critical emerging technologies may lead to illicit uses, and control the diffusion of hazardous nanosystems that may be potential precursors of weapons of mass destruction, and cooperate with CBRN emergency prevention organizations in order to plan suitable countermeasures. This presentation will cover some examples of nanosystems applied to defense from non-conventional warfare agents and answer questions regarding potential misuses of basic nanoscience and nanotechnology findings.
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(A212) The 2008 Mumbai Terrorist Attacks and the Changing Pattern of Violent Injuries

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Introduction: The 26–29 November 2008, terrorist attacks in Mumbai, have been referred to as "India's 9/11". Violent events in Mumbai over the past six decades were researched to understand the changing pattern of violent injuries.
Methods: A complex, retrospective, descriptive study on terrorist events was performed, using event reports, legal reports, newspaper reports, and police and hospital lists. The distribution of victims to various city hospitals, the critical radius, surge capacity, and nature of interventions required were assessed. The profile of those killed in the attacks was noted by sex, nationality, and occupation. Besides the overall mortality and case-fatality ratio, the critical mortality was calculated based on the death rates among the critically injured.
Results: In 51 violent events in Mumbai over a 60-year period (1950–2009), 1,582 people were killed and 4,145 were injured. In the Mumbai terrorist attacks of 2008, the financial loss due to direct physical damage was INR 847,612,971 (US$18.5 million). Among those killed, the average age was 33.4 years, 80% were male, and 12% were foreign nationals. The case-fatality ratio for this event was 36.2% and the mortality among the critically injured (critical mortality rate) was 11%. Among the injured, 79% were male and the average age was 33.21 years (three months–85 years); 38.5% of patients arriving at the hospitals required major surgical intervention.
Conclusions: The injuries of violent events in Mumbai have been changing due to the use of heavy firepower and explosives. Strengthening the public hospitals for trauma care is a