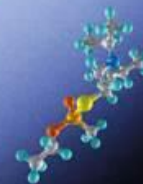
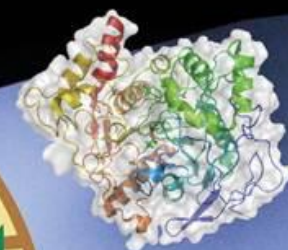
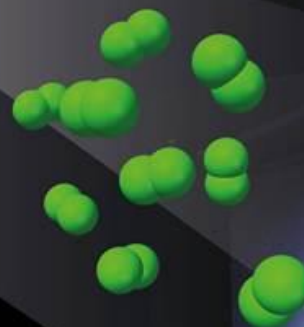


OPCW Scientific Advisory Board Briefing to State Parties

Thursday 22 March 2018
leper Room | 13:30-15:00
Light lunch served at 13:00



Christopher Timperley (Chairperson) and Cheng Tang (Vice-Chairperson)

Activities since SAB-26

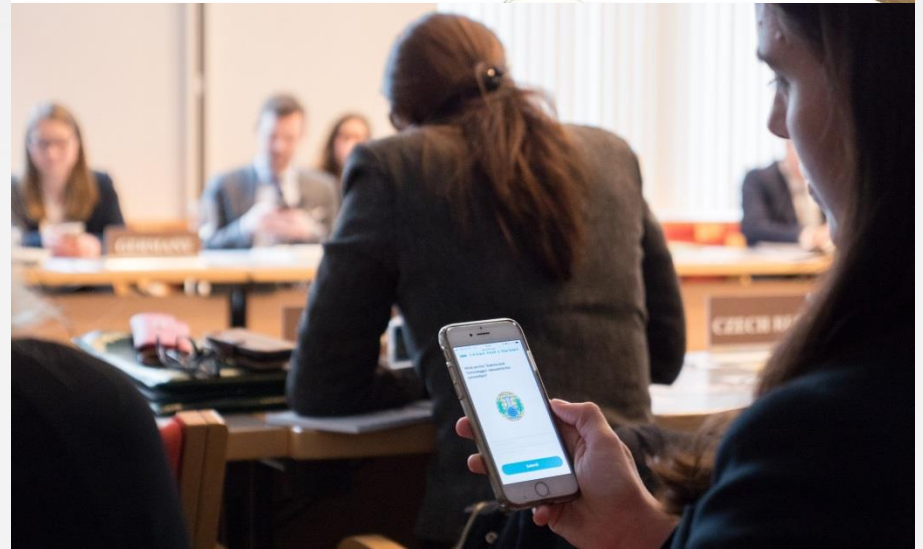
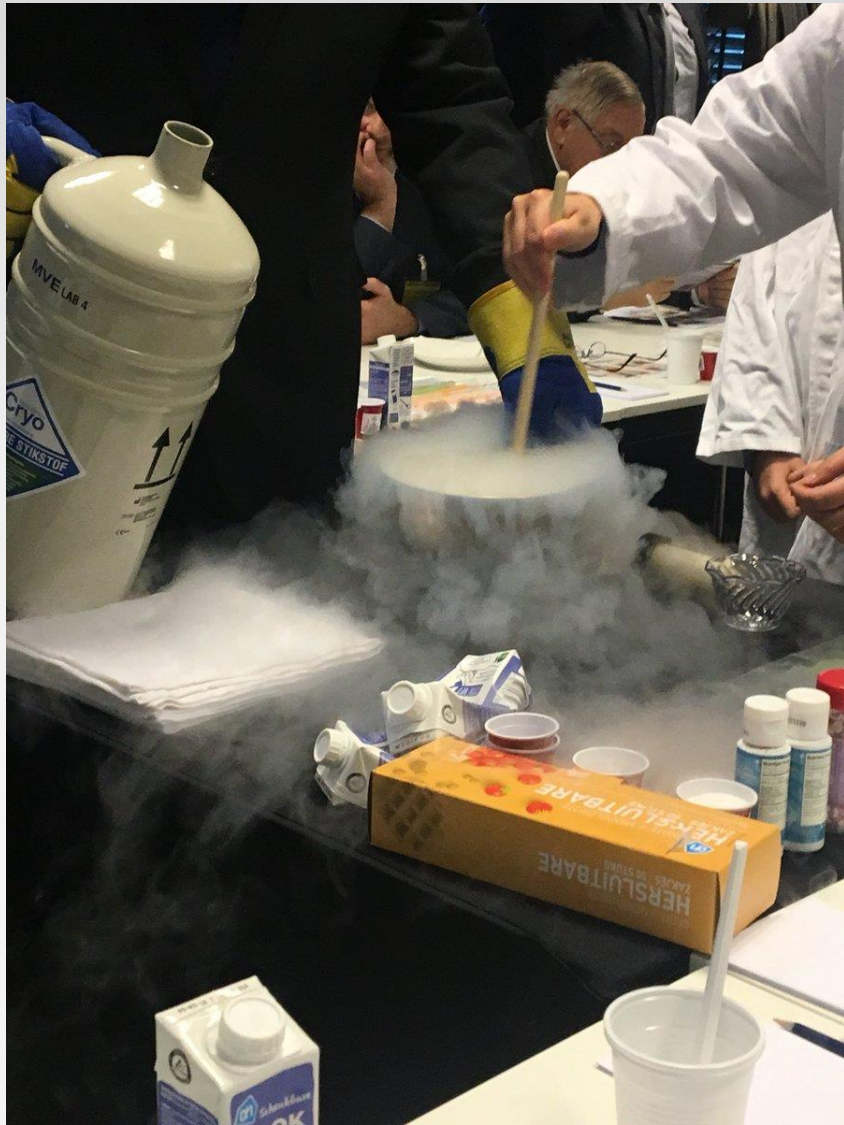
Central Nervous System-Acting Chemicals The Scientific Perspective

Dr Christopher M. Timperley
Chair of the Scientific Advisory Board, OPCW

Presentation to the CSP22
28 November 2017, The Hague



Science for diplomats



Schedule 1 Users Forum

S1 Users Forum

Madrid, 13-16 January 2014

S1 Users Forum

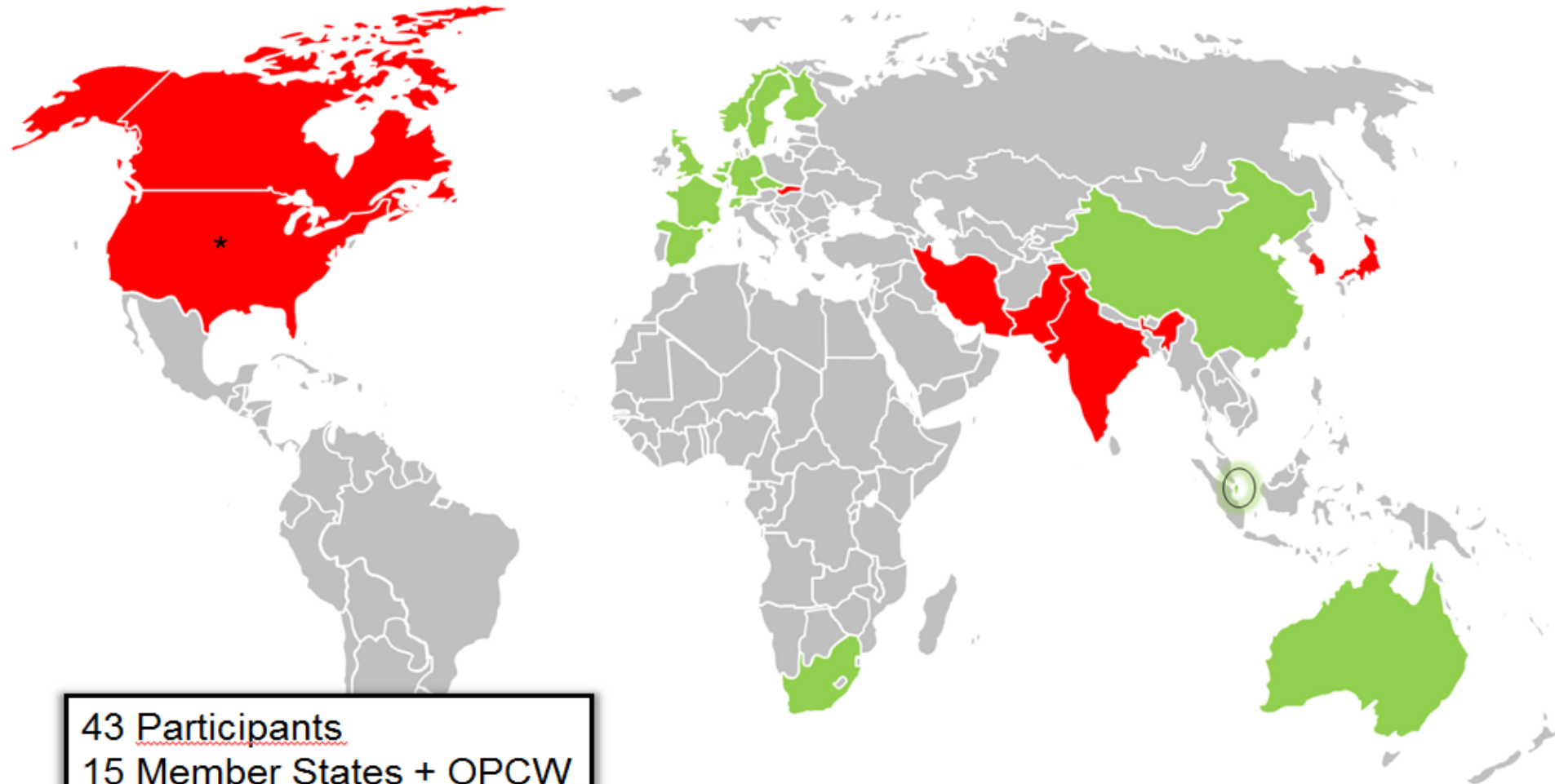
Spiez, 22-25 January 2018

Provide a unique platform for practitioners within S1 facilities to share knowledge of

- Toxic chemicals
- Verification
- Detection
- Decontamination
- Chemical analysis



Spiez Laboratory Schedule 1 Users Forum



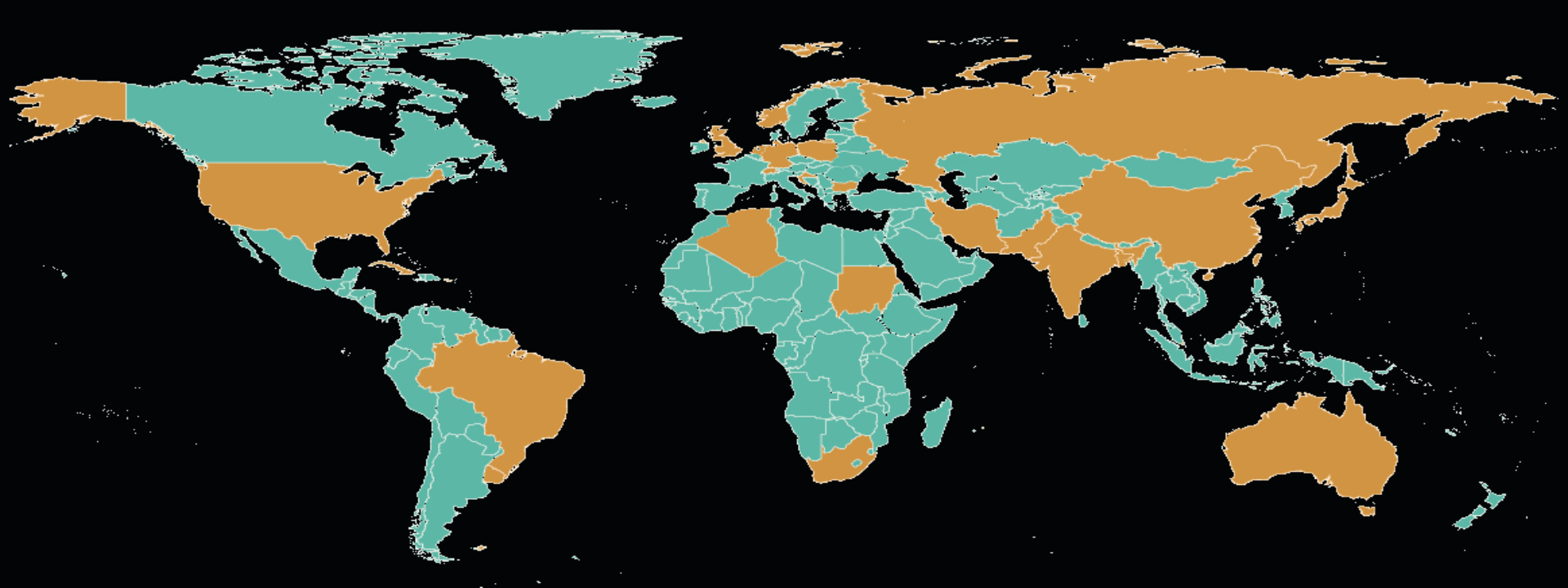
New members of SAB

Prof. Syeda Sultana Razia (of Bangladesh)

Prof. Vladimir Dimitrov (of Bulgaria)

Dr. Daan Noort (of The Netherlands)

Dr. Yasuo Seto (of Japan)



SAB-27



General updates

Update on work of the ABEO

Work of Declarations Branch

Future of industry verification

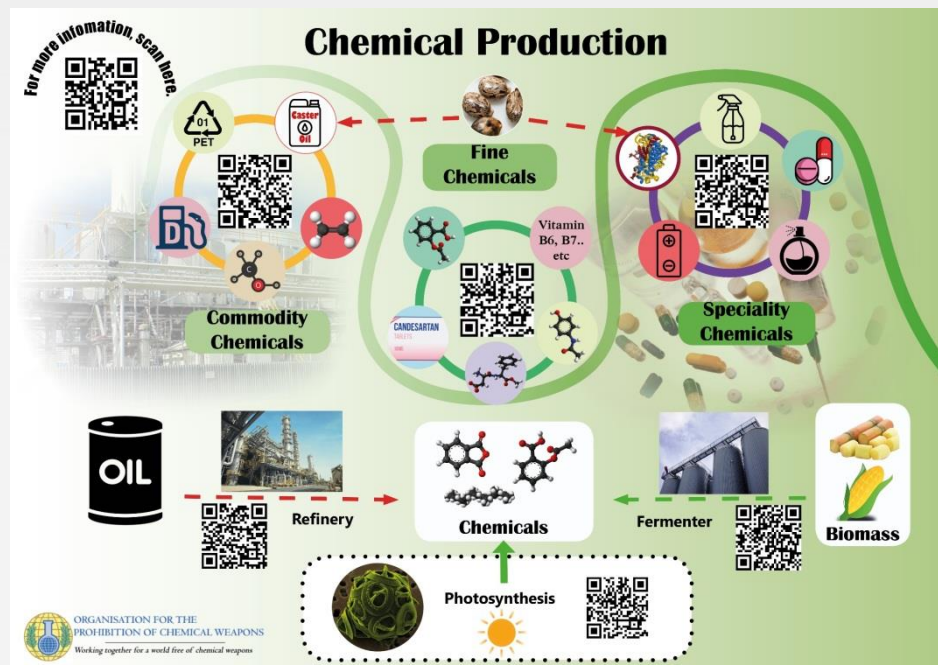
Monitoring Activities of the TS

OPCW contingency operations

Update on work of the RRAM

OPCW-interagency cooperation

Shutting down a S1 facility



Challenges of OCW discoveries (Sven Devroe)



Identification issues

Chemical risks

Explosive risks

Challenges of OCW discoveries (Sven Devroe)

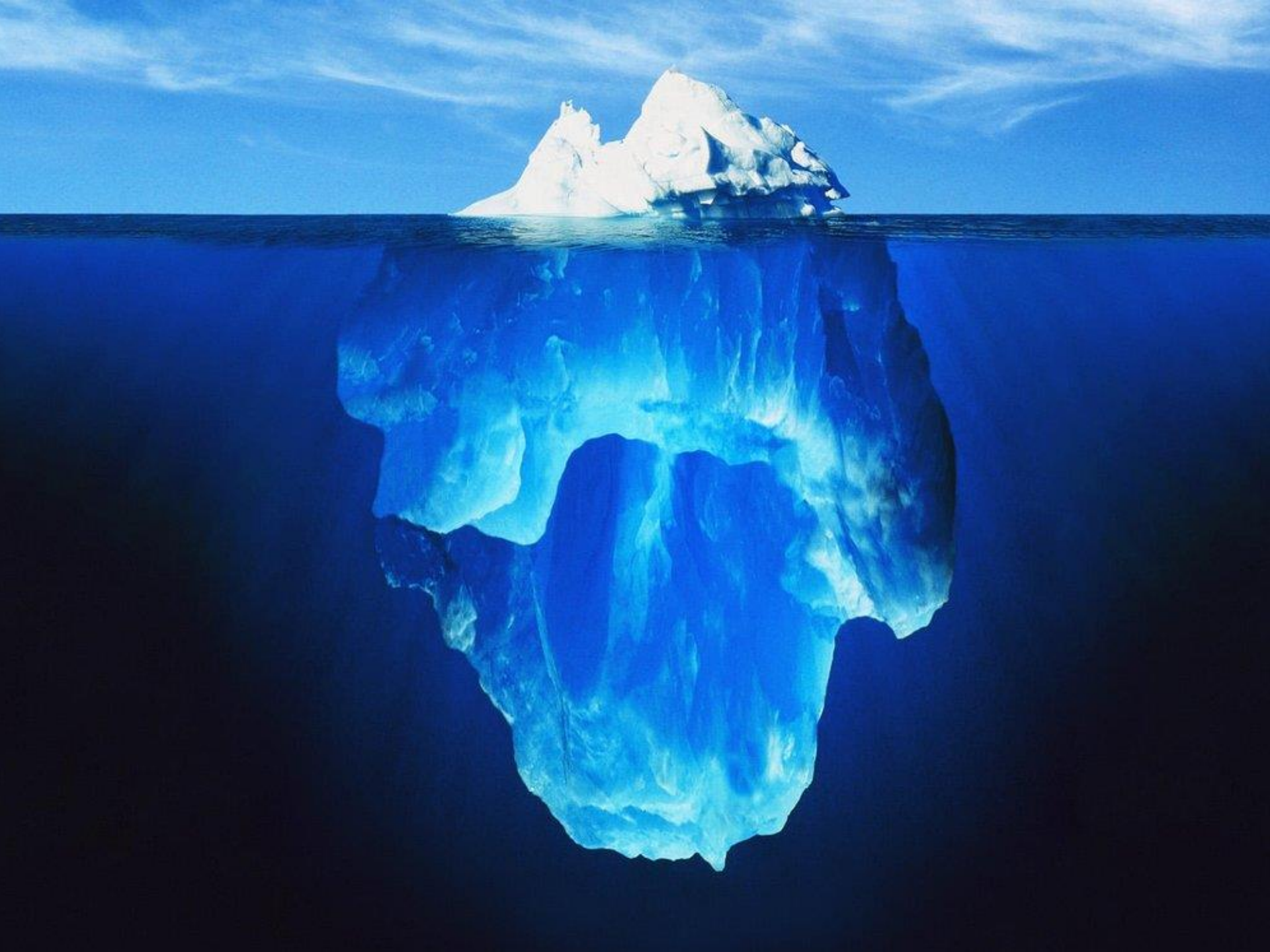


Choice based on risk
assessment



Challenges of OCW discoveries (Sven Devroe)









OPCW

Technical Secretariat

United Nations

**General Assembly
Security Council**

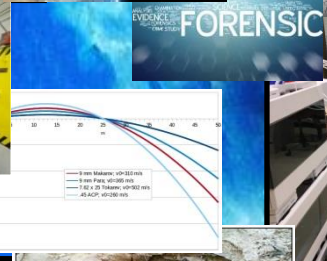
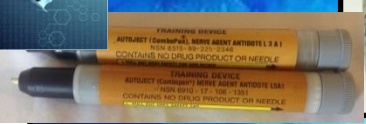
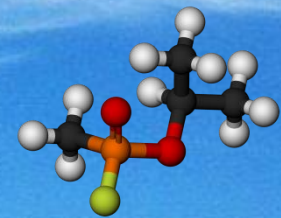
Report of the United Nations Mission to Investigate
Allegations of the Use of Chemical Weapons in the Syrian
Arab Republic on the alleged use of chemical weapons in the
Ghouta area of Damascus on 21 August 2013

A/67/997-S/2013/555

Date: General
16 September 2013
Original: English

General Assembly
Sixty-seventh session
Agenda item 57
Prevention of armed conflict

Security Council
Sixty-eighth year



Biosensors as detectors? (Dr. Franz Worek)



Bundeswehr Institute of Pharmacology and Toxicology, Munich, Germany



Raid-M



AP4C



LCD 3.3

- **Limited spectrum**
- **Only point-detection on surfaces**
- **No easy detection of persistent agents**



Biosensors as detectors? (Dr. Franz Worek)



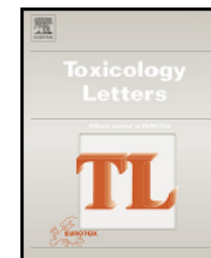
Toxicology Letters 262 (2016) 12–16



Contents lists available at ScienceDirect

Toxicology Letters

journal homepage: www.elsevier.com/locate/toxlet



Blaptica dubia as sentinels for exposure to chemical warfare agents – a pilot study



Franz Worek*, Thomas Seeger, Katharina Neumaier, Timo Wille, Horst Thiermann

Bundeswehr Institute of Pharmacology and Toxicology, Munich, Germany

Tested agents:

Nerve agents : tabun, sarin, soman, cyclosarin, VX

Blister agents : sulfur mustard, Lewisite

Blood agents : potassium cyanide



Biosensors using acetylcholinesterase (Franz Worek)



Toxicology Letters 280 (2017) 190–194



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Toxicology Letters

journal homepage: www.elsevier.com/locate/toxlet



Full Length Article

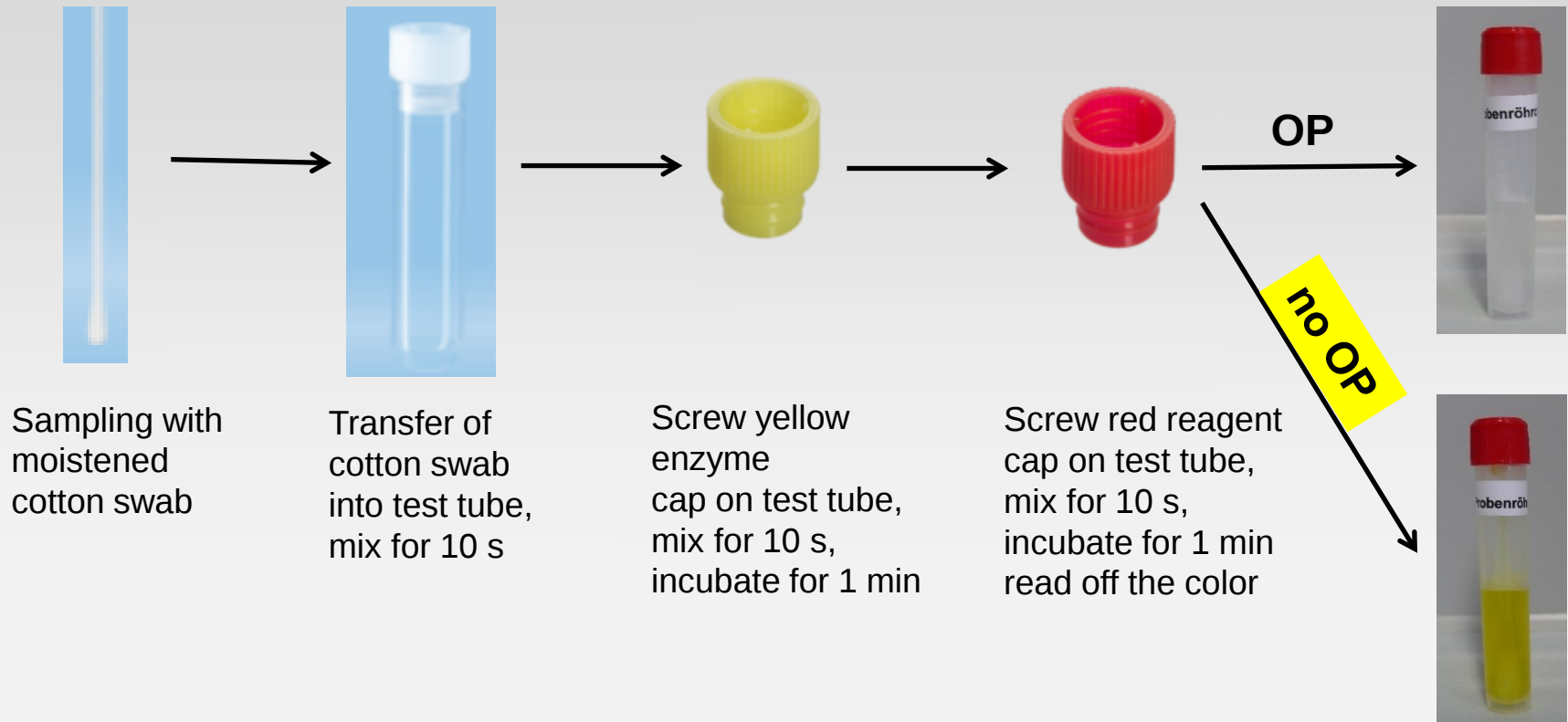
Development of a sensitive, generic and easy to use organophosphate skin disclosure kit



Franz Worek*, Andreas Wosar, Madlen Baumann, Horst Thiermann, Timo Wille

Bundeswehr Institute of Pharmacology and Toxicology, Munich, Germany

Biosensors using acetylcholinesterase (AChE) (Franz Worek)



4	3	2	1	0
No AChE Inhibitor				AChE Inhibitor

Biosensors using acetylcholinesterase (AChE) (Franz Worek)



Portable lightweight kit for measuring red blood cell AChE activity

Useful system for determining if exposure to a nerve agent has occurred

Designed by the Bundeswehr Institute of Pharmacology and Toxicology

For further details see : www.securetec.net

“If plants could talk” (Mukremin Balci, Gareth Williams)

IMAGE



- Concept: images might be scanned using mobile phones by OPCW inspectors
- Both imaging and analysis can then be performed remotely via robotics

Supervised AI application

AI



HUMAN



Not definitive output, but probable !

PHASE 1

CWA Positive

CWA Negative

PHASE 2

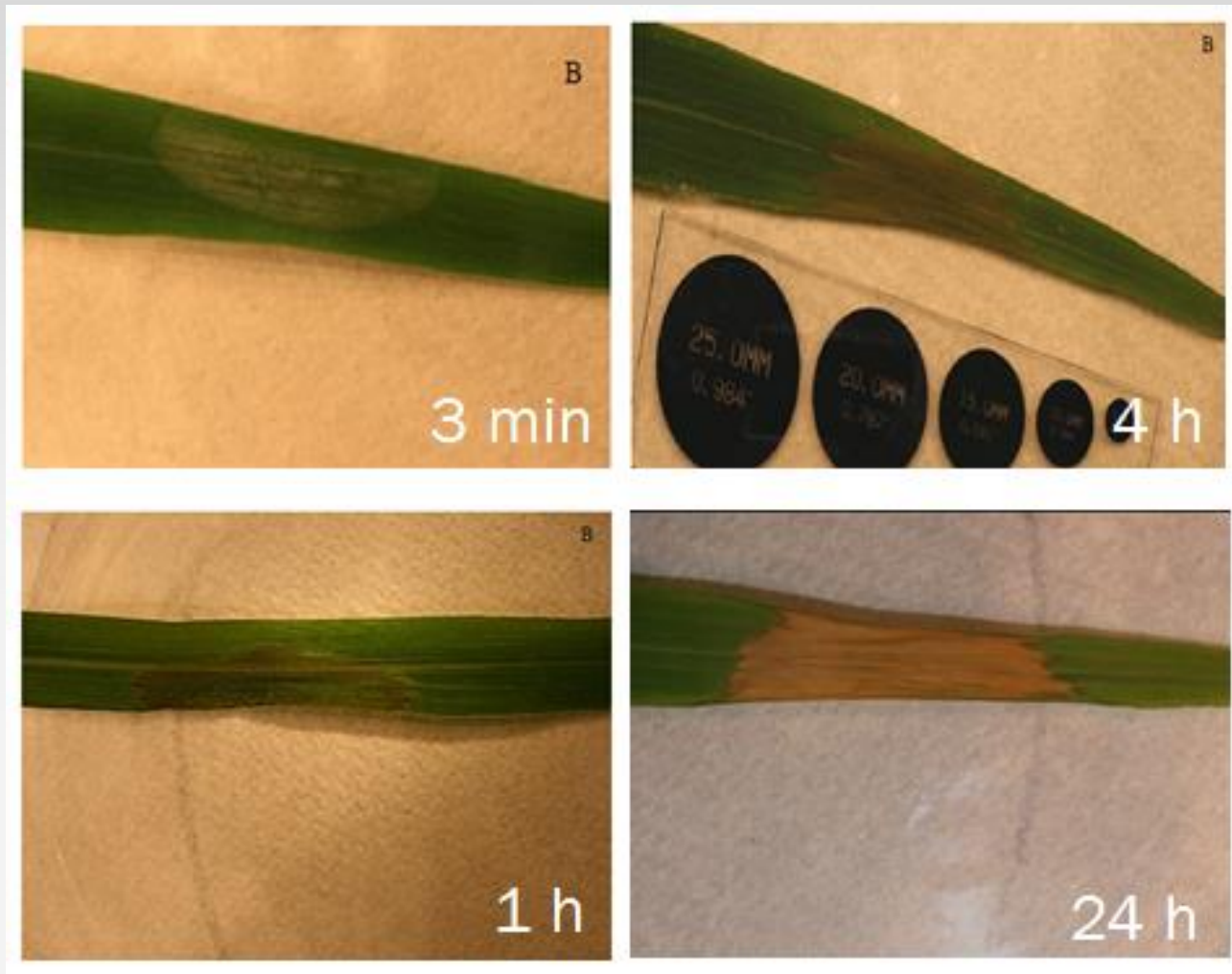
Mustard

Lewisite

Chlorine

CWA Negative

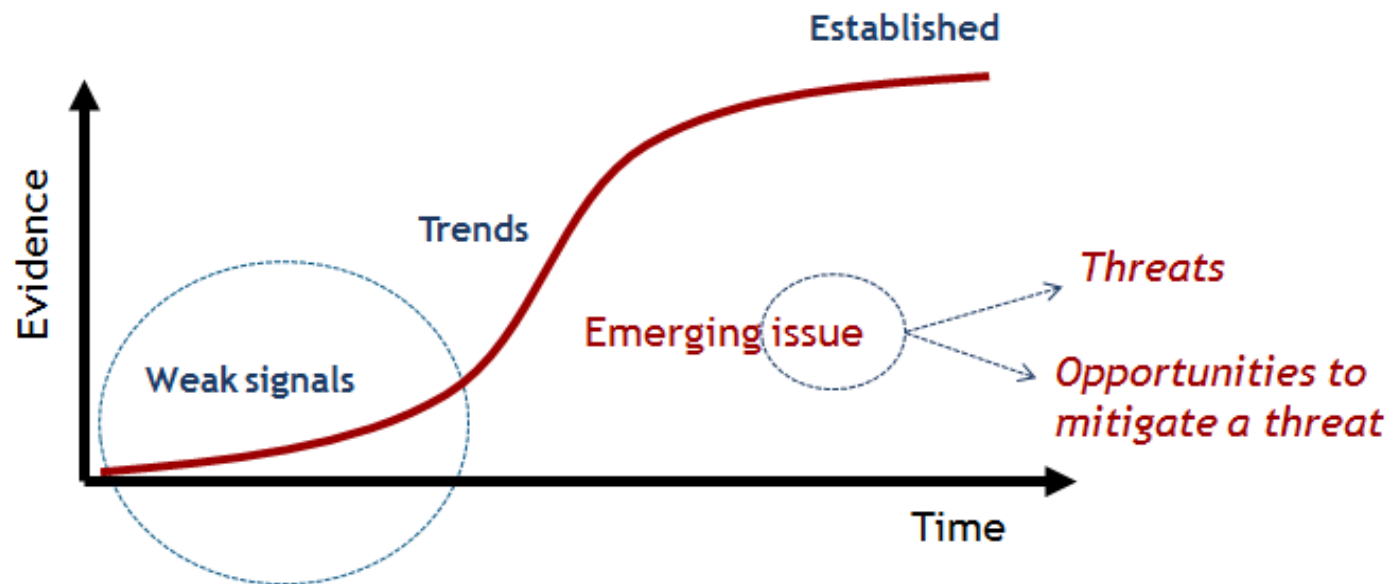
“If plants could talk”



© M Simini, R T Checkai, M V Haley. Visual characterization of VX droplets on plant foliage. Edgewood Chemical Biological Centre (ECBC), Maryland, USA, July 2016

Horizon scanning for emerging issues (B. Wintle, C. Boehm)

A systematic way of sifting through information, identifying and analysing early indicators of change (weak signals of an emerging 'issue')



CENTRE FOR THE STUDY OF
EXISTENTIAL RISK



UNIVERSITY OF
CAMBRIDGE

Early warning of bioagent exposure (Dr. Albert Swiston)



The NEW ENGLAND JOURNAL *of* MEDICINE

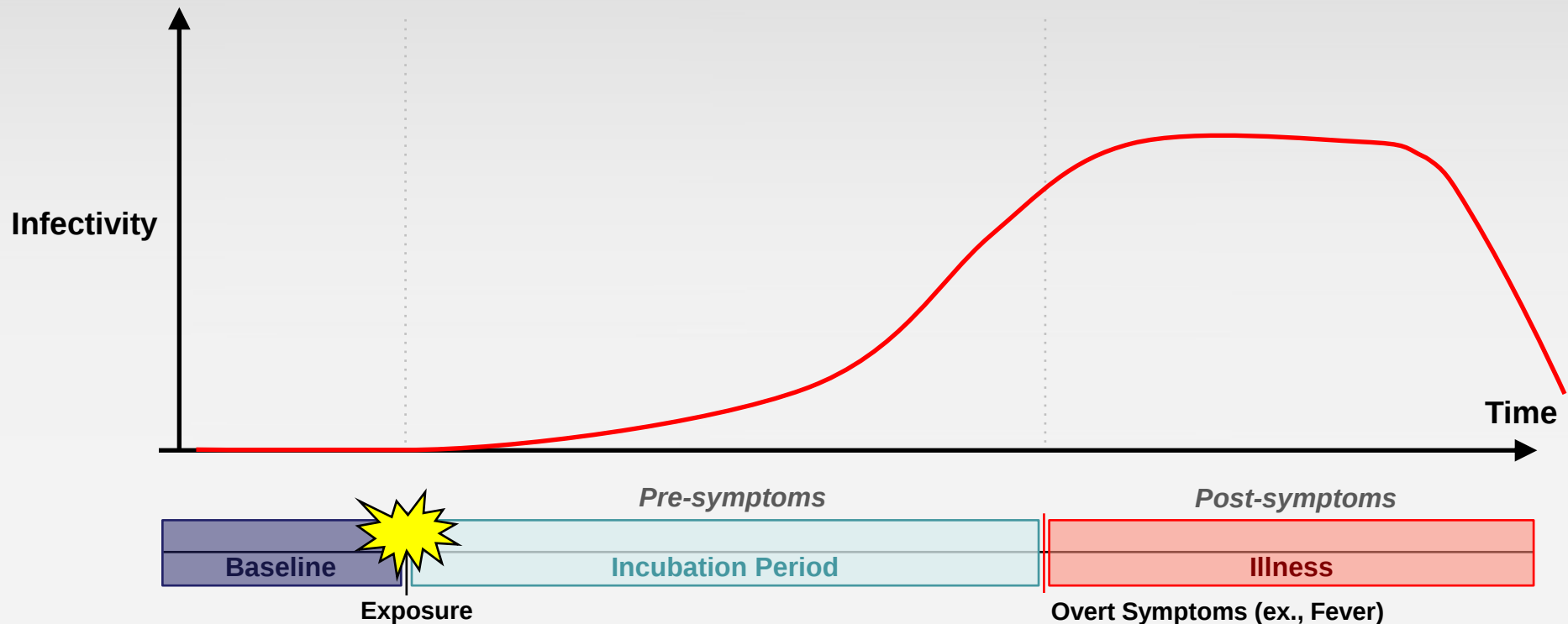
The Next Epidemic — Lessons from Ebola

Bill Gates

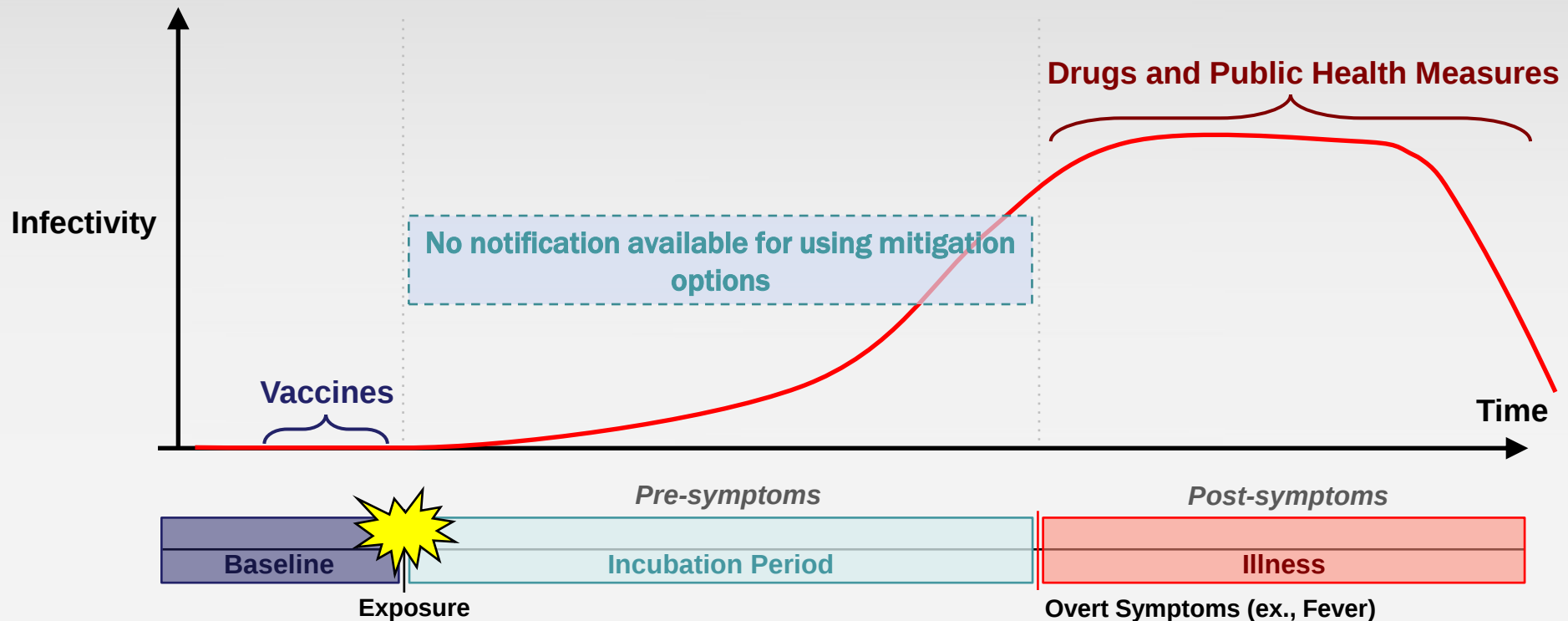
N ENGL J MED 372;15 NEJM.ORG APRIL 9, 2015

“... of all the things that could kill more than 10 million people around the world, the most likely is an epidemic stemming from either natural causes or bioterrorism.”

Early warning of bioagent exposure (Dr. Albert Swiston)



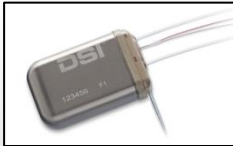
Early warning of bioagent exposure (Dr. Albert Swiston)



**Major 'window of opportunity' for outbreak mitigation
with Early Warning (EW) during incubation period**

Early warning of bioagent exposure (Dr. Albert Swiston)

All Available Features



- ECG
- Pulmonary
- Hemodynamic
- Temperature

ECG Only



"Classic" version

Newest types



Heart Rate + Temperature



Heart Rate Only



Operational Feasibility



EW time

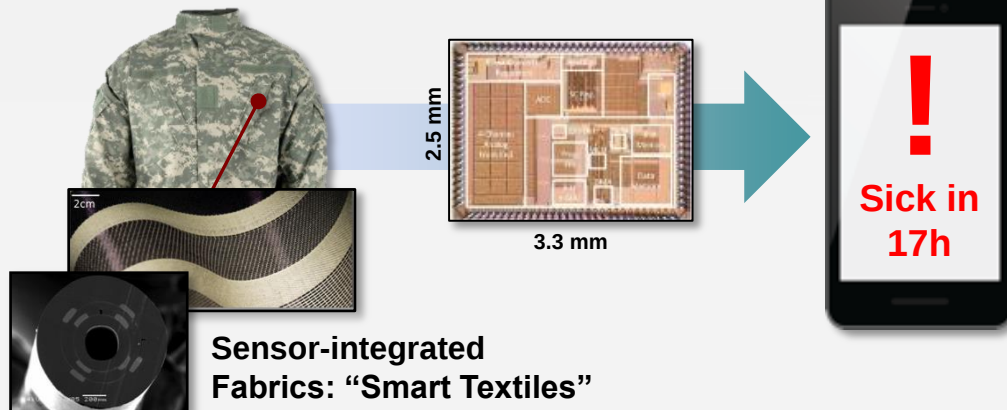
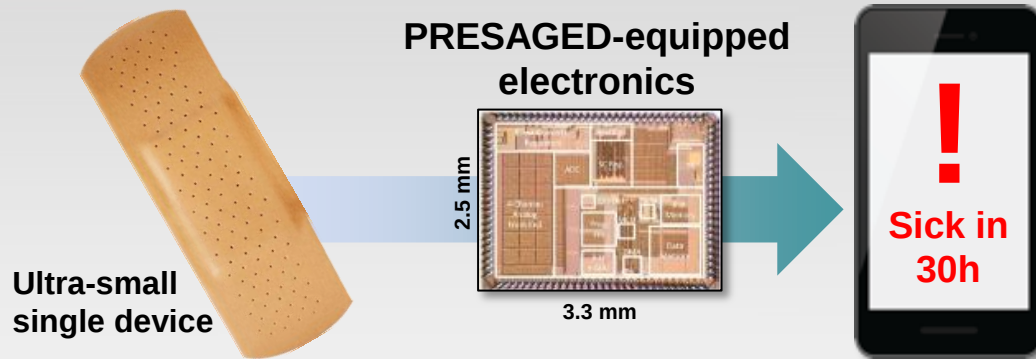


Many issues,
Poor performance

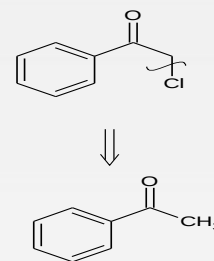
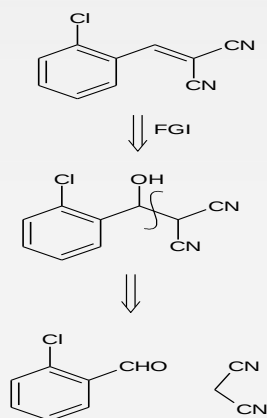
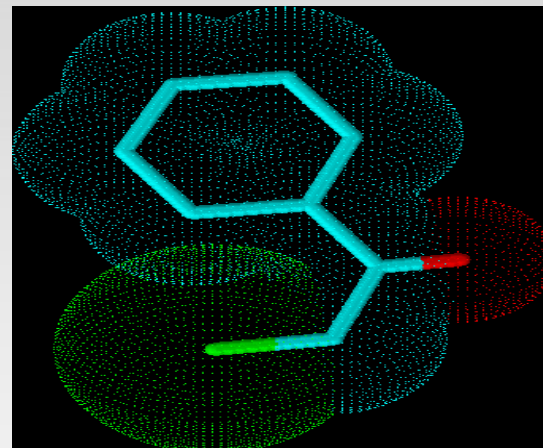
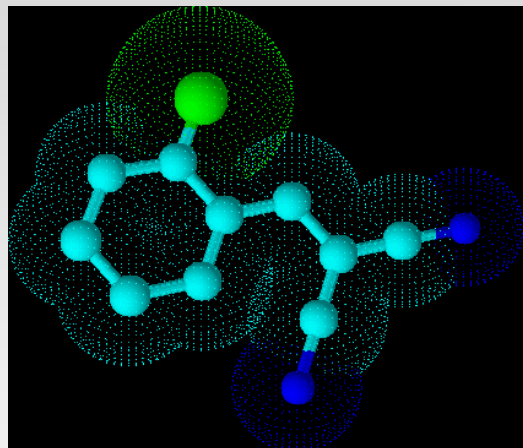
Some issues,
Mediocre performance

Few issues,
Good performance

Early warning of bioagent exposure (Dr. Albert Swiston)



Tools for chemical production (Prof. Ahmed Saeed)



o- chlorobenzylidene malonitrile

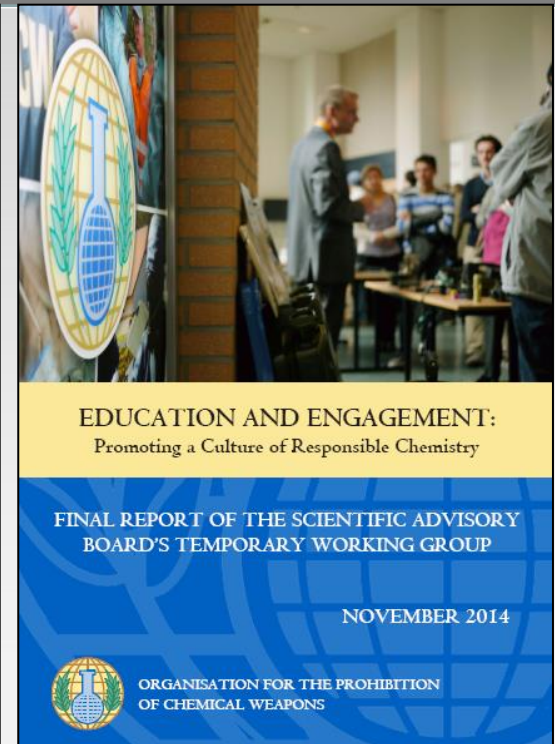
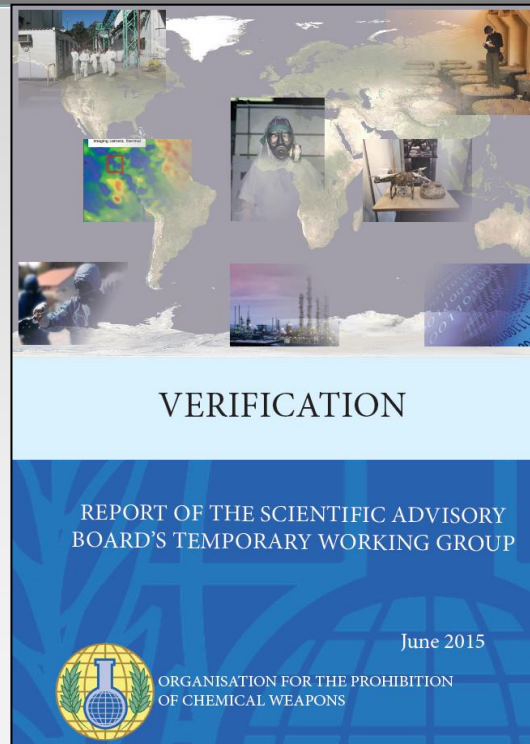
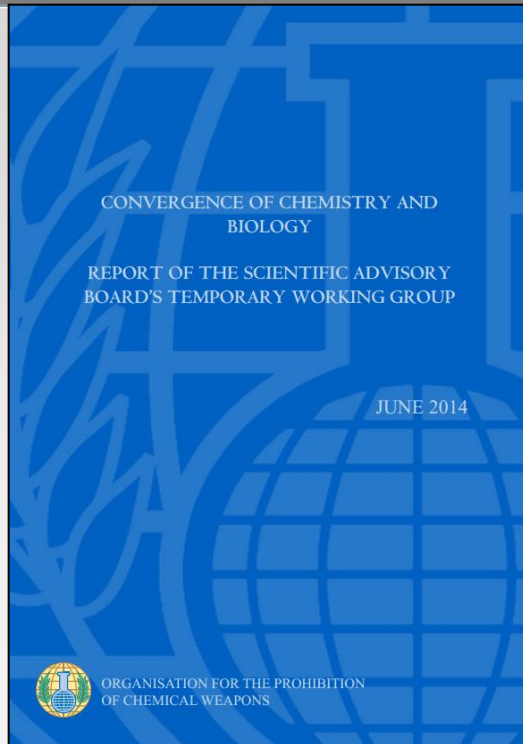
2- chloroacetophenone

21-30 November 2018 : a time to review



SAB report:
Overview of scientific and technological changes during review period
Advice on relevant and emerging areas of science and technology
Recommendations for moving forward

Where is the science review?



Where is the science review?



MENT:
emistry

Where is the science review?

OPCW
Scientific Advisory Board
SAB-21/WP.7
29 April 2014
ENGLISH only

Twenty-first Session
23 – 27 June 2014

RESPONSE TO THE DIRECTOR-GENERAL'S REQUEST TO THE SCIENTIFIC ADVISORY BOARD TO PROVIDE FURTHER ADVICE ON ASSISTANCE AND PROTECTION

EXECUTIVE SUMMARY

1. This report contains the SAB's response to the Director-General's request for further advice on assistance and protection. It is intended to be used with a health and safety knowledge, however, the Advisory Board assumes liability for the comprehensiveness of such information.

Annex:
Response to the Director-General's Request for Further Advice on Assistance and Protection

OPCW
Scientific Advisory Board
SAB-22/WP.2/Rev.1
16 June 2015
ENGLISH only

Twenty-second Session
8 – 12 June 2015

RESPONSE TO THE DIRECTOR-GENERAL'S REQUEST TO THE SCIENTIFIC ADVISORY BOARD TO PROVIDE FURTHER ADVICE ON ASSISTANCE AND PROTECTION

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Annex:
Response to the Director-General's Request for Further Advice on Assistance and Protection

OPCW
Scientific Advisory Board
SAB-23/WP.1
28 April 2016
ENGLISH only

Twenty-third Session
18 – 22 April 2016

RESPONSE TO THE DIRECTOR-GENERAL'S REQUEST TO THE SCIENTIFIC ADVISORY BOARD TO PROVIDE FURTHER ADVICE ON SCHEDULED CHEMICALS

EXECUTIVE SUMMARY

1. The Scientific Advisory Board (SAB) has provided its response to the Director-General's request for further advice on scheduled chemicals and stereoisomers. The SAB's response is based on the information provided by the Director-General and the SAB's previous work on this topic.

Annex:
Response to the Director-General's Request for Further Advice on Scheduled Chemicals

OPCW
Scientific Advisory Board
SAB-24/WP.2
25 May 2016
ENGLISH only

Twenty-fourth Session
27 – 31 March 2017

RESPONSE TO THE DIRECTOR-GENERAL'S REQUEST TO THE SCIENTIFIC ADVISORY BOARD TO PROVIDE FURTHER ADVICE ON CHEMICAL WEAPONS SAMPLE STABILITY AND STORAGE

EXECUTIVE SUMMARY

1. The Scientific Advisory Board (SAB) has provided its response to the Director-General's request for further advice on chemical weapons sample stability and storage. The SAB's response is based on the information provided by the Director-General and the SAB's previous work on this topic.

Annex:
Response to the Director-General's Request for Further Advice on Chemical Weapons Sample Stability and Storage

OPCW
Scientific Advisory Board
SAB-25/WP.1
27 March 2017
ENGLISH only

Twenty-fifth Session
27 – 31 March 2017

RESPONSE TO THE DIRECTOR-GENERAL'S REQUEST TO THE SCIENTIFIC ADVISORY BOARD TO PROVIDE CONSIDERATION ON WHICH RIOT CONTROL AGENTS ARE SUBJECT TO DECLARATION UNDER THE CHEMICAL WEAPONS CONVENTION

EXECUTIVE SUMMARY

1. This report provides advice from the Scientific Advisory Board (SAB) on which riot control agents (RCAs) should be subject to declaration under the Convention on the Prohibition of Chemical Weapons (CWC). The SAB's response is based on the information provided by the Director-General and the SAB's previous work on this topic.

Annex:
Response to the Director-General's Request for Further Advice on Riot Control Agents

Available at www.opcw.org/infocentre/OPCW/SAB/2017/WP.1/27-31-March-2017.pdf

Where is the science review?



OPCW

Scientific Advisory Board

SAB-24/WP.7
28 April 2014
ENGLISH only

GENERAL'S REQUEST TO THE
PROVIDE FURTHER ADVICE ON
TION

Twenty-first Session
23 - 27 June 2014

RESP
SCIENT

EXE

1. Re
2. Fy



Chemical Forensics: Capabilities across the Field and the Potential Applications in Chemical Weapons Convention Implementation

Helsinki, Finland. 20 to 22 June 2016

SAB-24/WP.1, dated 14 July 2016, URL: <http://q-r.to/bap1gy>

Coorganizer: VERIFIN



Chemical Warfare Agents: Toxicity, Emergency Response and Medical Countermeasures

Paris, France. 26 to 27 September 2016

SAB-24/WP.2, dated 14 October 2016, URL: <http://q-r.to/bap1h4>

Coorganizer:



Innovative Technologies for Chemical Security

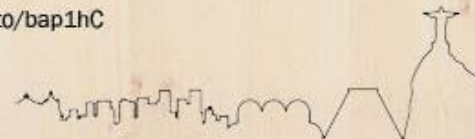
Rio de Janeiro, Brazil. 3 to 5 July 2017

SAB-26/WP.1, dated 21 July 2017, URL: <http://q-r.to/bap1hC>

Coorganizers:



The National
Academies of
SCIENCES
ENGINEERING
MEDICINE



International Workshop on Trends in Chemical Production

Zagreb, the Republic of Croatia. 3 to 5 October 2017

SAB-26/WP.2, dated 19 October 2017, URL: <http://q-r.to/bap1hD>

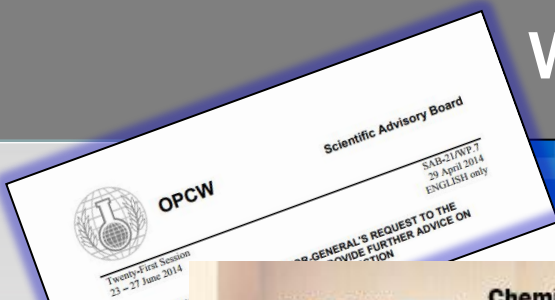
Coorganizers:



REPUBLIC OF CROATIA
MINISTRY OF ECONOMY



Where is the science review?



Chemical Forensics: Capabilities across the Field and the Potential Applications in Chemical Weapons Convention Implementation

Helsinki, Finland. 20 to 22 June 2016

SAB-24/WP.1, dated 14 July 2016, URL: <http://q-r.to/bap1gy>

Coorganizer: VERIFIN



Chemical Warfare Agents: Toxicity, Emergency Response and Medical Countermeasures

Paris, France. 20 to 22 September 2016

SAB-24/WP.2, dated 14 October 2016, URL: <http://q-r.to/bap1gy>

Coorganizer: ISGDSN



Innovative Technologies

Rio de Janeiro, Brazil. 3 to 5 July 2017

SAB-26/WP.1, dated 21 July 2017, URL: <http://q-r.to/bap1hC>

Coorganizers: IEPAC, IEPAC, IEPAC



International Workshop on Trends in Chemical Production

Zagreb, the Republic of Croatia. 3 to 5 October 2017

SAB-26/WP.2, dated 15 October 2017, URL: <http://q-r.to/bap1hC>

Coorganizers: Zagreb, Ministry of Economy, inli



27 events

717 attendees

- 285 individuals

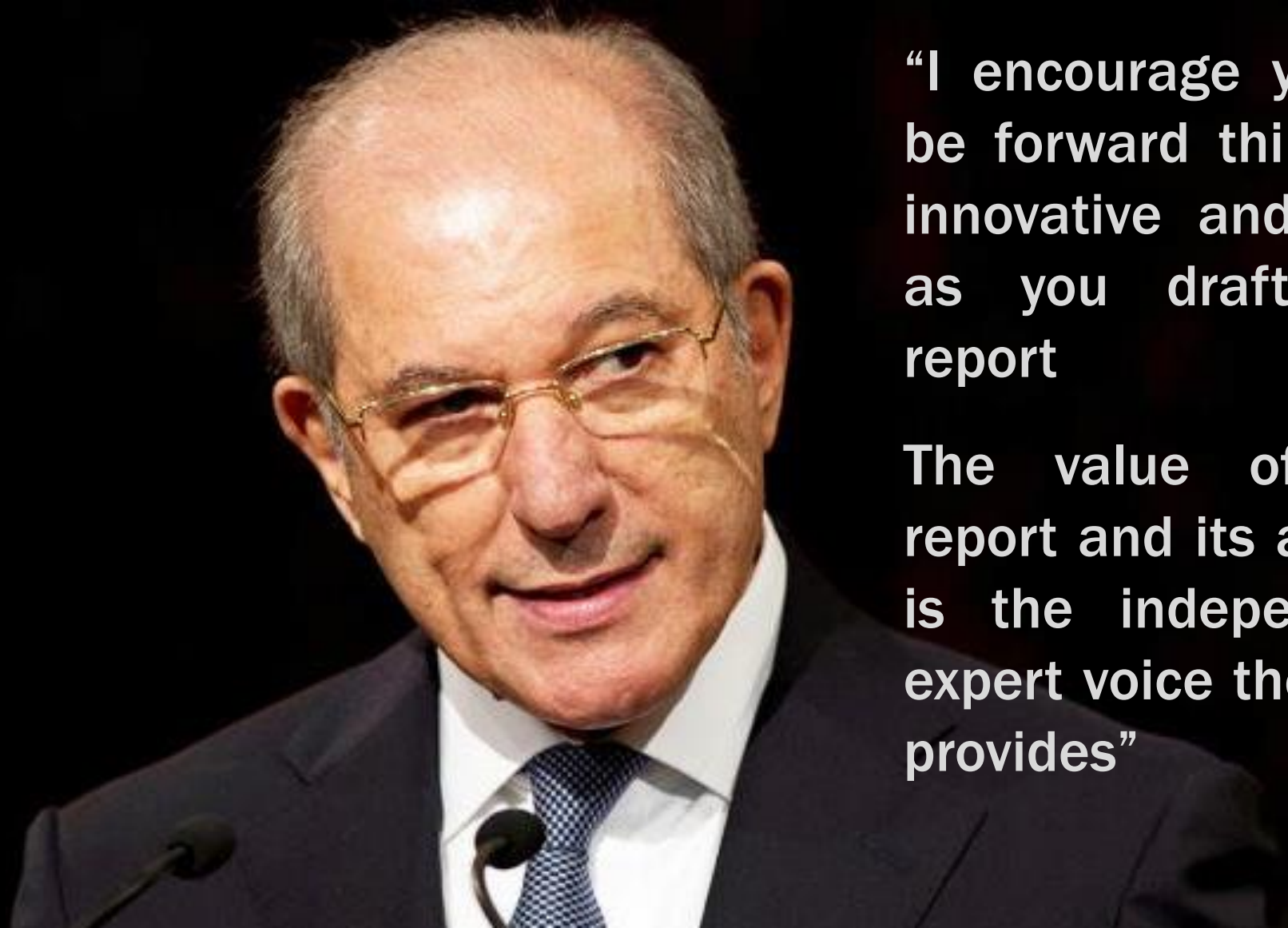
58 States Parties

429 speakers

- 197 individuals

31 reports

SAB report to Fourth Review Conference



“I encourage you to be forward thinking, innovative and bold as you draft this report

The value of the report and its advice is the independent expert voice the SAB provides”

General obligations, destruction and declarations

Most noted topics and issues:

- Destruction of remaining CWs, OCW and ACW discoveries**
- General obligation not to use of CWs – accountability**
- Prevention of re-emergence and rapid response**
- Strengthening of analytical capacity of OPCW**
- Improvement of VER**
- Importance of accurate, timely and complete declarations**
- Implementation of recommendations of the SAB-TWG on VER**

Industry verification

Most noted topics and issues:

- Industry VER adapted to new challenges and risk patterns
- SAB-TWG VER recommendations, “revitalisation” industry cluster
- Improved preparedness to verify misuse of toxic chemicals
- Convergence of chemistry and biology, biomediated synthesis
- Use of sampling and analysis
- Site selection methodologies

Consultations, cooperation and fact-finding

Most noted topics and issues:

- Non-routine missions that the TS conducted since 2013**
- Readiness to conduct contingency operations incl CIs and IAUs**
- Cooperation with other int organisations in the context of NSA**
- Expansion of the OPCW-LAB and network of designated labs**
- Addition of data to OCAD including non-scheduled chemicals**
- Chemical forensics**

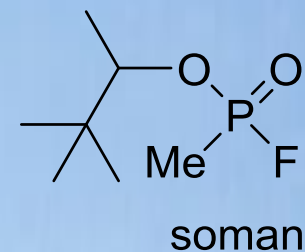
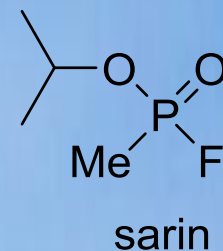
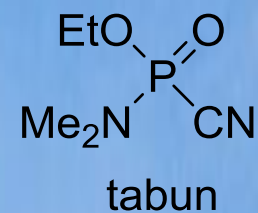
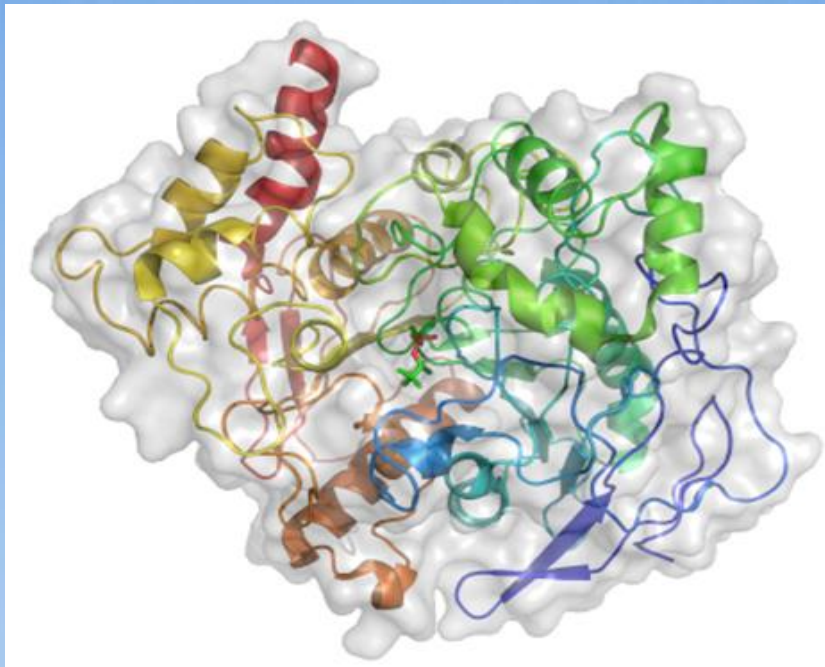
Threat spectrum

Classical CW	Other chemicals	Bioregulators Peptides	Toxins	Genetically modified BW	Traditional BW
blister agents nerve agents toxic gases	Toxic industrial, pharmaceutical and agricultural chemicals CNS-active chemicals	substance P neurokinins	botulinum saxitoxin ricin	modified/tailored bacteria and viruses	bacteria viruses rikettsia anthrax plague tularemia
Chemical agents		Agents of biological origin			
Poisons		Infectious Agents			
Chemical Weapons Convention (Article II)				Biological and Toxin Weapons Convention (Article I)	

Organophosphorus nerve agents



Atiyah



1930s

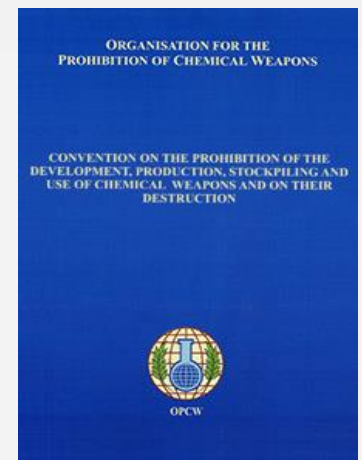
Schedules

Knowledge of chemistry related to the Schedules and industrial processes is key for inspectors

Adequate levels of scientific understanding will remain critical in making any assessments of an industrial capability or facility

A review of the schedules may be of value regarding chemicals previously not considered that are determined to pose a risk to non-proliferation, and could include :

- toxic industrial chemicals
- CNS-acting chemicals
- unscheduled toxic chemicals



Riot control agents (RCAs)

Reviewed list of 60 chemicals that had been discussed in a RCA context

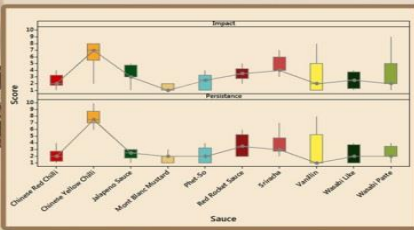
Only 17 met CWC-definition of RCA

Science for Diplomats at EC-84
What Defines a Riot Control Agent?

Come activate your TRP receptors!
and learn about the biochemistry of Riot Control Agents

Wednesday, 8 March 2017
Ooms Room | 13.30-14.45
Light lunch available at 13.00

OPCW



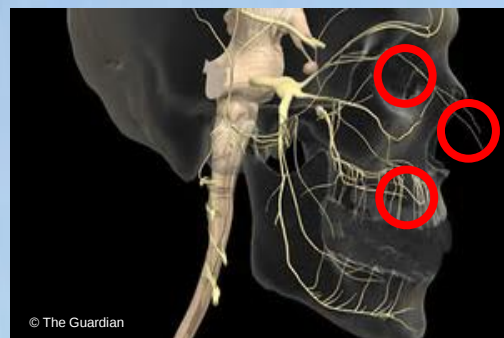
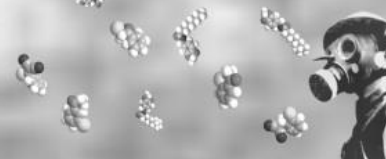
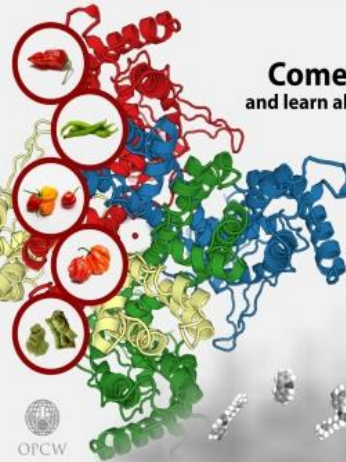
Sauce	Score	Impact
Chinese Hot Chili	1	1
Chinese Yellow Chili	2	2
Japanese Sauce	3	3
Mustard Black Mustard	4	4
Pea Soup	5	5
Red Hot Chili Sauce	6	6
Szechuan	7	7
Yunnan	8	8
Wasabi	9	9
Wasabi Paste	10	10

Science for Diplomats at EC-84
What Defines a Riot Control Agent?

Come activate your TRP receptors!
and learn about the biochemistry of Riot Control Agents

Wednesday, 8 March 2017
Ooms Room | 13.30-14.45
Light lunch available at 13.00

OPCW



The Scientific Advisory Board and Riot Control Agents

Response to the Director-General's Request to the Scientific Advisory Board to Provide Consideration on which Riot Control Agents are Subject to Declaration under the Chemical Weapons Convention (SAB-25/WP.1, dated 27 March 2017)
URL: <https://q-r.to/bap1Li>

Science for Diplomats at EC-84 on Riot Control Agents
URL: <https://q-r.to/bapS7f>

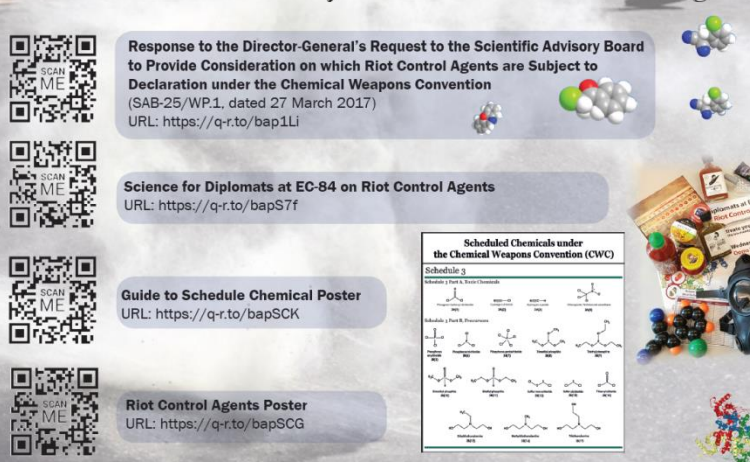
Guide to Schedule Chemical Poster
URL: <https://q-r.to/bapSCK>

Riot Control Agents Poster
URL: <https://q-r.to/bapSCG>

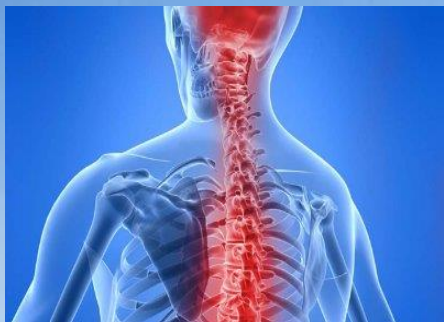
Scheduled Chemicals under the Chemical Weapons Convention (CWC)

Schedule 3

Substances with a Toxicity Threshold



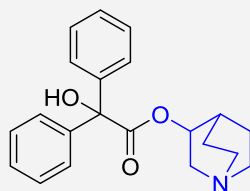
Central nervous system (CNS) acting chemicals



SAB reviewed 25 years of its advice on CNS-acting chemicals and concluded aerosolisation of these materials for law enforcement poses a significant health risk to humans

Technical discussions remain exhausted: issue now in the policy domain

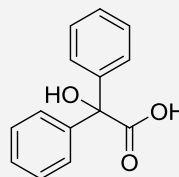
OPCW should start preparations for verification activities to prepare for any future IAU



3-quinuclidinyl benzilate (BZ)

Schedule 2.A.3

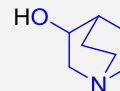
made from



2,2-diphenyl-2-hydroxyacetic acid

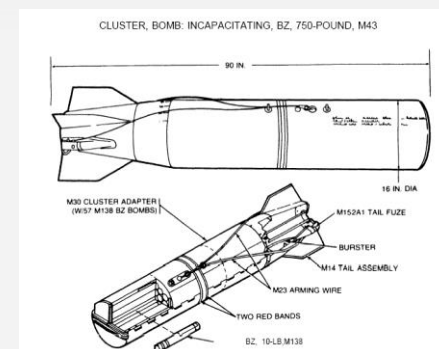
Schedule 2.B.8

and

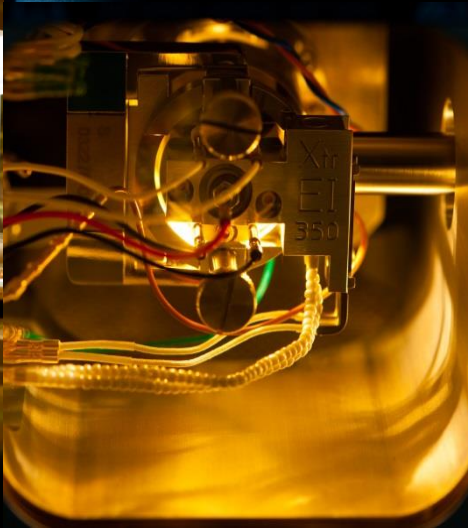
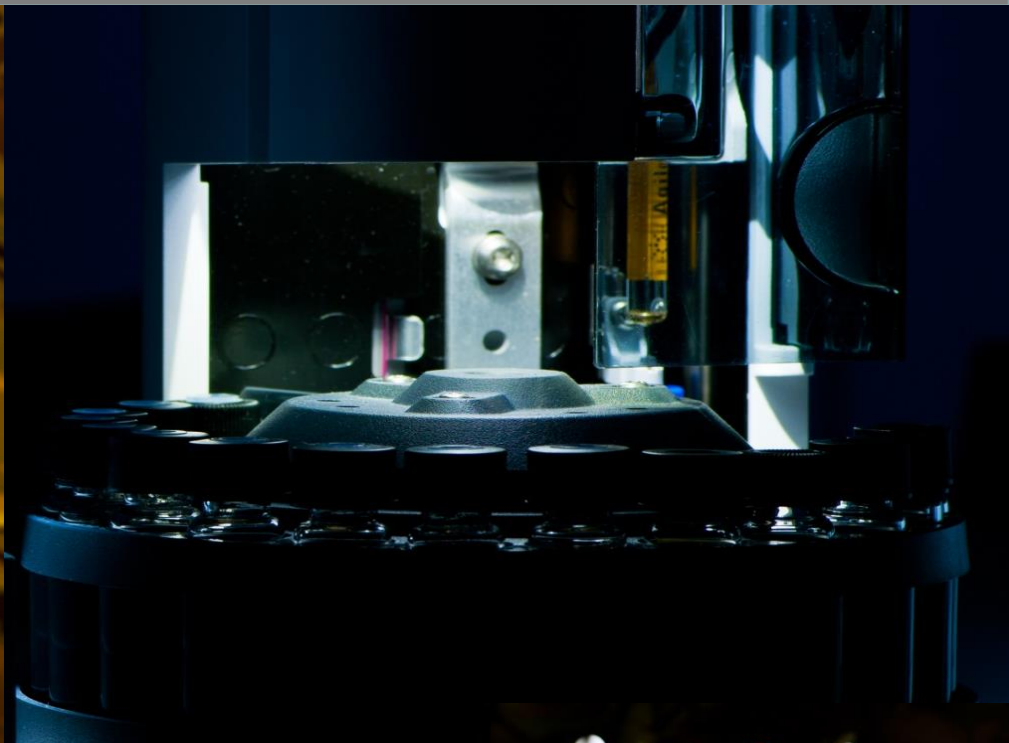


quinuclidin-3-ol

Schedule 2.B.9



TWG on Investigative Science and Technology



TWG on Investigative Science and Technology

Contingency operations have increasingly involved investigations, analysis, and fact-finding, with collection and evaluation of oral, material, and digital evidence of the use of chemical agents

- Review science and technology relevant to investigations mandated under the CWC
- Include science and technology for the validation and provenancing (determining the chronology of ownership, custody and/or location) of evidence, and integration of multiple and diverse inputs to reconstruct a past event
- Identify capabilities, skill sets, and equipment that will augment and strengthen the investigative capabilities of OPCW



TWG on Investigative Science and Technology

Veronica Borrett (TWG Chair)

Augustin Baulig

Christophe Curty

David Gonzalez

Robert Mikulak

Syed Raza

Valentin Rubaylo

Francois van Straten

Farhat Waqar

Daan Noort

Cheng Tang (SAB Vice-Chair)

Christopher Timperley (SAB Chair)

Crister Åstot

Brigette Dorner

Carlos Fraga

Paula Vanninen

Ed van Zalen (TWG Vice-Chair)

Australia

France

Switzerland

Uruguay

USA

India

Russian Federation

South Africa

Pakistan

TNO The Netherlands

China

United Kingdom

FOI Sweden

RKI Germany

PNNL USA

VERIFIN Finland

Netherlands Forensic Institute

Temporary Working Group on Investigative Science and Technology

Reporting to the Scientific Advisory Board (SAB), the Temporary Working Group (TWG) will in particular consider the following questions:

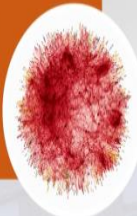
Question 1:

Which methods and capabilities used in the forensic sciences could usefully be developed and/or adopted for Chemical Weapons Convention-based investigations?



Question 2:

What are the best practices and analysis tools used in the forensic sciences for effectively cross-referencing, validating, and linking together information related to investigation sites, materials collected/analysed, and individuals interviewed?



Question 3:

What are the best practices for management of data collected in investigations, including compilation, curation, and analytics?



Question 4:

What are the best practices for the collection, handling, curation and storage, and annotation of evidence?



Question 5:

Which technologies and methodologies (whether established or new) allow point-of-care and non-destructive measurements at an investigation site to help guide evidence collection?



Question 6:

Which technologies and methodologies (whether established or new) can be used in the provenancing of chemical and/or material samples collected in an investigation?



Question 7:

Which methods are available (or are being developed) for the sampling and analysis of environmental and biomedical materials and can be used in the detection of toxic industrial chemicals relevant to the Chemical Weapons Convention?



Question 8:

Which technologies and methodologies (whether established or new) can be used in ensuring chain of custody and verifying authenticity (especially in regard to digital images and video recordings)?



Question 9:

Which technologies and methodologies (whether established or new) can be used to ensure the integrity of an investigation site?



Question 10:

Do collections of physical objects, samples, and other information for chemical weapons-related analysis exist and can they be made available to investigators for retrospective review? How might these collections be used to support investigations?



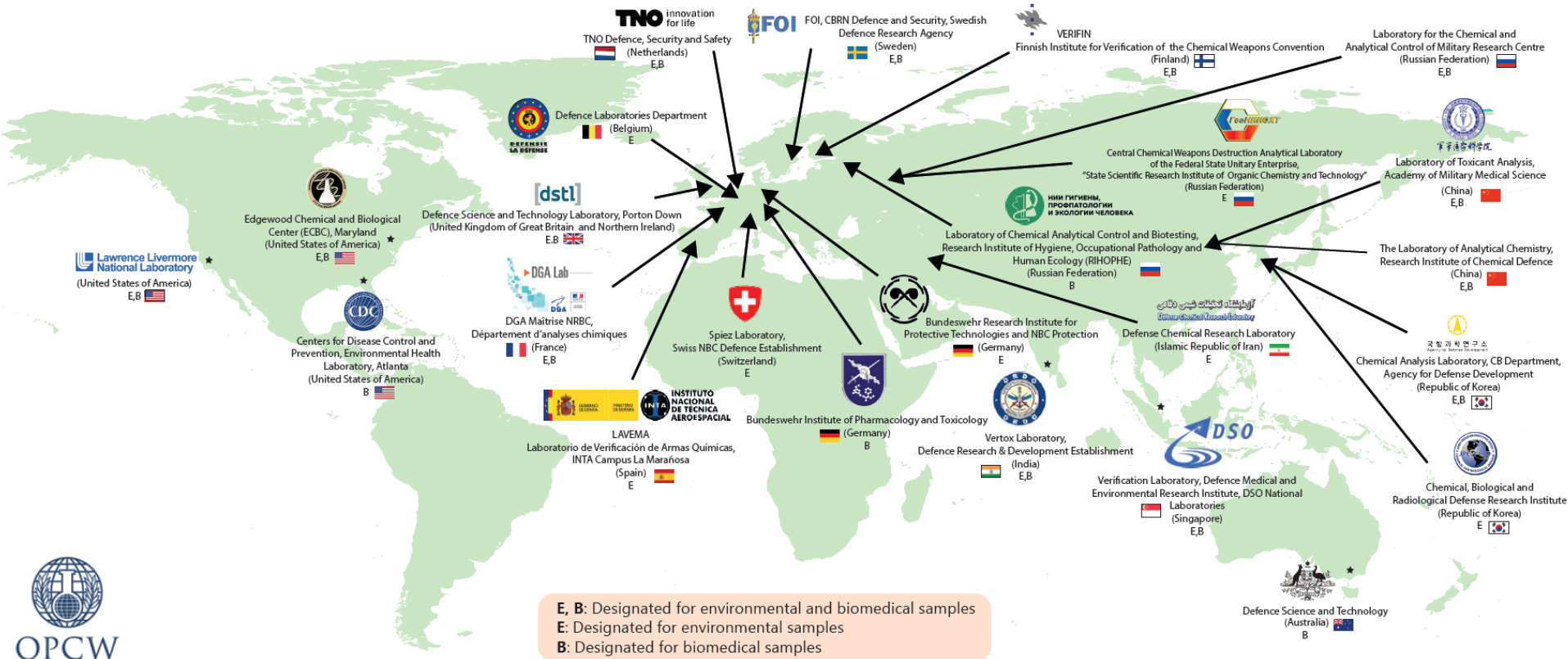
Question 11:

Are there stakeholders that the Technical Secretariat could usefully engage with to leverage their capabilities on investigative matters?



In addition, the TWG will provide advice on Technical Secretariat proposals for methodologies, procedures, technologies, and equipment for investigative purposes.

Designated laboratory network



- SAB supports expansion of the network which is a model of international cooperation
- SAB supports OPCW Laboratory redesign to a Centre for Chemistry and Technology

Inputs to S&T report finalized this week
Report submitted to Director-General in April
Response from Director-General in May

Key science and technology areas

Prevention of re-emergence: improvement of VER regime and consideration of CNS-acting chemicals/non-scheduled chemicals

Improvement of preparedness to verify the misuse of chemicals

Enhancement of analytical, forensic, and fact-finding capabilities

Gathering of more scientific evidence to support investigations and decision-making

OEWG-RC meeting to discuss science and technology

Meeting on S&T and its impact on CWC planned on 6 June

SAB Chairperson will brief the OEWG-RC on the S&T report

SAB S&T report to RC-4 and DG's response will be available

S&T sections will be included in forthcoming documents to inform the Review of the Operation on the Convention since RC-3

SAB review to be published in the scientific literature

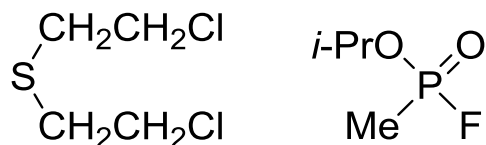


Advice on chemical weapons sample stability and storage provided by the Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons to increase investigative capabilities worldwide

Christopher M. Timperley,^{1a*} Jonathan E. Forman,^{8*} Mohammad Abdollahi,² Abdullah Saeed Al-Anri,³ Isel Pascual Alonso,⁴ Augustin Baulig,⁵ Veronica Borrett,⁶ Flerida A. Cariño,⁷ Christophe Curty,⁸ David González Berrutti,⁹ Zrinka Kovarik,¹⁰ Roberto Martínez-Álvarez,¹¹ Robert Mikulak,¹² Nícia Maria Fusaro Mourão,¹³ Ramasami Ponnadurai,¹⁴ Slawomir Neffe,¹⁵ Syed K. Raza,¹⁶ Valentin Rubaylo,¹⁷ Koji Takeuchi,¹⁸ Cheng Tang,^{19b} Ferruccio Trifirò,²⁰ Francois Mauritz van Straten,²¹ Paula S. Vanninen,²² Volodymyr Zaitsev,²³ Farhat Waqar,²⁴ Mongia Saïd Zina,²⁵ Marc-Michael Blum,^{26c} Hugh Gregg,^{26d} Elena Fischer,^{27e} Siqing Sun,^{27e} Pei Yang^{27e}



Review of, and advice given on, chemical weapons sample storage and stability, to assist chemical weapons-related forensic studies worldwide



IUPAC and OPCW

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IMPACT OF SCIENTIFIC DEVELOPMENTS ON THE CHEMICAL WEAPONS CONVENTION (IUPAC Technical Report)

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IMPACT OF SCIENTIFIC DEVELOPMENTS ON THE CHEMICAL WEAPONS CONVENTION (IUPAC Technical Report)

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Impact of scientific developments on the Chemical Weapons Convention (IUPAC Technical Report)*

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Abstract: This document represents the final report of discussions and conclusions arising
from the workshop on Developments in Science and Technology Relevant to the Chemical
Weapons Convention, held in Spiez, Switzerland in February 2012.
Keywords: Chemical Weapons Convention; CWC; implementation; science and technology;
Third Review Conference.

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 - 2.2 S&T advances and their impact on the scope of the CWC
 - 2.3 Developments that affect the practical implementation of the CWC
 - 2.4 S&T advances specifically relevant to protection against CW
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 - 3.7 Chemical safety and security: Possession, transfer, and acquisition
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 - 3.9 Chemical safety and security: Engaging the chemical sciences community

*Sponsoring body: IUPAC Executive Committee; see more details on p. 876.
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Innovation

and

the Chemical Weapons Convention

Scientific Review for an International Disarmament Treaty



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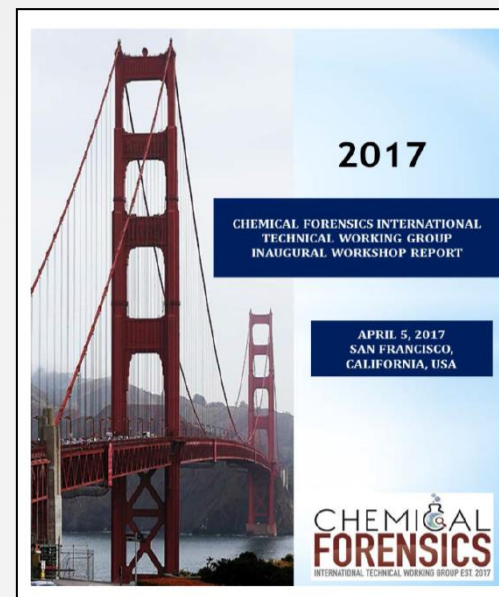
RECOMMENDATIONS

the scope of the CWC
the implementation of the CWC
to verification
to protection against CW
S&T environment
via outreach and education

and biology
logical analysis methods
and delivery mechanisms
production methods
security: Possession, transfer, and acquisition
agents
security: Engaging the chemical sciences community

ative Committee; see more details on p. 876.
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Future opportunities



Thank you for your attention



"Working together for a
world free of chemical weapons"