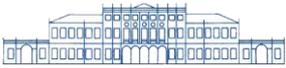


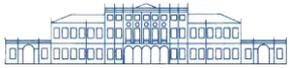
Sustainable Education and Awareness Raising of Life Scientists on Biosecurity and Potential Misuse Issues

Giulio M. Mancini



Science Community Should Be Aware & Engaged in The Policy Discussions

- **2004, US National Research Council (Fink Committee Report):** We recommend that national and international professional societies and related organizations and institutions create **programs to educate scientists about the nature of the dual use dilemma** in biotechnology and their responsibilities to mitigate its risks”
- **2006, WHO Biorisk Management: Laboratory Biosecurity Guidance:** “Training ...should include a **review of relevant national policies...** should provide guidance on the implementation of codes of conduct”
- **2007, OECD, Best Practice Guidelines on Biosecurity for BRCs:** “Staff training and developing **biosecurity-conscious culture**”
- **2009, European Commission, EU Group on Ethics:** “The relevant science communities should be encouraged to establish **ethical, preferably global, guidelines**, which may act as sign-posts and lead science institutions and individual researchers to assess the impact of their work including the consequences of misuse”
- **2009, EU CBRN Action Plan:** “consider and develop: ... in conjunction with universities and professional associations, minimal requirements for **academic training on biosafety, potential misuse of information and biological agents and toxins and bioethics** for undergraduate, graduate and postgraduate students
- **2011, G8GP – Assessment and Options for Future Programming, Deauville Summit,** “Strengthen and promote awareness and responsibility among CBRN scientists...develop a safety and security culture...promoting responsibility regarding access to CBRN curricula and intangible technologies...”



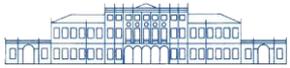
Who, What and How of Education

- What currently exists?
- Who needs to be educated?
- At what level?
- What contents?
- Who will be the educator?
- How to reach convergence of security concerns and practice of science?
- How to engage the relevant scientific communities?
- How to reach sustainability?



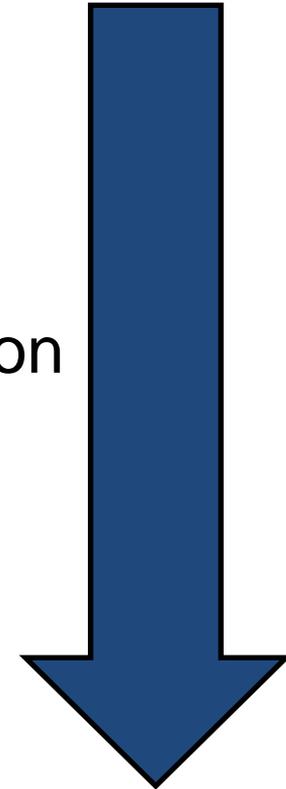
LNCV Networking Projects

- Strategic objectives:
 - Awareness raising of the “next generation of life scientists” (engaging universities)
 - Generate and promote a sense of ownership in the life science academia of education on biosecurity and potential misuse issues
- Specific objectives:
 - Assess current considerations and attitudes towards biosecurity education in universities
 - Collaborate to develop effective ways to deliver teaching and awareness raising activities
 - Form networks of interested individuals and institutes
 - Promote the incremental implementation in curricula



Networking Projects

- Gap & Situational analyses
- Engagement and network
- Educational materials
- Delivering and testing implementation
- Evaluation and sustainability
- Lessons learned





Gap & Situational Analyses

- Draw an illustrative picture of existing educational opportunities on biosecurity and dual use, and open channels of discussion with interested universities
 - Potential vehicles for education on biosecurity and dual use identified in existing courses of bioethics and biosafety
- Content analysis on syllabi and curricula programs
- Follow up surveys or interviews with lecturers, course coordinators and/or students



Gap & Situational Analysis – LNCV Collaborative Surveys

Educational Opportunities and Opinions of Scientists

2008 Landau Network Centro Volta-University of Bradford Survey on Biosecurity Contents in Life Sciences and Technologies Curricula in EU27+2¹	Europe
Curricula with modules clearly making references to biosecurity issues	26%
Curricula with modules clearly making references to codes of conduct or of ethics	21%
2011 Landau Network – Centro Volta and Quaid-i-Azam University Survey on Pakistani Life Science and Technology Students²	Pakistan
Yes to “Have any of your teachers delivered a lecture dealing with topics such as bioethics, biosecurity, bioterrorism, “dual use”, etc?”	25,62%
Yes to “Do you know any example of codes of responsible conduct which apply to life scientists and technologists?”	8,71%
Students replying at least “agree” to the item “Educational and research institutions should include study materials on dual use, biosafety and biosecurity in your course work”	58,34%
2011 Landau Network – Centro Volta and Association Marocaine de Biosécurité Survey on Life Science and Technology Professors³	Morocco
Yes to “Are there [in the faculty] any seminars on biosecurity/biosafety, misuse prevention, “dual use”, etc?”	12,33%
Professors replying at least “important” to the item “How do you qualify awareness raising of students on biosecurity and dual use?”	81,9%

Sources: ¹ Mancini G and Revill J (2008), Fostering the Biosecurity Norm. Biosecurity Education for the Next Generation of Life Scientists, Landau Network Centro Volta and the University of Bradford, Como Italy and Bradford UK; ² Shinwari, Z.K., Mancini, G.M., Pinard, W (2011), An Introduction to Biorisk Management and Dual Use, Quaid-i-Azam University, LNCV and Sandia National Laboratores, Islamabad, Como and Albuquerque; ³ LNCV-AMBS Survey, tabulation by staff on data from 13 universities; N=227, November 2011



Other Gap & Situational Analyses

Educational Opportunities and Opinions of Scientists

2009 AAAS-NRC Survey on Attitudes and Actions on Dual Use Research in the Life Sciences: A Collaborative Effort of the National Research Council and the American Association for the Advancement of Science¹	US
Scientists replying at least “Agree” to the item “Students should receive educational lectures and materials”	68%
2009 Japan National Defense Medical College and University of Bradford Survey on Biosecurity Contents in Life Sciences and Technologies Curricula in Japan²	Japan
Curricula including topics of relevance to “dual use”, also without using this specific term	17%
Faculty members in universities not providing any biosecurity education and thinking that it should be implemented, or that they are interested although it is difficult to implement	89%
2010 University of Exeter and University of Bradford Investigation of Biosecurity Education for Lifes Scientists in the Asia-Pacific Region (10 countries)³	Asia-Pacific
Curricula with modules specifically addressing biosecurity issues (both on misuse threats and environmental biosecurity)	18%
Curricula including references to “dual use” issues (potential misuse of genetic engineer in biowarfare, and consideration of bioterrorism scenarios)	25%

Sources: 1 based on 1637 respondents; AAAS-NRC (2009), A Survey on Attitudes and Actions on Dual Use Research in the Life Sciences: A Collaborative Effort of the National Research Council and the American Association for the Advancement of Science, Washington; ² Minehata M and Shinomiya N (2009), Biosecurity Education: Enhancing Ethics, Securing Life and Promoting Science: Dual Use Education in Life Science Degree Courses at Universities in Japan, National Defence Medical College and University of Bradford, Saitama Japan and Bradford UK; ³ Minehata M (2010), An Investigation of Biosecurity Education for Life Scientists in the Asia-Pacific Region, University of Exeter and University of Bradford, UK;

Engaging Universities in Collaborative Networking

- Working Meetings organized with faculties and students to discuss implementation challenges
- Workshops
 - “Fostering the Biosecurity Norm: An Educational Module for Life Sciences Students”, Como, 27 October 2008
 - “Biosecurity, Biosafety and Dual Use Risks. Trends, Challenges and Innovative Solutions”, Como, 13-14 November 2009
 - “Global Networking to Promote Biosecurity and Limit Dual Use Risks. The Science-Ethics-Law-Security Nexus”, Como, 12-13 November 2010
 - “Bioethics, Biosafety, Biosecurity and Dual Use Education”, Islamabad, 24 May 2011
 - “État et Promotion de l’Enseignement et de la Sensibilisation à la Biosécurité et au double usage», Rabat, 14 October 2011
- Collaborative networks presented to BTWC States Parties in Geneva

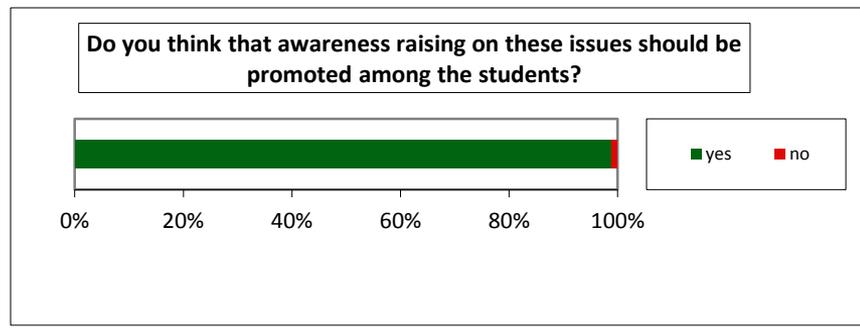
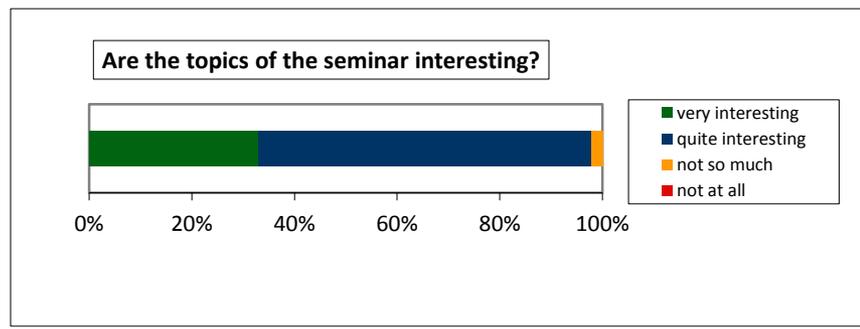


Educational Materials

- 2009 Educational Module Resource hosted by University of Bradford
 - Inputs from LNCV-Bradford networks in Europe and Bradford-NDMC project in Japan
 - Easy accessible, structured lectures on biowarfare, prevention regime and dual use dilemma
 - Available from www.dual-usebioethics.net
- 2010 – 2011 locally tailored, multidisciplinary reference and educational materials

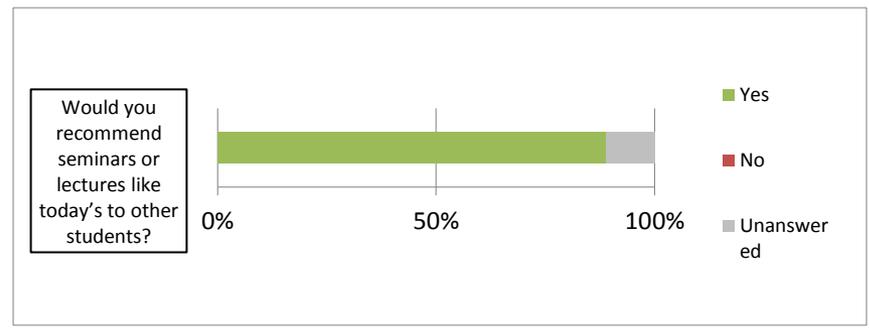
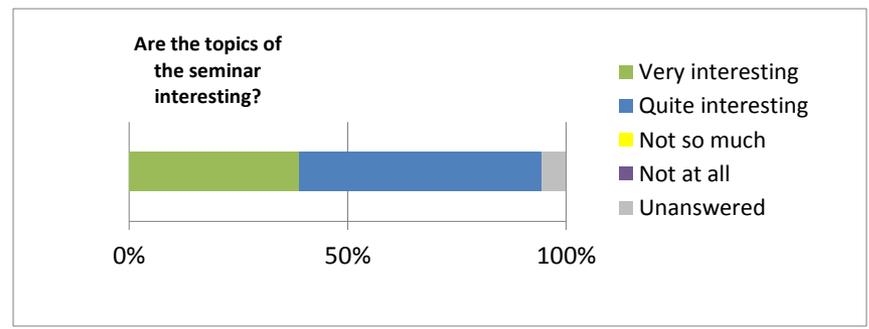
Implementation Testing and Feedback from Students

European students, post-seminar survey, LNCV-Bradford project, 2009



Source: Mancini G and Revill J (2009), Promoting Sustainable Education on Biosecurity and Dual Use Issues, LNCV and University of Bradford. 92 respondents from the seminars at University of Milan, University of Coimbra and University of Turin

Pakistani students, post-seminar survey, LNCV-QAU project, 2011



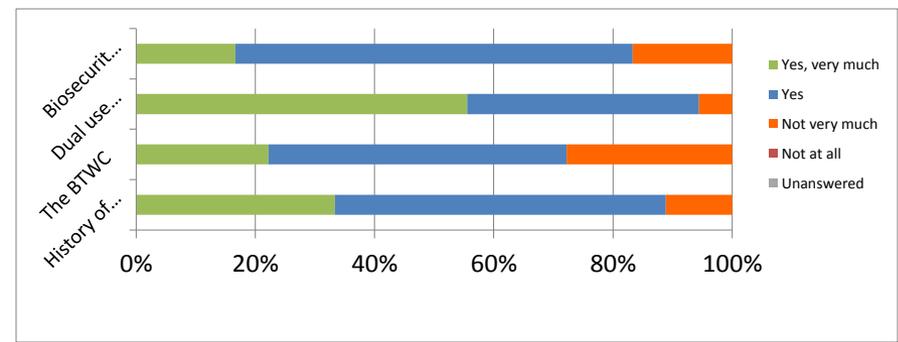
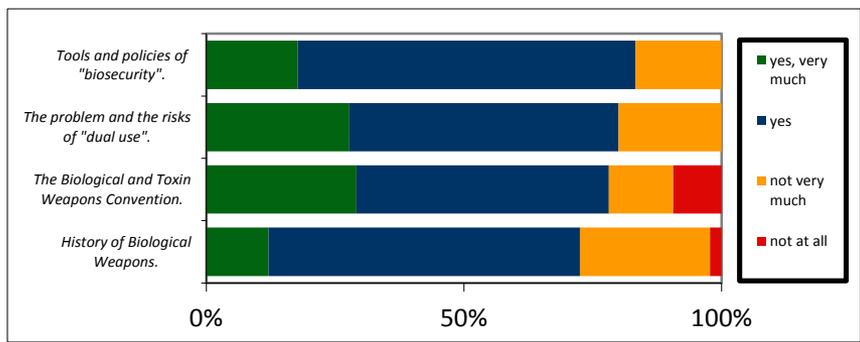
Source: LNCV-QAU seminars, Islamabad, May 2011. 20 respondents

Implementation Testing and Feedback from Students

European students, post-seminar survey, LNCV-Bradford project, 2009

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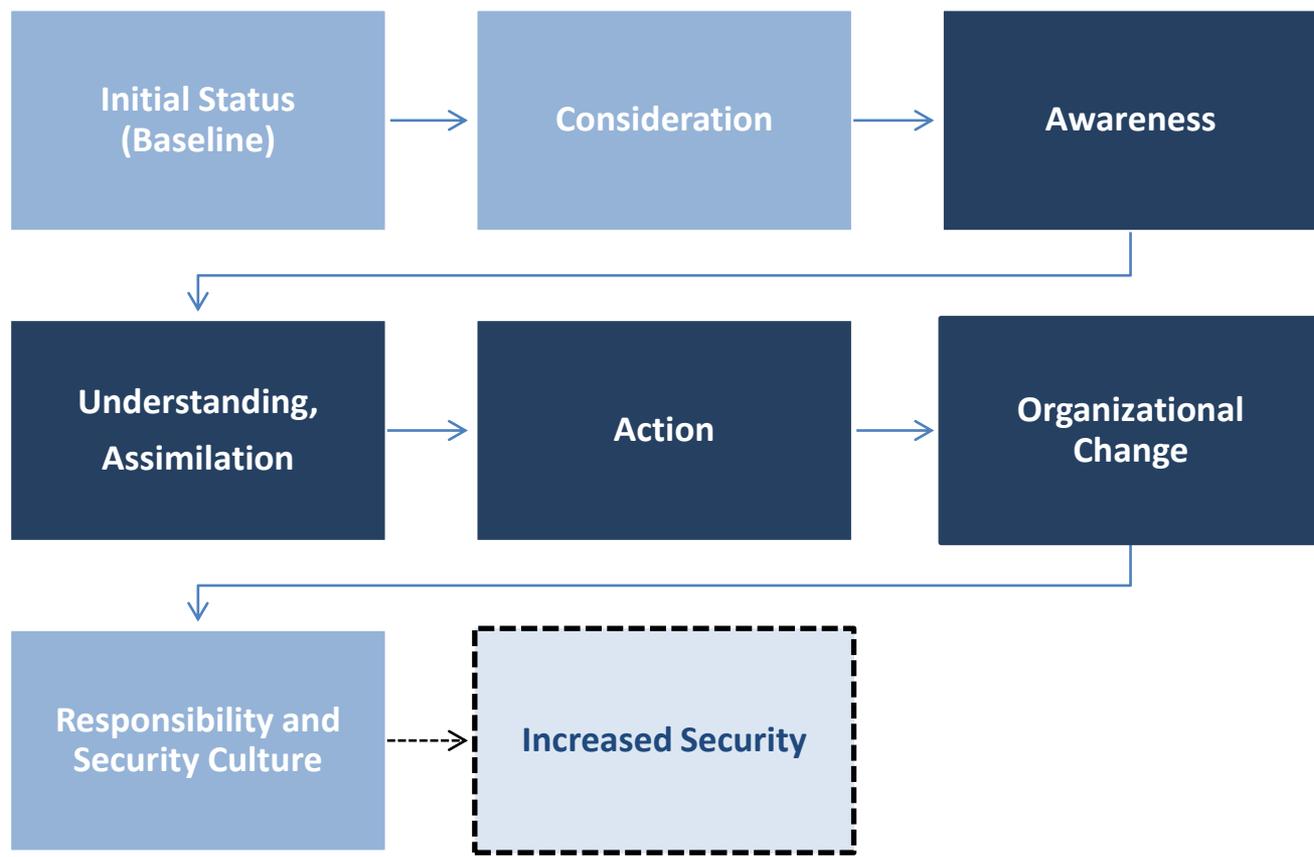
Do you think that your knowledge and understanding of the following specific aspects have been developed after this seminar?



Source: Mancini G and Revill J (2009), Promoting Sustainable Education on Biosecurity and Dual Use Issues, LNCV and University of Bradford. 92 respondents from the seminars at University of Milan, University of Coimbra and University of Turin

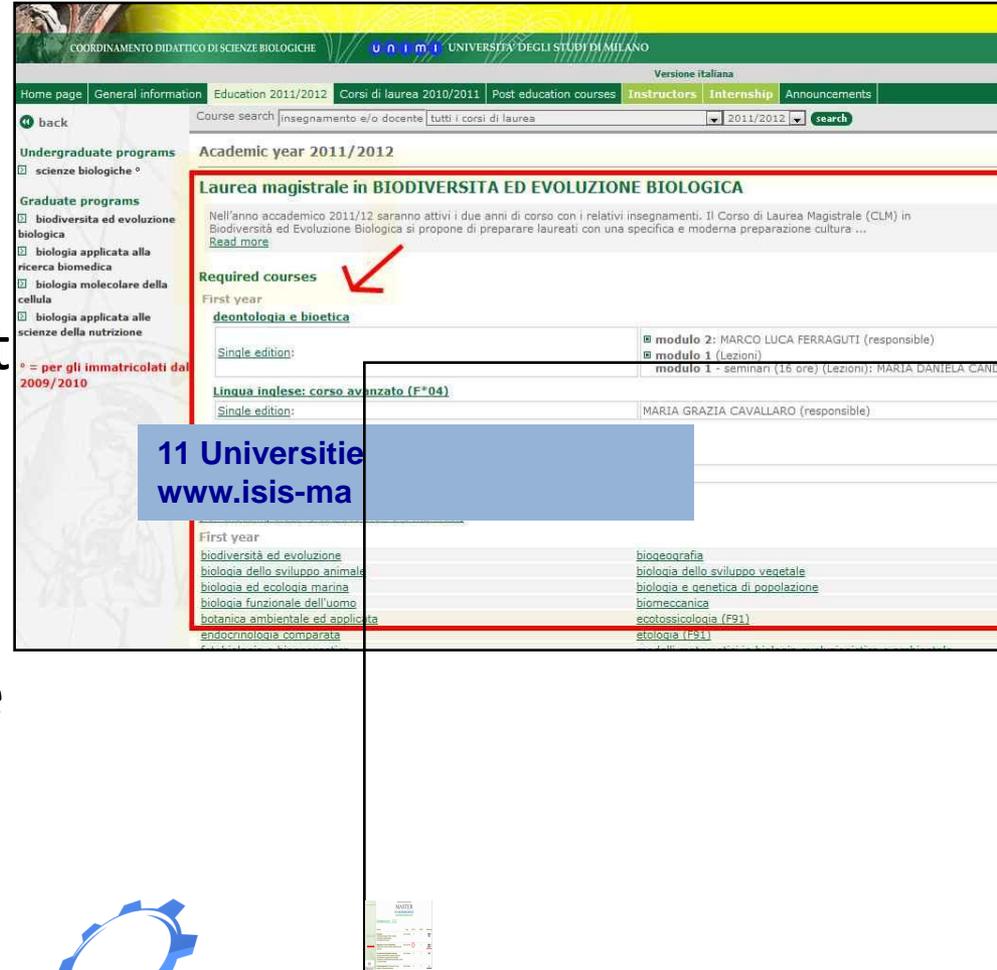
Source: LNCV-QAU seminars, Islamabad, May 2011. 20 respondents

Evaluating the Process of Raising Scientists' Awareness as a component of Biorisk Prevention and Security Policy



Sustainability?

- Follow ups from the European universities
 - Seminars in subsequent academic years
 - Engaged universities including new modules on biosecurity/dual use
 - Biosecurity Awareness Raising Network



The screenshot shows the website for the 'Laurea magistrale in BIODIVERSITA ED EVOLUZIONE BIOLOGICA' at the University of Milan. The page is in Italian and lists required courses for the first year, including 'deontologia e bioetica' and 'Lingua inglese: corso avanzato (F*04)'. A red arrow points to the 'Required courses' section. A blue box with the text '11 Universit e www.isis-ma' is overlaid on the page.



The European Biosecurity Awareness Raising Network

- EUBARnet is supported by 2010 EU ISEC Programme on the implementation of 2009 EU CBRN Action Plan
- Connects universities and organizations in the EU that are working on raising awareness of life scientists on biosecurity and dual-use concerns
- Promotes information for students and young scientists on the multidisciplinary aspects of biosecurity
- Appraises the European Commission on the status of education on biosecurity
- Networks' universities aimed at addressing various aspects of biosecurity/dual use, including an holistic approach to possible "threats" and "risks" (either natural or deliberate)



EUBARnet
European Biosecurity Awareness Raising network

With financial support from the Prevention and Fight Against Crime
Programme of the European Union - European Commission –
Directorate-General Home Affairs





Consortium Partners

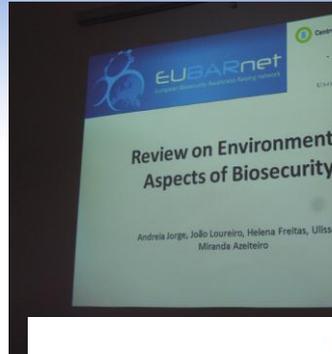


Larger Network



2011 - 2012 EUBARnet Seminar Series

- Seminars organized locally
 - Internal teachers
 - Embedded in courses: follow ups, continued discussion...
 - Tailored to contexts (language, specialization...)
 - Including EU policy and legislation, case studies on dual use experiments, ethics...
- EUBARnet
 - provides external experts (and “multidisciplinary”);
 - monitors feedback of students;
 - collects informational materials on the website



Prof. M. Daniela Candia (Department of Life Science) introduced the seminar. Giulio Mancini provided an biosecurity terminology and issues, including exam biosecurity, misuse of life sciences for hostile purpose, unexpected consequences on the environment of presentation, in English).



Prof. Silvana Galassi (University of Milano) presented on “Ecosystem Vulnerability to Accidental Pollution by Dangerous Substances” with a particular focus on aquatic ecosystems. The presentation focused on prevention, response and impacts of environmental impacts of toxic risks of biological (but also chemical origin), and their relations with biosafety/biosecurity. Reference European regulation was presented, including the Seveso Directive, important historical examples and ecotoxicological models (download the presentation, and watch the video of the lecture below, both in English).



Prof. Henk Zandvoort (Delft University of Technology, Netherlands) presented on Ethics of environmental conservation and prevention, including the governance of risk, the ethical principles governing consequences of research, and the discussion over liability. He also addressed examples of both “dual use” cases and environmental accidents in the EU (download the presentation, in English).

90/219 bioethics bioetica biological
 and toxin weapons convention
Biological Weapons biorisk
 spectrum biosafety biosecurity 81WC
BWC cartagena protocol CBD cbw Codes
 codes of conduct dual use ecotoxicology
 education environmental environmental, biosafety
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seminar seminari standards torino
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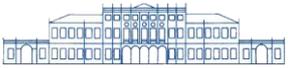
EUBARnet
 European Biosecurity Awareness Raising network



www.biosecurityeducation.eu
www.eubarnet.eu

facebook.com/eubarnet
Twitter @EUBARnet





Lessons learned and challenges/1

- Little currently exists on biosecurity and dual use in university curricula;
- Gaps in educational offer are similar in various regions, but priorities may be different;
- Faculties and students are interested, but...
 - Risks have to be discussed in perspective with the beneficial purposes of science;
 - Biosecurity has to integrate with communities' priorities (public health, occupational safety, biosafety, naturally occurring diseases...), not replace them;
- Biosecurity and dual use is a multidisciplinary field: ethics, legislation, policy, science, engineering, ecology, ...



Lessons learned and challenges/2

- Terminology issues, including translations from English: biosafety, biosecurity, “dual use” ...
- Awareness should be two ways: objective of awareness raising is also to engage scientists in policy formulation, public communication of risk, ...
- Information and materials can be internationally applicable, but should be locally relevant;
- Support engagement of universities and include industry, professional associations or societies and other relevant stakeholders;
- Evaluate success of awareness raising on potential misuse as a tool of the “web of prevention”;
- Long term sustained impacts will result from the sediments of shared values, principles and practice.
 - While currently the process of education on biosecurity and dual use is generally discussed and promoted in and by security circles, some passage of ownership will have to be generated as a requisite of sustainability of results.



Landau Network - Centro Volta