Addressing Security in Synthetic Biology: Roles and Responsibilities of the Research and Security Communities

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The modification of biological organisms and construction and use of organisms not found in nature carry potential safety and security risks if misapplied, raising issues of responsible conduct including ethics, responsible use, and environmental awareness, among others.

These advances raise important ethical and security issues that are also top priorities for the Administration, but go beyond the scope of this document.
FBI WMD Directorate

- In 2006, FBI consolidated its investigation, intelligence and prevention efforts into one HQ Division, the WMD Directorate → Centralized structure affords a more cohesive and coordinated approach to incidents involving WMD; focus on prevention.

- FBI WMD Directorate actively engaged in building capacities by developing national-level policy, guidance, and countermeasures to prevent, detect, disrupt, and respond to WMD.

- WMD Directorate taps into the tactical and technical expertise of other FBI operational and support divisions, embedding personnel in these components as needed and coordinating investigations and initiatives.
The FBI field offices allow the United States to counter biological threats at the local level while utilizing federal FBI expertise and resources.
WMD Coordinator Responsibilities

- **Conduct outreach** with federal, state, and local stakeholders (including industry, academia, and scientific communities)
  - Conduct biosecurity outreach to universities to promote a culture of security
  - Develop partnerships with industry leaders

- **Implement countermeasures** to detect and deter biological threats
  - Conduct assessments within area of responsibility; identify risks and vulnerabilities
  - Promote biosecurity guidelines (ex. HHS Screening Guidance for Synthetic DNA Providers)

- **Investigate bio crimes and acts of bioterrorism**
  - Coordinate with public health Laboratory Response Network

- **Provide training** to both FBI and public community
  - Conduct Joint Criminal-Epidemiological Investigation Training
  - Conduct exercises with local law enforcement and first responders
FBI Operations

Domestic FBI Operations

• 56 domestic Field Offices
  – Each with a WMD Coordinator
• 400+ Resident Agencies
• FBI Headquarters Division

International FBI Operations

• 2 overseas WMD Coordinators
  – Georgia, Singapore
• 75 Legal Attaché that cover 200 countries, territories, and islands
• INTERPOL, CBRN Program Manager

FBI's 56 Field Offices

- Albany, New York
- Albuquerque, New Mexico
- Anchorage, Alaska
- Atlanta, Georgia
- Baltimore, Maryland
- Birmingham, Alabama
- Boston, Massachusetts
- Buffalo, New York
- Charlotte, North Carolina
- Chicago, Illinois
- Cincinnati, Ohio
- Cleveland, Ohio
- Columbia, South Carolina
- Dallas, Texas
- Denver, Colorado
- Detroit, Michigan
- El Paso, Texas
- Honolulu, Hawaii
- Houston, Texas
- Indianapolis, Indiana
- Jackson, Mississippi
- Jacksonville, Florida
- Kansas City, Missouri
- Knoxville, Tennessee
- Las Vegas, Nevada
- Little Rock, Arkansas
- Los Angeles, California
- Louisville, Kentucky
- Memphis, Tennessee
- Miami, Florida
- Milwaukee, Wisconsin
- Minneapolis, Minnesota
- Mobile, Alabama
- Newark, New Jersey
- New Haven, Connecticut
- New Orleans, Louisiana
- New York, New York
- Norfolk, Virginia
- Oklahoma City, Oklahoma
- Omaha, Nebraska
- Philadelphia, Pennsylvania
- Phoenix, Arizona
- Pittsburgh, Pennsylvania
- Portland, Oregon
- Richmond, Virginia
- Sacramento, California
- Salt Lake City, Utah
- San Antonio, Texas
- San Diego, California
- San Francisco, California
- San Juan, Puerto Rico
- Seattle, Washington
- Springfield, Illinois
- St. Louis, Missouri
- Tampa, Florida
- Washington, D.C.
# Enforcement of U.S. Laws

## U.S. Criminal Code, Title 18 (Crimes)

### Biological crimes

<table>
<thead>
<tr>
<th>18 USC 175(a)</th>
<th>Crime to knowingly possess a biological agent, toxin, or delivery system for use as weapon → establishes BWC violations as crime</th>
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<tbody>
<tr>
<td>18 USC 175(b)</td>
<td>Crime to knowingly possess a biological agent, toxin, or delivery system if not for peaceful research purposes</td>
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<tr>
<td>18 USC 175b</td>
<td>Crime to knowingly possess select agent, regardless of intent, if not registered with Select Agent Program</td>
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<tr>
<td>18 USC 175c</td>
<td>Crime to produce, engineer, or synthesize smallpox</td>
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</tbody>
</table>

### WMD crimes

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<tr>
<th>18 USC 806</th>
<th>Enhances ability to seize assets of those with WMD intent</th>
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<tbody>
<tr>
<td>18 USC 842</td>
<td>Crime to teach or demonstrate the making or use of a WMD</td>
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<tr>
<td>18 USC 2332a</td>
<td>Crime to use (or conspire, threaten, or attempt to use) a WMD</td>
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Looking Ahead

The Threat
Al-Qaeda seeks WMD, US unprepared: reports

“Washington no longer has the luxury of a slow learning curve, when we know Al-Qaeda is interested in bioweapons.”

- Former Senator Bob Graham, Chair of the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism.
Cyber Security

Hacking of DuPont, J&J, GE Were Undisclosed Google-Type Attacks

Chronicle

Tuesday, March 8, 2011

The incidents described in the stolen e-mails portray industrial espionage by hackers. U.S. law enforcement agencies say the attacks have intensified in number and scope over the past two years.

"We are on the losing end of the biggest transfer of wealth through theft and piracy in the history of the planet," said Democratic Senator Sheldon Whitehouse of Rhode Island, who chaired a U.S. Senate Select Committee on Intelligence task force on U.S. cyber security in 2010.
DHS: Hackers Mounting Organized Cyber Attack on U.S. Gas Pipelines

By JASON RYAN (@JasonRyanABC)
May 8, 2012

For the past six months, an unidentified group of hackers has been mounting an ongoing, coordinated cyber attack on the control systems of U.S. gas pipelines, prompting the Department of Homeland Security to issue alerts.
Revealed: the lax laws that could allow assembly of deadly virus DNA

Urgent calls for regulation after Guardian buys part of smallpox genome through mail order

James Randerson, science correspondent

Wednesday 14 June 2006

A vial containing an incomplete sequence of smallpox DNA, obtained by the Guardian over the internet
Harvard scientists to make LSD factory from microbes
Simple microbes such as those found in baker’s yeast can be modified to make LSD, suggests research by Harvard scientists

Students on a bread making course. But did the tutor remember to warn them about the other things that yeast turn into? Photograph: Fabio De Paola

Ian Sample Tuesday 21
June 2011 15.55 BST
 guardian.co.uk
Looking Ahead

FBI Outreach
FBI Synthetic Biology Conference
“Building Bridges Around Building Genomes”

August 4 - 5, 2009        San Francisco, California
FBI Synthetic Biology Tripwire Initiative

• Partnership with the U.S. synthetic biology industry to report suspicious requests for genetic sequences
  – Reporting mechanism in place between participating industry leaders and FBI field office WMD Coordinators
  – Shared best practices with Germany and Canada during bilateral meetings (2009)

Industry very happy that problem of “who to call” was resolved
Federal Guidance to Synthetic DNA Providers

1. Customer Screening

2. Sequence Screening

3. Government Notification
   • FBI WMD Coordinator
2012 Jamboree
3,000+ Participants
34 Countries
190 University Teams

FBI Sponsor of iGEM since 2009
FBI Biosecurity Workshop
FBI Outreach Booth
A security related iGEM project: VT-ENSIMAG Biosecurity 2010

The VT-ENSIMAG Biosecurity team from 2010 focused their efforts on a security related bioinformatics project. They succeeded in creating screening software to identify uniquely related to agents of concern (pathogens and toxins). The team then used the screening software to show that virtually no parts in the registry came from such agents. The single part that was identified had already been clearly labelled as coming from a pathogen. This project demonstrated that security and science can be mutually beneficial and how effectively iGEM has engaged in these areas. For their work, VT-ENSIMAG Biosecurity won a special award in safety and security.

A security related human practices project: PKU Beijing 2009

The PKU Beijing team in 2009, as its human practices project, conducted a survey of 17 biotech supply companies to see if they would deliver a variety of laboratory resources to a domestic address. The PKU Beijing team in 2009, as its human practices project, conducted a survey of 17 biotech supply companies to see if they would deliver a variety of laboratory resources to a domestic address. The team discovered that many of the companies they contacted would complete their orders. As a result, PKU Beijing 2009 made a series of suggestions on how regulators, companies and the community might work together to enable exciting science whilst minimizing associated risks. These suggestions were then forwarded to the relevant authorities in their own country for further consideration.
Preventing Malign Use

"Biology should be more fun. It should be about exploring the world around us. We should want to get out there and do things. We should be able to do things more easily. Securing biology should be something that helps us do that. It cannot be something that gets in the way."

As a participant in iGEM, there are three things you can do right now to help us secure our science:

1. Fully answer the safety questions that demonstrates that you have thought about how others could misuse your work.
2. Contribute to community discussions on what needs to go into a code against the use of our science for hostile purposes (see A Community Response).
3. Look into what security provisions, such as laws and regulations, are already in place in your country (see Working within the Law).
1. Facilitate open communication between the security and the scientific communities

2. Determine how the university and security communities can work together

3. Develop and disseminate to both the security and academic communities recommendations for building a collaborative framework

4. Develop and disseminate to the scientific community and policy-makers possible solutions

http://www.aaas.org/cstsp/programs/bridging-science.shtml
Letter to U.S. Congress

June 11, 2012

The Honorable Harry M. Reid
Majority Leader
U.S. Senate
Washington, DC 20510

The Honorable Mitch McConnell
Minority Leader
U.S. Senate
Washington, DC 20510

The Honorable John Boehner
Speaker of the House
U.S. House of Representatives
Washington, DC 20515

The Honorable Nancy Pelosi
Minority Leader
U.S. House of Representatives
Washington, DC 20515

Dear Majority Leader Reid, Minority Leader McConnell, Speaker Boehner and Minority Leader Pelosi:

On behalf of the Association of Public and Land-grant Universities (APLU) and the Association of American Universities (AAU), whose combined members include the majority of the nation’s public and private research universities, we write to express our serious concern with Section 308 of H.R. 3146, the Digital Accountability and Transparency Act, and Sec. 501 of S. 1789, the 21st Century Postal Service Act. These provisions, inserted as amendments to the underlying bills in their respective chambers, would place severe restrictions on the ability of government employees to attend important meetings, workshops, and conferences at our educational institutions.

We believe it is important to prevent wasteful government spending. However, these provisions as written would inadvertently harm the partnership between the federal government and the nation’s higher education institutions that has served the country so well over many decades. Higher education institutions, particularly research universities, have daily interactions with many Federal agencies, ranging from the Department of Education (ED) to the National Institutes of Health to the Department of Homeland Security. Whether it is a meeting between an ED official and our financial aid officials on student aid programs, a university conference on research advances in clean coal technology that includes a Department of Energy participant, or a meeting between university research administrators and weapons of mass destruction coordinators from the Federal Bureau of Investigation regarding biowon security safeguards, these interactions between higher education and the federal government are important to our national security, public health, education, and global competitiveness.

Under these provisions, these types of interactions would be severely curtailed because a government agency would not be permitted to expend any funds, however small it may be, on more than one visit per year to the same university. This would be harmful to continuing projects, programs, initiatives, and discussions that require more than a single in-person meeting or conference. Given that many campus departments have good reasons to interact with the same federal agencies, this could also create unintended and unproductive competition within a single campus to be the first to arrange a campus visit from a federal agency official.

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Association of Public and Land-grant Universities + 1307 New York Ave., NW, Washington, DC 20005 + (202) 478-6040

UNCLASSIFIED
On behalf of the Association of Public and Land-grant Universities and the Association of American Universities, whose combined members include the majority of the nation’s public and private research universities, we believe it is important to prevent wasteful government spending. However, …

…meeting between university research administrators and weapons of mass destruction coordinators from the Federal Bureau of Investigation regarding biosecurity safeguards, these interactions between higher education and the federal government are important to our national security, public health, education, and global competitiveness.
The Role of the FBI

Meeting the Biosecurity Challenge:

• Outreach
• Partnership
• Risk Mitigation/Effective Policy Making
THANK YOU

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