Cyber biosecurity: case studies & data analysis

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Literature

Databases:

- Frontiers, a leading open access publisher and open science platform, and read articles under “Mapping the Cyberbiosecurity Enterprise”
- VT Cals Literature and Reading Materials - Google Drive Folder
- Keyword searches for hacks and security issues in the Agriculture Industry

Collected information

- Article Summaries
- Keywords related to cyberbiosecurity
- Discussed possible case studies

Much of the information found had similar themes, but varied across different fields and businesses.

Major buckets/themes from your findings

Keyword Groups

- Agriculture (Adulterated GMO, and Precision Ag)
- Biology (Biological Databases and Synthetic Biology)
- Cybersecurity (Red Teaming and Data Injection Attack)

Fields that are vulnerable:

- precision agriculture
- bio-fabrication systems
- synthetic biology
- genome databases

Consistencies:

Most articles described a need to improve cyberbiosecurity in different industries by focusing on the confidentiality, integrity, and availability of data.

Risk Factors:

- Stealing data and Sensitive Ag information : livestock health, land prices, and crop yield
- Destroying equipment
- Corrupting data and the technological systems that Ag businesses rely on.
- Human attacks, Viruses, Malware, and Signal Jamming (to online databases)

Potential solutions:

- Encryption
- Red Teaming (used to assess risk)
- Better Human Practices (no personal laptops on an organization's network)
- Machine learning (for anomaly detection)

November Edamame Focus Group

Major Themes

- Capacity building
  - Need for improved education, training, and tools that team members can use to protect sensitive information
- Intellectual property issues
  - Data from vendors and companies - determine who owns the data and has access to it?
- Data collection techniques/issues
  - Increase security measures when working with data and collaborating with graduate students or other groups.
  - Increased encryption and data protection

The goal is to utilize end product consumer knowledge and economic projections to try to guide economic decisions. Unique data is used to breed edamame varieties and determined which ones will be most profitable and easy to use for a producer.

Case Study Examples

Threat to Precision Agriculture:

A farmer has fields planted across multiple counties. The farmer deploys remote weather stations to the fields with soil moisture sensors, connected to water pivots, to automate water systems. A soil moisture sensor fails, or is maliciously hacked by a neighbor, and the sensor indicates watering is continuously needed, triggering the pivot when not needed, and flooding a field.

Cyberbiosecurity Implications for the Laboratory

Many labs can now be monitored remotely from a cell phone or laptop. Things like temperature, pressure, or other aspects critical to lab projects can be manipulated remotely. While useful for researchers, this is a security threat. Also, equipment like printers and fax machine are rarely encrypted and easy targets to steal data from as they save their task history on their internal storage.

Questions & feedback from audience

Should the cases be more broad or more specific?

More tangible in ‘real life’ as opposed to a far reaching/pie in the sky?

We have not found a lot of targeted attacks on agriculture field.

Making things up, which might not be accurate

General Electric stopped production last week due to a flaw in equipment that could enable hacking. Is this realistic for agriculture? Is that what the case studies should be?