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FRENCH GOVERNMENTAL APPROACH FOR SYNTHETIC BIOLOGY- RELATED BIOSECURITY

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Implementation of biosecurity

- OECD definition : Biosecurity is intended to deter or detect the loss or theft of dangerous biological materials for illicit or malicious purposes.
- General tools :
 - regulation (law, control organisms, etc.),
 - recommendation (guidelines, harmonization, codes-of-conduct, etc.),
 - sensitization (seminar, training, education, etc.).



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Potential risks

- Biological :
 - *De novo* synthesis of known biological threat agents.
 - *De novo* synthesis of new biological agents.
- Others :
 - *De novo* synthesis of known chemical threat precursors.
 - Hybrid organisms with nanotechnologies.



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Recommendations to improve biosecurity

- Origin of the recommendations to governmental authorities :
 - Academies of sciences,
 - National advisory boards,
 - 6th FP.
- Selected recommendations :
 - Adapted regulation to limit malicious application,
 - Control of gene synthesis,
 - Guidelines, harmonization and codes-of-conduct,
 - Sensitization, education and training,
 - Committee to check and control synthetic biology research.



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Adapted regulation to limit malicious applications : existing frame

- National regulations for biological risks at work.
- National regulation to follow and control whole or part of listed micro-organisms and toxins.
- European regulations for biological risks at work.
- European regulation for export control (Australia Group).
- International regulation (United Nations resolution, chemical weapons convention, the biological and toxin weapons convention).

New adapted regulations need to identify complete applications and risks of synthetic biology



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Control of DNA synthesis

- Sensitization of gene synthesis industries :
 - Communication to industries of the illustrative Australia group's list of indicators to identify suspicious orders* of synthetic nucleic acid sequences.
 - National points of contact list.
- Control of DNA synthesis :
 - Uncommon use in research laboratories.
 - Need appropriate database.
 - Need international control to be effective (purchase in different companies).

Control DNA synthesis must be international to be effective

* unidentified client, discrepancy between client and usage, abnormal amounts...



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Sensitization of scientific community

- Sensitization by security civil servant in each research institution.
- Conference by governmental agency (health, feeding).
- Seminar from the internal information central direction (DCRI).
- Education with specific university degrees in biosecurity.
- National forum.

Sensitization of scientific community is considered as very important approach to improve biosecurity concern of scientist



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Monitoring and control Committee for synthetic biology research

- To be initiated in the framework of UN (the biological and toxin weapons convention).
- National advisory scientific committee on emergent scientific fields (French academy of sciences).



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In Summary

**Synthetic biology promises powerful applications.
Regulations without discrimination could handicap research.**

- Biosecurity can be improved by sensitization of the scientific community.
- Tools for education or training are welcome.
- Control of suspicious order for gene synthesis industries is supported.
- Analysis of biorisks induced by synthetic biology is still ongoing.
- Guidelines of good practices to improve biosecurity of synthetic biology are welcome.