iGEM FCB-UANL 2021

DURC ANALYSIS

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DUAL-USE

The University of Boston (2014) defines Dual Use Research of Concern (DURC) as "Life sciences research that, based on current understanding, can be reasonably anticipated to provide knowledge, information, products, or technologies that could be directly misapplied to pose a significant threat with broad potential consequences to public health and safety, agricultural crops and other plants, animals, the environment, materiel, or national security."

Additionally Sandbrink and Koblentz (2013) report 3 main dimensions of analysis to report a research as DURC or not:

1. The capacity to misuse civilian facilities.
2. The misuse of equipment and agents to cause harm.
3. The generation and dissemination of scientific knowledge with potential misuse.

The following analysis will be using these criteria as guidelines for the DURC analysis.

THE PROJECT

We propose the creation of an environmentally friendly firefighting foam that will be produced using synthetic biology techniques. To achieve this, we have continued our work on Synbiofoam, a firefighting foam composed of foaming and stabilizing agents like Ranaspumins (a series of proteins from a native frog) and surfactin and biofilm, both naturally produced by ***Bacillus subtilis***, and whose production will be regulated through a circuit intended to control the bacterium's own regulatory network.

POTENTIAL HARM FROM MISUSE

Potential harm of the project

Both ***Escherichia coli*** K12 Top10 and ***Bacillus subtilis*** ATCC 6633 have a history of being safe organisms in the laboratory. It is unlikely for them to cause illness to

other organisms. Also, genetic modifications are not expected to alter these characteristics. In addition to this, the inserts do not give the recipient organisms characteristics that may cause harm. Based on the characteristics of the final products, the estimated risk involved in the project is low.

Potential harm of the information and technologies used in the project

Regarding the potential misuse of knowledge, information, and technologies from this project, the risk is minimal since all of the methodologies used in the project were basic molecular biology techniques. The digital tools used are from public domains and are widely used for genetic circuit construction. The project did not develop any novel technologies that may be of concern, and the magnitude of the potential misuse of technologies is minimal. It would take special facilities, equipment, and knowledge to maintain the organism somewhere else for ill-use or potential modification.

POSSIBLE BENEFITS

The potential benefits of this project are many and of great magnitude; since one of the most widely spread tools to fight fires involves the use of firefighting foams; but these usually contain fluorosurfactants (PFOs) which are in the group of "forever chemicals," which pose an environmental threat. The development of a non-contaminant alternative is a necessity. This project aims to produce a clean choice for traditional firefighting foams at an affordable price. The main areas of society that will benefit from this project are the biotechnology industry since the mass production of the product will create jobs for people in the field. Also, firefighters will be positively affected since the project offers a new alternative to safely fight fires.

The likelihood of these benefits taking place is high. For more than a year, the team worked in the entrepreneurial part of the project, developed a well-structured business model, and contacted stakeholders. Private companies and organizations have already shown interest in implementing the idea and supporting further

research. Considering the project's response from the stakeholders, it would be feasible for the project to be commercialized in around ten years.

SPECIAL RECOMMENDATIONS TO ENSURE SAFETY AND SECURITY

All the procedures followed in the lab are within the scope of a BSL1 laboratory. Thus, the laboratory personnel do not need further preparation other than the basic biosafety measures given to all lab members before they enter the laboratory.

Also, the research does not need special oversight since all the sequences used in this project are not dangerous or pose any misuse risk. Nevertheless, our PI is constantly overseeing our progress.

RISK-BENEFIT COMPARISON

The benefits of the project outweigh the risk associated with the project's development and final product. In addition the possibility of misuse of this technology is low, considering the information expressed in this document.

Based on the aforementioned analysis, we can conclude that the project does not meet the criteria to be considered as DURC.

REFERENCES

- University of Boston (2014). *Dual-Use Research of Concern*. https://www.bu.edu/researchsupport/compliance/ibc/dual-use-research-of-concern/
- Sandbrink, J. B., & Koblentz, G. D. (2021). Biosecurity risks associated with vaccine platform technologies. *Vaccine, S0264-410X(21) 17 1-7. Advance online publication*. https://doi.org/10.1016/j.vaccine.2021.02.023