



RESEARCH SUMMARY

Identifying and Analyzing Future Biotechnology Developments

U.S. decision-makers use a process known as horizon scanning to surmise the country's preparedness to meet imminent developments in numerous domains. This summary describes the outcome of a 12-month pilot of a method for scanning the horizon for developments in biotechnology.

Institute for Defense Analyses (IDA) researcher Janet Marroquin Pineda led a year-long pilot of an IDA-developed method for scanning the open literature for indicators of innovative biotechnology developments that could benefit or threaten U.S. chemical and biological defenses or warfighter health in the next 5 to 10 years. At the end of each month, the team assessed the technologies in the research identified in terms of battlefield applications, technical surprise and technical maturity. The team found that technical surprise, defined as an unexpected development in biotechnology, had different levels of potential impact (see table).

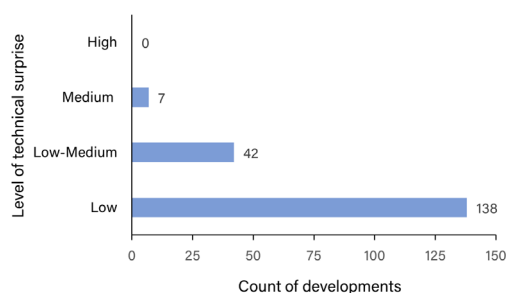
The team analyzed the most disruptive technologies and characterized their potential risks and rewards in the context of U.S. chemical and biological defense capabilities. With feedback from the Defense Threat Reduction Agency (DTRA), the sponsor of the research, the team divided findings into nine application areas of which three exhibited the most findings overall: vaccines/therapeutics, injury recovery, and enabling dual use. Of these areas, enabling dual use — developments with potential for both beneficial and nefarious uses — demonstrated the highest impact (see charts).

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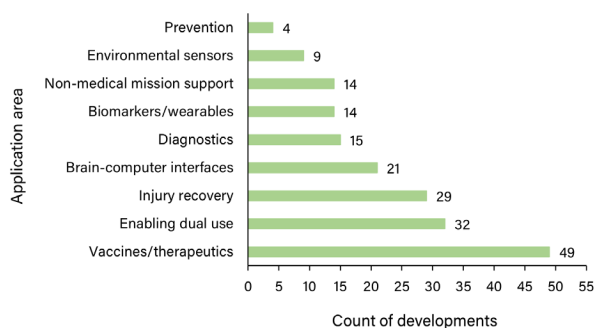
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Levels of impact to technical surprise (derived from [Persistent Forecasting of Disruptive Technologies](#))

Potential Impact to Technical Surprise	Technology Type	Technology Description
No Impact	Novel	Technology that builds upon an existing biotechnology product or discovery in an anticipated way or rate
Low Impact	Catalyst	Technology that alters rate of change of technical development or rate of improvement of one or more biotechnologies
Low-Medium Impact	Enhancer	Technology that modifies existing biotechnologies, tipping interest in technology across critical threshold
Medium Impact	Breakthrough	Discovery or technology that changes the fundamental understanding of nature or makes possible something that previously seemed impossible or improbable
High Impact	Disruptive	Innovative technology that triggers sudden and unexpected effects



Distribution of identified developments by level of technical surprise



Distribution of identified developments by application area

Continuing the horizon-scanning effort over time will likely improve forecasting ability and allow for retrospective analysis of trends. The

IDA team plans to focus future work on increasing the breadth of material covered by the horizon-scanning method. For example, automation may allow them to increase the number of developments identified and the application types examined. The scope of the research could then be expanded to include non-biological technologies relevant to DTRA's Chemical and Biological Defense Program.

For more information about this project, see IDA Document [D-33388](#).



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