COMBATTING FUTURE BIOLOGICAL THREATS – HOST-DIRECTED INTERVENTIONS TO EMERGING THREATS FOR RAPID RESPONSE

Kestrel: Knowledge Extraction For Strategic Threat Response Using Evidence From The Literature

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The quest for effective vaccines is a critical need for current and emerging pathogens, yet it is hindered by notable gaps in data and knowledge integration. Vaccine development relies on a comprehensive understanding of the interplay between pathogens, the immune system, and vaccine design components. Despite significant advances in the field, vaccine development faces numerous challenges, including the rapid mutation of pathogens, the lack of standardized data integration and curation practices, and the difficulty in determining correlates of protection. In this talk, we introduce the KESTREL knowledgebase which uses shared semantics to map correlates of immunity to underlying mechanisms of immunity across host-pathogen interactions and vaccine platforms. KESTREL combines expert-curated databases with automated literature mining to aggregate evidence on vaccines targeting specific pathogens and organizes vaccines into a taxonomy based on the technology platform being employed. Evidence ranges from preclinical experiments in animal hosts to clinical trials and active licensing status. This allows for a systematic assessment of the compatibility of vaccine platforms with current and emerging pathogens. KESTREL is developed as a part of the DTRA-funded RAPTER (Rapid Assessment of Platform Technologies to Expedite Response) program, which aims to develop computational and artificial intelligence/machine learning tools to predict vaccine platform compatibility with any current or future biological threat. KESTREL is a centralized metadata hub incorporating experimental data collected by RAPTER consortium members and data integrated with computational modeling approaches. We discuss the current landscape of vaccine-related data and knowledge, highlighting the challenges, limitations, and opportunities associated with integrating diverse data types.

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