Crowdsourcing breakthrough treatments for blood infections

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Image: Weis, W.I., Drickamer, K.

If asked how today's toughest medical problems are being solved, most people would probably envision highly skilled physicians and scientists working countless hours with sophisticated lab equipment, not people sitting in their homes playing computer games. Yet DARPA feels the gamers of the world have something to contribute. By pooling the time of hundreds or even thousands of computer users, DARPA hopes to accelerate new research into better treatments for sepsis—an overwhelming infection of the bloodstream that affects thousands of servicemembers each year and often leads to death.

This research is made possible by Foldit, a game and online community funded by DARPA. It works like this: Experts and nonexperts alike download the game and are presented with a simulated structure of a protein. The user tries to "fold" or to rearrange the shape of the protein. When a stable, unique shape is created, the results are sent to researchers to analyze. When successful, the result is new insight into protein designs and functions which may enable the development of new proteins to prevent and treat diseases. Gamers solving a previous Foldit puzzle remodeled an important reaction in organic synthesis in three weeks—a solution that evaded scientists for years. That puzzle demonstrated that Foldit can be used not only for protein design, but also for protein function prediction, a more complex challenge that cannot currently be solved by automation.

DARPA now asks the Foldit community, and those who might be interested in solving a challenging new puzzle, to set their cursors over the problem of treating sepsis. In support of DARPA's Dialysis-Like Therapeutics (DLT) program, a new puzzle was posted to the Foldit website that tasks users with creating proteins that can better bind to pathogens in the blood.

"The DLT program began in fall 2011 with the goal of creating a single device that removes sepsis-causing material from the blood," said Timothy Broderick, physician and DARPA program manager. "DARPA is currently selecting integrators to bring various technologies developed under DLT into a single device. Hopefully, the players of Foldit will help develop new proteins that make this device more effective at removing pathogens and helping patients recover from sepsis."

Those who logon to Foldit to take on the DLT puzzle will start with the structure of the Mannose-Binding Lectin and create designs that increase the number and strength of protein-sugar interactions. DARPA hopes to identify better protein-based pathogen capture reagents to be used for

the removal of circulating pathogens patients' blood as part of a larger DLT system. The process is very similar to the body's natural defense against invading pathogens. DARPA performers at the University of Washington and Wyss Institute at Harvard University will analyze the results. The most promising reagent designs may be manufactured for testing at Wyss.

Provided by DARPA