- Defense Meritorious Service Medal (2009)
- Army Commendation Medal (2001, 2003, 2005)

Severe blood loss due to trauma is the leading cause of death for American civilians under 45 years of age **and is the most common cause of potentially rescuable deaths from combat-related injuries.** Acute blood loss resulting from trauma can lead to hemorrhagic shock when blood loss exceeds the body's ability to compensate. Current treatment options restore the volume of lost blood, but do not address the additional damage done during excessive blood loss. A more effective therapy could protect organs and brain during and after hemorrhagic shock due and extend the time window for survival after injury.

Beta-hydroxybutyrate/melatonin (BHB/M) is being developed to treat patients with severe blood loss following traumatic injury, which should translate into improved clinical outcomes for trauma patients and wounded combatants suffering from severe blood loss. The use of beta-hydroxybutyrate and melatonin, both of which occur naturally in mammals, is based on hibernation research performed at the University of Minnesota. BHB/M's potential as a treatment of trauma-induced acute blood loss has been demonstrated in both small and large animal models of hemorrhagic shock. The project team is currently completing the remaining preclinical steps and then will file an Investigational New Drug (IND) application to gain approval from the FDA to start the initial clinical trial.

College of Science and Engineering, Department of Mechanical Engineering

Dr. Michael McAlpine

In a groundbreaking new study, researchers used a customized, low-cost 3-D printer to print electronics on a real hand for the first time. The technology could be used by soldiers on the battlefield to print temporary sensors on their bodies to detect chemical or biological agents or solar cells to charge essential electronics. The success printing of biological cells on the skin wound of a mouse could lead to new medical treatments for wound healing and direct printing for grafts for skin disorders.

Conventional 3D printing technologies typically rely on open-loop, calibrate-then-print operation procedures. An alternative approach is adaptive 3D printing, which is a closed-loop method that combines real-time feedback control and direct ink writing of functional materials in order to fabricate devices on moving freeform surfaces. Using this same approach, cell-laden hydrogels are also printed on live mice, creating a model for future studies of wound-healing diseases. This adaptive 3D printing method may lead to new forms of smart manufacturing technologies for directly printed wearable devices on the body and for advanced medical treatments.

Categorizing and Sharing Information Effectively

Importantly, research and innovation must be grounded in transparent and effective data organization and sharing. The University of Minnesota Library system, among higher education systems largest and most innovative libraries, represents the bedrock on which research is based. In 2017 the University of Minnesota Libraries won the National Medal for Museum and Library

Service, becoming only the third academic library to win the award in the past 23 years. In 2009 the Library was awarded the Excellence in Academic Libraries award from the American Library Association, again in recognition of our superior information organization and sharing abilities.

The University Library system has partnered with a number of other higher education library to create the Data Curation Network, an initiative that brings together the perspective of research data librarians, academic library administrators, and data curation subject experts to deliver tools, datasets, and advice for researchers nationwide.

University of Minnesota Veterans Services

The University provides a wide variety of resources for student veterans, service members, and their families. Among the variety of resources on campus to serve veterans and service members are:

- **Tilman Scholars Program:** The Pat Tillman Foundation invests in military veterans and their spouses through academic scholarships helping build a diverse community of leaders committed to service. The Tillman Scholarship covers direct study-related expenses—including tuition and fees, books, and a living stipend—for eligible service members, veterans, or military spouses who are pursuing undergraduate, graduate, or post-graduate degrees as a full-time student at a public or private U.S.-based accredited institution.

  The University of Minnesota-Twin Cities is one of seventeen institutions from around the country that serves as a University Partner for the Tillman Scholars Program. This means that applicants for the Tillman Scholars program compete in a separate pool of applicants for University Partner schools.

- **Student Veterans Association (SVA):** Located in the Veterans Transition Center (VTC), the SVA is a non-partisan, student-led veterans group at the University of Minnesota-Twin Cities. The SVA exists to support the veterans of our country's Armed Forces and our main goal is to help student veterans' transition from military to civilian life. The SVA provides student veterans with a place where they can meet other student veterans in a friendly atmosphere.

- **On-Campus VA Psychologist:** Whether facing an academic challenge or difficulty adjusting to civilian life, an On-Campus VA Psychologist is available to address student veterans' veteran-specific concerns and easily connect them to additional medical services.

- **Minnesota Department of Veterans Affairs Higher Education Veterans Program:** A staff member from the Minnesota Department of Veterans Affairs Higher Education Veterans Program is on campus every other week.