AFRL
AIR FORCE RESEARCH LABORATORY

Factsheet Technology: Cell Salvage Techniques in Trauma to Improve Blood Product Utilization
Technical Directorate: RH – Human Effectiveness
Distribution Statement: Approved for Public Release - AFRL-2025-3273

ReVive

Rescue•Recycle•Restore•Resuscitate•Recover

KEY BENEFITS

- **Mitigates depletion of blood supply and the logistic stress of utilizing a walking blood bank in less-than-optimal environments**
- **Lowers risk of transmitting blood borne disease using autologous transfusion**
- **Reduces potential complications caused by allogenic transfusion**
- **Utilizes the functionality of portable organ support capability in operational conditions**

WHAT IS IT?

The ReVive effort seeks to develop a far forward field portable capability reducing the need for donor blood transfusions to a hemorrhaging patient while providing support for secondary injuries.

The AFRL's Rapid Prototyping Cell (RPC) and military physician-scientists are developing the capability to collect shed blood and safely return the blood (autologous transfusion) while providing secondary injury support during post-hemorrhage recovery as well as patient warming for normothermia regulation.

The ***primary use case*** is extending the Golden Hour through autologous transfusions until the patient can receive definitive hemorrhage control.

Secondary uses include treating hypothermic patients requiring advanced rewarming, and patients requiring warmed infusion therapy. Preliminary data supports the use of such capability in a hemorrhagic swine model demonstrating improved blood pressure and lactate levels with earlier return of shed blood. The singular device with modular components would replace complex machines requiring specialized medical personnel support and enable use by medical personnel with minimal pre-utilization training. Size, weight, and power optimization ensure the development of a far forward, portable device. **The ReVive effort aims to increase survival rates, reduce logistical challenges, and conserve donor blood.**

HOW DOES IT WORK?

ReVive seeks to develop a modular capability that can be used by medical personnel based on resources and use case need. It functions as an extracorporeal circuit that can collect, clean, and return blood. Additional features to filter and optimize blood return can be added based on patient need. The device connects to the patient via vascular access to circulate and return shed blood with a standard suction device.

Image taken at the Advanced Resuscitation in Combat Casualty Care (ARC3) Laboratory. Image is property of the U.S. Air Force.

WHY IS IT IMPORTANT

Hemorrhage is the leading cause of preventable death from trauma for injured warfighters and civilians. Even with endovascular and hemostatic advances in hemorrhage control, injured warfighters are dying from potentially survivable injuries. Current and future conflicts run the risk of geographically dispersed resuscitative and surgical teams thus surpassing the Golden Hour to life-saving interventions and increasing the risk of injured warfighter morbidity and mortality, either from immediate hemorrhage or the sequalae of massive bleeding (respiratory failure, organ failure, myocardial dysfunction, etc.) seen during prolonged casualty care. In addition, donor blood supply may be limited due to lack of storage capability or the exhaustion of walking blood banks. To address gaps in advanced resuscitation and stabilization in austere environments and decrease the logistical burden of cold storage and re-supply, the AFRL has developed the ReVive effort to improve warfighter survival from point of injury to prolonged casualty care.

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