could have implications for search-and-rescue teams, medical emergency teams, and other hazard profession staff.
Keywords: certification; medical staff; phsycho-physiological; training
Prehosp Disast Med 2010;25(5):s100–s101

Seven Day Storage at 4°C of Previously -80°C Frozen AB Plasma

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Background: The Netherlands military mainly uses deep frozen (-80°C) blood products to support operational medical care. Thawed red cells can be stored for 14 days at 4°C, and are directly available for transfusion, whereas -80°C (refrozen from thawed -30°C) AB FFP must be thawed first for 30–40 min. The possibility of extending the shelf life of this thawed plasma to make both products directly available for damage control resuscitation in trauma patients with (massive) blood loss was studied.
Methods: Apheresis leukodepleted AB plasma (n = 42) were frozen at -30°C, quarantined, and released after repeated donor testing. On average, units contain 296 ±14 ml of plasma and have been stored at -30°C for 316 ±20 days. The units were thawed in a water bath at 37°C (Type 2032, Forma Scientific) repacked, frozen, and stored as deep frozen plasma (DFP) at -80°C for 20–40 days, before the final thawing procedure. Each day, before sampling, the units were inspected visually. Samples were drawn into sample pouches using sterile techniques, after thawing from -30°C (Day minus 1), from -80°C (Day 0), and after storage for 5, 7, and 14 days at 4°C respectively. Samples were immediately processed and APTT, PT, INR, fibrinogen, FV, FVII and FVIII were measured within 4 hours, using an automated coagulation analyzer (Destiny Amelung plus, Trinity Biotech).
Results: Apart from a slight prolongation of the APTT, no significant changes were observed when plasma was refrozen and thawed from -80°C. During subsequent storage at 4°C, only the activity of FVII remained stable. Fibrinogen decreased after 14 days of storage, whereas Factor V and VIII decreased after only 5 days of storage. There was no significant difference between 5 or 7 days 4°C stored units. The appearance of the majority of the thawed DFP units changed after 7–14 days storage at 4°C from clear into more turbid solutions, and sometimes even with clots.
Conclusions: All units contained more than 50 IU/dL FV, FVII, FVIII on Day 7 and had a normal APTT, PT, INR and fibrinogen concentration. In May 2009, a maximum storage time of seven days at 4°C of -80°C refrozen AB plasma was implemented, making this thawed plasma readily available together with thawed red cells for damage control resuscitation in combat casualties.
Keywords: blood products; frozen AB plasma; storage; thawed plasma
Prehosp Disast Med 2010;25(5):s101

-80°C Red Cells Plasma and Platelets in Combat Casualty Care

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Background: Since 2004, the Netherlands military mainly uses -80°C frozen blood products to cover operational needs. The experiences with these products based on data collected from two NLD blood bank facilities in Afghanistan during the past 33 months are described in this study.
Methods: Apheresis leukodepleted group O platelets in 5% DMSO/plasma are frozen as a concentrate (±15ml) at -80°C. After thawing, the platelets are resuspended in thawed AB plasma, to be used within six hours. Apheresis leukodepleted AB plasma is thawed from -30°C, repacked and frozen to -80°C before the final thawing procedure. Red cells from leukodepleted group O whole blood are frozen at -80°C in 40% (w/v) glycerol. After thawing and deglycerolization, the red cells are stored for no longer than 14 days at 4°C in AS3, before use. All thawed (and washed) products are in compliance with international regulations and guidelines.

All frozen products are produced in the Netherlands, shipped at -80°C (dry ice), stored in theater at -80°C, thawed on demand (all products) or for liquid storage (red cells). Occasionally, standard liquid red cells are sent from the Netherlands as a supplement, to cover periods of (expected) higher usage.
Results: During the past 33 months, 533 patients (85% Afghan) were transfused with 533 units of standard liquid red cells and 3,380 frozen blood products (1,360 red cell units, 1,425 plasma units and 595 apheresis platelet units). On one location, where all blood products were provided by the Netherlands Military Blood Bank, blood usage and survival were further analyzed. It showed that >90% of the transfused patients were trauma victims, of which, 14% (30 out of 209) required >10 red cell units within 24 hours. In these massively transfused patients, survival improved from 44% (n = 16) to 85% (n =14) after the introduction of a new transfusion policy in November 2007 (1:1 red cell to plasma ratio, with or without platelets). No shortages or transfusion reactions were reported.
Conclusions: Fully tested, frozen blood products, readily available after thawing, proved to be an effective and safe blood support for combat casualty care. A 1:1 red cell to plasma ratio appeared to increase survival in MT patients, also when only -80°C frozen blood products were used.
Keywords: combat casualty care; frozen blood products; storage; thawing
Prehosp Disast Med 2010;25(5):s101

Establishment of NATO Trauma Registry—A Joint Project within the NAT Framework

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In 2004, the Human Factors and Medicine (HFM) panel of the NATO research and technology organization (RTO) arranged a symposium on combat casualty care in order to address the problem of combat injuries in joint operations. The symposium was held together with the American yearly

ATACCC conference in Florida, and the referee of the meeting, Howard S. Champion emphasized the need for a common registry. The HFM then established an exploratory team to look at the possibilities to establish a trauma registry. The team had one meeting in 2005, where it was decided to start working on a trauma registry. In the fall 2005, the HFM established a Research Task Group (RTG) to identify the structure of a registry, and also the possibilities and challenges in establishing a registry. The RTG finalized its report in 2007, suggesting the establishment of a registry. The plan to establish a trauma registry was endorsed by COMEDS in November 2007, and the Military Medical Committee was given the responsibility to lead the work. Both the MedCis working group and the healthcare working group were tasked to work with the registry. To facilitate and speed up the process, the HFM established a lecture series (RTC) to address the COMEDS working groups. Lectures were given at core NATO meetings on five occasions in 2008.

The purpose of the proposed NATO database as suggested by the HFM RTG was:

1. Collect, process, and analyze summary data in any role 2 facility;
2. Contribute to the reduction of injuries and related deaths in the field by identifying, describing, and quantifying trauma;
3. Increase awareness of combat injury;
4. Assist injury prevention and improve treatment programs; and
5. Support injury-related approved analysis and research within NATO.

Possible outcome to the NATO nations were:

1. Define risk situations for different casualties;
2. Quality assessment of primary treatment;
3. Assessment of evacuation;
4. Assessment of secondary and tertiary treatment;
5. Compare different modes of management;
6. Establish common practice within NATO;
7. Perform multinational clinical trials; and
8. Create an evidence-based practice within NATO in the treatment of trauma.

In October 2008, the Netherlands and Norway agreed to establish a trial database, and test communication of data between the nations first in a sham situation. Once the two nations have established a working solution, this will be made available to the other NATO nations.

The NATO Database system consist of several elements:

1. Develop a registry on agreed standardized elements;
2. Develop a system for communication between nations;
3. Develop a system for acquiring data at the role 2;
    a. Electronic, paper format;
    b. Appoint dedicated registrars at the role 2 facility; and
4. Develop a system for communication from the field to the central national registry.

The present project aims at developing the database structure, the element structure and the mode of communication of data between the two nations.

Keywords: combat casualty care; communication; database; trauma registry
Prehosp Disast Med 2010;25(5):s101–s102

The Human Factors and Medicine Panel of the NATO Research and Technology Organization

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The NATO Research and Technology Organization (RTO) promotes and conducts co-operative scientific research and exchange of technical information amongst 28 NATO nations and 38 NATO partners. The largest such collaborative body in the world, the RTO encompasses more than 3,000 scientists and engineers addressing the complete scope of defense technologies and operational domains. This effort is supported by an executive agency, the Research and Technology Agency (RTA), that facilitates the collaboration by organizing a wide range of studies, workshops, symposia, and other forums in which researchers can meet and exchange knowledge.

The RTO was established in 1998 by combing several NATO institutions within research and science. The RTO has divided its activities between six panels: (1) Applied Vehicle Technology (AVT); (2) Human Factors and Medicine (HFM); (3) Information Systems Technology (IST); (4) System Analysis and Studies (SAS); (5) Systems Concepts and Integration (SCI); and (6) Sensors & Electronics Technology (SET).

The mission of the Human Factors and Medicine Panel is to provide the science and technology base for optimizing health, human protection, well being, and performance of the human in operational environments with consideration of affordability. This involves understanding and ensuring the physical, physiological, psychological, and cognitive compatibility among military personnel, technological systems, missions, and environments. This is accomplished by exchange of information, collaborative experiments and shared field trials.

Since the scope of the HFM panel is broad, comprising all aspects of medical and human factors research, the work is divided between four areas:

1. Human Effectiveness focusing on psycho-social, organizational, cultural, and cognitive aspects in military action;
2. Human System Integration focusing on human-in-the-system analysis, design, and evaluation and experimentation;
3. Operational Medicine focusing on aerospace, hyper/hypobaric, and military medicine necessary to ensure sustenance, health, safety, and survival of military personnel; and
4. Human Protection focusing on human-centered research for optimizing physiological tolerance, protection, and survivability in adverse mission environments.

The human factors and medicine panel organizes two major symposia every year, organizes task groups to explore specific topics, and conducts lecture series to promote scientific knowledge.

A number of activities also are central in civilian medicine and personnel selection.

Keywords: Human Factors and Medicine Panel; NATO Research and Technology Organization; research
Prehosp Disast Med 2010;25(5):s102