

accidents with overexposure of both workers and the population. The threat of nuclear terrorism with possible negative consequences for the population is real. Medical triage of exposed individuals by the extent of required medical aid is critical in large-scale radiation emergencies. Medical triage is based on the prediction of acute radiation consequences by estimated exposure dose. Whereas physical dosimetry, which provides more accurate dose estimates, often is not feasible in the event of large-scale radiation accidents, especially within the first hours and even days after exposure, biological dosimetry is of special value. Thus, a scale of Radiation Injury Severity Classification (RISC) has been developed based on the recently available medical data on 59 workers in Russia and two in the US, who were exposed due to the short-term acute irradiation.

The RISC scale includes clinical and hematological parameters for triage of acute radiation injuries into three prognostic categories: (1) survival probable; (2) survival possible; and (3) survival improbable. For *in-situ* testing of the RISC scale, 24 workers with the full clinical information for the first days after acute exposure have been selected. Eight physicians with limited training in assessment of radiation injuries have been recruited to test the scale. They have used the RISC scale to assign a numerical score to each of the 24 cases. Physicians have been able to classify appropriately 84% of cases. More importantly, they have correctly classified 96.8% of cases into a category of possible survival, i.e., those who would benefit of medical care. A more extensive *in-situ* testing is planned to validate these findings.

Keywords: prediction; Radiation Injury Severity Classification; severity

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8th NATO Blood Conference

The Blood Supply of Foreign Missions Army of the Czech Republic

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The residence of the Czech Armed Blood Transfusion Service is the Department of Hematology, Biochemistry and Blood Transfusion (DHBBT) in the Central Military Hospital in Prague. This facility is the blood collection, processing, and storage base for the military health service, and in special circumstances (frozen blood) also for civilians. The DHBBT is responsible for the blood supply of the foreign army missions as well as for blood transfusions in field hospitals.

The blood supply is based on regular delivery by aircraft every 4–5 weeks, one pack usually consists of 20 TU RBC and 20 TU FFP. The field military blood bank is part and parcel of laboratory of field hospital in container ISO-1C.

The Czech Army operated in numerous field foreign missions with field hospitals: 1994–1996 Croatia (Knin UNPROFOR), 1996–1998 Croatia (Klisa UNTAES), 1999 Albania (Kavaje AFOR), 1999 Turkey (earthquake, Gölcük), 2002 Afghanistan (Kabul, ISAF), 2007 Iraq (Basra, Enduring Freedom), 2007–2008 Afghanistan

(Kabul, ISAF). During missions, more than 1,600 TU red cells and 500 TU FFP was delivered these from DHBBT. Some situations were solved by blood collection in place of the operation.

The problems with aircraft delivery led to the decision to build-up the special blood bank container for field hospitals with frozen blood storage and to have the blood supply ensured in 3 components: (1) frozen blood components; (2) delivery of fresh blood (if available); (3) and blood collection in place of operation.

Keywords: blood supply; Czech Armed Blood Transfusion Service; field hospitals

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Allergy Symptom Response Following Conversion from Injection Immunotherapy to Sublingual Immunotherapy

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Background: The objective of this research was to determine the clinical response to sublingual immunotherapy (SLIT) among patients with allergic rhinitis previously managed with injection immunotherapy (SCIT). Because deployed, active-duty military personnel often are prevented from using SCIT due to logistic and safety concerns, a secondary aim was to consider the appropriateness of SLIT in this group.

Methods: Questionnaires were offered to a sample of patients using SLIT during the period November 2009 to February 2009. The questionnaire assessed changes in nasal, eye, sleep, and constitutional symptoms following conversion to SLIT. Allergy-related quality of life was quantified using a validated instrument.

Results: Thirty patients (100%) agreed to participate. The average age was 48.6 years and 27.5% were military personnel. 100% with nasal symptoms reported improvement or no change following conversion to SLIT. Of those with eye symptoms, 97% were improved or unchanged. Sleep and constitutional symptoms were reported in 26 patients each. Improvement or no change was reported in 25 (96%; $p < 0.001$) and 24 (93%; $p < 0.006$). No adverse reactions were reported.

Conclusions: Allergy patients receiving SCIT can be converted to SLIT without loss of allergy symptom control. Because military personnel in this study were able to use SLIT in conjunction with their duties, larger studies are indicated to fully assess the potential role of SLIT in deployed military personnel.

Keywords: allergy; response; sublingual immunotherapy; symptom

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The Use of Anthrax and Orthopox Therapeutic Antibodies from Human Origin in Biodefense

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Introduction: It is impossible to protect whole nations from the effects of bioterrorism by preventive vaccination. There are too many possible agents, costs would be exorbitantly high, and the health risks associated with complex mass vaccination programs would be unacceptable. Adequate protection, however, could be provided via a combination of rapid

detection and diagnosis and the treatment of those exposed with drugs that would be beneficial in all stages of disease. Monoclonal antibodies, preferably from human origin to prevent severe complications, which neutralize or block the pathological effects of biological agents, are the optimal candidates to be deployed in case of biological warfare or a bioterrorist event. Recent research has shown that a combination of monoclonal human antibodies against the protective antigen (PA) and lethal factor (LF) of the anthrax toxin even after application 48 hours after the infection is therapeutically effective. This new development offers a safe therapy that can start several days after bioterrorist victims are possibly infected with anthrax spores.

Study Design & Production Process: The human body is one of the better and most suitably equipped places for the generation of monoclonal antibodies that can be used effectively in humans for treatment. Such antibodies will be of optimal physiological specificity, affinity, and pharmacological properties. In addition, the chances of severe adverse effects and cross-reactivity with human tissues will be slim. Therefore, the human immune response has been used by the Dutch company IQ Therapeutics; a spin-off of the Groningen University and financially supported by the Dutch Armed Forces, as a basis for selecting the antibodies. People, immunized against or infected with the agent in question, donate blood cells voluntarily, which are used to generate fully human monoclonal antibodies.

The antibody-based part of the human immune response, which, by selection, is found in the blood of the donors is preserved by processing the antibody producing B lymphocytes according to a novel human adaptation of Köhler and Millstein's mouse hybridoma technology. The antibody producing genes are transferred to the human PER.C6 cell line (licence from Crucell), which produces up to 3.5 g/l therapeutic antibody; but the culture of this human cell line also can be done in an XD™ (eXtreme Density) process to get higher yields.

In this way, effective therapeutic class IgG1 antibodies, with an affinity typically better than 10¹⁰ against the protective antigen (PA) and lethal factor (LF) toxin components of *Bacillus anthracis* are developed. Currently antibodies against orthopox viruses are generated as well from donors, which have been immunized with vaccinia. Other projects are the development of therapeutic antibodies for antibiotic-resistant *Staphylococcus aureus*, and *Enterococcus spp.*

Results: Both human antibodies against the anthrax toxin components are efficacious in vitro and in pre- and post-exposure settings in mice and rabbits (inhalation). The anti-LF IgG1 (k-light chain) antibody against domain 1 of the anthrax lethal antigen has been tested in a phase I clinical trial in Q3 of 2009. GMP-testing material already is available. The anti-PA antibody is in a pre-clinical stage, as are the other antibodies mentioned.

A remarkable result is that we have seen a strong synergistic effect in the treatment of anthrax infections when both anti-LF and anti-PA are used simultaneously. Studies have shown that a sub-optimal concentration of anti-PA can be supplemented with anti-LF to obtain 100% survival of the rabbits infected with a lethal dose of anthrax by inhalation.

The animal experiments indicated that with the use of dual (anti-LF and Anti-PA) antibodies, the window of treatment can be extended as well. While the onset of disease in the rabbit anthrax inhalation studies is in 25–29 hours, the lifesaving treatment of the animals with a normal dose has proven to be still effective when the treatment starts 32 hours after the lethal dose is given.

Conclusions: The Dutch company IQ Therapeutics has successfully generated and developed a fully human monoclonal antibody against the lethal factor of *Bacillus anthracis*. The same technology can be used to generate antibodies for passive immunization after (suspected) exposure to other biological threat agents. As such, antibodies are effective immediately after application, the scientists have termed them Instant Immunity™ antibodies. There is a strong synergistic effect of human antibodies directed against LF and PA epitopes of anthrax, which leads to higher therapy rate, lower dose, and wider window of treatment.

Keywords: anthrax; bioterrorism threat; monkey pox; MRSA; orthopox; smallpox; toxin
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Feasibility of Use of ROTEM to Manage the Coagulopathy of Military Trauma in a Deployed Setting

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Introduction: Hemostatic resuscitation; the rapid, proactive treatment of the coagulopathy associated with major trauma, is an accepted part of combat casualty care. Thromboelastography offers timely and convenient monitoring of the coagulation state when compared to standard laboratory tests; ROTEM® is one method to do this. This paper describes the evaluation of use of the ROTEM into a deployed setting, and how it has been used to optimize management of trauma patients.

Methods: Over a seven-week period from January to March 2009, ROTEM was used prospectively to gain information on trauma patients who underwent immediate transfusion when admitted to the Role2E facility. Analysis also was undertaken of admission physiology, injuries, blood product use, and outcome. In patients who underwent massive transfusion, further ROTEM were performed to monitor product use.

Results: Thirty-one patients were tested with ROTEM; 20 were enrolled onto the massive transfusion protocol (MTP). 15% of the MTP group (3/20) had an abnormal PT/APTT on arrival, whereas 60% (12/20) had an abnormal initial ROTEM trace. In these patients, the initial average results were; temp = 34.8°C; pH = 7.24; Base excess = 6.42; and total blood product (units) use was 168 P RBC; 121 FFP; 13CRYO; 16PLT. Specific cases clearly demonstrated the machine's benefit in guiding management.

Conclusions: ROTEM can be used successfully in a deployed setting, and has shown its value in both monitoring and guiding patients who have a massive transfusion situation.

Keywords: coagulopathy; deployed setting; massive transfusion; ROTEM®; trauma
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