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MILITARY PHARMACY AND MEDICINE

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Military Pharmacy and Medicine is quarterly interdisciplinary journal of Military Centre of Pharmacy and Medical Technique in Celestynów, Poland published in English on scientific, socio-professional and training issues of Military Pharmacy and Medicine.

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Article with published erratum:
Koffler D, Reidenberg MM. Antibodies to nuclear antigens in patients treated with procainamide or acetylprocainamide [published erratum appears in N Engl J Med 1979;302:322-5]. N Engl J Med 1979; 301: 1382-5.

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Drayer DE, Koffler D. Factors in the emergence of infectious diseases. Emerg Infect Dis [serial online] 1995 Jan-Mar [cited 1996 Jun 5];1(1):[24 screens]. Available from: URL:*http://www.cdc.gov/ncidod/EID/eid.htm*

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Book, editor(s) as author:
Norman IJ, Redfern SJ, editors. Mental health care for elderly people. New York: Churchill Livingstone; 1996.

Book, Organization as author and publisher:
Institute of Medicine (US). Looking at the future of the Medicaid program. Washington: The Institute; 1992.

Chapter in a book:
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Conference proceedings:
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Biochemistry

Study on the intermolecular interactions and analysis of the internal structure in liquid 2-methoxyethanol + ethylene glycols binary mixtures by measuring their densities, viscosities and relative permittivity

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Summary:

In the work presented authors analyse intermolecular interactions in 2-methoxyethanol + ethylene glycols binary liquid mixtures, from the point of view of correlations existing between some physicochemical intensive properties (density, viscosity and relative permittivity) of the same binary mixtures. The pure solvents examined as well as their mixtures are used as antileukemic agents.

Key words: 2-alkoxyetanols, ethylene glycols, leukaemia, intermolecular interactions.

Issues concerning analysis of the intermolecular interactions as well as evaluation of internal structure of the pure solvents and their mixtures should be close to anybody who is dealing with problems concerning homophase chemical reactions or heterophase electrode processes in environment of those solvents. It results from the fact that structural information is helpful in explaining the issues concerning ion – ion, ion – solvent, and solvent – solvent types of interactions within liquid system. Thus they are crucial in interpretation of data acquired in thermochemical, electrochemical, biochemical and kinetic research. In structural research on the liquid solvent mixtures both spectral and thermochemical methods are employed as well as research of intensive macroscopic properties of solvents in a wide range of temperatures.

The subject as well as the aim of presented research were inspired by the works of Houchens and Dieter:

- *Houchens D.P., Ovejera A.A., Niemeier R.W.; Effects of ethylene glycol monomethyl (EGME) and monoethyl (EGEE) ethers on the immunocompetence of allogeneic and syngeneic mice bearing L 1210 mouse leukemia. Environ Health Perspect 57, 113-118 (1984)*

- *Dieter M.P., Jameson Ch.W., Maronpot R.R., Langenbach R. and Braun A.G.; The chemotherapeutic potential of glycol alkyl ethers: structure-activity studies of nine compounds in a Fischer-rat leukemia transplant model. Cancer Chemother Pharmacol, 26, 173 – 180 (1990)*

The above mentioned scientists employed in National Cancer Institute in Worcester, USA have

been conducting research aiming at exploitation of ethylene glycols (containing up to 8 atoms of carbon per particle), monoalkyl ethers of ethylene glycol and their binary mixtures in the fight against leukaemia for many years.

The civilization development, rapid industrialization and degradation of the natural environment have negative effect on health and life of people all over the world. The humanity more often struggles with civilization diseases of different kind including hypertension, ischemic heart disease, stroke, diabetes, osteoporosis, allergic and cancer diseases. The most life threatening are, apart from circulatory system diseases (they are a cause of death of every second person in Poland), cancer diseases.

The cancer diseases provoke the most emotions as the cancer diagnose is still perceived as an inevitable death sentence. It is of no surprise as according to statistics around 70% up to 90% of people diagnosed with cancer die. Cancer diagnose does not need to mean a death sentence, every day doctors and scientists all over the world are looking for a cancer treatment. Unfortunately as of today there is no magic and universal cancer cure. Currently the most popular cancer therapies include radiation and chemotherapy.

In case of frequently diagnosed disease as leukaemia the additional treatment tool is a bone marrow transplant from healthy donor. However it turns out the procedure is not that simple as it requires finding a donor who has to meet a number of medical criteria required for bone marrow transplant. Thus for many years now there have been research carried out in institutions all over the world in order to find a chemical species which would fight the so called proliferation centres.

In the previously mentioned works of Houchens and Dieter a very interesting interaction between the size of ethylene glycols and their monoalkyl ethers dosage, and the leukemia stage in rats was presented. It turned out that the substances in question when introduced into rat's body in a dosage of over 50mg/l cause sudden growth of spleen and other proliferation centres (manifesting in sudden decrease of a number of red blood cells). It is interesting that the same substances when introduced in relatively low concentration (under 2.5mg/l) into body of rat diagnosed with leukaemia act as an effective anti-leukaemia agents. The results achieved clearly proved that in the said concentration 2-methoxyethanol, 2-ethoxyetanol, diethylene glycol, triethylene glycol cause decreased mortality among mice and rats exposed to activity of leukaemia cancer cells. Furthermore, research conducted in years between 1989 and 2000 in the scope of National Toxicological Program in the USA proved that monomethyl ether and ethylene glycol monomethyl ether as well as their mixtures with di-tri and tetra ethylene glycol when used in vivo in dosage under 0.005 mg per 1kg body mass of sick rat, prevent development of so called accidental leukaemia.

In all the above mentioned works there is one very interesting structural thread repeating. It has been observed that the group of substances in question has similar structure of a single molecule but not all of them have the same effect on proliferation centres. It also turns out that change in the composition of binary mixtures containing mentioned ethers and glycols causes change in their pharmacological effect.

There is no doubt that the internal structure of the configurations used and as a result the intermolecular interactions between their components, is the reason of this phenomenon.

Confirmation of this hypothesis are works of Houchens and Hong:

- *Houchens D.P., Ovejera A.A., Niemeier R.W.; Effects of ethylene glycol monomethyl (EGME) and monoethyl (EGEE) ethers on the immunocompetence of allogeneic and syngeneic mice bearing L1210 mouse leukemia. Environ Health Perspect. 57, 113-118 (1984)*

- *Hong H.L., Canipe J., Jameson C.W., Boorman G.A.; Compara-tive effects of ethylene glycol and ethylene glycol monomethyl ether exposure on hematopoiesis and histopathology in B6C3F1 mice. J Environ Pathol Toxicol Oncol. 8, 27-38 (1989)*

They proved that said glycols and simple ethyl glycol ethers build via hydrogen bonds into alkyl lysophospholipids (such as ET-18-OCH_3) indicating selective cytotoxicity toward mice and human blood cancers.

Review of literature information shows that while physicochemical properties and internal structure of pure ethylene glycols and alkoxyethanols are relatively well characterized, and while said properties of liquid binary mixtures of these solvents with water are also well described, the research on basic physiochemical properties and internal structure of polyethylene glycol + alkoxy-ethanol mixtures has not been conducted by any scientific institution. It can be explained by a simple fact that this is experimentally hard and very laborious.

In order to fill in the information void we carried out research on macroscopic properties (such as: density, viscosity, permittivity and ultrasound propagation speed as well as structural parameters calculated with the use of those) in liquid mixtures of: **2-metyxoethanol (ME) with ethylene glycol (EG), diethylene glycol (DEG), triethylene glycol (TEG) and tetraethylene glycol (TETRAEG)**.

Densitometric measurements within liquid two- and multicomponent structures enable calculation of the values of excess molar volume (V_E^E), changes of which are one of the key structural parameters. They allow for not only evaluation of internal structure of these structures but also for analysis of intermolecular interactions between components of mixed solvents. It results from the fact that positive or negative deviations of this function from additivity are sum of physical, structural and chemical effects appearing when components of observed structure are being mixed. It should also be pointed out that structural conclusions from analysis of changes of the V_E^E = f(x) function have full thermodynamical justification [1-7]. The course of changes of the function in liquid 2-methoxyethanol + ethylene glycols mixtures are shown on the graph (Figure 1):

In all examined mixtures, in full spectrum of composition, the negative values of V_E^E are observed with distinct minimums found at content of around 45-50% mol. ME. It means that in analyzed liquid structures we observe a significantly greater molecular packing in mixed solvents compared to molecular packing in pure components of the mixture.

Considering literature information on interpretation of structural results, from the perspective of changes of values of excess molar volume, one should assume that in case of discussed solvent mixtures at least four different effects might influence the observed course of changes of V_E^E = f(xME) function values:

- First one is associated with mutual disruption of internal structure of pure components of binary solvent in the moment of mutual mixing. As a result free molecules of alkoxyethanol and examined glycols appear in the solution.

- Second effect is a consequence of the first one. The free molecules of examined solvents create intermolecular hydrogen bonds. The newly created internal structure of mixed solvent is characterized with greatest energy stability. Negative value of excess molar volume in full spectrum of composition of examined mixtures also allows to set up a hypothesis indicating that this structure is characterized with the least number of free intermolecular spaces. Thus the structure is of maximum density and molecular packing.

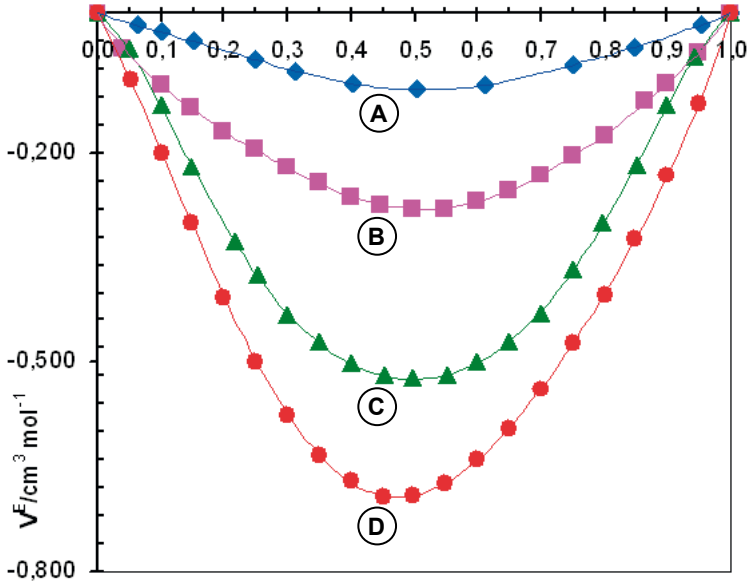

Figure 1: Course of changes of deviations from viscosity additivity in a composition function of examined liquid mixtures of 2-methoxyethanol (ME) with (A) ethylene glycol, (B) diethylene glycol, (C)t riethylene glycol and (D) tetraethylene glycol in temperature T = 298.15 K.

- Third structural effect is a consequence of an occurrence of hydrophobic interactions in the examined mixtures between –OH group of examined glycols and –CH2– groups of aliphatic chain of alkoxyethanol.

- Fourth structural effect, which can be also responsible for negative values of excess molar volume in the examined liquid solvent mixtures, is so called "penetration effect" (in a literature also called effect of maximum molecule packing). The free molecules (not bonded with intermolecular hydrogen bonds) of both components of mixed solvent locate themselves in free spaces of its structure. This effect is the strongest the greater the difference between molar volume values of both components is [1-7].

According to analysis of changes of values of excess molar volume in the examined mixed solvents (see Figure 1) , minimum values of in all measured temperatures satisfy the same dependency:

It leads to conclusion that the strongest internally

$$V^{E}_{12(\min)}(ME+TETRAEG) > V^{E}_{12(\min)}(ME+TEG) > V^{E}_{12(\min)}(ME+DEG) > V^{E}_{12(\min)}(ME+EG)$$

packed structure is an internal structure of ME and tetraethylene glycol mixture. While this effect is the weakest in 2-alkoxyethanol and ethylene glycol mixtures.

Considering the above presented conclusions from our own research as well as literature information on structural research based on analysis of changes of values V_E^E, it should be assumed that in all examined ME + glycol mixtures the energetically stable intermolecular complexes are forming, whose stoichiometry always equals **1 : 1 (ME • ethylene glycol)**.

Similar conclusion may be drawn from analysis of the structural parameters acquired in the viscosimetric and dielectrometric measurements.

Review of literature information indicates that there is a close relation between liquid viscosity (η) and its internal structure, and also intermolecular interactions [8-11].

This is due to the fact that viscosity (internal friction) is nothing else but internal resistance happening during a movement of layers of a liquid medium against one another. This means that spatial structure of examined configuration as well as force of intermolecular interactions (both close and distant range) are of fundamental influence on values of this physicochemical function, more specific on its deviations from additivity ($\Delta\eta_{12}$). Correlation of viscosimetric and dielectrometric measurements allows us to determine thermodynamic functions describing liquid structure. The most important one, providing the most structural information, is free enthalpy of viscous flow (G_{ij}^{o*}). This thermodynamic character of said function is very

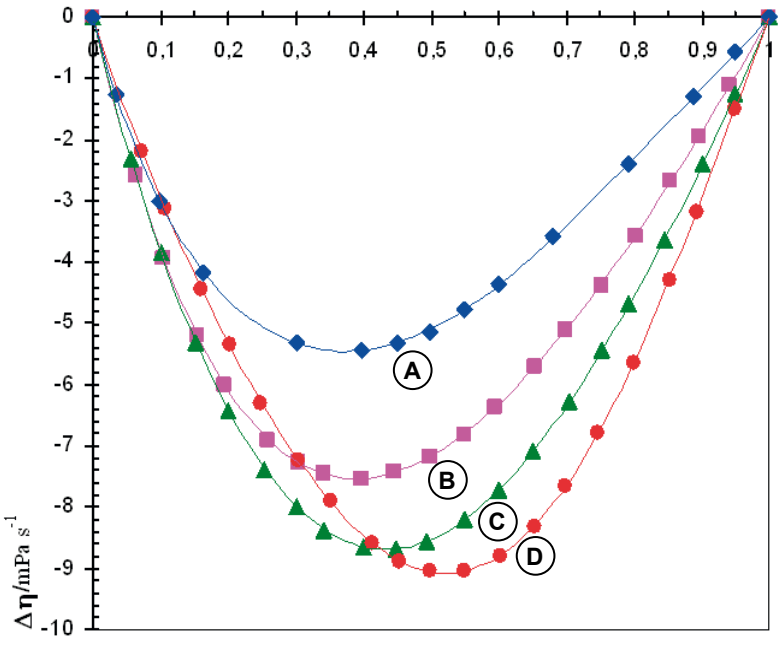

Figure 2: Course of changes of deviations from viscosity additivity in a composition function of examined liquid mixtures of 2-methoxyethanol (ME) with (A) ethylene glycol, (B) diethylene glycol, (C) triethylene glycol and (D) tetraethylene glycol in temperature T = 298.15 K.

important in the research carried out by authors as

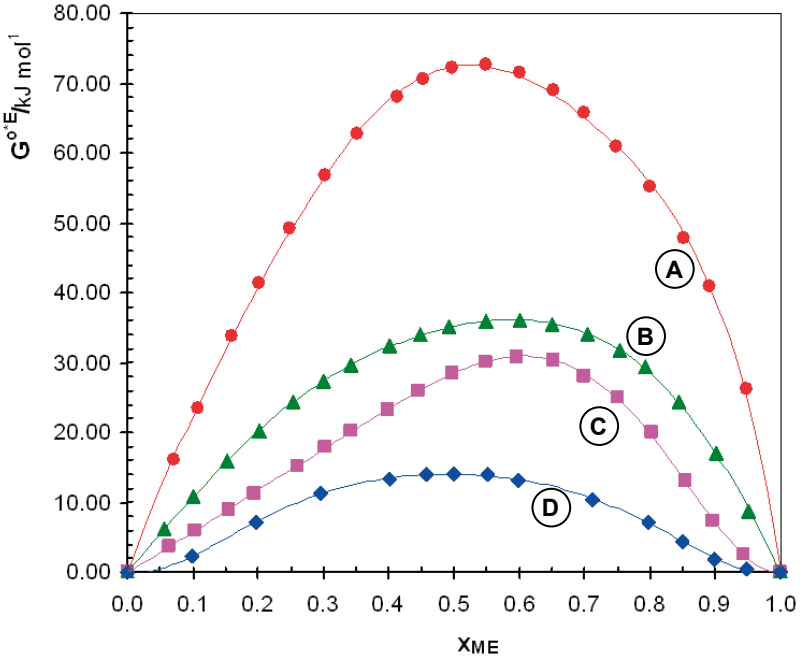

Figure 3: Course of changes of the deviations of excess values of Go*E in a composition function of examined liquid mixtures of 2-methoxyethanol (ME) with (A) ethylene glycol, (B) diethylene glycol, (C) triethylene glycol and (D) tetraethylene glycol in temperature T = 298.15K.

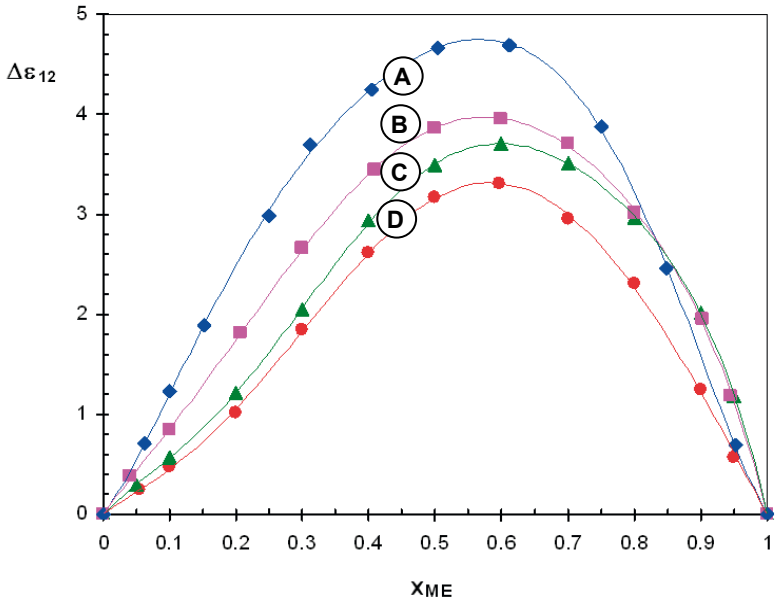

Figure 4: Course of changes of excess values of $\Delta\varepsilon_{12}$ in a composition function of examined liquid mixtures of 2-methoxyethanol (ME) with (A) ethylene glycol, (B) diethylene glycol, (C) triethylene glycol and (D) tetraethylene glycol in temperature T = 298.15K.

it enables fully justified thermodynamic analysis of intermolecular interactions and evaluation of internal structure of examined liquid mixtures.

The deviations from viscosity additivity and excess value of free enthalpy of viscous flow in the examined mixed solvents are presented in Fig. 2 and 3.

Detailed analysis of changes of $\Delta\eta_{12} = f(xME)$ function shows that in all four sets of examined mixed solvents below dependency is satisfied:

This means that the smaller ethylene glycol in any mixture with ME, the strongest the tendency to

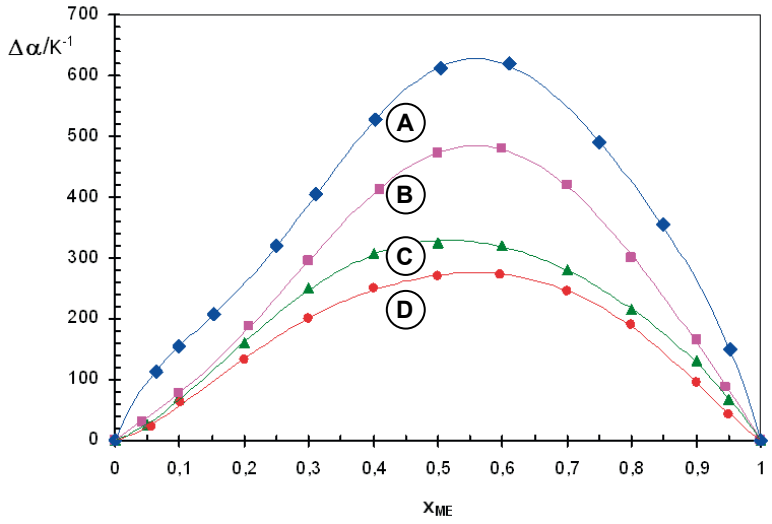

Figure 5: Course of changes of deviations from additivity of temperature permittivity coefficient (Δα) in a composition function of examined liquid mixtures of 2-methoxyethanol (ME) with (A) ethylene glycol, (B) diethylene glycol, (C) triethylene glycol and (D) tetraethylene glycol in temperature T = 298.15K

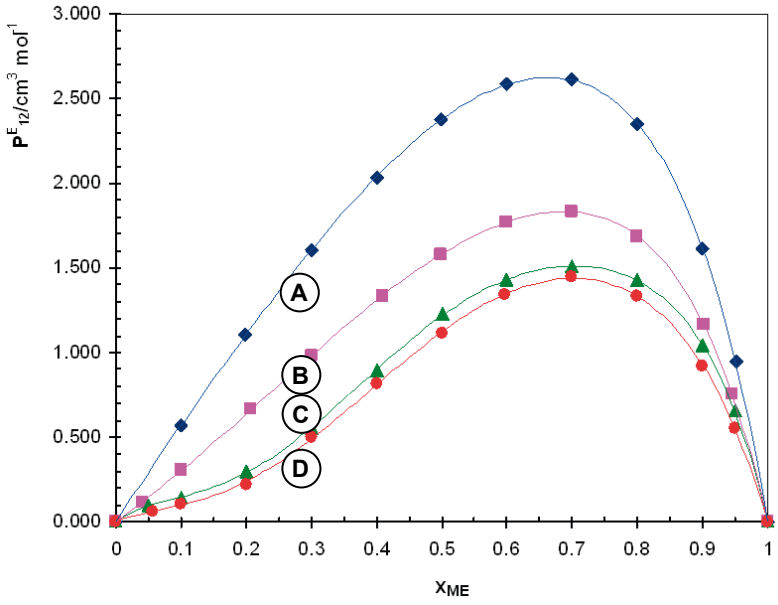

Figure 6: Course of changes of excess values of molar polarization (P_{12}^{E}) in a composition function of examined liquid mixtures of 2-methoxyethanol (ME) with (A) ethylene glycol, (B) diethylene glycol, (C) triethylene glycol and (D) tetraethylene glycol in temperature T = 298.15K

$$(\Delta\eta_{12})_{\min.}^{ME+EG} < (\Delta\eta_{12})_{\min.}^{ME+DEG} < (\Delta\eta_{12})_{\min.}^{ME+TEG} < (\Delta\eta_{12})_{\min.}^{ME+TETRAEG}$$

$$(\Delta G^{0*})_{\max.}^{ME+EG} < (\Delta G^{0*})_{\max.}^{ME+DEG} < (\Delta G^{0*})_{\max.}^{ME+TEG} < (\Delta G^{0*})_{\max.}^{ME+TETRAEG}$$

create honeycomb structures formed with hetero- and homoassociates.

Analysis of functions showed in Figure 2. and 3. indicates that in respect to quality changes of G^{o*E} and $\Delta\eta_{12}$ values in a composition function of examined liquid mixtures are almost mirror image. The only difference is that excess values of free enthalpy of viscous flow are positive. The character of changes of both discussed functions, as well as previously presented conclusions and structural observations, allows to form not only hypothesis but empirically documented conclusion indicating strong packing of internal structure of ME +

ethylene glycol mixtures. Furthermore the position of extreme values of G^{o*E} and $\Delta\eta_{12}$ also confirms stoichiometry of complexes, ***ME • ethylene glycol****, forming in examined structures. These results do not answer the question whether this associates are of linear or cyclic structure. That is why we also conducted dielectrometric research which, according to opinion of many scientists should (at least partly) answer the above question [12-17].*

Permittivity (ε) of a mixed solvent gives not only possibility of analyzing its deviations from additivity ($\Delta\varepsilon_{12}$), but also evaluation of such important structural parameters as deviation from additivity of temperature permittivity ($\Delta\alpha$) coefficient and excess value of molar polarization (P_M^E).

The courses of changes of discussed structural parameters are presented in the Figure 4 – 6.

For all analyzed groups of solvents the below dependency is satisfied:

This means that length of linear associated changes in the same direction. The longest linear associates are present in ME, EE and PE mixtures with ethylene glycol, and the shortest ones in mixtures with tetraethylene glycol. It is possible that in the examined mixed structures the

$$(\Delta\varepsilon_{12})_{\min.}^{ME+EG} > (\Delta\varepsilon_{12})_{\min.}^{ME+DEG} > (\Delta\varepsilon_{12})_{\min.}^{ME+TEG} > (\Delta\varepsilon_{12})_{\min.}^{ME+TETRAEG}$$

dominating are linear structures of used solvents of conformation anti. As previously mentioned while discussing structure of ethylene glycols and alkoxyethanols, balance shifting towards anti structures causes disappearance of 8 and 9 segmental cyclic spatial structures in favour of linear associates of these particles. As a consequence it has to influence the probability of forming of linear heteroassociates.

At this point it should be reminded that changes of permittivity in mixed structures are not the measure of changes of their dipole moment. Thus all the above presented structural suggestions may at best be perceived as structural hypotheses. In order to move from structural hypotheses to justified physiochemically and thermodynamically conclusions we analyzed deviations from additivity of temperature permittivity coefficient ($\Delta\alpha_{12}$) and excess values of molar polarization (P_M^E).

Course of changes of discussed structural parameters confirm our previous structural conclusions indicating that in examined ME + ethylene glycols mixtures the stable **ME · etylene glycol** intermolecular complexes are forming. Furthermore they indicate that the longest linear associates are present in ME mixtures with ethylene glycol, and the shortest ones in mixtures with tetraethylene glycol.

Considering literature structural information on pure 2-methoxyethanol and ethylene glycols it may be assumed that introducing ethylene glycol into 2-methoxyethanol (or other way round) causes shifting of structural balance in pure 2-methoxyethanol:

non-associated monomers (anti)
<–> associated monomers (gosz)

in the direction of conformers *anti* [18-22].
ME monomers formed in such way, without intramolecular hydrogen bond, in all probability take part in forming of intermolecular complexes with examined glycols. The -OH group of 2-methoxyethanol is a proton donor while free electron pair on etheric oxygen atom of the glycol is an acceptor.

References:

1. Pouchly J, Quin A, Munk P, J. Solution Chem., 1993; 22: 399.
2. Elbro H S, Fredenslund A, Rasmussen P, J. Solution Chem., 1991; 20: 2576.
3. Franchini G C, Marchetti A, Preti C, Tassi L, Ann. Chim. (Roma), 1996 ; 86 : 357.
4. Corradini F, Marchetti A, Tagliazucchi M, Tassi L, Aust. J. Chem., 1994 ; 47 : 415.
5. Corradini F, Franchini G C, Marscheselli L, Tosi G, Tassi L, Anal. Chem., 1989 ; 61 : 1971.
6. Corradini F, Marchetti A, Tagliazucchi M, Tassi L, Bull. Chem. Soc. Japan, 1995; 68 : 3373.
7. Pal A, Singh Y P, J. Chem. Eng. Data, 1996; 41: 425.
8. Bass S J, Nathan W J, Meighan R M, Cole R H, J. Phys. Chem., 1964; 63: 509.
9. Tassi L, Multiphase – Reactor and polimeryzation system hydrodynamic, 1996; 97: 6.
10. Oswal S L, Desai H S, Fluid Phase and Equilibria, 1999; 161: 191.
11. Eyring H, Powell R E, Roseweare W E, Ind. Eng. Chem., 1941; 33: 837.
12. Benesi H B, Hilderbrand J H, in: Organic Liquids - Structure, Dynamics and Chemical Properties, by A. D. Buckingham and A. D. Lippert, Ed. J. Wiley, New York, p. 375, 1978.

13. Kinart C M, Kinart W J, Skulski L, Polish J. Chem., 1985; 59: 915.
14. Kinart C M, Kinart W J, Skulski L, Polish J. Chem., 1986; 60: 879.
15. Kinart W J, Kinart C M, Skulski L, Polish J. Chem., 1989; 63: 581.
16. Skulski L, Kinart C M, Polish J. Chem., 1992; 66: 287.
17. Räetzsch M T, Kehlen H, Rosner H: Z. Physik. Chem. (Leipzig), 1974; 225: 115.
18. Prabhumirashi L S, Jose C I: J. Chem. Soc. Faraday II, 1975; 71: 1545.
19. Prabhumirashi L S, Jose C I: J. Chem. Soc. Faraday II, 1976; 72: 1721.
20. Prabhumirashi L S, Jose C I: J. Chem. Soc. Faraday II, 1978; 74: 255.
21. Takeuchi H, Tasumi H: Chem. Phys., 1983; 77: 21.
22. Strelkova L F, Ginzburg I M: Zhur. Obshch. Khim., 1986; 56: 1884.

Tropical Medicine

The Use of Individual Prophylactic Kit for Observers Assigned to the Regions of Polish Military Contingents

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Summary:

During military operations and engagement of the Polish Military Contingents in stabilization missions in different parts of the world – it is a matter of utmost importance that the Prophylactic and Treatment Kit for those taking part in the mission, as well as the observers, is properly equipped.The equipment of the Kit safeguards the observer during regrouping and heading to the mission's destination point, especially when contact with a doctor is difficult as well as access to medications, cosmetics and medical devices. The Kit consists of OTC products, Rx medications, dietary supplements, cosmetics and medical devices. The composition ofthe Individual Prophylactic Kit for the observer allows, at least basic: anti-malarial prophylaxis, local antifungal therapy, symptomatic diarrhoea treatment, counteracting food poisoning, frostbites, sunburns and heat burns, protection and skin care, bandaging and disinfection of wounds, stemming life-threatening bloodloss, water decontamination, insects repelling. All the medications and medical materials were put together in a special package, i.e. a bag. A detailed description of the Kit along with instructions for use for each component has been outlined in this article.

Key words: First aid, preparation of the rescuer, prophylactic and treatment kit.

The components of the Individual Prophylactic Kit for the observer safeguards the user during regrouping into the mission region, as well as during adapting to new service conditions. Let the stabilization mission in Afghanistan serve as an example. Afghanistan is a country with a variety of climate conditions. It is dominated by subtropical climate, continental, dry, which becomes extremely dry, with great differences in temperatures, both in daily and yearly cycle, with low humidity and little rain. In the mountains and uplands above 2000 m.a.s.l. highland climate is dominant, whereas the areas on the East and South are in the monsoon climate with high air humidity and lots of rain. Average temperature in July, the hottest month during the year, is more than 45 degrees Celsius in the region of Jalalabad. In west Hindu Kush, on the other hand, not more than 5 degrees Celsius. Average temperature in January is from – 20 Celsius degrees in Hindu Kush to -2 Celsius degrees on the Tukestan's Plains.

The staff of the stabilization mission stationing in Afghanistan is exposed to many diseases. The most common health hazards one can come across are:

1) Infectious diseases
   1a) Transmitted diseases:

- Mosquitoes-borne: malaria, Deng's disease, West Nile Fever;
- Diptera-borne: Cutaneous and Visceral Leishmaniasis, Sandfly Fever;
- Tick-borne: Crimean–Congo hemorrhagic fever (CCHF);
- Lice-borne: Epidemic typhus (rash);

- Flea-borne: Endemic typhus (rats).

1b) Food-borne diseases: diarrhoeas, parasitic diseases of the food tract, hepatitis type A and E, typhoid fever, cholera;

1c) Air-borne diseases: tuberculosis, children's diseases, e.g. poliomyelitis, diphtheria and pertussis;

1d) Sexually transmitted diseases: gonorrhoeas, Chlamydiaceae, trichomoniasis, syphilis, chancroid, hepatitis type B, HIV/AIDS.

2) Environmental factors.
Influence of high and low temperature, high altitude, wind, sand and dust.

3) Fauna and flora.
We distinguish hazards related with animal-borne diseases, poisonous reptiles, poisonous and non-poisonous arthropods and poisonous plants.

4) Body injuries
5) Stress

The equipment of the Kit safeguards the observer during regrouping and heading to mission's destination, especially when contact with a doctor is difficult as well as access to medications, cosmetics and medical devices. The Kit is free of vacuum packages in order to improve the safety of air transport to the mission region. The Kit is equipped with: OTC medications (no prescription required), Rx medications (doctor's prescription required), dietary supplements, cosmetics, and medical devices.

The composition of the Individual Prophylactic Kit for the observer allows, at least basic: antimalarial prophylaxis, local antifungal therapy, symptomatic diarrhoea treatment, counteracting food poisoning, frostbites, sunburns and heat burns, protection and skin care, bandaging and disinfection of wounds, stemming life-threatening blood loss, water decontamination, insects repelling.

All the medications and medical materials were put together into a special package, i.e. a bag. The bag is made of Cordura fabric and is designed to store and transport medications and medical materials. The inside of the bag is divided in a way allowing grouping of the equipment by kind. The appearance of the bag and the equipment is shown in the photographs below.

The IPK (Individual Prophylactic Kit – original: IZP – Indywidualny Zestaw Profilaktyczny) Observer consists of:

A)

Figure 7: Individual Prophylactic Kit bag. Model: Observer.
A) Individual Prophylactic Kit bag with equipment

I. Medications and dietary supplements.

I.1. Antimalarial medication – atovaquone + proguanili hydrochloride.

Malarone – anti malarial drug.
Malarone is a drug consisting of two active ingredients - atovaquone and proguanil hydrochloride – which has a biocidal effect on schizonts of Plasmodium falciparum (a protozoan parasite causing malaria) found in blood and liver. Malarone is used for:

- Preventing malaria caused by Plasmodium falciparum;
- Treatment of acute, uncomplicated malaria caused by Plasmodium falciparum.

Because Malarone is effective in the treatment of infections caused by Plasmodium falciparum, both resistant and non-resistant to other drugs, therefore it is advised for preventing and treating malaria caused by other strains of Plasmodium

falciparum, which may be resistant to other antimalarial drugs.

I.2. Antiseptics and disinfecting preparations – ethacridine lactate, gel (30 g)

Rivel – antiseptic gel.
Rivel, an antiseptic gel with a main ingredient Ethacridine lactate, is used for disinfection of superficial skin and mucous membrane damage. Intended to treat infected wounds, carbuncles, abscesses, mixed skin infections. Highly effective against gram-positive bacteria (especially Streptococcus spp.) and gram-negative, but also fungi. It does not work on bacterial spores. The antibacterial properties of the preparation come from the fact that Ethacridine lactate binds with the DNA of the bacterial cell and inhibits the biosynthesis of nucleic acids. The preparation works not only on the surface of the skin but it also penetrates deeper into surrounding tissues. It does not irritate the skin nor the mucous membrane. It does not cause drug resistance. It can be used after insect bites.

Chemical formula:
It's an aromatic organic compound based on acridine. Its formal name is 2-ethoxy-6,9-diaminoacridine monolactate monohydrate. It forms orange-yellow crystals with a specific smell. Its primary use is as an antiseptic in solutions of 0.1%.

I.3. Drugs inhibiting peristaltic activity of the gastrointestinal tract – loperamide hydrochloride 2 mg, 10 tablets.

Loperamid – anti-diarrhoea drug.
A strong anti-diarrhoea drug. As a result of treatment, the number and frequency of defecations is reduced. The effect lasts for about 24 hours. Used in symptomatic treatment of acute and chronic diarrhoea caused by functional disorders or inflammatory diseases of the intestines. Also given to patients with ileostomy, after colectomies or extensive resections of the intestines in order to reduce the volume of faeces.

Loperamid as a chemical compound.
Loperamid (loperamide) – an organic chemical compound, an opioid anti-diarrhoea drug. It is one of opioid substances, yet it does not cross the blood-brain barrier fully, as a consequence it does not have a typical effect on the nervous system, which allows for its common use in medicine without the risk of addiction. Most commonly known in medicine under the brand name – Laremid.

Mechanism of action.
Loperamid affects the opioid receptors in the intestinal wall, causing a reduction in prostaglandins and acetylcholine release, and also an increase in water and electrolyte reabsorption by the intestine wall cells. It inhibits the peristalsis of the gastro-intestinal tract, increases the tone of anal sphincter and reduces the loss of water and electrolytes into the gastro-intestinal tract. The onset of action can be noticed within one hour of administering a single dose of 4 mg. Clinical trials of other drugs showed that Loperamid starts acting unusually fast. The effect lasts for up to 24 hours.

I.4. Medications restoring intestinal flora – containing live bacteria: Lactobacillus, Bifidobacterium, Enterococcus; 10 capsules.

Synbiotics.
A synbiotic is a combination of a probiotic with a prebiotic. Synbiotics help to restore a proper intestinal flora.

According to research, probiotic bacteria need about 4 weeks after the treatment ends, to recolonize the intestines. A complete restoration of the intestinal flora may take up to 6 months!

Why are synbiotics worth using?

- Using a synbiotic has some extra advantages, because apart from a probiotic, it also contains a prebiotic ingredient (in case of Multilac, this is oligofructose). Prebiotic is a valuable source of energy needed for probiotic bacteria to grow. It ensures proper conditions for multiplying and high activity of good bacteria. Synbiotics (including Multilac) restore and maintain a proper composition of the intestinal flora.

- Synbiotics more effectively than probiotics defend the organism against bad bacteria, they protect us against diarrhoea during antibiotic therapy, have a positive effect on intestinal peristalsis, counteract both diarrhoeas and constipations.

- Antibiotics are an effective weapon against bacterial infections, though they are ineffective against viruses which are insensitive to them. During antibiotic treatment, our own bacterial flora becomes imbalanced which in turn disrupts the microbiological balance of the body. Let us therefore remember to include a synbiotic in the therapy, which allows to restore the necessary protection.

Multilac – an example of a synbiotic
Multilac is a modern synbiotic consisting of 9 selected live strains of probiotic bacteria. An innovative process of encapsulation ensures increased longevity and efficacy of the probiotic

bacteria. It does not need to be stored in a refrigerator. It is used in case of intestinal disorders.

I.5. Antifungal medications for external use (powder, skin fluid, cream, ointment, gel) – containing: miconazole nitrate, terbinafine hydrochloride or undecylenic acid.

Undofen – an example antifungal medication.
An example of antifungal medication is Undofen. Undofen works on: superficial fungal infections ofthe skin, feet, hands, groins, armpits, head and coexisting bacterial infections. It also works in prophylaxis:preventing fungal infections of feet (at the swimming pool or baths) and recurrence of a previous infection. Using the medication reduces the formation of bad smell accompanying Plantar Hyperhidrosis (sweaty feet).

How to protect against fungal infections of the feet?

In order to avoid a fungal feet infection or its recurrence, it is essential to ensure proper feet hygiene and prophylaxis. It is necessary to dispose of all the objects used for washing feet, which had been in use during the therapy: sponges, pumice stones, brushes. Tools for pedicure, such as pliers and clippers, must be disinfected by boiling in hot water and treating with a disinfecting agent or alcohol. Also shoes and socks require disinfection.

In order to avoid fungal feet infection, it is not necessary to give up our favourite leisure time activities, such as swimming or fitness. One should always remember to bring his/her own flip flops and towel, and to carefully dry the feet right after coming home. It would be best to treat them with a disinfecting agent or soak in water with an antiseptic oil added, such as tea tree oil. One should also avoid wearing tight, non-breathing shoes all day long, as well as socks made from synthetic fabrics.

II. Cosmetics

II.1. Medication for radiation burn treatment (100ml)

Radiosun – a soothing cream based on natural ingredients for skin irritated after exposure to radiation, UV burn and thermal burns. It soothes tension and itching sensation, reduces the feeling of heat and burning, effectively cares for and oils the skin, neutralizes the effects of free radicals.

II.2. Cream or emulsion with sun protection, SPF 50+ (75ml)

MED PLUS – is a cream which ensures an effective, high protection of skin of all types, prevents sun burns, contains SPF 30UVA + UVB.

II.3. Hand care cream with vitamins A+E (75ml)

Anida – Glycerine aloe cream with vitamins A+E, 75ml.

Description: The cream is meant for hand care. Thanks to aloe extract, it sooths irritations. It perfectly moisturises, protects and regenerates skin exposed to adverse external conditions
Mechanism of action: The cream regenerates and moisturises. It contains vitamins A and E, which neutralize free radicals, rebuild and smoothen rough skin. It readily absorbs and, if used systematically, protects hands from adverse external conditions. Product dermatologically tested.

Ingredients: (INCI):Aqua, Stearic Acid, Mineral Oil, Glycerin, Cetyl Alcohol, Glyceryl Stearate, Dimethicone ,TEA, Aloe Vera Extract, Tocopheryl Acetate, Retinyl Palmitate,Citric Acid, Benzyl Alcohol, Methylchloroisothiazolinone, Methylisothiazolinone, Parfum, Linalool.

Hand creams.
Hands are often the most hard-working parts of the body. Unfortunately, they rarely receive sufficient protection, which makes them a forgotten and neglected organ. In the course of evolution, hands got equipped with a very limited number of sebaceous glands, as well as adipose tissue. That is why, when exposed to adverse external conditions, they become weak and start to look bad. It is due to frequent washing, contact with chemicals, detergents, wind, cold and even dry air. Signs of aging appear on hands very quickly, so it is obvious that hands should be cared for. One should remember to choose the right hand cream and make sure that the cream tube does not contain "whatever". When choosing a hand cream, one needs to define his/her expectations. It is also worth defining what problem with our hands we really have, so that the treatment could be effective. It is common that we have no knowledge of the properties of some substances in the cream and its use does not bring expected results; the treatment is unsatisfactory then.

III. Medical devices

III.1. A set of hypoallergenic plasters (a minimum quantity in a set – 20, different sizes, including waterproof plasters)

Dermaplast Universal - plasters.

General Information. Hypoallergenic plaster made of waterproof foil, which protects the wound from dirt, is an ideal solution for fast and hygienic dressing of minor wounds. Use on dry and clean skin.

Properties:

- DermaPlast Universal is covered with stripes of synthetic rubber cement and a foil with high permeability for air and moisture, thus it is especially friendly for the skin and helps it breath.
- The plaster has a firmly attached adhesive layer but it can be torn off the skin painlessly, without leaving any marks.
- The plaster reveals excellent absorbing properties and does not stick to the wound.
- The adhesive layer: stripes of synthetic rubber cement.

Versions of the product.
Three versions of DermaPlast universal are available: version for individual cutting and two versions of readymade pieces of plasters:

1) DermaPlast Universal, version for individual cutting – single package contains:
   – 5 pieces of plasters in the size of 6 cm x 10 cm;

2) DermaPlast Universal, version with readymade pieces of plasters - single package contains:
   – 12 pieces, size: 19 mm x 72 mm;
   – 8 pieces, size: 25 mm x 72 mm;

3) DermaPlast Universal, version with readymade pieces of plasters - single package contains:

   – 4 pieces, Ø 22 mm;
   – 6 pieces, 9 mm x 38 mm;
   – 8 pieces, 16 mm x 57 mm;
   – 12 pieces, 19 mm x 72 mm;
   – 10 pieces, 25 mm x 72 mm.

III.2. Haemostatic dressing

QuickClotGauze - Haemostatic dressing.
Haemostatic dressings are perfect for stemming bleedings from both shallow and deep wounds. They are send to areas with a risk of a severe injury, being shot, receiving a penetration wound or bleeding. Therefore, they are dedicated especially to uniformed services, i.e. the Police, Military, Fire Service, Boarder Police or Special Forces, e.g. antiterrorist squads.

An example dressing can be used to stem life-threatening moderate or intensive bleeding, especially from deep wounds. It reveals a high haemostatic efficacy, is immediately ready to use and safe, due to:

- limited exothermic reaction – no health-threatening adverse effects;
- it is not absorbed by the body;
- it does not stick to the wound, thus is easy to remove from the wound.

The dressing has a form of a gauze haemostatic agent, in the size of 7.5 cm x 3.7 m. The packaging is sterile, waterproof, hermetic (vacuum packing), single and easy to open.

QuickClot COMBAT GAUZE does not require special storing conditions. It remains stable in various atmospheric conditions.

Thanks to haemostatic agents, the haemostatic dressings are perfect for stemming bleeding. One of them is purified horse collagen type I, which has a unique property of stopping bleeding. When the collagen mixes with blood, the platelets aggregate, activating clotting factors and, together with plasma clotting factors, lead to the formation of fibrinogen, and consequently a blood clot.

Furthermore, the Kit contains a gauze roll coated with CELOX – a haemostatic agent. The gauze owes its haemostatic properties to a substance extracted from the shells of shrimps, called chitosan. Chitosan has proven antibacterial properties and is not an agent enhancing coagulation. Chitosan breaks down and is absorbed by the body through normal metabolic pathways. It is known as an agent for closing blood vessels and in Cardiovascular surgery.

The mechanism of action of a clean CELOX haemostatic dressing is as follows: after putting directly onto the bleeding wound and pressing it, the positively charged granules of CELOX bind with negatively charged blood cells, creating a sticky pseudo-clot, which blocks the blood flow. The clot created this way adheres firmly to the damp tissue and blocks the outflow of blood. CELOX does not initiate a normal process of blood clotting, it only binds blood which comes in contact with it. Neither does CELOX cause blood clotting, as a reaction to an outflow, because this could lead to clot formation in a certain distance from its application. CELOX does not generate heat and there is no risk of burning the patient or the rescuer. It is extremely effective, as it stems bleeding in the very first minute after application.

Scientific research proves the efficacy of haemostatic agents. Data from research entitled

"The use of a dressing made from collagen fibres coated with fibrin glue (Tachocomb) in haemostasis after the procedure of blood vessels joining in the groin", Department and Clinic of General and Vascular Surgery and Transplantology, Wroclaw Medical University, authors: Artur Pupka, Artur Ruciński, Stanisław Pawłowski, Piotr Barć, Dariusz Janczak, Grzegorz, are shown in Table 1.

Table 1: The time of haemostasis and blood loss after blood vessel joining with and without the use of TachoComb haemostatic preparation.

Characteristics	Group I – fibrin glue used	Group II – without a haemostatic preparation
Blood loss (g)	20-35	23-47
Mean blood loss (g)	28.87+/-5.04	35.04+/-9.61
Time of haemostasis (sec.)	126-456	213-658
Mean haemostasis time (sec.)	298.3+/-89.11	364.68+/-117.35

During the study, the haemostatic dressing was used in 30 patients and compared with the control group of 25 patients, who were given gauze dressings. Mean blood loss in group I, in which TachoComb was used, was significantly lower ($p<0.003$) than in group II. Also the mean time necessary to stem bleeding was shorter in group I ($p<0.01$). It was concluded that using a collagen fabric coated with fibrin glue limits bleeding from the place of joining of the synthetic vessel prosthesis with the artery.

IV. Miniature sucking pump

ASPIVENIN – miniature sucking pump
ASPIVENIN® a product of a French company ASPIR® is a miniature sucking pump generating vacuum of about 0.75Atm and, therefore, allowing painless and non-invasive removal of venoms and toxins of all sorts. ASPIVENIN® apart from the basic function of sucking out toxins has an additional effect. The generated vacuum stops local blood circulation and therefore prevents further spreading of toxins around the organism. It plays a role of a tourniquet, but does not have any of its negative properties when used for a long time while waiting for medical help in more serious cases.

A one-minute use can prevent from suffering harmful consequences of being bitten by:

- hornets;
- wasps;
- bees;
- mosquitoes;
- warble flies;
- ants;
- black flies;
- spiders.

A two-minute use sucks out intact ticks. A three-minute use prevents suffering consequences of being bitten by:

- adders;
- spiders (e.g. black widow , tarantula);
- poisonous fish (e.g. whiptail stingray, greater weever);
- scorpions.

IV.1. Hand and skin disinfecting liquid – chlorhexidine 0.2% (75ml)

Cha ha – antibacterial liquid
Cha-ha 0.2% is a diluted solution, ready-to-use, intended for common hygienic disinfection of skin. The liquid acts against a wide spectrum of bacteria and has a long-lasting effect. It does not contain alcohol. It does not irritate or itch, even when the skin is highly sensitive with a sore epidermis or a cut. It does not dry the skin. It does not stain or leave marks. When used as an antibacterial agent, it effectively disinfects and cleans the skin of the hands and body. For external use only.

How to use:
Spray the skin with the preparation and let it dry up. If necessary, repeat the procedure.

IV.2. Personal dressing

Individual dressing.
Individual dressings were developed for military purposes in order to allow quick dressing of soldiers wounded on the battlefield.

The dressing consists of an elastic band (made of muslin gauze, 2.8 m long and 10 cm wide and after stretching - about 3.30 m)(approximate size) and two absorbing pillows attached to it (size: 11 cm x 10 cm, 5 mm thick)(approximate size). The pillows play a role similar to sterile gauze compresses. Made of cotton wool and wrapped in gauze comprise a ready-to-use dressing (the material is coated on one side with foil).

One of the absorbing pillows is firmly attached to the end of the bandage, whereas the other can be positioned anywhere along the muslin band (it was devised to facilitate bandaging of a "through and through" gunshot wounds). The side of the pillow where it can be grabbed during wound dressing is marked with a colour thread. The other side must

not be touched, in order for the dressing to remain sterile.

Individual dressings are manufactured in two versions:

- W type – waterproof – packed in a waterproof packaging made from khaki rubber-coated linen. It is mainly manufactured for the military and civil defence services. This type of dressing comes in two sizes, which are different in terms of absorbing abilities – smaller: "standard", and bigger: a fibre dressing, commonly called "battlefield dressing".
- A type – dustproof, in a white paper packaging. Popular on the civil market.

In Polish soldier's military uniform there is a special pocket for the individual dressing. Special pockets manufactured in the Molle system (attached to PALS bands) are intended for carrying personal dressings.

Individual dressings are widely used in civil first aid kits, both in tourist and car kits, because of their compact size.

V. Other

V.1. Individual water disinfecting preparations, 20 tablets

Aquatabs – water disinfecting tablets
Self-dissolving chlorine tablets are meant for treatment of drinking water of unknown or uncertain origin. They eliminate microorganisms, which cause gastro-intestinal disorders. They are indispensible during tourist travels, journeys to tropical countries and military missions. One tablet is used for 1 litre of water. The product is described, according to European Standards EN 12931 and 12933, as a chemical substance for water purification in cases of an epidemic threat (cholera, typhus, dysentery, intestinal disorders). Aquatabs tablets are a preparation used by the Polish Military for disinfecting drinking water from unchecked source.

How to use Aquatabs:

- in case of a muddy and murky water, filter it through a piece of material;
- put Aquatabs tablets into the water;
- wait 30 minutes from the moment of putting them in the water.

V.2. Anti-mosquito and anti-tick preparation – a synthetic DEET type repellent (75ml).

Panko – a repellent.
Panko is an effective preparation preventing mosquito and tick bites, but also many other insects, including some types of black flies. It effectively repels insects, soothes the effects of bites and ensures 8-10 hours of protection. Contains DEET, the most effective repelling substance.

The preparation in the form of a solution of the active substance (N,N-Diethyl-3-methylbenzamide, other name: N,N-Diethyl-m-toluamide) in isopropyl alcohol with the addition of propylene glycol (propane-1,2-diol), isopropyl myristate and a fragrance with a reserved composition.

Repellents, also known as repelling agents (Latin: repellere), are live organisms, chemical compounds, light or sound emitting devices having the property of repelling unwanted, in that particular place, species. Their use is classified as a biological (ecological) protection method.

Some of the repellents when used on animals closed in a cage can lead to their death (experimental conditions, especially sound is very badly tolerated by some species, e.g. Indian Meal Moth and rodents). In normal conditions, animals which can freely move, can also leave the protected area and find a new place to forage. The use of repellents is not always a result of concern about the environment or respect for life. In a situation when each bite can cause an infection with a certain animal-borne disease, it is hard to imagine a different way of protecting humans against ticks or mosquitoes. The repelling effect of repellents can also be a result of their bad smell or caustic substances they contain, which attack the extremities and respiratory system of the insects.

Chemical repellents.
Chemical repellents are available in a variety of formulations. Sprays, body milks and creams, electrical devices with replaceable inserts, candles and incenses, fly papers and nets. Today one can even spread special agents in the area surrounding the house to get rid of pesky insects. There are even pendants on the market which, by emitting sounds inaudible for humans, repel mosquitoes and ticks.

References:

1. Indeks leków Medycyny Praktycznej 2006. Kraków: Wydawnictwo Medycyna Praktyczna, 2006, s. 400.
2. Demska M, Szmigiel A. Pielegnacja skóry u chorych onologicznych poddawanych radioterapii oraz chemioterapii. GIN ONKOL 2009, 7 (1), s. 71-72.

3. Korzeniowski K. Afganistan Kompendium uczestnika misji stabilizacyjnej, 10 Wojskowy Szpital Kliniczny z Polikliniką Fundacja valetundinaria w Bydgoszczy; 2006.
4. Podlewski JK. Leki współczesnej terapii. Warszawa: Split Trading, wydania z lat 1996–2008.
5. Chruściel TL, Gibiński K. Leksykon Leków, PZWL; 1991.
6. Kostowski W, Zbigniew SH. Farmakologia, Podstawy farmakoterapii. PZWL; 2007.
7. Jachowicz R. (red.). Farmacja praktyczna. PZWL, Warszawa; 2010.
8. Janiski S, Fiebig A, Sznitowska M (red). Farmacja stosowana. Podręcznik dla studentów farmacji. PZWL, Warszawa; 2006.
9. Kurnatowski W. Urazy spowodowane zimnem. Wprowadzenie. Twój Magazyn Medyczny- Medycyna Rodzinna; 2003.
10. Opieka nad rannym w warunkach pola walki - procedury dla żołnierzy. Podręcznik szkolenia medycznego żołnierza profesjonalnych Sił Zbrojnych RP
11. PHTLS Prehospital Trauma Life Support wyd. VI, Mosby; 2006.
12. http://www.polimery.am.wroc.pl/2004/205.pdf
13. Ziemba R. Pierwsza pomoc w nagłych wypadkach i zachorowaniach. Index Copernicus International, Warszawa; 2011.

Physiology

Essential requirements for wound dressings resulting from Directive 2007/47/EC

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Summary:

The article presents the essential requirements resulting from Directive 2007/47/EC for various types of wound dressings and borderline products incorporating, as an integral part, an ancillary medicinal substance as well as containing animal tissue originated substances. Changes incorporated in above-mentioned directive were implemented on March 21st, 2010 and they represent the main reference in case of certification for not only wound dressings but also for all medical devices.

New aspects of conformity assessment, implemented along with Directive 2007/47/WE, result in necessity of keeping up with the technological development of novel, innovative medical devices, implementation of new tools to the practices allowing for the increase in medical devices safety as well as for the verification and validation of their performance

Key words: specialized wound dressing, essential requirements, safety, performance, risk analysis.

1. Introduction

Continued technical development, especially innovation development as dynamic as in a medical devices sector requires continued process of amending legal and normative documents especially the ones specifying essential performance and safety requirements.

In case of wound dressings including specialised wound dressings as well as dressings incorporating, as an integral part, medicinal product or containing animal tissue originated substances the most important aspects are:

- enhancing the provisions on clinical evaluation, including clarification that clinical data is generally required for all devices regardless of classification,
- introducing the possibility to centralise data on clinical investigations in the European databank,
- clarifying the requirements for borderline medicinal products (formerly known as combined products) incorporating, as an integral part, medicinal products or substance which may be considered to be a medicinal product [2].

2. Classification of wound dressings

In accordance with the new definition, a medical device [2] is understood as any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination, together with any accessories, including the software intended by its manufacturer to be used specifically for diagnostic and/or therapeutic purposes and necessary for its proper application, intended by the manufacturer to be used for human beings. Main purposes of the medical device are:

- diagnosis, prevention, monitoring, treatment or

alleviation of disease,
- diagnosis, monitoring, treatment, alleviation of or compensation for an injury or handicap,
- investigation, replacement or modification of the anatomy or of a physiological process,
- control of conception.

What distinguishes a medical device from medicinal product is that the former does not achieve its principal intended action in or on the human body by pharmacological, immunological or metabolic means, but which may be assisted in its function by such means [2-3].

Therefore the wound dressings directly falls within the definition of medical device, especially within the scope of treatment and alleviation of disease, treatment, alleviation of or compensation for an injury and partial replacement of skin function.

In accordance with [2-3] medical devices were divided into four classes: I, IIa, IIb and III. Majority of the typical, non-sterile wound dressings which come into contact with intact skin (rule 1) or form a mechanical barrier, and are intended for applying pressure and/or exudate absorption (rule 4) were classified as class I [13,17].

In case of wound dressings intended for dressing wound with disruption of the dermis which can be healed only through granulation, they are classified in accordance with rule 4 as class IIb. Dressings which provide proper wound microenvironment are classified as class IIa.

The resorbable wound dressings intended for internal use (for example hemostatics based on oxidised cellulose) are classified in accordance with rule 8. The above mentioned dressings are in class III. Similarly in class III are wound dressings which:

- incorporate, as an integral part, a substance which, if used separately, may be considered to be a medicinal product (rule 13),
- are manufactured utilising animal tissue which is rendered non-viable or derivatives thereof (rule 17).

Table 1 presents examples of the classification of different types of wound dressings.

3. Essential requirements

The classification rules for medical devices, including wound dressings, are based on the assessment of the risk associated with the use of specific device type with regard to time and place of contact with

Table 2: Examples of wound dressings classification

Device class	Classification rule	Function or composition/ingredients	Examples of wound dressing
I	1	Specific wound dressing fixing	Elastic bands Silicone wound dressings for keloids treatment
	4	Applying pressure	Pressure bandages Pressure devices for keloids treatment
		Exudate absorption	Adhesive bandages Absorption pads Gauze
IIa	4	Ensuring proper wound microenvironment (i.e. moisture keeping, adjusting temperature, oxygen and other gases level, pH)	Plastic film-faced dressings Non resorbable hydrogel dressings Impregnated gauze dressings Foam dressings
IIb	4	Dressing wound with disruption of the dermis which can be healed only through granulation.	Dressings intended for treatment of chronic pressure sores, burns, ulcers and temporary skin substitutes (“artificial skin” dressings type), ex: - hydrogels, - hydrocolloids, - resorbable dressings.
III	8	Evoking biological effects Partial or full absorption	Oxidise cellulose dressings
III	13	Matrix whose integral part is a medicinal product.	Silver-containing dressings
III	17	Manufactured utilising animal tissue which is rendered non-viable or derivatives thereof.	Collagen-containing dressings Collagen or gelatin sponges Chitosan-containing dressings

human body, level of invasivity, local or systemic effect, taking account of the potential risks associated with the technical design and manufacture of the devices.

In the case of devices in class III (among others: resorbable wound dressings and wound dressing integrating medicinal products or substances of animal origin) in order to place devices on the market the assessment of conformity with the essential requirements, verification of the documentation and clinical evaluation are required [2].

For all other classes of devices (class I; non-sterile and sterile, class IIa and class IIb) it is essential and necessary for a notified body, in order to be assured of the compliance of the manufacturer with the requirements of Directive 2007/47/EC, to review the design documentation for the medical device [2-3].

The depth and extent of this review depends on:

- the classification of the medical device,
- the novelty of the intended treatment,
- the degree of intervention proposed,
- the novelty of the technology and/or construction materials,
- the complexity of the design and/or technology.

This review can be achieved by taking a representative sample of a specific wound dressing (type: "*the most representative*") or on selected, the most risk involving, type of dressing (type: "*the worst case*"). It is of significant importance for wound dressings with a wide range of products different only in shape, size while manufactured from the identical materials, in the identical manufacturing process and in case of sterile dressings sterilised with the use of identical sterilisation method. In such case the technical documentation (so called "*Technical Dossier*") should only include data on:

- the most frequently sold product

or

- the most risk involving type of product.

For novelty dressings it is recommended to base technical dossier on the worst case. In case of changes to the design of the device, the assessment should be carried out in reference to risk analysis (in order to assess whether new risks appeared and whether the already identified risks have not changed their acceptance level) to ensure conformity with the essential requirements. Further reviews should be part of the surveillance activities of the notified body.[2]

In accordance with the essential requirements on the design and manufacture of medical devices, including wound dressings, manufacturers should avoid the use of substances that may possibly compromise the health of patients, in particular use of substances which are carcinogenic, mutagenic or toxic to reproduction. The same applies to assessment of the potential risk of toxicity of the device degradation products in clinical use. Manufacturers should, as appropriate, strive to use and/or develop alternative substances or products with a lower risk potential [2]. The toxicological profile of substances and materials used should be a part of the risk analysis allowing assessment of superiority of advantages over potential harms. Aspects of toxicological profile assessment and rules for selection and assignment of scope of research to time and place of a device's contact with a human body are listed in PN-EN ISO 10993-1:2009 [9] standard and in its revised version PN-EN ISO 10993-1:2010 [10].

Technical specification of the ISO/TS standard [6] contains guidelines on risk management in reference to:

- the assessment of identified or theoretical biological risks directly or indirectly related to the device,
- the development of the most suitable methods of decreasing biological hazards,
- the use of the most suitable research methods and analytical tests in order to prove the decrease of the risk.

The above mentioned specification is a groundwork for revised PN-EN ISO 10993-1: 2010 standard containing guidelines on risk management in reference to biocompliance research [10]. Selection and assessment of the materials used in a design and production of wound dressings as well as biological risk assessment is an integral part of risk analysis, design assumptions and design process itself.

4. Wound dressings incorporating, as an integral part, medicinal products.

Where a wound dressing incorporates, as an integral part, an ancillary substance which, if used separately, may be considered to be a medicinal product as defined in Directive 2001/83/EC [4] and which is liable to act upon the body with action ancillary to that of the device, the quality, safety and usefulness of the substance must be verified by analogy with the methods specified in Annex I to Directive 2001/83/EC. The most important amendment in the MEDDEV

guidelines [7] for, among others, wound dressings incorporating, as an integral part, an ancillary medicinal substance, is a requirement that the notified body should, having verified the usefulness of the substance as part of the dressing and taking account of the intended purpose of the dressing, seek a scientific opinion from one of the competent authorities designated by the Member States (in case of Poland - The Office for Registration of Medicinal Products, Medical Devices and Biocidal Products) or the European Medicines Agency (EMEA) on the quality and safety of the substance. This also applies to demonstrating the clinical benefit/risk profile of the substance. When giving scientific opinion the competent authority should take into account the manufacturing process and the data related to the usefulness of incorporation of the ancillary medicinal substance into the dressing.

Where changes are made to an ancillary substance, in particular related to the manufacturing process, the notified body shall be informed of the changes and shall analyze and consult the relevant medicines competent authority (i.e. the one involved in the initial consultation), in order to confirm that the quality and safety of the ancillary substance are maintained. Prior to consultation the notified body verifies the changes introduced, mainly in relation to the usefulness of the proposed solution and provides the data to the relevant medicines competent authority. The notified body shall take the updated scientific opinion into account in reconsidering its assessment of the conformity assessment procedure.

Where a wound dressing incorporates, as an integral part, medicinal products or substance which may be considered to be a medicinal product, the following data should be submitted in the certification procedure [2, 7]:

1) For the ancillary medicinal substance:
   - documentation required by CTD-Module 3 „Quality" [1],
   - qualitative documentation containing information on the ancillary substance in the form of an Active Substance Master File (ASMF), reference should also be made to the European Pharmacopoeia (PhEur) or in the absence of a PhEur monograph to a national pharmacopoeia.

2) For ancillary medicinal substance incorporated in the wound dressing:

   - qualitative and quantitative data on the ancillary medicinal substance. If the medicinal substance is modified during its incorporation into/integration with the medical device, relevant safety information shall be provided concerning modification process and its final effect,
   - description of manufacturing method, indicating the section dealing with the incorporation of the substance into the dressing,
   - information on qualitative assessment of the ancillary medicinal substance (for example specification, attests, results of quality control of the substance),
   - results of control tests carried out at intermediate stages of the manufacturing process if necessary to prove the desired quality of the ancillary medicinal substance as incorporated in the dressing,
   - qualitative and quantitative data on safety and usefulness of the final product incorporating ancillary medicinal substance in relation to quality and quantity control of the substance,
   - stability – information showing the ancillary medicinal substance incorporated in the dressing maintains its desired function throughout the defined shelf-life of the dressing in the manufacturer's recommended storage conditions. The potential interaction with other materials (for example direct packaging) and potential degradation of the ancillary medicinal substance shall also be documented.

3) Pre-clinical investigation documentation:

   - Pharmacology:
     – Pharmacodynamics (information on verification of the intended action of the ancillary medicinal substance in the context of changes occurring after its incorporation into the dressing, for example structure modifications, availability etc.),
     – Pharmacokintetics (description of the pattern of local and systemic exposure to the ancillary medicinal substance, level of exposure fluctuations (AUC), information on the release from the dressing with potential subsequent absorption, distribution, metabolism and excretion. The information should be selected if relevant),

   - Information on toxicity including single-dose toxicity, repeat-dose toxicity, geno-toxicity, carcino-genicity and reproductive and developmental toxicity, as applicable. For well-known ancillary medicinal substances it is allowed to reference to literature, taking into account the equivalence of the specified dressing. In the case of new active substances, the results of toxicity test should be provided (taking into account relevant CHMP guidelines [5]). The information on toxicity and biocompatibility research of the dressing incorporating the ancillary medicinal substance which may be

available from evaluation in accordance with the PN-EN ISO 10993-1:2009 standard [9] might be helpful.
- Local tolerance – since the route of administration and exposure of the ancillary medicinal substance may be different from its conventional application, the relevant results of local tolerance of specified dressing testing according to PN-EN ISO 10993-6:2009 standard [11], or where available, information from the scientific literature taking into account the equivalence of the specified dressing should be provided.

4) Clinical evaluation
- Considering that all wound dressings incorporating, as an integral part, a medicinal product are in class III the clinical evaluation is required (in accordance with Annex X to Directive 93/42/ EEC [2]). The clinical data addresses the safety of the wound dressing in its entirety (dressing + ancillary substance), while information on the usefulness of the ancillary medicinal substance incorporated in the dressing allows to cross-reference data acquired prior to clinical investigation. It is necessary to carry out clinical evaluation including clinical data on equivalent products. An appropriate methodology for clinical investigations is described in PN-EN ISO 14155-1:2010 [12] and PN-EN ISO 14155-2:2010 standard [13]. The above mentioned methodology should include revisions made in Directive 107/47/EEC [2].

5) Labelling
- Labelling and instructions for use provided by the manufacturer should include all the necessary information on safety and usefulness of the dressing, especially in reference to the ancillary medicinal substance incorporated.

5. Wound dressings containing animal tissue originated substances

In case of wound dressings containing animal tissue originated substances (ex collagen, gelatin, chitosan etc.) it is extremely important to carry out risk analysis of the source of the substance. PN-EN ISO 22442-1:2008 [14] standard contains guidelines on risk management in reference to risk evaluation of the contamination with:

- bacteria, fungi and moulds,
- viruses,
- transmissible spongiform encephalopathy (TSE) agents,
- as well as presence of materials and substances causing the pyrogenic, immunological and toxic reactions.

PN-EN ISO 22442-2:2008 [15] standard describes specific requirements concerning control process of the manufacturing of animal tissue originated substances designed for potential use in design and production of specialized and hemostatic dressings. The most relevant part of the PN-EN ISO 22442 series of standards (PN-EN ISO 22442-3:2008 [16]) contains guidelines on process of validation of the elimination and/or inactivation of viruses and transmissible spongiform encephalopathy (TSE) agents, it is necessary to implement them in the manufacturing process of medical devices containing animal tissue originated substances.

References:

14. Common Technical Document for the Registration of Pharmaceuticals for Human Use.-Quality Overall Summary of Module 2 and Module 3: Quality, July 2003 http://www.tga.health.gov.au/docs/pdf/euguide/eumod3.pdf
15. Dyrektywa 2007/47/WE Parlamentu Europejskiego i Rady z dnia 5 września 2007 r. zmieniająca dyrektywę Rady 90/385/EWG w sprawie zbliżenia ustawodawstwa państw członkowskich odnoszących się do wyrobów medycznych aktywnego osadzania, dyrektywę Rady 93/42/EWG dotyczącą wyrobów medycznych oraz dyrektywę 98/8/WE dotyczącą wprowadzania do obrotu produktów biobójczych,
16. Dyrektywa Rady 93/42/EWG z dnia 14 czerwca 1993 r. dotycząca wyrobów medycznych,
17. Dyrektywa 2001/83/WE z dnia 6 listopada 2001 r w sprawie wspólnotowego kodeksu odnoszącego się do produktów leczniczych stosowanych u ludzi
18. http://www.ema.europa.eu/htms/human/humanguidelines/nonclinical.htm
19. ISO/TS 20993 Biological evaluation of medical devices — Guidance on a risk management process
20. MEDDEV 2.1/3 rev 3, MEDICAL DEVICES: Guidance document - Borderline products, drug-delivery products and medical devices incorporating, as an integral part, an ancillary medicinal substance or an ancillary human blood derivative, Guidelines relating to the application of: the Council Directive 90/385/EEC on active implantable medical devices and the Council Directive 93/42/EEC on medical devices, December 2009, http://ec.europa.eu/enterprise/sectors/medical-devices/files/meddev/2_1_3_rev_3-12_2009_en.pdf
21. MEDDEV 2. 4/1 Rev 8, MEDICAL DEVICES : Guidelines for the Classification of Medical Devices, Guidelines relating to the application of: the Council Directive 90/385/EEC on active implantable medical devices and the Council Directive 93/42/

EEC on medical devices, July 2001, http://ec.europa.eu/enterprise/sectors/medical-devices/files/meddev/2_2_4-1part1_07-2001_en.pdf

22. PN-EN ISO 10993-1:2009 Biologiczna ocena wyrobów medycznych - Część 1: Ocena i badanie
23. PN-EN ISO 10993-1:2010 Biologiczna ocena wyrobów medycznych - Część 1: Ocena i badanie w procesie zarządzania ryzykiem
24. PN-EN ISO 10993-6:2009 Biologiczna ocena wyrobów medycznych - Część 6: Badania miejscowej reakcji po implantacji
25. PN-EN ISO 14155-1:2010 Badania kliniczne wyrobów medycznych na ludziach - Część 1: Wymagania ogólne
26. PN-EN ISO 14155-2:2010 Badania kliniczne wyrobów medycznych na ludziach - Część 2: Plany badań klinicznych
27. PN-EN ISO 22442-1:2008 Wyroby medyczne wykorzystujące tkanki zwierzęce i ich pochodne - Część 1: Zastosowanie zarządzania ryzykiem
28. PN-EN ISO 22442-2:2008 Wyroby medyczne wykorzystujące tkanki zwierzęce i ich pochodne - Część 2: Kontrola pozyskiwania, zbierania i postępowania
29. PN-EN ISO 22442-3:2008 Wyroby medyczne wykorzystujące tkanki zwierzęce i ich pochodne - Część 3: Walidacja eliminacji i/lub inaktywacji wirusów i czynników zakaźnej encefalopatii gąbczastej
30. Rozporządzenie Ministra Zdrowia z dnia 30 kwietnia 2004 r. w sprawie klasyfikacji wyrobów medycznych do różnego przeznaczenia, Dz. U. Nr 100, poz. 1027

Surgery

Hydrogel and hemostatic dressings in body injuries

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Summary:

A simple procedure of first aid for burns can be quickly carried out by an amateur, or any person providing first aid, allowing to stop the process of tissue damage by heat and causing a significant pain relief. After applying a hydrogel dressing to a burn wound, cooling of the wound starts (the heat is pulled out from the body to the gel). In case of cooling the patient's body with hydrogel burn dressings, a large loss of body temperature can be avoided in patients who require transport over long distances.

Uncontrolled hemorrhage remains a leading cause of traumatic death. Despite advances in medical intervention and protective equipment, fatal traumatic hemorrhage remains one of the most challenging problems for both military and civilian medicine. As a result, much attention has been focused on the development of alternative methods of controlling hemorrhage, including topical hemostatic dressings. Hemostatic dressing works by interacting directly with red blood cells and platelets to form a cross-linked barrier clot. There have also been concerns related to side effects, specifically thermal injury from the exothermic reaction, although documented occurrences are relatively rare.

Key words: thermal injuries, hydrogel dressings, hemostatic dressings.

Thermal injuries of the skin can be substantially reduced by cooling the burned areas. One of the main effects of such a treatment is the inhibition of further and deeper penetration of the heat into the skin. Emergency procedures consist in eliminating the heat accumulated at a deeper level of the skin, by its 'pulling out' towards the surface, which allows for avoiding secondary injuries of these parts of the skin. If no cooling is applied, burn classified initially as a second-degree burn, turns into a third-degree burn, as a result of heat penetration. Shortly after cooling with hydrogel dressings, most of the patients report pain reduction. The anaesthetic effect after applying hydrogel dressings is a result of heat emission to the outside of tissues (which inhibits the penetration of the temperature into the body) and blocking of the release of substances that belong to tissue mediators (e.g. thromboxanes, prostaglandins, and leukotriens). Mediators (intermediating substances) are also a key element in developing the burn syndrome. Their release in high amounts leads to an increased permeability of the capillaries with formation of oedema and hypotension due to vasodilation which may lead to ARDS (acute respiratory distress syndrome).

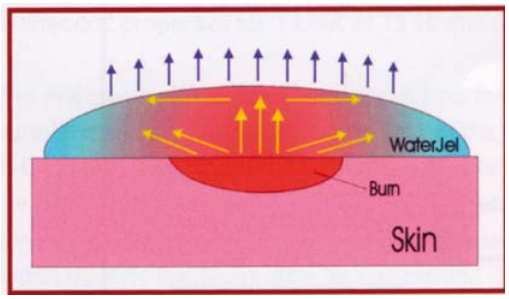

Figure 8: The principle of operation of the „Water Jel" system

The most popular burn dressings include hydrogel dressings, e.g. Water Jel – Burn Dressing (Fig. 1).

Commercially available hydrogel dressings have a specific composition and properties. Their matrix is

Table 3: Bacterial growth among 15 most common microorganisms after a contact with gel enriched with tea tree oil (modified according to Torsov in 1995).

	Bacterial growth after		
Microorganisms	**30 min**	**60 min**	**240 min**
Staphylococcus aureus	+	+	negative
Streptococcus pyogenes	+	+	negative
Streptococcus agalactiae	+	+	negative
Streptococcus faecalis	+	+	negative
Escherichia coli	+	negative	negative
Klebsiella pneumoniae	+	negative	negative
Enterobacter cloacae	+	negative	negative
Serratia marcescens	+	negative	negative
Proteus vulgaris	+	negative	negative
Pseudomonas aeruginosa	+	negative	negative
Acinetobacter calcoaceticus	+	negative	negative
Clostridium perfringens	+	+	negative
Clostridium difficile	+	(+)	negative
Candida albicans	+	+	negative
Candida tropicalis	+	+	negative

a special gel produced by mixing 94% of demineralised sterile water with a gelling agent. Its consistency is similar to the one of a popular preparation Defi-Gel [1].

Some of the hydrogel dressings include also natural oils with bacteriostatic properties (oil from tea tree). Their addition reduces the risk of infection of the burn wound, and disinfects the already infected wounds. The spectrum of action of the oil from tee tree includes 15 most common microorganisms [2] (Table 1).

The carrier material of the gel, used in hydrogel dressings, should be resistant to tearing and allow a simple application of the dressing on the wound. Water Jel dressings use a special knitted material made of polyster, highly resistant to tearing and allowing a simple application of the dressing on the burn. In dressings of large sizes, i.e. emergency blanket, the carrier material is sheep worsted wool, with properties that allow for carrying large amounts of gel on its surface. Due to that, such dressings are heavy and must be carried in special tubes allowing for their easy use, when needed. Other producers of dressings for burns usually use a carrier material made of polyurethane foam which is not as resistant as polyester. Another disadvantage is that any compression squeezes nearly the whole gel out of the dressing. As a result, a dry polyurethane foam covers the wound, and the gel is squeezed out onto the surface of the dressing. All dressings are sterile and packed in disposable packaging; some of the products are labeled with information on the percent of body surface that can be protected with the dressing, with a classification into adults and children. The most common size of the available dressings is: 5x15 cm (e.g. small burn wounds), 10x10 cm (e.g. hand), 10x40 cm (e.g. the upper or the lower limb), 20x45 cm (e.g. back or stomach), 20x55 cm (e.g. hand with protection of the burned fingers) and rescue blankets from 91x76 to 244x183 cm (Fig. 2). There are also special dressings for specific body parts, as in case of burn wounds of the face causing problems with cooling; there is a special dressing in the form of a face mask, size 30x40 cm, allowing the protection of the injured ears, which often get burned as a result of the influence of such factors as high temperature in the region of the head (Fig. 3). The structure of this type of hydrogel dressing (properly placed openings for eyes, nose, and

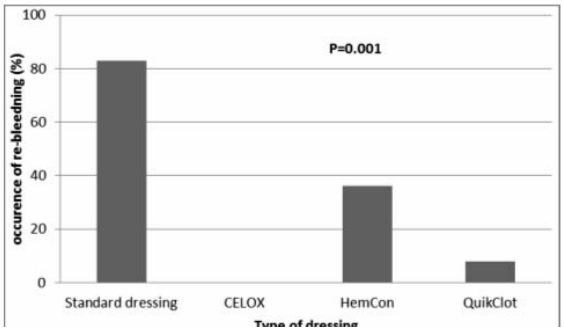

Figure 9: Percent of cases of re-bleeding during studies

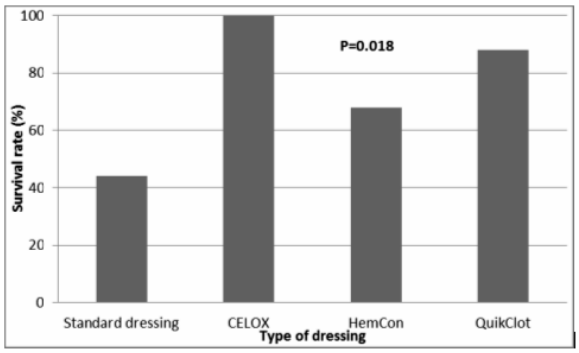

Figure 10: Survival rate for the whole study time.

mouth) allows for using it in intubated patients as well [1].

The most common and effective cooling system used in hydrogel dressings acts by collecting the heat from the skin surface and transferring it to the hydrogel layer (Fig. 1). The heat is transferred directly from the burn to the gel, by means of thermal conductivity. This leads to thermal dissipation over the whole surface of the gel, and thus the surface conducting the heat to the outside increases, which was marked with blue arrows in Fig. 1. The "buffering" effect of the gel layer allows for a faster and more effective heat removal directly from the burn wound, with a lower loss of heat of the adjacent tissues. As a result of this process, the temperature of the tissue under the burn wound is becoming much reduced, which in turn leads to a decrease in tissue damage, inhibition of burn spreading into the tissues and soothing effect on pain. In the gel layer, the heat spreads – thermal convection, marked with yellow arrows in Fig. 1.

The most common cooling technique has so far been the use of cold (15-20°), preferably running water, for at least 15 minutes. The indication for water use is the fact that this is a factor quickly and effectively reducing the temperature of the skin subjected to heat damage. A major disadvantage of the traditional method (cold water) as the first aid in burn wounds is a high risk of local hypothermia, which can expand. The cooling time of up to 15 minutes is supposed to limit hypothermia and its expansion. This rule is not true for burned surface of more than 10%, because this situation requires large quantities of cold water. The use of large quantities of cold water as a cooling factor may lead to a sudden body temperature drop due to large amounts of heat being removed from the body in a manner difficult to control.

Using water as a cooling factor requires also a free access to the cooling substance itself, which is often difficult to achieve in pre-hospital conditions. Apart from newborns and small children, there are also other groups of patients with an increased risk of hypothermia after the use of cold water as a method advised in first aid of burn wounds:

- Patients with extensive burns
- Patients with burns of the back
- Elderly patients
- Patients in the state of shock
- Multiple injuries.

In case of these groups of patients, cooling of burns should be very careful, with constant monitoring of vital signs and body temperature. Cooling with hydrogel dressings allows for hypothermia control by gradual thermal conduction from deeper layers towards the body surface, until stabilisation of the temperature at 36.6°C. Hypothermia is a common phenomenon in case of burns covering larger body surfaces and with longer times of heat conduction [3, 4].

Patients with burns in whom the body temperature decreases due to cooling to 30°C or less, should be protected at intensive care units. This fact has been observed by many physicians all over the world who deal with treating burns and it led to their questioning of the need to use the method of cooling with cold water as a means of first aid for burns. The risk of hypothermia and further health complications which may occur, cause an increased mortality among patients treated at burn units. The meaning of body temperature in the context of burn management was clearly stated in the data from studies conducted at burn treatment centres in the whole world. The studies showed that body temperature reduction by 1°C below 36.6°C on admission to hospital is the cause of increased mortality among patients by 43%.

There have been studies in which a series of measurements of body temperature were conducted in young and healthy individuals and in real cases – patients with burns, brought in by Emergency Medical Services, provided with hydrogel dressings [5]. The observations showed that using hydrogel dressings causes a gradual reduction in body temperature, up to 36.6°C, in burn casualties. The observed effect was also present in case of covering large body surfaces with a rescue blanket, with no hypothermia noticed in those patients (Table 2).

Table 4: Time of cooling the burn wound to the level of the body temperature, with the use of a hydrogel dressing

Cooling time	Temperature in the burn wound
	Hydrogel dressings
Start	80.5 °C
after 30 seconds	78.4 °C
after 1 minute	71.2 °C
after 2 minutes	52.1 °C
after 3 minutes	44.7 °C
after 4 minutes	36.6 °C

An indisputable advantage of hydrogel dressings is their long storage period, with expiry date of 5 years from the moment of production. The possibility of storing at -5 - +35°C. A long shelf life and a high amplitude of temperatures at which it can be stored allow for equipping the ambulances with these dressings. Owing to that, it is possible to act quickly and effectively at the site of occurrence and to fully secure the burned patients in pre-hospital conditions.

Despite advances in interventional medicine and protective equipment, massive haemorrhages caused by injuries remain one of the main causes of death of such patients and thus one of the main challenges to the current civilian and military medicine. Uncontrolled bleedings are at present the cause of almost 50% of fatalities among soldiers, on the battlefield, before evacuation to hospital. Mortal haemorrhages due to injury are the cause of 80% of deaths among civilians (studies conducted on the territory of the USA).

The constantly increasing number of hostilities in hardly accessible areas and an increasing number of cases with the use of guns in civil conditions requires an effective protection of the haemorrhages as a part of the first aid . In order to meet these requirements, our effort was focused on developing alternative methods of bleeding control, including special dressings for haemorrhage control. A few preparations have been developed which were mostly introduced for use on battlefields, in military conditions: a standard dressing containing chitosan (HemCon), powder dressing including zeolite (QuickClot) and dressing with granulated chitosan (Celox). The dressing with chitosan is a quite rigid plate forming a mucoadhesive physical barrier at injury site.

Zeolite is a hard granulate, quickly absrobing water from blood and concentrating natural coagulation factors at bleeding site. The dressing with granulated chitosan acts through a direct interaction with red blood cells and platelets, forming a cross-linked barrier clot, irrespective of the application conditions (irrespective of the blood clotting factors) [6, 7, 8].

Studies on the effectiveness of these agents show that some products have their adverse effects, especially heat injuries caused by exothermic reactions after using preparations from zeolite. However, documented cases of such injuries are infrequent. Preparations including granulated chitosan (Celox) bond to the surface of red blood cells and platelets and to produce a gel-like clot or plug without producing high energy (this is not an exothermic reaction). They work independently of the body's normal clotting mechanism and can hypothermic or even heparinised blood. An additional advantage of dressings with granulated chitosan (Celox) is the fact that they do not cause allergic reactions in the users. It is possible because chitosan is a natural polymer extracted from the shells of shrimp and is subjected to the process of deep purification (rafination) during which proteins causing potential allergic reactions are removed. Possible penetration of the granulate to the blood flow causes its biodegradation because chitosan is a natural polysaccharide (polymer consisting of sugars) under the influence of lysozyme (enzyme naturally occurring in the body).

Comparative parallel studies of Celox produced on the base of chitosan with two haemostatic agents commonly used in the military (HemCon and QuickClot) were conducted, with the use of a standard dressing from gauze.1 The experiments were conducted under conditions of a fatal wound with bleeding from groin in 48 adult pigs fed and prepared for surgery in standardised conditions.

It was decided to use the model of haemostatic study, which is the closest to the conditions of groin injury on a battlefield and procedures of first aid. The reason for recreating the groin wound was the current tendencies among injuries on the battlefield, where the majority of wounds includes the lower limb, especially in the region of groin, and the upper limb, in the region of groin. Some wounds are only superficial and can be easily controlled (limited) by a direct compression, application of a compression dressing or other conventional techniques of bleeding control. The greatest difficulties are connected with wounds with anatomical structure making it difficult to control bleeding. An example of such injuries is groin wound and thus it was decided to use such a wound in these studies.

Additionally, the adopted model was supposed to create a fatal bleeding wound with the fastest possible recreation of methods of first aid on the battlefield. It was decided to recreate a 3-minute bleeding, before protecting it, which reflects the realities of a fatal wound. There are no uniform data on the mean time until protection (the first aid) from the moment of bleeding onset, under the conditions of a battlefield. Adapting a 3-minute bleeding time allowed the researchers to reflect the time of waiting for the first aid team in battlefield conditions.

In the conducted study, the dressing with granulated chitosan (Celox) was performing similar to other dressings with chitosan. It did not produce any significant heat during application. The

wound temperature was 37.2°C. Moreover, similarly to other dressings with chitosan, Celox was easy to remove. After coming into interaction with blood, it produces a soft, slightly viscous, gel-like mass, which can be easily removed with hand, without the use of tools. The remaining material can be easily washed off the wound by means of saline solution. One of the main advantages of this agent is the possibility to use it in the form of granulate. In some situations, non-exothermic dressing is very useful, which can easily adapt to the shape of the wound. In many aspects, Celox seems to be combining the advantages of HemCon and QuicClot, without revealing the disadvantages of those two. It was found that this agent is as effective as HemCon and QuickClot in controlling the bleeding, and this is the only dressing which significantly increases the survival rate as compared to a standard dressing from gauze.

A conclusion from observation was that the real reactional layer of Celox is only 1 mm thick. This ability helps in creating a capsule of unabsorbed preparation around a soft "dome" made of the agent bonded to blood. The remaining agent, not bonded to the wound, can be used again for controlling the next haemorrhage. The possibility of a "multiple use" allowing for potential control of re-bleeding is a feature of hemostatic agents, not possessed by the currently used agents.

In this study of objects treated with the use of HeHcon, there was a higher incidence of re-bleeding and a higher mortality than in case of Celox and QuickClot, and a lower incidence of re-bleeding and mortality than in case of a standard gauze. It was found that when used in accordance with its purpose, the haemostatic agent HemCon in the form of a layered plate was very effective, but in some situations this form was completely ineffective, with potential fatal results. The basic reason for such a wide range of effectiveness figures, is the physical form of that dressing.

The use of HemCon was more difficult than of other materials. It seems to follow from the rigidity of the layered plate, applied to a narrow wound in conditions of a poor visibility of its contents. In spite of the repeatability of the application method, the dressing did not always adhere to incised blood vessels. Instead of that, it adhered to the surrounding tissue. However, in case of a proper adherence to blood vessels, the application was effective. Difficulties with applying the HemCon dressing suggest that wide and flat wounds are be more appropriate than the deep and narrow ones, when the application follows the indications. No possibility of a universal use of the dressing may require more precise trainings. Generally, 8 out of 12 (67%) animals subjected to therapy with HemCon survived until the end of the study, but no statistically significant result was achieved, as compared to standard dressings from gauze.

The QuickClot dressing acts through exothermic reaction. This is the heat generated in the region of QuickClot application that causes problem of thermal damage to tissues of human organs as a result of increased body temperature, up to 61.0°C on average. The Z-Medica company developed a new composition of the preparation, which does not produce such an exothermic reaction any more. Studies on the new formula (preparation) have shown that it does not cause such thermal damage. According to the studies, the agent proved to be very effective; 11 of 12 (92%) animals survived the time of the study and one remaining case was connected with the occurrence of re-bleeding. The survival rate of animals treated with QuickClot (as compared to a standard dressing from gauze) was substantial ($p = 0.072$).

During autopsy of the mentioned fatal case, it was found that the majority of the preparation moved to a cavity in the tissue, running across the bundle of blood vessels; only a small amount of the agent was left in place, acting directly on the incised vessels. Although the dressing was applied in accordance with the manufacturer's instructions, the dislocation of the substance was a probable cause of death. The QuickClot preparation is mechanically relatively easy to use. However, it may require some additional training in order to make the right decision on its use, taking into consideration the risk of thermal damage.

It is commonly believed that early control of bleeding may limit the early and late mortality by reducing a substantial loss of blood, hypotension, coagulopathy, and abnormal metabolism or infections [9, 10]. The results of this study, conducted on a model of uncontrolled bleeding in pigs showed that Celox improved bleeding control and increases the survival rate. Celox is a preparation substantially increasing the possibility of managing severe bleeding owing to its easy application. It should be placed directly on the wound and then compressed. The wound should be pressed for a short time, in order to squeeze the granulated chitosan out into the wound and to stop blood outflow. During that time, Celox will form a clot and obtain an appropriate endurance. The required time and compression force depend on the pressure of outflowing blood. In case of less severe wounds, it is enough to compress

the dressing with a finger for a few seconds. In case of more severe wounds, it is advised to compress it strongly for 5 minutes, or as long as it is required by the circumstances. If the blood starts flowing again from the wound (and we are sure that Celox covers the whole surface of the wound), one should just hold pressure for a longer time, and when necessary, use additional amounts of Celox preparation. Owing to its properties and easy application, this dressing from granulated chitosan is close to a perfect hemostatic dressing.

References:

31. Castner T, Schlor J, Harz C (2002) Water Jel burns gel compresses - practical test. Rettungsdienst 25: 32 – 35
32. Dolecek R, Torsova V (1990) Water Jel in the treatment of burns. A bacteriologic study. Journal of Burn Care Rehabilitation 11:135-141
33. Klose R, Hempelmann G (1998) First-Aid for burns and heat injuries. Der Notarzt 14: A44
34. Rossi R (1993) Hypothermia of emergency patients. Der Notarzt. 9: 179 – 182
35. Steen M (1997) Burns - Scalds. In: Domres B, Enke K, Schmidt U (Hrsg.) Lehrbuch fur praklinische Notfallmedizin, Band 3. Stumpf & Kossendey Verlag, Edewecht
36. Pusateri AE, Delgado AV, Dick EJ Jr, et al. Application of granular mineral-based hemostatic agent (QuikClot) to reduce blood loss after grade V liver injury in swine. J Trauma. 2004; 57:555-62.
37. Wright JK, Kalns J, Wolf EA, et al. Thermal injury resulting from application of a granular mineral hemostatic agent. J Trauma. 2004; 57:224-30
38. McManus J, Hurtado T, Pusateri A, Knoop KJ. A case series describing thermal injury resulting from zeolite use for hemorrhage control in combat operations. Prehospital Emerg Care.. 2007;
39. Champion HR, Bellamy RF, Roberts CP, Leppaniemi A. A profile of combat injury. J Trauma. 2003; 54: S13-9.
40. Pusateri AE, Holcomb JB, Kheirabadi BS, Alam H, Wade CE, Ryan KL. Making sense of the preclinical literature on advanced hemostatic dressings. J Trauma. 2006; 60(3):674-82

Pharmacy

Quality of medicinal products in the process of authorization

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Summary:

Quality of medicinal product is assessed in the authorization process on the basis of chemical, pharmaceutical and biological documentation attached to the application for granting Marketing Authorization.

Key words: quality, active product ingredient, medicinal product, documentation assessment.

Introduction

Prior to marketing, a medicinal product is assessed in the authorization process (registration). The European Union member states have institutions responsible for registration proceedings and issuing proper decisions. In Poland, it is the Office for Registration of Medicinal Products, Medical Devices and Biocidal Products [1].

In the European Union, four types of registration procedures are applied:

1) Centralized Procedure (CP)
2) Decentralized Procedure (DCP)
3) National Procedure (NP)
4) Mutual Recognition Procedure (MRP), preceded by Decentralized or National Procedure.

The Polish Office for Registration actively participates in all types of procedures.

The process of registration consists of several steps, including formal assessment of the submitted application for medicinal product marketing authorization [2], evaluation of documentation attached to the application [3], and issuing a decision on marketing authorization or, in the case of negative opinion on the application, a refusal of marketing authorization. Such decisions, concerning medicinal products registered in the Centralized Procedure, are issued by the European Commission. For medicinal products registered in the Decentralized, National or Mutual Recognition Procedures, decisions are issued by the National Registration Authorities, in Poland - by the President of The Office for Registration of Medicinal Products, Medical Devices and Biocidal Products.

For all types of European Registration Procedures, the binding format of documentation is CTD (Common Technical Document). This format has also been accepted in the USA and Japan.

Registration Documentation in CTD format

Module 1
Administrative data and information concerning medicinal product use.

Module 2
- Summary included in CTD
- Quality Overall Summary (2.3.)
- Nonclinical Overview (2.4.)
- Clinical Overview (2.5.)
- Summary of Nonclinical Data (2.6.)
- Clinical Summary (2.7.)

Module 3 Quality
Chemical, pharmaceutical and biological documentation

Module 4
Nonclinical Study Report

Module 5
Report on Clinical Studies

Documentation concerning medicinal product quality

Each authorized medicinal product is characterised by a high quality, safety of use and therapeutic efficacy, which are thoroughly evaluated during the registration process. Medicinal product quality is assessed on the basis of chemical, pharmaceutical and biological documentation (Modules 3 and 2.3), submitted together with an application for medicinal product authorization.

Pursuant to the binding pharmaceutical law, analytical tests of the medicinal product are performed during the registration process, when the doubts of the expert evaluating the medicinal product may only be resolved experimentally.

Prior to ordering analytical tests, the President of the Office informs in writing the Marketing Authorization Holder about any questionable issues and substantiates the necessity to perform the above mentioned tests [4].

Documentation concerning a drug substance (active ingredient) and drug product (medicinal product) is presented in Module 3 CTD which contains the following data:

3.1. Table of Contents
3.2. Body of Data
3.2.S. Drug Substance
3.2.P. Drug Product
3.2.A. Appendices
3.2.R. Regional Information
3.3. References

CTD is only a documentation format and it does not define in detail what investigations and data regarding the drug product are required for issuing a positive opinion on the application. Detailed information about quality is included in the European Pharmacopoeia and Quality Guidelines (available online at: http://www.ema.europa.eu/htms/human/humanguidelines/quality.htm), indicating the methods of conducting studies that document the quality of drug substance and drug products, as well as interpretation of the obtained results.

The European Pharmacopoeia (in Poland also its translation included in the Polish Pharmacopoeia) defines the basic quality requirements and methods of testing active ingredients, excipients, medicinal products and their containers. If the European Pharmacopoeia does not contain the particular monograph, the requirements are based on pharmacopoeias of the EU member states or member states of the European Free Trade Association (EFTA) – pages concerning the agreement on the European Economic Area. In the absence of the monographs in the above mentioned pharmacopoeias, conformity with monographs included in the pharmacopoeias of Third Countries is accepted. The most commonly used Third Country pharmacopoeia is the United States Pharmacopoeia (USP). Using USP interchangeably with the European Pharmacopoeia is only possible with respect to harmonized basic texts and specific monographs [5].

Appropriate quality of the medicinal product is mainly determined by active ingredient quality. It is also important to maintain adequate quality of used excipients and manufacturing process of the drug substance and drug product, pursuant to the guidelines of Good Manufacturing Practice (GMP). An essential element of each medicinal product is its primary and secondary packaging. Appropriate selection of the packaging material and type of container has a direct influence on product stability and storage conditions. It is crucial to use proper and validated analytical methods; correct preparation of the specification for the active ingredient, excipients and medicinal product is also essential.

Drug Substance

Documentation concerning the quality of drug substance is presented in Module 3.2.S. containing the following data:

3.2.S.1. General Information
3.2.S.2. Manufacture
3.2.S.3. Characterization
3.2.S.4. Control of Drug Substance
3.2.S.5. Reference Standards or Materials
3.2.S.6 . Container System Closure
3.2.S.7. Stability

This method of presenting documentation basically concerns situations, when the manufacturer of this substance is also the manufacturer of the medicinal product.

In the case, when the manufacturer of the medicinal product purchases the active ingredient, two ways of submitting documentation are possible:

- Active Substance Master File (ASMF) in a format compliant with Module 3.2.S

- Certificate of Suitability of the Monographs of the European Pharmacopoeia (CEP).

ASMF Procedure

ASMF documentation applied to nonpharmacopoeial and pharmacopoeial active ingredients. When purchasing an active ingredient, the manufacturer of the medicinal product must receive from its manufacturer the open part of ASMF documentation compliant with Module 3.2.S, and include it in the documentation attached to the application for the marketing authorization. Manufacturers of the medicinal products are obliged to present their own specifications for active ingredients, description of methods and validation, if they are different from those included in the pharmacopoeia, as well as information about the used standards or reference materials, and results of batch analysis (Analytical certificates).

The manufacturer of the active product ingredient is obliged to submit directly the open and closed parts of ASMF documentation and original Letter of Access to the Registration Agency (in Poland, to The Office for Registration of Medicinal Products, Medical Devices and Biocidal Products) [6].

A separate issue is the fact, that ASMF procedure for commercial mixtures/granulates of the active ingredient with excipients, is not accepted as documentation for the active ingredient, except for substances whose physicochemical properties do not allow using the pure substance in the manufacturing process, during storage or transport. The stage of manufacturing granulate/active ingredient together with excipients should be considered the first stage of medicinal product production, with granulate/mixture being an indirect product. Such ASMF documentation should be included in the documentation of the medicinal product in Module 3.2.P.3.

CEP Procedure

CEP Procedure concerns exclusively active ingredients that have monographs in the European Pharmacopoeia. The Certificate of Suitability of the Monographs of the European Pharmacopoeia is issued by the European Directorate for the Quality of Medicines and Healthcare (EDQM), on the basis of ASMF documentation for particular manufacturer and the site of substance production. In the documentation, CEP replaces Module 3.2.S. However, it is required to enclose the results of batch analysis performed for the substance at the manufacturer's place and, if CEP does not contain such data, results of stability tests and information about the packaging. Manufacturers of medicinal products should enclose their own specifications containing parameters defined in the Annex to CEP and description of test methods and validation, if these methods are different from those included in the European Pharmacopoeia or in the Annex to CEP , as well as the results of batch analysis (Analytical certificates).

Regardless of the method of presenting documentation for active ingredients, their manufacturers submit written declarations in which they commit themselves to inform the marketing authorization holder about all changes concerning this substance.

Drug Product

Documentation concerning the quality of drug product is presented in Module 3.2.P, containing the following data:

3.2.P.1. Description and Composition
3.2.P.2. Pharmaceutical Development
3.2.P.3. Manufacture
3.2.P.4. Control of Excipients
3.2.P.5. Control of Drug Product
3.2.P.6. Reference Standards of Materials
3.2.P.7. Container and Closure System
3.2.P.8. Stability

Medicinal products submitted for registration in the National Procedure and in European procedures DCP and MRP, are mainly equivalents to Reference Medicinal Products, and the results of development studies presented in Module 3.2.P.2. should document their basic similarity with reference to product quality.

Some medicinal products have their own pharmacopoeial monographs (e.g. in USP, BP); this fact, however, does not release their manufacturers from the necessity to prepare and present data required in Module 3.2.P. Specifications for particular medicinal product are approved in the registration process, based on data obtained from development studies (Module 3.2.P.2.) and stability tests (Module 3.2.P.8.).

Module 2.3. Quality Overall Summary – QOS
QOS should be prepared by a person with a documented knowledge in the field of the quality assessment of active ingredients and medicinal products. QOS ought to contain a scope of information from individual parts of Module 3 that allows the assessing expert to review this Module. QOS should include all critical, key parameters of the product.

Quality Assessment

In all types of registration procedures, assessment of the active ingredient and medicinal product is performed with respect to conformity of the chemical, pharmaceutical and biological documentation with requirements of the pharmaceutical law, requirements

of the valid issues of Pharmacopoeia and binding Quality Guidelines CHMP, CVMP and ICH.

Assessing experts usually find missing data and errors in the documentation for both active ingredient and medicinal product. During the process of marketing authorization, the applicant is obliged to solve the problems related to documentation assessment and submit the required supplements and explanations.

Such supplements and explanations must be submitted within the time limits for the particular registration procedure. Answers should be comprehensive and addressed to all issues raised by the expert.

Quality assessment of the medicinal product is completed with the Quality Assessment Report prepared by the expert.

References:

41. Ustawa z dnia 18 marca 2011 r. o Urzędzie Rejestracji Produktów Leczniczych, Wyrobów Medycznych i Produktów Biobójczych (Dz. U. Nr 82, poz.451).
42. Rozporządzenie Ministra Zdrowia z dnia 10 lutego 2010 r. w sprawie wzoru wniosku o dopuszczenie do obrotu produktu leczniczego (Dz. U. Nr 36, poz. 202).
43. Rozporządzenie Ministra Zdrowia z dnia 2 kwietnia 2010 r. w sprawie sposobu przedstawiania dokumentacji dołączanej do wniosku o dopuszczenie do obrotu produktu leczniczego (Dz. U. Nr 82, poz. 538).
44. Ustawa z dnia 6 września 2001 r. – Prawo farmaceutyczne (Dz. U. z 2008 r. Nr 45 poz. 271 ze zm.).
45. Leciejewicz-Ziemecka E, Pachecka J. Farmakopea Polska – od wymagań narodowych do zharmonizowanych. Farmacja Polska, 2010,Tom 66, nr 5, 369 – 372.
46. Guideline on Active Substance Master File Procedure, CPMP/QWP/227/02 Rev. 1 http://www.ema.europa.eu/pdfs/human/qwp/013402en.pdf 01.08.2011.

Catastrophe Medicine

Evaluation of predicted injuries based on a computer simulation of a disaster with the release of Toxic Industrial Chemicals in the context of proposed changes the rescue procedures

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Summary:

This article is to evaluate the predicted injuries due to the release of TIC (Toxic Industrial Chemicals) from certain industrial plants located in the area of the Capital city of Warsaw. In the article, a computer simulation of disasters was applied, with the type and quantity of the chemicals also taken into account.
A suggestion of changes to rescue procedures was set out in this article, taking into account close cooperation between the technical services, Fire Service, Police, Military, Civil Defence and Healthcare (both Civil and Ministerial) in the disaster response. The present law regulations in Poland were compared with law regulations in the USA and Russia in the context of rescue procedures.

Key words: Toxic Industrial Chemicals, predicted range of contamination, National Rescue and Fire Fighting System .

In order to assess the emergency situation, those industrial plants situated in the area of the city centre in which TIC are processed and stored in large quantities, were included in the simulation. The district in question used to be called "Warszawa Centrum". The following substances were chosen: ammonia, chlorine and hydrochloric acid. They pose a significant threat of causing damages in case of a sudden release. Variable meteorological parameters for specific seasons of the year (spring, summer, autumn and winter) and time of day (day and night) were taken into consideration.

Data concerning industrial plants using TIC were mostly acquired from MIOC (City Civil Defence Inspectorate). For further evaluation, over a dozen of industrial plants located in the city centre using ammonia, chlorine and hydrochloric acid in substantial quantities, were chosen. In the computer simulation, the safety of tanks with TIC was assumed based on actual conditions in each plant. The possible safety measures were: free-standing or embanked tanks. Based on climate data from the Institute of Meteorology and Water Management (IMiGW) in Warsaw, mean wind speed, temperature and vertical air stability for the urban area, were assumed. For prognostic purposes, it was assumed that the centre of Warsaw is situated on a flat plain without forests. The assumed population density was based on a yearly statistical book – issued in 2001, according to which, the mean population density is 7442 /km^2.

Four industrial plants in the city centre, where significant quantities of ammonia are used, were chosen. These are the following plants:

- Speed Skating Rink "STEGNY";
- Warsaw Brewery "Królewskie;"
- "Danone" Sp. z o.o. (PLC).

- Mechanical Works PZL – WOLA SA (PLC)

Chlorine threat was evaluated for the following plants:

- Central Water Main Junction;
- Warsaw Water and Sewerage Company. Central Water Main;
- Warsaw Water and Sewerage Company. Praga District Water Main.

Large quantities of hydrochloric acid, which had to be taken into account when analysing the threat of contamination, are found in the following plants:

- Warsaw Heat and Power Plant SA (JSC). "SIEKIERKI" Heat and Power Plant;
- Warsaw Brewery "Królewskie"

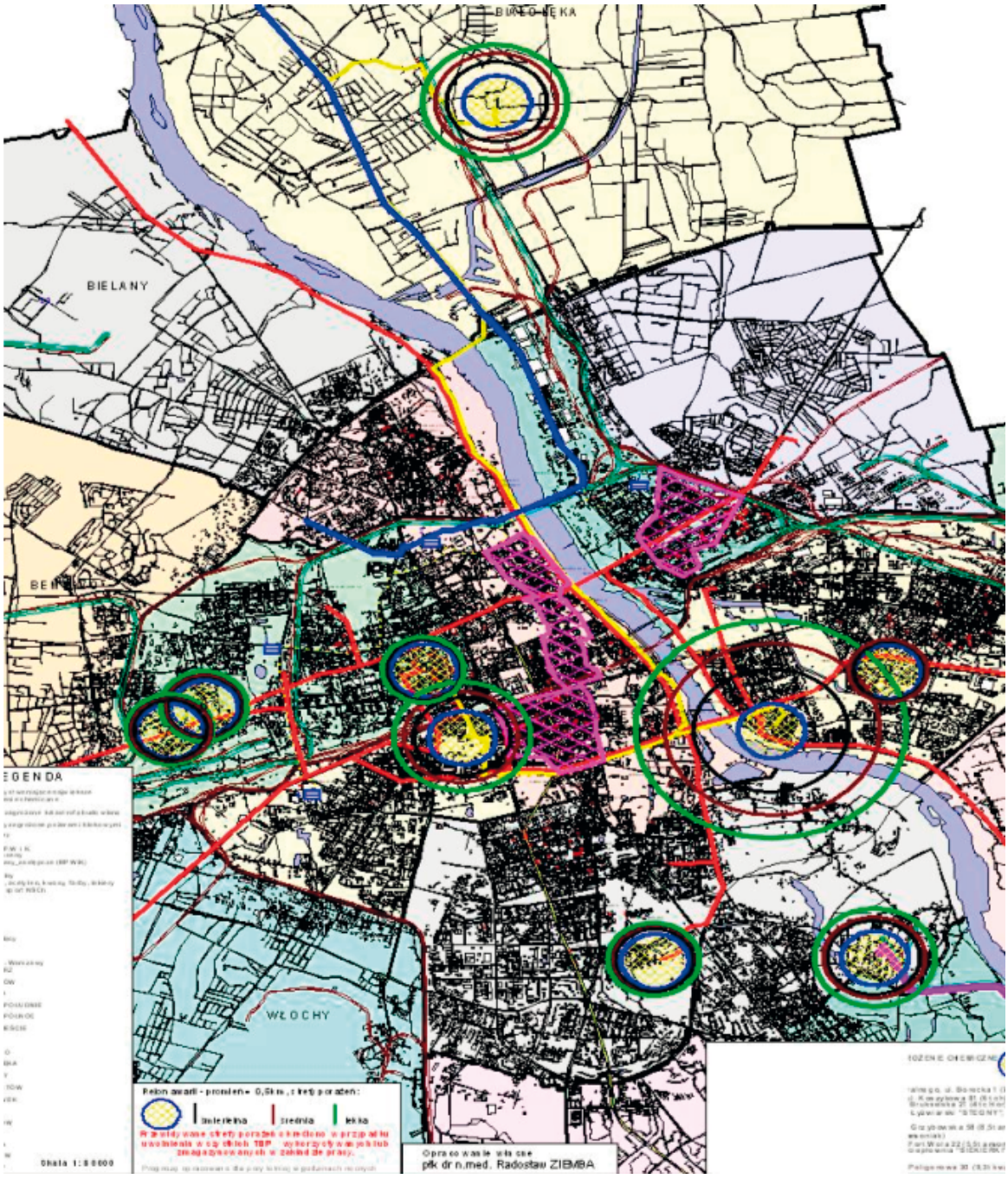

Figure 11: Predicted ranges of zones of damage after a sudden TIC release into the atmosphere.

Predicted ranges of zones of damage after a sudden TIC release into the atmosphere in selected industrial plants in the area of Warsaw city centre.

Picture /self made/. .

- "RADWAR" SA (JSC) The Scientific-Industrial Centre of Professional Electronics

Using methodology of predicting the range of contamination, the regions in danger after a sudden release of TIC, were calculated. Each colour represents the range of slight, severe and fatal injuries as a result of a primary and secondary cloud. Brown and blue colour represent main routes via which TIC are transported, both roads and railways. As seen on the map /picture 6.3.1.1/ substantial area of Warsaw centre may find itself within the range of TIC in case of their release. Taking Warsaw city centre population density into consideration, the number of people who may find themselves within the danger zone was estimated. The predicted regions of threat show the main locations where rescue efforts would be focused. The map might prove useful during organising segregation and evacuation of casualties occurring within the region of a toxic cloud effect. The map will help to devise a concept of localisation and setting up of the Casualty Centres that would be able to admit the influx of severely injured people in critical condition.

Baseline data for predicting the number of injuries

Based on methodology and the computer program, the lengths of areas of slight, moderate and fatal injuries were calculated. The estimation for the contamination regions, by means of computer programs, was conducted for all the industrial plants using the discussed TIC, for all four seasons of the year and also for night and day. In the table containing the results, there is a comparison of the range of the primary and secondary cloud after the release of TIC in selected industrial plants. For all the cases, an equal radius of the disaster area (R_a) was accepted – length of 0.5 km.

Taking the population density of Warsaw city centre into consideration, the number of slight, moderate and severe injuries after a sudden release of TIC was estimated. A comparison was made for the number of injuries in case of TIC release (ammonia, chlorine, hydrochloric acid) in selected industrial plants during night and day in all the seasons of the year.

In order to depict graphically the results of the simulation, bar charts of the number of slight, moderate and fatal injuries were constructed. The charts showed injuries after TIC release in selected industrial plants. The scenarios of injuries are shown for day and night, as well as all four seasons of the year. The charts show that a great majority of casualties will be fatal, therefore they will not be a matter of concern for the healthcare system. The highest number of slight and moderate injuries would occur during the night in summer. This period should be the focus point, as it might require maximum efforts from the rescue and evacuation services.

Analysis of predicted injuries after TIC release in selected industrial plants

When comparing the numbers of predicted injuries, in case of a sudden ammonia release, it is easy to notice that the highest figures occur in summer, during the night.

In case of a chlorine release in selected industrial plants, the number of slight and moderate injuries is significantly higher than in case of ammonia release. Similarly, as in case of ammonia, the highest number of injuries occurs in summer during the night.

Hydrochloric acid causes similar damages to chlorine. Both of these substances, opposite to ammonia, have higher vapour density than air, therefore the cloud moves closer to the ground and crosses greater distances than ammonia.

Law regulations in the context of rescue efforts during disasters

According to present regulations, administration authorities using appropriate state services (the Fire Service, Healthcare, Police, Civil Defence and Ministerial Healthcare), are responsible for helping disaster casualties.

The possibility of situations disaster (random events, terrorist attacks, wars) causing great injuries among the population requires, according to our experience, effective systems of helping the injured and reducing the percentage of fatal injuries.

In many developed countries, the basis of the medical rescue system in case of a disaster are so called EMS (Emergency Medical Services), which work every day.

In Poland, on 1 July 1992, the setting up of the Integrated National Rescue System has started. The Defence Committee being a part of the Council of Ministers, chaired by the Polish Prime Minister, was made responsible for running the System.

Proposed changes to the rescue system

According to a draft prepared by the Ministry of Internal Affairs and Administration, the Medical Rescue System would become a part of the National Rescue and Fire Fighting System. It assumes that medical rescue should be composed of two complete parts:

Pre-hospital rescue unit – based on mobile rescue units, which would form immediate reaction forces, acting on alarm and having two kinds of rescue units – basic and special:

Basic unit:

- A paramedic – able to help in states of emergency;
- Two emergency medical responders (medical technicians) able to give basic medical help, knowing the basics of reanimation;

Special unit:

- A medical doctor trained in intensive pre-hospital care,
- A paramedic
- Two emergency medical responders (medical technician).

Hospital Rescue Unit – based on Hospital Casualty Departments.

- As part of the process of creating a new Medical Rescue System in emergency situations, a reform of the Polish Rescue System was initiated, based on guidelines devised by a group of experts in 1992 and accepted by the Parliamentary Health Commission and the representatives of the Ministry of Health.

The following changes are to be made:

- introduction of medical coordination system and streamlining the process of notification,
- standardisation of procedures from the distress call to the end of the intervention,
- standardisation of medical equipment, technical resources and also professional training of staff,
- creating Medical Rescue Units (ORMed) on the basis of Voivodeship (Regional) Emergency Care Stations.

The main task of the ORMed will be to ensure medical help in case of great injuries in a particular area and time. So far, one trial Medical Rescue Unit at a Voivodeship Emergency Care Station in Lublin has been formed. However, so far there are no credible data concerning its functioning, or information about setting up of new units.

RESCUE SYSTEMS in SELECTED COUNTRIES

In many countries around the world, including the USA and Russia, there are already fully functional systems allowing mobilization of rescue potential in the right time, thus minimising the negative effects of disasters.

In the USA there is the NDMS (National Disaster Medical System), which is being constantly improved.

As a part of the system, the following agencies cooperate with each other: Department of Defence, Department of Veterans Affairs, Department of Health and Human Services, and Federal Emergency Management Department. NDMS is supported by the Military which, among other activities, actively participates in the training of civil staff for the purpose of NDMS. According to NDMS, medical help should be provided by means of:

- quick medical help;
- medical evacuation of casualties;
- final hospital treatment of casualties.

Medical help on a local level is provided by EMS (Emergency Medical Services). EMS, in case of disasters and unfortunate accidents, provide LSFA (Life Supporting First Aid) and further ATLS (Advanced Trauma Life Support) comprising intubation, oxygen therapy and intravenous infusions of medications and fluids.

Cooperation between neighbouring EMS allows carrying out of the rescue operation on a local level. On a central level, immediate medical help in mass accidents is provided by DMAT (Disaster Medical Assistance Team).

DMAT comprises of 30 people, including: doctors, nurses, trained medical technicians and other staff. Three combined DMATs form a CSU (Clearing and Staging Unit), for which a 15-people command centre is set up. The full CSU comprises of 105 people, who can set up 240 hospital beds for the casualties, using the resources they have. Currently, NDMS has also mobile surgery units with 215 people as staff, whose job is to provide care for those requiring surgery. They are able to perform from 36 to 40 major surgeries during a single working day. Each unit can provide help to 60 wounded in a critical state.

As part of improving the system, it is proposed to form 150 DMATs combined into 50 CSUs and 15 mobile surgery units, which will be located around the whole country.

The evacuation of the casualties is conducted by air and coordinated by Military Forces, which have their Command Centre at Scott Air Force in Belleville, Illinois. The following planes may be used for evacuation: a C-9, capable of carrying 40 lying patients and a C-41 for transportation of 32 lying patients and 70 sitting ones. C-9 planes are prepared for evacuation purposes and transportation of medical and technical equipment.

To provide specialist care in the NMDS system, there is a possibility to set up 100 000 hospital beds all around the country. The Department of Defence, with the help of Armed Services Medical Regulating Office (ASMRO), can set up beds for both civil and federal hospitals, the latter being under the supervision of ASMRO. ASMRO has 8 kinds of specialist beds at its disposal. This well developed infrastructure is intended for treatment of orthopaedic, surgical, maternity and gynaecology, and paediatric injuries, as well as for those with spine injuries, burns and mental disorders.

In case of a disaster the rescue systems being part of NDMS react as follows:

- Identify the disaster and the local authorities.
- Local authorities notify the state and federal authorities.
- Local EMS begin rescue efforts.
- Local authorities ask state authorities for help (both medical and financial).
- The Governor initiates the FEMA (Federal Emergency Management Agency) (medical and financial help).
- FEMA asks the President to initiate NDMS.
- NDMS activates national DMAT (there will be 150 of those in the USA).
- NDMS sets up 100 000 hospital beds.

In Russia, Fast Response Brigades, composed of civil healthcare staff, play a significant role in the rescue system in case of mass casualties. The composition of the Brigade depends on the kind of the disaster. For instance, in case of a disaster in a nuclear power plant, it is planned that the Brigade will have the following doctors: a radiologist and haematologist, a laboratory technician, physicist (dosimetry), hygienist (haematologist).

These brigades are to work at the points of gathering the casualties, where also Military Medical Forces will be assigned. A relatively well-developed sanitary and anti-epidemic infrastructure is noticeable.

Sanitary and epidemic supervision at the place of the occurrence, as well as in other areas of the city or region, will be a task of SEGs (Sanitary and Epidemic Group) and SEOs (Sanitary and Epidemic Forces), equally to the Regional and City Sanitary and Epidemic Centres.

The segregation of the casualties evacuated to hospitals will be done in the waiting rooms by segregation brigades: four general (general practitioners) and one surgical.

The hospitals segregate the patients according to their condition and divide them into three groups:

- **Severely injured** – sent to special intensive care units (50 beds);
- **Moderately injured** – sent to general units (50 beds);
- **Slightly injure**d – sent to cardiologic units and other specialised units (60 beds).

For the purpose of evacuation, military planes (Ił-76 MD), helicopters (Mi 8 MB) and other medical vehicles with multiple beds are planned to be used.

In many countries, great emphasis is placed on increasing the participation of the military, with its specialised organizational structures and often a specialist equipment for disaster relief, both in their homeland and abroad.

Analysis of the rescue and evacuation potential of civil and ministerial healthcare in the context of rescue efforts

The analysis of the Ministerial Healthcare potential has shown that it can significantly support the civil healthcare and, in case of joined efforts with other Ministries, could be able to handle a critical situation on its own.

The involvement of Ministerial Healthcare should not be limited, though, to assigning special equipment. The Ministerial healthcare has certain resources which are, by definition, a part of Ministerial units, which in time of peace are not always fully complete. In the regions at higher risk of a disaster, there should be a possibility to engage those resources in providing help for the casualties.

The experience of the USA and Russia in terms of handling mass injuries by the medical services has shown that without efficient cooperation of the technical services, Fire Service, Police, Military, Civil Units, Civil and Ministerial Healthcare, it is impossible to effectively tap all the resources available in case of a disaster.

References:

1. Adams SC, Kadivar H. Treatment of Chemical and Biological Warfare Injuries: Insights Derived from the 1984 Iraqi Attack on Majnoon Island. Military Medicine 1991:156.
2. Adler J. Terrorist Bombing Experiences During 1975-1979 in Jerusalem. Disaster Medicine 1983; 1/3/:351.
3. Ahnefeld W. Medycyna stanów nagłych i ratownictwo w Niemczech. Ratownictwo Polskie 1997;(2): 38-47.
4. Akty normatywne dotyczące problematyki Obrony Cywilnej: Dz. Ustaw R.P. z lat 1992 nr 4, poz.16;1993r. nr 91, poz.420, 421; nr 93, poz.429.
5. Aleksjejew G, Iwanow BP ,Pjerszin WN. Organizacja medicinskoj pomoszczi prichimicielskich awarjach. Woj Med Ż 1990, 87:3.
6. Alexejev GI. Military – Civilian Colaboration for Disaster Medicine in the USSR. Word Assiociation for Emergency and Disaster Medicine 1998;1: 31.
7. Alloway B, Aures D. Chemiczne podstawy zanieczyszczenia środowiska. Warszawa; 1999.
8. Andurant R. Swift assesment of the conseqvences of a rathe long lasting release Conference Chemical Accidents. Roma - July 1987.
9. Augustyn S. Koncepcja nowoczesnego systemu zarządzania kryzysowego. Ratownictwo Polskie, 3/98.
10. Augustyn S. Problemy ochrony ludności przed skutkami awarii chemicznych, Przegląd Obrony Cywilnej 1990, 12, 4.
11. Augustyn S. Zarządzanie kryzysowe – faza reagowania. Przegląd Obrony Cywilnej 1998, nr 7.
12. Augustyn S. Zarządzanie kryzysowe w fazie odbudowy. Przegląd Obrony Cywilnej 1998, nr 12.
13. Augystyn S. O zarządzaniu kryzysowym w Polsce. Przegląd Obrony Cywilnej 1999, nr 1.
14. Better OS. Traumatic (Crush syndrome). Geneve; 1989.
15. Bogdanik T. Toksykologia kliniczna. PZWL, Warszawa; 1978.
16. Borysiewicz M. Modelowanie wypływu i transportu uwolnień w atmosferze niebezpiecznych substancji chemicznych. Instytut Podstawowych Problemów Techniki PAN BUK BT 1996, 12–14.
17. Brzykczy K. Substancje niebezpieczne - bezpieceństwo produkcji i stosowania. Wrocław 1999, 6, 8, 11.
18. Chomiczewski K, Gall W, Grzybowski J. Epidemiologia działań wojennych i katastrof. Medica pres, Bielsko–Biała; 2001.
19. Fedan M, Kurnatowski L, Ziemba R. Pierwsza pomoc w nagłych wypadkach i zachorowaniach. Warszawa 2011.
20. Jakubaszko J, Spławiński A, Złotkowska A. Koncepcja szpitalnych oddziałów ratunkowych dla polski. Materiały Ogólnopolskiego Forum Ratownictwa Medycznego, Inowrocław; 1997.
21. Jakubaszko J, Smreka J, Sehn M. Próba oceny przydatności komputerowego programu symulacji działań na miejscu katastrofy Triage w nauczaniu studentów medycyny. Materiały Ogólnopolskiego Forum Ratownictwa Medycznego, Inowrocław, 1997.
22. Karty charakterystyk substancji niebezpiecznych, Wersja 2,2, CIOP, Warszawa; 1999.
23. Kitler W. Wybrane aspekty kierowania państwem w sytuacjach kryzysowych, w obronie narodowej RP, wobec wyzwań i zagrożeń współczesności. AON Warszawa; 1999.
24. Kocur J, Trendak W, Nowakowski R. Postępowanie w ostrych zaburzeniach w następstwie katastrof i klęsk ekologicznych. I konferencja nauk. Zak Med Kat AM, Łódź; 1997.
25. Krauze M, Nowak I. Broń chemiczna. MON, Warszawa; 1984.
26. Kubica W, Tomecki Z, Kowalski Z, Duszka B. Zarys Toksykologii Wojskowej. Ministerstwo Zdrowia i Opieki Społecznej – skrypt dla studentów studiów wojskowych akademii medycznych. PZWL, Warszawa; 1976.
27. Malysev V. Ocenka vvozmoznych posledstvii avarii s toksiceskim vybrosom. Voen med 1993, 11,7.
28. Maniscalco C. H. The EMS Incident management system. New Jersey; 1998.
29. MAZUREK M. Terroryzm światowy a broń chemiczna. Ministerstwo Gospodarki, Warszawa 2000, s. 61.
30. Metodyka oceny sytuacji chemicznej po skażeniach toksycznymi środkami przemysłowymi. Warszawa 1993, s. 5, 7, 8, 19,11.
31. Michalik JS, Kijeńska DT, Gajek A. Wykonywanie procedury zgłoszenia zakładów o zwiększonym oraz o dużym ryzyku poważnej awarii przemysłowej. Poradnik CIOP, Warszawa; 2001.
32. Michalik JS, Kijeńska DT. Identyfikacja obiektów zagrażających poważną awarią przemysłową. Substancje niebezpieczne i zasady postępowania. Wytyczne. CIOP, Warszawa; 2000.
33. MIOC - Materiały informacyjne o danych dotyczących zakładów przechowujących i przetwarzających TSP 2003.
34. Nowakowski R, Lembke J, Nowakowski M. Pomoc medyczna w zagrożeniach środkami chemicznymi. Przegląd Obrony Cywilnej 1995, 7, 10.
35. Ziemba R. Pierwsza pomoc w nagłych wypadkach i zachorowaniach. Warszawa; 2011.
36. Nowakowski R, Klonowski RJ. Organizacja zabezpieczenia medycznego katastrof i stanów nagłych. Łódź 1997, 9, 128, 129.
37. STANAG 2103 - Meldowanie o wybuchach jądrowych, uderzeniach chemicznych i biologicznych oraz prognozowanie i ostrzeganie o związanych z nimi niebezpieczeństwach i zagrożonych rejonach (Allied Tactical Publication 45).
38. STANAG 2112 – Rozpoznanie skażeń.

39. STANAG 2133 – Ocena zagrożenia wojsk bronią chemiczną i biologiczną.
40. STANAG 2367 – Terminy i definicje z dziedziny obrony przeciwchemicznej. NATO Glossary of NBC Terms and Definitions (AAP-21)
41. Stańczyk J. Współczesne pojmowanie bezpieczeństwa. ISP PAN, Warszawa; 1996.
42. Strategia Obronności Rzeczypospolitej Polskiej, Warszawa; 2000.

Pharmacy

Premises for manufacturing of medicinal products - 'clean rooms'

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Summary:

Manufacturing conditions are critical for high quality of medicinal products. Regulation of Good Manufacturing Practice (GMP) specifies required conditions to be met by all premises for manufacturing process. Product quality and personnel protection are the problems to be taken into consideration.

Key words: clean rooms, premises for manufacturing

Manufacturing of medicinal products is regulated by multiple acts, directives and a number of recommendations. It is directly related to the provision of the highest quality and safety to medicinal products.

Technological activities used in manufacturing process as well as conditions and premises for particular operations are subjected to the statutory regulations.

The recommendations for Good Manufacturing Practice constitute the basic principle clearly stating that both the buildings and premises located in the buildings shall be designed, constructed and utilized so that they are completely adopted to the operations conducted.

Premises, their arrangement and design shall meet the basic objective that include: lowering the risk of errors, enabling the effective cleaning and maintenance protecting both a product and human against mutual 'contamination'.

Constantly growing quality requirements relating to manufactured products result in increasing demand for the use of clean rooms technique. The fields, which use this technique, include:

- pharmacy and chemistry,
- biology,
- medical products,
- microsystem electronics,
- food industry,
- plastics industry,
- hospitals (operating theatres, intensive care),
- packaging technology.

The reasons for construction of clean rooms include mainly:

- the requirements for products (purity, homogeneity, safety, sterility),
- fulfilment of the requirements specified by international and national regulations.

An important reason for constructing clean rooms is also an increasing awareness of the recipient of finished products. The growing interest related to the desire of obtaining information about the conditions of manufacturing process by a medicine recipient is currently being observed. Human consciousness relates it to the safety of the medicine.

Generally, it can be stated that the basis for technique of construction and design of clean rooms is constituted by the necessity to provide them a specific air quality in the production area. The main goal of the actions is to eliminate harmful influence of air pollution on the medicine manufacturing process. It should also be noted that a very important objective in the development of construction is human rights protection.

Depending on the criteria adopted, clean rooms shall ensure:

- general protection against the influence of the particles suspended in the surrounding air,
- full protection against microorganisms (fungi, spores, bacteria, viruses, etc.).

Taking into account the above-mentioned requirements, structural objectives shall consider protection of the air inside a clean room and in many cases preventing the escape of undesirable substances and microorganisms into the atmosphere outside.

To ensure the above-mentioned requirements, ventilation systems operating in clean rooms are fitted with various HEPA (High Efficiency Particulate Air) filters and ULPA (Ultra High Efficiency Particulate Air) filters.

The process of developing the constructional objectives and building a clean room shall take into consideration the following issues:

- temperature (adjusted to a product and personnel),
- relative humidity (at low humidity ≤ 55% the risk of static charge on surfaces is increased),
- logistics (determination of the flow of materials and personnel),
- number of exchanges and distribution of air pressure in particular areas,
- arrangement of technological devices and auxiliary devices (access of servicing personnel),
- cleaning procedures (cycles, hygiene plan, odours, vapours, etc.)
- development of documentation appropriate for the type of premises,
- qualification and validation.

The technique of clean rooms is an interdisciplinary field and, thus, requires the integration of various science and technique disciplines including:

- technology for a given production or functions of the premises,
- ventilation and air conditioning,
- techniques for equipping buildings (infrastructure and fabric technology),
- techniques for measuring and monitoring,
- safety and occupational hygiene,
- organization of labour.

Maritime & Tropical Medicine

The role of cosmetics included in the individual preventive kits for the Polish Army soldiers participating in the operations of Polish Military Contingents

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Summary:

Individual preventive kits i.e. an individual medical equipment of a soldier intended for first aid in the battlefield constitute an essential part of the equipment of the soldiers taking part in foreign military contingents, which operate in extremely varied climatic and environmental conditions. Therefore, the selection of a proper set of cosmetics protecting a body of a soldier against natural conditions and the effects of warfare is very important. The paper presents a minimal set ofcosmeticsas a necessary partof the individualpreventive kit.

Key words: individual preventive kit, radiation, sun protection, barrier cream.

Individual preventive kit constitute an individual medical equipment of a soldier which is intended for first aid in the battlefield. The equipment of individual preventive kits (IZP) in cosmetics enables providing mutual assistance in the conditions of tactical medicine under the assumption that each soldier wastrainedtoadminister firstaidin case of emergency. Providing first aid should occur directly after a triggering agent causing health hazard until the arrival of a rescuer or a paramedic, or contacting a physician. The most commonproblems associatedwith skin irritationincludechanges associatedwith the appearance of skin flushing, oedema or desquamation. Severe actinic reaction of a skin may arose in the course of treatment.

It may manifest with flushing and skin peeling, resulting in effusion. Physicians recommend theuse of variouscreams, ointments andsprays,which accelerate healing of the skinand preventinfection.In the period ofirritation tight clotheswithsynthetic fibres should not be worn on the affected areas. The areas should not be scratched, irritated, sunbathed. Compresses should not be used. The most commonly used cosmetics found in the kits include substances, which are usedfor protectionand skin careas well aspreventsunburns or heat burns and counteractthe effects offrostbite. Moreover, the majority of substances included in the kit relievefeelings of tensionand itching, reduce heatand burningsensation, effectively conditionandgrease the skin, neutralizefree radicals.

Human skin is an organ connecting the system with surrounding environment and simultaneously creating a barrier, which protects theinternal organsfrom the adverse impactof theenvironment. Sunrays are inextricably associated with health and well-being. It should, however, be kept in mind that sun carries also a risk.

Solar radiation is electromagnetic radiation and includes infrared radiation, visible light and ultraviolet radiation (UV).

Infrared radiation reaches the deepest layers of the skin causing vasolidation, which in turn may result in the sensation of heat during sunbathing.

Ultraviolet radiation has been divided into three main ranges with various biological effects:

1) UVA
2) UVB
3) UVC

The shorter is the radiation, the larger is its energy. The effect of UV at human skin depends on geographic location, occupation, lifestyle, age, environmental pollution, seasonand day of a year.

UVA

It is radiation with a length of 320-400 nm penetrating the dermis. It causes pigmentary changes (pigmentation spots and cell disturbances) rather than erythema. Its direct effect is not felt. Penetrating the skin, UVA rays damage collagen and elastinfibersandweaken theimmune system. Damages are irreversible (agingof the skin, excessive dryness) and usuallymanifest themselvesafter many years.UVA radiationis highfrom sunriseto sunset and about 50% of theexposuretakes place in shade.

UVB

It causes erythema. It is a wave of length of 290 – 320 nm and acts on the surface of the sin (penetrates the epidermis) casing increased synthesis of skin pigment, sunburns and skin cancer at long-term exposure. The peak of UVB radiation occurs during the noon. It is worth noticing that panes and car panes protect against UVB, but are permeable to UVA.

Suntanis caused by UVA and UVB rays. Itis formedafter 72 hours ofsunlight andis associated with anincrease in the numberof pigmented cellsalong with increasedsynthesisof melanin.

UVC

This radiation of short wavelength below 280 nm is the most harmful and dangerous, but also almost entirely absorbed byatmosphericozone layer,it never reaches theEarth's surface. Skin subjected to persistent activity of sunrays undergoes thickening, becomes rough andinflexibleand eventuallymay undergoatrophyandthinning. Deep wrinkles, furrows, various discolourations and depigmentations are formed. The most commonchanges includefreckles, lentigines, pigmented actinic keratosis, serborheic keratosis and pigmented types of basal-cell carcinomas.

Sun protection

Skin in fitted with natural solar system i.e. defensive mechanisms against UVA and UVB rays including:

- suntan,
- thickening of thestratum corneum,
- the process of cell regeneration.

This systemdepends onqualities such asskin phototype, age and hereditarytendencies. However, thenaturalprotectivemechanisms ofthe skinare not alwaysenough. In this case, there is a need to use appropriatepreparationsto protectfrom the sun. Externalmeans ofprotectingit from lightinclude generallycosmetic preparationscontainingsubstances(filters) that reduceskin contact withUV rays.

Types of filters

chemical – protective action is based on the absorption of UV rays.

- physical – they protect skin by reflectingordispersingUV radiation.
- Features of an ideal preparation for sun protection include:
- ideal tolerance,
- high quality cosmetic properties
- lack of toxicity
- waterproof quality
- high effectiveness against both UVA and UVB rays
- favourablephysicochemical parameters(colourless, odourless, withoutgloss, non-greasy)
- internationalhighSPFindex(sunprotectivefactor= degree ofsun protection).

New generation substances protecting against the sun usually contain a mixture of several chemical filters and a physical filter. Such combination aims at widening the range of protective action of various preparations.

SPF is a sun protective factor i.e. the degree of sun protection. According to the recommendations of the European Unions, the highest factor equals 50+, although products labelled with a factor of SPF 100 are available on the market. It means that from applying until occurrence of erythema i.e. flushing of the skin one can stay on sun for such longer time as is the value of SPF. In our latitude in summer, timeto onsetof erythemain the casenotapplyingsunscreenon averagerangesfrom10-30minutes.

An example ofa product withSPF 30 and duration ofsafesun exposure.

- Duration of sun exposure until the onset of erythema: 10-30 min.
- 10x30= 300min.(5 hours),
- 30x30= 900min.(15hours).

Duration of safe sun exposure: 5-15 hours (10 hours on average).

It should be borne in mind that a thick and uniform layer of preparation must be applied. Significantis the factthat ourcalculationsdo not take intoaccount thesweating,frictionwith a towelorsand,which significantlyreducethe protectivevaluesof the preparation.Therefore,in order to maintainadequate protectionagainst UV radiation, it is necessary torepeat applicationsof the preparationto the skinduringsun exposure.

Medicinal products should be used in accordance to doctor's orders or as recommended bythe manufacturer (according to information suppliedto the packagingofmedical devices). The kitsconsist of the followingmedical supplies:

Dermatological and application studies have not confirmed any irritating and allergenic action of the preparation. Moreover, Radiosun® is appreciated by specialists who recommend it to patients suffering from radiation-induced reaction of the skin after radiotherapy, because it soothes and calms the skin so that soldiers can feel comfortable. The creamshould be appliedwiththe fingertipsand gentlymassaged intoskin inirritatedareas3-4times a day.

Figure 1: RADIOSUN Sunburns cream; 100 ml tube.

Radiosun is asoothing andcalmingcream usedintreatment of radiation burns. It is also in radiationinduced reaction of the skin after radiotherapy, UV burns and thermal burns. Itssoothing actionit owes to the following substances:aqua, olive oil, myristal myristate, olivem, glicerin, reynoutria japonica extract, panthenol, squalene, sylibum marianym extract, carbomer, suttocide, parfum menthe. The cream alleviates the feeling of tension and itching, reducesheat,burningsensation andredness, effectivelynourishesandlubricatesthe skin,neutralizesfree radicals. The creamis efficientto use, easy to spread and leaves a softprotective layer on the skin. Very well absorbed. It soothes, softensskinburnsoccurring afterexposure to UV andheat. alleviatessensation of tensionand itchingof the skin,reducesheatand burningsensation, redness,soothes, smoothes and firms theskin.

Dermatological and application studies have not confirmed any irritating and allergenic action of the preparation. Moreover, Radiosun® is appreciated by specialists who recommend it to patients suffering from radiation-induced reaction of the skin after radiotherapy, because it soothes and calms the skin so that soldiers can feel comfortable. The creamshould be appliedwiththe fingertipsand gentlymassaged intoskin inirritatedareas3-4times a day

Figure 2: MED. PLUS, UV protecting cream-emulsion 75 ml.

Cream provides effective, high protection of the skinof each type, prevents sunburn, SPF30UVA+UVB.

Faceand handsare often the mostwork-wornbody parts. Unfortunately, they are not provided with proper and sufficient protection. The faceand handson the roadof evolutionhave been equipped witha very smallnumber ofsebaceous glandsandfatty tissue.Hand skincan bedamagedbymanyfactors.Therefore, after the contact with negative factors they are weakened, and thus lookbad. One can say thatit happensdue tofrequent washing, contact with chemicals, detergents, wind, cold,and evendry air.The skinon the faceis constantlyexposedto sunlight. It may result in severe erythema manifesting with burning, swelling, blisters, and generalskin irritation in burnt area. Symptoms ofburnscaused bysunbathingin the sunoccurafter 1 to4 hours. Face and handskin isconstantlyexposedto sunlightandweather conditions.

Such actionoccurs inthe soldiers involvedin the stabilization missionsin Afghanistanand Iraq, countries with dry climate, with large diurnal range, lowhumidity andlowrainfall, especiallyduring the summer. Regularsunbathingis healthy, if itisdonein moderation. It maintainswell-being, improvesthe skin tone, and above all, stimulates secretion of vitamin D3 that ensures proper and efficient operationof the immune systemthat protectsagainst diseases. Sunbathing is the most important factor

regulating the metabolism of calcium in the body and it is known as the hormone of happiness.

It is importanttosunbathedeliberatelyand withmoderation.The causes ofUVburns include poor genetic resistanceof the skin toUV protection, too long-sunbathing. Our organism is equipped withspecial protection system against UV rays, which warn us that it is enough. It manifests with erythema and burning sensation after which the skin shoulddefinitelytake a break fromexposureto ultraviolet light.

Figure 3: Anida, glycerine–aloe vera hand cream with vitamin A, E, 75 ml.

Handskin can bedamagedbymanyfactors. We oftendo not realizehowharmfulto the hand skinaredetergents,or even thesun. Hand cream with regenerative properties should be used at night. Wearing gloves during sleep will create heat, influencing the absorption of the cream. Thus, the healing process of epidermal microtraumas is accelerated.

Barrier creams usually create invisible gloves on the skin of hand, which during theclimaticstressdefendit against aggressive action of icywind, dangerous and intense solar radiation,frostand preventit fromexcessivedryness.

Nourishing creams are a different type of cream, usually containing large amounts of vitamins E and A. Due to regular application skin becomes nourished and the cream prevents theappearance ofirritationordryness.

Anidacreamisintended forhand care. Thecontent ofaloe veraextractsoothes irritations. Ideal moisturizer. It protects and regeneratesskinexposed to theadverseexternal conditions.

Creamregeneratesandmoisturizes. It containsvitamins Aand E, whichneutralize free radicals,restoreand smoothroughskin.Easily absorbedandused systematicallyprotectshandsfrom exposure toadverseexternal factors.

Anida cream is composed of the following ingredients: Aqua, Stearic Acid, Mineral Oil, Glycerin, Cetyl Alcohol, Glyceryl Stearate, Dimethicone, TEA, Aloe Vera Extract, Tocopheryl Acetate, Retinyl Palmitate, Citric Acid, Benzyl Alcohol, Methylchloroisothiazoli none,Methylisothiazolinone, Parfum, Linalool.

References:

1. Dermatologia Praktyczna; lekarze dermatolodzy: Małgorzata Opalińska, Katarzyna Prystupa, Wadim Stąpór, Wyd.Lek. PZWL 1997.
2. Ochrona przed słońcem podczas uprawiania sportu - materiały internetowe udostępniane przez Centralny Instytut Ochrony Pracy – Państwowy Instytut Badawczy CIOP-PIB
3. Zaburzenia barwnikowe hiperpigmentacyjne jako problem kosmetyczny; Aneta Urbańska; Nowa Medycyna - Dermatologia V zeszyt 120 (1/2003).
4. Słońce i skóra – cykl publikacji; dr. Katarzyna. med. Katarzyna Prystupa (alergolog-dermatolog) , Edward Ozga-Michalski, Anna Gotowiec; Moje Zdrowie; 1997-2000
5. The role of VITAMIN A in prevention and corrective skin treatments' Dr Des Fernandes, Polish J. of Cosmet. 2003,1
6. Kosmeceutyki Urban&Partner, Wrocław 2006/6
7. Cosmetic Dermatology' L.Baumann, The McGraw-Hill 2002/12
8. Witamina A-strażnik naszego organizmu B Kwiatkowska, 2002
9. Indeks leków Medycyny Praktycznej 2006. Kraków: Wydawnictwo Medycyna Praktyczna, 2006, s. 400.
10. Jan Kazimierz Podlewski: Leki współczesnej terapii. Warszawa: Split Trading, wydania z lat 1996–2008.
11. Leksykon Leków, Tadeusz Lesław Chruściel, Kornel Gibiński, PZWL 1991
12. Farmakologia, Podstawy farmakoterapii / Wojciech Kostowski, Zbigniew S.Herman – PZWL 2007
13. Jachowicz R. (red.): Farmacja praktyczna. PZWL, Warszawa 2010
14. Janiski S, Fiebig A., Sznitowska M. (red): Farmacja stosowana. Podręcznik dla studentów farmacji. PZWL, Warszawa 2006.

Catastrophe Medicine

The role of medicinal products and dietary supplements included in the individual preventive kits for the Polish Army soldiers participating in the stabilisation missions of Polish Military Contingents

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Summary:

Individual preventive kit (IZP) is configured depending on the region, where it will be used by soldiers (and other participants of foreign military contingents), season, climatic conditions, or the type of a user. The paper describes selected medicinal products and dietary supplements included in the individual preventive kits for the Polish Army soldiers participating in the stabilisation missions of Polish Military Contingents.

Key words: individual preventive kit, preventive health care, fungal infections, antibiotics.

Individual preventive kit (IZP) contains OTC drugs (sold without a prescription), prescription medications (taken according to doctor's instructions, medical prescription required) and dietary supplements. They are prepared depending on the region, season, climatic conditions, or the type of a user. Depending on the region are prepared for use in Africa, Asia and Europe, depending on the season are fitted for: winter, summer, dry season and wet season. The differences in equipment occur, however, depending on the type of user e.g. for a soldier, a civilian army employee, casual observer and the emergency team.

The equipment of IZP enables the primary:
- malaria prophylaxis,
- local antifungal treatment,
- symptomatic treatment of diarrhoea
- counteracting the effects of food poisoning,
- counteracting the effects of frostbites, sun and thermal burns,
- skin protection and care,
- dressing and disinfecting the wounds,
- stopping life-threatening bleedings,
- water disinfection,
- repelling the insects.

Substances found in the IZP are used by soldiers, who were previously trained in preventive health care during foreign missions. Preventive health care includes measures aiming at disease prevention through early detection and treatment.

According to the definition declared by the World Health Organization, health is complete physical, mental and social well-being and not merely absence of disease or infirmity.

Preventive health care is a way to respond to a variety of social phenomena, which are believed to be harmful and undesirable. These phenomena take place, inter alia, in Afghanistan or Iraq. The assessment encourages to treat these phenomena in terms of threats and to make efforts to eliminate them or reduce their occurrence.

In preventive health care the following phases can be distinguished:

- Early prevention – aiming at consolidating the correct patterns of a healthy lifestyle and preventing the spread of negative patterns of behaviour, in relation to healthy individuals,
- Primary Prevention (I phase) – aiming at preventing the disease by controlling risk factors in relation to persons exposed to risk factors,
- Secondary Prevention (II phase) - preventing the consequences of the disease by its early detection and treatment (screening tests to detect sick individuals),
- Phase III Prevention - aiming towards halting disease progression and reducing complications.

Medicinal substances and dietary supplements found in IZP are applicable particularly in phase I i.e. primary prevention.

Conducting prevention activities brings tangible benefits to the soldiers in the form of:

- improvement of the health awareness of the population,
- improvement of the health status of the population,
- reduction of the number of people with complications of diseases and permanent disability,
- reduction of the number of incidences of diseases and deaths,
- increase in the detection of diseases at an early stage of development,
- increase in the proportion of cures,
- reduction of sickness absences,
- reduction of the cost of treatment,
- smaller financial loss (sickness benefits, manufacturing losses).

Malarone is a very important drug found in IZPL, because malaria is a parasitic disease occurring endemically in many areas of Central and Southern Africa, Central and Southern America, Southeast Asia, Indonesia and Oceania. Amoeba Entamoeba histolytica occurs in Southern and Western Africa, Central America, India and Indonesia. In Poland, there are ca. 30 recorded cases of malaria acquired outside Europe. In some cases it ends with death. Therefore, prophylactic actions, preventing from a disease, are very important for health.

Malarone contains two active ingredients, atovaquone and proguanil hydrochloride, having biocidal effect on the agamonts of Plasmodium falciparum parasite present in the blood and liver.

Malarone is used for:

- prevention of malaria caused by Plasmodium falciparum
- treatment of acute, uncomplicated malaria caused by Plasmodium falciparum.

Because Malarone is effective against infections caused by the strains of Plasmodium falciparum susceptible and resistant to other drugs, it is recommended for the prevention and treatment of malaria caused by Plasmodium falciparum strains that may be resistant to other antimalarials.

Composition: each tablet of Malarone contains 250 mg of atovaquone and 100 mg of proguanil hydrochloride; other ingredients: poloxamer 188, microcrystalline cellulose, hydroxypropyl cellulose, povidone K30, sodium starch glycollate (Type A), magnesium stearate, hypromellose, titanium dioxide (E171), iron oxide red (E172), macrogol 400 and polyethylene glycol 8000.

Possible side effects: in the doses used for malaria prevention and treatment, possible adverse reactions caused by Malarone are usually mild and transient. Side effects that may be caused by Malarone and various ingredients include: abdominal pain and diarrhoea, headache, anorexia, nausea and vomiting, coughing.

Vascular and lymphatic system: anaemia, neutropenia (reduced numbers of white blood cells), pancytopenia (a decrease in all types of blood cells) in patients with severe renal failure.

Endocrine system and metabolism: anorexia, hyponatraemia (low levels of sodium in the plasma).

Digestive system: abdominal pains, nausea, vomiting, diarrhoea, gastric disorders, oral mucosa inflammation.

Dosage and further information: daily dose of Malarone should be taken at the same time.

To prevent malaria: Preventive administration of Malarone should begin 24 or 48 hours before coming to the endemic area with the incidence of malaria. Treatment should be continued throughout the period of residence in an endemic area, but for no longer than 28 days. Administration should continue for 7 days after leaving the endemic area. The recommended dosage of Malarone is one tablet once a day.

To treat malaria: The usual dose for adults is 4 tablets once a day for 3 days. For children the dose depends on their bodyweight:

- 11-20 kg - 1 tablet once a day for 3 days
- 1-30 kg - 2 tablets once a day for 3 days
- 31-40 kg - 3 tablets once a day for 3 days
- over 40 kg - dose as for adults.

Package: 12 tablets of Malarone.

Contraindications: hypersensitivity to atovaquone or proguanil hydrochloride, or any other auxiliary ingredient and in the prevention of malaria caused by P. falciparum in patients with severe renal failure.

There is no single, golden mean, which will provide hundred percent protection against malaria. The most important is the prevention of mosquitoes bites. The main attributes of the fight against malaria include mosquito nets, repellent and long sleeve shirt. Regular chemoprophylaxis is a supplement to malaria prevention. It works by preventing the development of the parasite, which nonetheless penetrated the body. Doxycycline is such antibiotic found in IZP.

Doxycycline

Trade names: Cyclidox, Doryx, Doxycyclinum, Doxyratio, LAA, Vibramycin, Vivocycline, Dotur and others.

Description:
Antibiotic of the tetracycline group, perfectly absorbed by the body. It is also used to treat pneumonia, pharyngitis, tonsillitis, syphilis, foot and mouth disease as well as typhus, plague and cholera.

Side effects:
Rare. Nausea, vomiting, stomatitis, photosensitivity (too fast and strong suntan). Since not only malaria parasites die, but also other bacteria sensitive to the drug, other microbial infections such as fungal infections may occur. Oral contraceptives during treatment are less effective.

Contraindications:
Hypersensitivity to tetracyclines, liver failure.

Dosage:
In Poland Doxycyclinum seems to be the cheapest. One packaging contain ten 100g capsules.

Dosage: 1 tablet (100 mg of doxycycline)
Frequency: daily (at the same time)
Beginning: 1 day before departure
End: 4 weeks after return
Maximum duration: 2 years, if there are no side effects

Notes: take with a large amount of fluids (but not milk) or during a meal (preferably on a full stomach). It is not recommended to be taken along with lime, magnesium or iron, and less than an hour before bedtime. Doxycycline is available in two forms: hyclate and monohydrate. The monohydrate is better tolerated by the body.

Loperamide

Loperamide is another drug found in IZP. It is **an organic chemical compound**, opioid antidiarrhoeal medication. It is one of the opioid substances, but it does not pass completely through the blood brain barrier, and thus there is no typical opioid effects on the nervous system what allowed its free use in medicine without the consequences of addiction. In medicine, it is the most widely distributed under the trade name - Laremid.

Figure 1: LOPERAMID WZF 2mg pills, a'30

DESCRIPTION: Strong acting antidiarrhoeal medication. The effect of a reduction in the incidence and number of bowel movements. The effect is maintained for approximately 24 hours. It is used in the symptomatic treatment of acute and chronic diarrhoea occurring in functional disorders or inflammatory bowel disease, in patients with external fistula of the ileum (ileostomy) after colectomies or extensive resection of intestines to reduce the volume of eccrisis.

Indications: Symptomatic treatment of acute and chronic diarrhoea of various origins (with the exception of acute bacterial diarrhoea).

Dosage: Oral. Adults and children over 12 years of age: acute diarrhoea - two tablets initially, followed by one tablet after each loose bowel movement., the maximum dose is 8 tablets a day, chronic diarrhoea - initially 1 tablet 2 times a day, increase the dose to 4 tablets, if necessary (up to 6 tables a day). In chronic diarrhoea loperamide should not be used longer than 10 days. Children aged 6 to 12: 1 tablet after each abnormal bowel movement (Do not administer more than 2 tablets in children aged up to 8 and 3 tablets in children aged below 10 in any 24 hour period). This medicine is not recommended for children under 6 years old. While the use of loperamide adequate amounts of water and mineral salts should be taken. In the case of no improvement within 48 hours, discontinue treatment and contact a physician. Familiarize yourself with the properties of the medicine described in the leaflet before use. Before using this medicine, check the expiry date stated on the label. Do not use after expiry date. Keep the medication in a tightly closed container, out of reach and sight of children and as required by the manufacturer.

Possible side effects: skin rash, abdominal pains, flatulencies, nausea and vomiting, constipation, drowsiness, dizziness, dry mouth, loss of appetite. Side effects may include tiredness, dizziness or drowsiness. Therefore, it is advisable to exercise caution when driving or operating machinery.

When a person is hypersensitive to loperamide or to other ingredients when a person takes opioid analgesics, or if you are or think you are pregnant and when breast-feeding, preparation should not be used during pregnancy unless your doctor

decides otherwise. It should be used with caution in nursing mothers.

Another antiseptic being a component of IZP is a gel used to disinfect the skin and mucous membranes as well as in treatment of infected wounds, carbuncles, abscesses, mixed skin inflammations. The gel is known under the name Rivel.

RIVEL

Figure 2: RIVEL 0,5% gel 30g

Description: Rivel gel is used for skin, mucous membranes and superficial skin damages disinfection and for the treatment of infected wounds, carbuncles, abscesses, mixed skin inflammations (bacterial and mycothic),

Action: RIVEL is a convenient, gel with rivanol mainly used in the treatment of skin inflammations and wounds. Active ingredient of the preparation acts on the skin surface and also penetrates deeper, acting as disinfectant and preventing infectious agents from penetrating into the wound. As a result, redness and swelling subsides, a sensation of warmth or pain disappears, the inflammation is reduced and the wound heals faster. The preparation does not irritate the skin and mucous membranes.

Indications: disinfecting of skin and mucous membranes, disinfecting of superficial skin damages (lacerations, harms, skin abrasions), disinfecting of wounds, furuncles, abscesses, mixed skin inflammations (bacterial and mycothic), on insects bites.

Contraindications: diagnosed hypersensitivity to ethacridine lactate, acridine derivatives or other auxiliary ingredients.

Dosage: Apply a thin layer of gel on the affected skin or mucous membrane 2-3 times a day (more often if necessary). The gel can also be used under the dressing.

Composition: Active ingredient 1 g of gel contains 5 mg of ethacridine lactate (Rivanolum 0.5%). The other ingredients: Macrogoli 7 glyceroli cocoas, triethanolamine, Eumulgin B3, Nipaguard MPA, polyacrylic acid, purified water.

Another factor common among soldiers taking part in missions mainly in Afghanistan and Iraq is in the summer heat and humidity of the surrounding environment. These factors, along with garment, result in variously severe skin lesions i.e. enathemas and ruptures. The factors cause persistent pruritus.

Fungi reproduce primarily in the stratum corneum, especially between the toes. Usually fungal lesions situate initially in web spaces, at first between 4th and 5th toe, then between 3rd and 4th one. Finally, mycosis attacks all web spaces, progressively moving to the back of the foot and to the sole. High humidity and heat contribute to the rapid growth of mycosis.

Factors predisposing to the development and growth of fungal infections include i.a.:

- disorders of the immune system,
- circulatory disorders and cold feet,
- excessive sweating,
- hormonal disorders - diabetes,
- obesity,
- gastro – intestinal disorders,
- antibiotic treatments,
- steroid treatments,
- chemotherapy,
- anaemia,
- minor injuries and abrasions of the epidermis,
- wearing shoes and socks that are not air permeable.

Particularly exposed to the infection are people, who reside in warm, damp and dark rooms, who use public saunas, swimming pools and sports centres, workers in mines, mills, laundries, bricklayers, policemen and soldiers that is all those who during work or doing chosen sport discipline perspire heavily, use the public showers, as well as those who walk barefoot on hotel carpet or flooring, or wear heavy, laced boots fitting tightly around the ankle. The most important factors that influence the increased incidence of onychomysosis include the environmental conditions (heat, humidity), type of footwear (non-ventilated sport shoes made of synthetic materials) and long-term burden on the lower limbs as a result of work.

Undofen

Figure 3: RIVEL 0,5% gel 30g

An example of the antifungal drug found in IZP is Undofen in aerosol.

Indications:
Therapeutic: in superficial fungal infections of the toes' skin as well as skin of hands, groins, armpits, head and accompanying bacterial superinfections.
Prophylactic: to prevent fungal infections of the feet (after contact of the feet with the places of potential infection i.a. in the pool, in the bath house). After mycosis, to prevent relapse. Using this preparation reduces the unpleasant smell associated excessive sweating of the feet.

Contraindications:
Do not use Undofen Spray: for skin lesions with severe inflammatory reactions, in individuals hypersensitive to the active ingredients or other ingredients.

Interactions:
There was no information on the impact of the preparation Undofen Spray with other medications for use on skin.

Side effects:
Like all medicines, Undofen Spray may cause side effects. If you notice symptoms such as local skin irritation, burning, rash, you should discontinue the treatment and contact a physician immediately. In some people Undofen Spray may cause other side effects, not listed in this leaflet. Inform a physician in that case.

How to use:
Shake the preparation before use. The preparation should be used on cleansed and dry skin, in an upright position. Avoid contact with mucous membranes and eyes.

Therapeutic: Spray precisely infected areas of skin. The procedure should be performed 2 to 3 times daily for a period of 2 to 4 weeks. Once symptoms have subsided it should be used for a further period of 4 weeks. It is also recommended to spray it inside shoes and socks. Further daily use of the preparation helps to prevent recontamination.

Prophylactic: The product should be applied once a day. Precisely spray the feet and the spaces between the toes.

When the temperature drops below 0° C, the skin is exposed to a frostbite. Particularly sensitive areas include: fingers, nose and earlobes. Lesions may be limited to redness and burning, but serious frostbite cause irreversible tissue necrosis. Balsolan ointment is a preparation found in IZP of the Polish Army.

As a result of cold skin blood vessels are shrinking. Cutaneous circulation is also inhibited due to the damage of epithelium lining the arteries, platelet clumping and clots formation. Extravasation of the blood and dehydration occur as a result.

The following stages of the frostbites are to be distinguished:

First degree: After temporary turning pale, it is characterised by redness with slightly bluish tint, oedema, burning and numbness sensation, following temporary circulatory disorders and acute inflammation.

Second degree is characterized by formation of blisters with serous or serosanguineous fluid, whereas oedema and swelling and bruising are much larger. It results in a long-term oedema and skin discoloration.

Third degree is characterized by skin necrosis, sometimes also of deeper tissues, including bone. The separation of the necrotic part results in defects, which heal by granulation.

- Symptoms:
- skin redness
- pain
- blisters
- hard, frozen skin
- necrosis of the skin and muscles.

In case of a frostbite, first aid consists on restoration of blood circulation as quickly as possible in the frozen body part, especially when the frozen body part is still pale. For this purpose we use rapid heating of damaged limb in water at increasingly higher temperature (25 - 30° C) for several minutes until it increases to 38 - 40° C. Heating should be applied until the tissue will have the right temperature. After the bath, you can lightly rub frostbitten place with a small amount of ethyl alcohol 70%, until the skin turn pink again. Then apply a dry sterile dressing with a thick layer of cotton wool.

Afterwards transport the patient with warmly wrapped legs to the hospital. If there is no possibility to perform heating bath, a short, gentle massage, using a small amount of ethyl alcohol 70% should be applied. Then, apply a thick protective dressing. Frostbitten area must not be rubbed with snow or cold water, as it was once recommended, as it may do more harm than good due to damage to frozen tissues. In the prevention of frostbites also antitetanus prophylaxis is recommended (preventive injection of tetanus antitoxin or a booster dose – Anatoxin).

Prevention: It is best to prevent frostbites by wearing dry and warm clothing. The feet and hands should be particularly carefully protected against moisture and cold (gloves, socks, soft shoes). Exposed body parts (face, ears) should be greased. Moreover, the fresh air movement accelerates blood circulation preventing frostbites.

Balsolan

Figure 4: BALSOLAN ointment 30g

The indications for the use of Balsolan ointment include: pressure sores, burns, frostbite and skin diseases (e.g. ulcers, scabies).

Ingredients:
1 g of ointment contains 100 mg of Peru balsam.

Action:The active ingredient in the preparation is a balsam obtained from the trunk of Myroxylon balsamum var. pereirae, which contains cinamein, cinnamic acid, benzoic acid and resin. The preparation exhibits anti-inflammatory, antibacterial and antifungal, and protective action.

Indications:
Decubitus ulcers, burns, frostbites and skin diseases (e.g. ulcers, scabies).

Contraindications: Hypersensitivity to the ingredients.
Dosage:
Apply a thin layer of the ointment on the affected place. Use 2-3 times a day.

Antibiotics should be taken at the same time, at least one hour before eating or two hours after. Taking them with food decreases the absorption of the drug. Non-carbonated mineral water is the best to wash a pill down with. Juices, fruit drinks or milk products also hinder the absorption of the drug. Viral infections often lead to bacterial infections. Often the treatment of viral infections with antibiotics will not prevent bacterial infections, but will actually increase the likelihood of their occurrence. Such treatment can lead to infections with resistant bacteria. Inadequate number of good probiotic bacteria in the intestines decreases the immunity, often for a long period. To restore the normal intestinal flora, it is recommended to use live bacterial cultures, e.g. Multilac in the form of capsules.

Multilac

Studies have shown that probiotic bacteria need ca. 4 weeks after completion of antibiotic treatment in order to repopulate the intestines. Complete recovery of the bacterial flora can last up to 6 months! Therefore, it is not worth to weaken the health during antibiotics treatment and wait until friendly probiotic bacteria create in the intestines a protective barrier against various microbes. It is recommended to take probiotic preparations with the start of antibiotic treatment. They contain friendly bacteria of the genus Lactobacillus and Bifidobacterium, which protect the intestines against pathogenic microbes and stimulate the immune system to work. They prevent diarrhoea and decline in immunity in connection with the cure with antibiotics. They should be used even for 5-7 days after ending the antibiotic treatment.

The preparations composed of prebiotics i.e. nutrients for probiotics (e.g. oligofructose) are worth noticing. This is called a synbiotic product and has a particularly beneficial effect, because properly nourished friendly bacteria will be faster in the digestive tract and multiply. Therefore they will more effectively defend the body against bad bacteria and will favourably influence peristalsis, preventing both diarrhoea and constipation.

Figure 5: Multilac, capsules, 10 pc

It is a modern synbiotics containing nine selected strains of living probiotic bacteria. The innovative process of encapsulation provides increased durability and effectiveness of probiotic bacteria. It does not require storage in the refrigerator. Used in intestinal disorders.

Multilac is an innovative formula of synbiotics containing nine strains of living probiotic bacteria. It restores and maintains normal gastrointestinal microflora. Prebiotic ingredient is oligofructose, which is a valuable source of energy for the development of probiotic bacteria, giving them a longer activity in the gastrointestinal tract. Multilac can be also distinguished by an innovative encapsulation technology. It provides greater durability and efficacy of probiotic bacteria.

Due to the encapsulation probiotic bacteria are resistant to moisture and temperature, so that the preparation does not require storage in the refrigerator. One capsule of Multilac contains up to ca. 4.5 billion probiotic bacteria what allows the use of synbiotic only once a day. Due to its properties, Multilac is recommended as an adjunct in the period of increased propensity to infection and during and after antibiotic treatment. It does not contain milk, casein or preservatives, so it can be taken by persons with allergies to the above-mentioned products.

Antibiotics are an effective weapons in the fight against bacterial infections, but are not applicable in case of viruses being resistant to their action. In the course of antibiotic treatment, our own bacterial flora is disrupted what disrupts the organism microbial balance. Therefore, synbiotics should be included in the treatment what will allow for restoring the necessary protection.

References:

1. AS Kalgutkar, HT Nguyen. Identification of an N-methyl-4-phenylpyridinium-like metabolite of the antidiarrheal agent loperamide in human liver microsomes: underlying reason(s) for the lack of neurotoxicity despite the bioactivation event.. „Drug Metab Dispos" Sep 2004; 32 (9): 943-52,.
2. Indeks leków Medycyny Praktycznej 2006. Kraków: Wydawnictwo Medycyna Praktyczna, 2006; 400.

3. Jan Kazimierz Podlewski: Leki współczesnej terapii. Warszawa: Split Trading, wydania z lat 1996–2008.
4. Leksykon Leków, Tadeusz Lesław Chruściel, Kornel Gibiński, PZWL 1991
5. Wojciech Kostowski, Zbigniew S Herman Farmakologia, Podstawy farmakoterapii – PZWL 2007
6. Jachowicz R. (red.): Farmacja praktyczna. PZWL, Warszawa 2010
7. Janiski S., Fiebig A., Sznitowska M. (red): Farmacja stosowana. Podręcznik dla studentów farmacji. PZWL, Warszawa 2006.
8. Kurnatowski W.:Urazy spowodowane zimnem. Wprowadzenie. Twój Magazyn Medyczny- Medycyna Rodzinna, 2003
9. Opieka nad rannym w warunkach pola walki - procedury dla żołnierzy. Podręcznik szkolenia medycznego żołnierza profesjonalnych Sił Zbrojnych RP
10. PHTLS Prehospital Trauma Life Support szóste wydanie, 2006, wydawnictwo Mosby
11. Tactical Combat Casualty Care Guidelines - February 2009
12. Nielubowicz J. Chirurgia tętnic: Zmiany wywołane zimnem. w: Chirurgia kliniczna.
13. Nielubowicz J, Rudowski W. red.. PZWL Warszawa 1967,659-663.
14. Nasiłowski W. Obrażenia termiczne: Obrażenia wywołane zimnem. w: Chirurgia kliniczna. Nielubowicz J, Rudowski W. red.. PZWL Warszawa 1967,273-277.
15. Nasiłowski W. Obrażenia wywołane działaniem zimna. w: Oparzenia i odmrożenia. PZWL Warszawa 1972,40-48.
16. Potocki JL. Oparzenia i odmrożenia. PZWL Warszawa 1990,56-63.
17. Sikorski J. Obrażenia termiczne, elektryczne i chemiczne: Odmrożenia w: Chirurgia dla studentów medycyny – podręcznik. Fibak J. (red.). PZWL Warszawa 1996,711-712.
18. Klukowski M. Uszkodzenia spowodowane zimnem. Warszawski Informator: medycyna, zdrowie i uroda. 2002;3:39–40.
19. Kurnatowski W. Urazy spowodowane chłodem – Wprowadzenie. Twój Magazyn Medyczny –Medycyna Rodzinna 2003.
20. Cauchy E, Chetaille E, Marchand V, Marsigny B: Retrospective study of 70 cases of severe frostbite lesions: a proposed new classification scheme. Wilderness Env. Med. 2001;12(4):248-255.
21. Skvortsov I, Kichemasov SK: Frostbite in modern fighting pathology. Voen. Med. Zh. 2002;323(1):23-27.
22. Kazenbach TL, Dexter W.W.: Protecting your patients from the dangers of hypothermia and frostbite. Postgaduad. Med. 1999;105/1/:72-76.
23. Lehmuskallio E, Lindholm H, Koskenovuo K, oraz inni: Frostbite of the face and ears: Epidomiological study of risk factors in Finnish conscripts. Brit.Med.J. 1995;311(7021): 1661-1663..
24. Nissen E..R., Melchert P.J., Lewis E.J.: A case of bullous frostbite following recreational snowmobiling. Cutis 1999;63(1):21-23.
25. Laskowski-Jones L. Responding to winter emergencies. Nursing 2000;30 (1):34-40.
26. Day MW. Frostbite. Nursing 1998;28(1):33.
27. Rintamaki H. Predisposing factors and prevention of frostbite. Int. J.Circumpolar Health 2000;59(2):114-121.
28. Hassi J, Makinsen TM. Frostbite: occurrence, risk factors and consequences. Int.J. Circumpolar Health 2000;59/2/:92-98.
29. Bhatti MA., Chesney DJ, Ferrier GM. An unusal complication of basic first aid. Injury, 2002;33/6/:544-545.
30. Skolnick AA. Early Date Suggest Clot-Dissolving Drug May help Save Frostbitten limbs from amputation. JAMA 1992;267/15/2008.
31. Finderle Z, Zare J, Cankar F, Ksenija B: Delayed treatment of frostbite injury with hyperbaric oxygen therapy: a case report.Aviat-Space-Environ-Med. 2002;73(4):392-394.
32. Kazimierza Janickiego „Domowy poradnik medyczny" Państwowy Zakład Wydawnictw Lekarskich, Warszawa 1990.

Emergency Medicine

Acute myocardial infarction with ST elevation in emergency medicine practice

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Summary:

Introduction: Myocardial infarction is a state of imminent threat to life. The early institution of treatment and rapid transport to haemodynamic laboratory constitute the most important stages of pre-hospital treatment. *Materials and methods:* The analysis of myocardial infarction cases in the material of the Emergency Ambulance Service in Piaseczno is presented in the paper. *Results:* 94 patients, including 63 men and 31 women, have been qualified to the test group. The average age was 75 years. In 71% cases of myocardial infarction covered the anterior and lateral wall of a heart. *Conclusion:* Men were more often affected with myocardial infarction (67%). Myocardial infarction occurs in the morning. The peak of departures to the patients complaining of chest pain took place between 12 and 2 p.m.

Key words: myocardial infarction, pharmacotherapy, emergency ambulance service, clinical procedure.

Introduction

Myocardial infarction is one of the best known and most dramatic form of ischemic heart disease, characterized by inadequate blood supply to the heart muscle caused by a significant stenosis of the coronary arteries that supply the heart with oxygen and nutrients.

In the world literature myocardial infarction is defined in relation to its clinical, electrocardiographic, pathological and biochemical properties [1,2]. The term *myocardial infarction* may be regarded as a necrosis of a muscle fragment caused by long-lasting stenosis.

The development of the knowledge about the mechanisms of formation of myocardial infarction reaches the early twentieth century, when Obrazcow described the first clinical symptoms of acute myocardial infarction in 1910. Two years later these symptoms were associated by Herrick with the closure of a coronary artery by a thrombus. But it took another 70 years to prove the role of thrombus in formation of myocardial infarction which was done by de Wood in 1980 [3,4].

Thrombus, which is usually initiated by atherosclerotic plaque rupture and release of a substance provoking blood coagulation, is responsible for over 85% infarcts [1,5,6]. In most cases it is impossible to determine why there was a plaque rupture. It is often initiated by great physical exertion, trauma or emotional stress [7]. Other mechanisms of acute myocardial infarction can include: coronary artery spasm or the inflammation, congestion, congenital coronary artery. The clinical picture and prognosis in this disease depend on the localisation of the stenosis, time and the degree of myocardial ischaemia. Myocardial necrosis caused by complete closure of coronary artery occurs when severe ischaemia lasts for 15 to 30 minutes, hence the time from the onset

of first symptoms is so important in the treatment of ischaemic heart disease. Reperfusion and reactivation of collateral circulation may save the fragment of heart muscle endangered with necrosis.

Clinical procedure in every directly life-threatening nosological entity and so myocardial infarction may be illustrated with 'chain of survival' so frequently used in emergency medicine (Fig. 1).

Figure 6: 'The chain of survival' for patients with acute myocardial infarction in pre-hospital care.

The first link influencing the effective treatment of patients with myocardial infarction [8], and thereby reducing mortality in this disease entity, is accurate diagnosis of the symptoms suggestive of myocardial infarction by the patient himself or other people.

Typical symptoms include: chest pain, usually retrosternal, shortness of breath, anxiety, sweating, nausea. Irradiation of pain to the jaw, back, shoulder or upper abdomen is characteristic [9,10]. An important criterion for differentiation in terms myocardial infarction with coronary artery disease is the duration of pain symptoms. During heart attack pain usually lasts more than 20 minutes in contrast to the pain during a stable coronary artery disease. The above-mentioned symptoms are often underestimated by patients which extends the period to undertake specialized treatment of such patients. Sometimes myocardial infarction manifests with no pain, unusually, or with minor ailments. Painless course of the heart attacks occurs in patients with diabetes with reduced pain perception due to diabetic neuropathy. In some cases it manifests in the most dramatic way possible, namely with cardiac arrest and sudden death [11,12]. Therefore, it is important that a patient reaches a specialist centre as quickly as possible. Possible 'routes' of patients to the centre having a possibility to conduct PCI are illustrated on Fig. 2.

After the arrival medical emergency team should in the first place protect the patient's basic vital functions and constantly monitor them [13-15]. Currently, ambulances are equipped with defibrillators with an 12-lead ECG. It is already a standard and therefore allows for creating the cardiac emergency medical system [16-19]. Electrocardiograph in pre-hospital care is an extremely useful device, as basing on ECG results, symptoms and physical examination, myocardial infarction can be identified and the team can decide where to take the patient. The

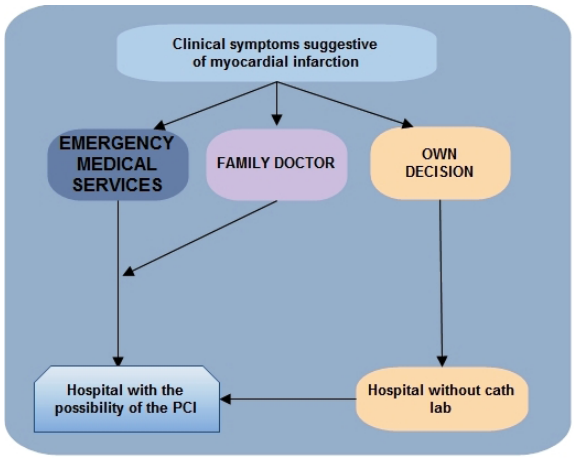

Figure 7: Possible 'routes' of the patient to haemodynamic laboratory .

presence of the defibrillator is extremely important when a cardiac arrest occurs due to myocardial infarction.

Myocardial infarction in progress can be recognized due to the use of ECG already in pre-hospital treatment:

- ST-elevation myocardial infarction i.e. new ST elevation in section J of the cut-off point of ≥ 0.2 mV in leads V1 to V3 from and ≥ 0.1 mV in other leads;
- Non-ST elevation myocardial infarction i.e. with its reduction or anomaly of T wave.

In addition, myocardial infarction, which have already occurred, can be recognized in the presence of any Q wave in V1, V2, or V3, or Q-wave lasting ≥ 0.03 s in one of the leads I, II, aVL, V4, V5 or V6 [17].

Electrocardiogram allows also for the identification of the location of myocardial necrosis and the orientation which coronary artery has undergone critical stenosis. Myocardial infarction of posterior or inferior wall suggests that right coronary artery is narrowed, whereas myocardial infarction of anterior wall suggests that a descending branch of left coronary artery is responsible or necrosis and in case of infarction of lateral wall – its circumflex branch. Extensive infarctions including anterior and lateral wall are common and are caused the closure of common trunk of left coronary artery and due to its extent they are extremely dangerous.

At a time when teleconsultations are available on the order of the day, the doctor or paramedic being next to the patient can make teletransmission of electrocardiogram and connect by phone with the intervention cardiology centre in order to obtain a expert consultation. The goal of teletransmission and consultation is to transport the patient to

a specific hemodynamic laboratory, and thus they motivate the studio team to stand ready and wait for the patient. In addition, a physician analyzing the ECG in haemodynamic laboratory, as he confirms the diagnosis, may order immediate administration (except for drugs included in the schema MONA - discussed later in this article) of heparin in an ambulance at a dose of 5000j. and clopidogrel 300-600mg - which is a drug that reduces the viscosity of blood platelets [20]. The use of such drugs undoubtedly contributes to reduction of damage to the heart and mortality.

European Society of Cardiology has set specific objectives in the guideline for dealing with acute myocardial infarction with persistent ST elevation:

- ECG transmission time should last less than 10 minutes;
- teleconsultation - less than 5 minutes;
- the time of first medical contact until inflating the balloon – less than 120 minutes (for patients with the onset of first symptoms in less than 2 hours and with excessive infarction and low risk of bleeding – less than 90 minutes);
- fibrinolytic therapy should be initiated in less than 30 minutes after first medical contact.

Due to the important factor, which is the time, early diagnosis and precise place risk assessment in patients reporting chest pain are extremely important in the treatment of patients with acute myocardial infarction.

During pre-hospital treatment it is important to alleviate the pain caused by infarction, because pain by activating sympathetic nervous system leads to vascular spasm and thus increases the load on the heart. The following side effects of morphine can be observed: nausea, vomiting, hypotension, respiratory depression and bradycardia. In order to reduce nausea and vomiting antiemetics can be combined with opioid medicines. The depression of respiratory system caused by morphine is usually effectively treated with naloxone, while hypotension and bradycardia - atropine. If the administration of opioid medicines in analgesic therapy is not effective, sometimes the administration of nitrites is helping. It is important to administer oxygen to the patient during pre-hospital assistance, especially in cases when patient reports shortness of breath, or when symptoms of heart failure occur. Pharmacology in myocardial infarction in the pre-hospital procedure is shown in Table 1.

During the transport, patient should be immobilised in a supine position [21]. It is also recommended to continuously monitor ECG and the patient's basic life functions [18,19]. It is important to protect and transport the patient along with any possible previous patient records - if he has any.

Table 5: Pharmacotherapy in myocardial infarction (MONA)

Therapeutic agent	Dosage
Morphine	3-5 mg intravenously, the dose may be repeated every 5 minutes until symptoms have stopped or the dose of 10 mg, under the control of heart rate, blood pressure, respiratory rate and depth of breaths.
Oxygen	4-5 L / min
Nitroglycerin	1 tablet of nitroglycerin 0.5 mg S.L. in a patient without symptoms of hypotension (SABP> 100 mm Hg), the dose may be repeated every 5 minutes under the control of blood pressure and heart rate
Aspirin	300 mg

Procedure with the patient after his arrival to the hospital must be rapid, particularly in relation to the primary diagnosis and administration of fibrinolytics, or, if recommended, the implementation of primary PCI [22-24]. Patients, who were selected for PCI on the basis of teletransmission ECG, should be admitted directly to the hemodynamic laboratory, bypassing the Hospital Emergency Department [16,25,26].

While transferring a patient to a physician, it is essential to note the time of onset of first symptoms, medicines administered during pre-hospital assistance, personal data including the phone number to the guardian of the patient, as well as the actual ECG record [23.27].

Aim of the study

The aim of this study was to analyze patients with acute myocardial infarction with persistent ST-elevation in the Emergency Ambulance Service in Piaseczno from 01.04.2008 to 01.04.2009 with emphasis on the relationship between gender, patient age and time of occurrence of myocardial infarction.

Materials and methods

A retrospective analysis of the exit cards of the Emergency Ambulance Service teams in Piaseczno that during 1.04.2008-1.04.2009 performed 10 406 emergency visits, including 94 cases of the departures to the patients with retrosternal pain diagnosed with acute myocardial infarction with ST-elevation. The study was conducted based on the Personal Data Protection Act, to what due diligence was applied.

The study group was dominated by men (67% - 63 patients) (Fig. 3). The arithmetic mean of the age of analysed group amounted to 75.24 years (Fig. 4).

Data were collected on the basis of the departure cards of Medical Rescue Teams in Piaseczno that protect the entire population of the district Piaseczno (140 thousand people). The studies omitted cases of exacerbation of coronary artery disease, where no ST-elevation was observed.

The following parameters have been analysed: age and sex of patients, time of day and year.

Student's t-test, Wilcoxon rank-sum test, chi-squared test were used in the analysis. All analyses were performed at the significance level $\alpha = 0.05$.

Results

94 patients were diagnosed with acute myocardial infarction (STEMI). It constituted approximately 0.9 % of all interventions in the period considered.

Among all the interventions, with identified sudden myocardial infarction with ST-segment elevation there were 63 men and 31 women. Patients were aged from 34 to 95 years. The average age for men was 59.54 years and 70.09 years for women. The overall mean age of the study group was 63 years.

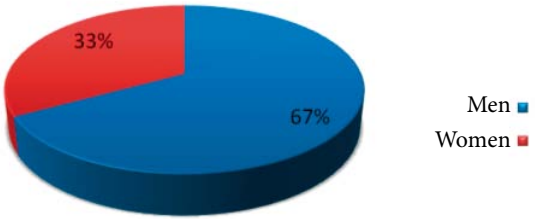

Figure 8: The incidence of myocardial infarction with ST segment elevation according to gender.

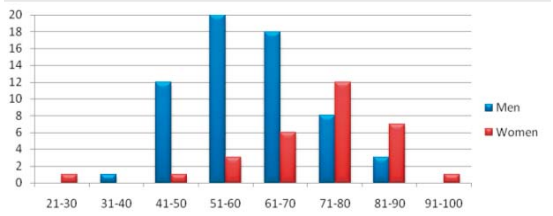

Figure 9: The incidence of myocardial infarction with ST segment elevation according to age group and sex.

In all 94 cases teletransmission of electrocardiogram were made to the interventional cardiology centre in order to obtain expert consultation and enhance diagnosis accuracy.

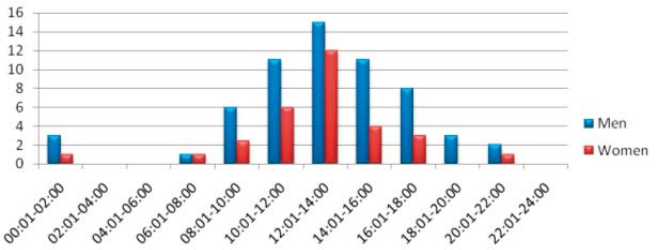

Figure 10: The incidence of myocardial infarction with ST segment elevation according to the hour of intervention and gender

The analysis of exit cards has revealed that in 27 cases, despite the severity of pain in retrosternal area, patients have been delaying to call Medical emergency team.

Acute myocardial infarction with ST-elevation most frequently occurred in the age group of 50-70 years. The higher tendency for STEMI was among males. After the analysis of the cards of patients with acute myocardial infarction with ST-elevation it may be stated that ambulance trips to the patients of this group most often took place between 10 a.m. to 6 p.m. The ultimate number of trips occurred around 1 p.m. Between 2 a.m. to 4 a.m. and 10 p.m. to midnight there were no notifications to patients with retrosternal pain suggesting myocardial infarction (figure 5).

85 patients in the study group (which constituted ca. 90%) were suffering from various chronic diseases, including cardiac failure, coronary artery disease, hypertension, atherosclerosis, deep vein thrombosis, etc. 9 patients, who were diagnosed with STEMI, have not yet been treated for any chronic disease. In 4 cases cardiac arrest occurred during the emergency measures taken as a result of extensive myocardial infarction, 3 patients achieved a return of spontaneous circulation. 93 people were sent directly to the haemodynamic laboratory bypassing the Hospital Emergency Department.

On the basis of ECG and teleconsultation with the haemodynamic centre the location of myocardial infarction was determined (figure 6). The vast

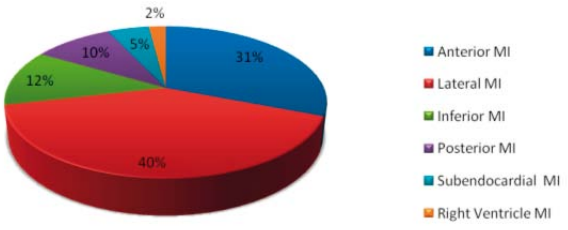

Figure 11: Location of the infarction.

majority of infarcts affected the anterior and lateral wall - 71% in total. The rest of the infarcts affected the inferior and posterior wall, right septum or it was apical infarction.

Discussion

In the current study it was found that medical interventions due to myocardial infarction with ST-elevation constituted 0.9 % of all medical interventions in the period considered. No fewer than 28.7 % of patients calling for medical services delayed call for help. Delay was associated mainly with self-healing, belief that symptoms are not serious and will pass and the lack of knowledge of the benefits of early treatment. Men after 50 predominated in the study groups. Only 10% patients diagnosed with STEMI had not previously complained of chronic diseases, including diseases of the cardiovascular system.

Contrary to popular belief that the myocardial infarction usually occurs in the morning, departures to patients reporting chest pain occurred most frequently in 12-14 hours and concerned both men and women. Physical examination, medical interview and ECG were performed in all patients. Unfortunately, the entire MONA scheme was not implemented, due to contraindications, which included hypotension, poor general condition.

They concerned 4 patient in the discussed group. In one patient the team failed to restore spontaneous circulation, despite the use of cardiopulmonary resuscitation using a defibrillator. Using telecommunication, all patients were transported directly to the haemodynamic laboratory, which significantly shortened the time "door to balloon". Telephone consultation also allowed for quick implementation of fibrinolytic treatment and confidence in the diagnosis posed by the rescue team. The most common infarction among the examined group was a myocardial infarction of the anterior wall.

Conclusion:

A teletransmission of ECG plays a significant role in accelerating the patients' way to haemodynamic laboratory bypassing Hospital Emergency Department.

Electrocardiogram remains an essential tool in the diagnosis and subsequent therapy of myocardial infarction with ST-elevation.

In the diurnal cycle the vast majority of myocardial infarction occurred around the noon.

References:

33. Fox KA, Huber K. A. European perspective on improving acute systems of care in STEMI: we know what to do, but how can we do it? Nat ClinPractCardiovasc Med. 2008; 5: 708-14.
34. Zanini R, Aroldi M, Bonatti S, Buffoli F, Izzo A, Lettieri C, et al. Impact of prehospital diagnosis in the management of ST elevation myocardial infarction in the era of primary percutaneous coronary intervention: reduction of treatment delay and mortality. J CardiovascMed (Hagerstown). 2008; 9: 570-5.
35. Cheng, T. O. James Herrick, sickle cell disease, and the thrombogenic theory of myocardial infarction. J.LabClin.Med. 2002; 140 (2): 126.
36. Muller, J. E. Diagnosis of myocardial infarction: historical notes from the Soviet Union and the United States. Am.J.Cardiol. 1977; 40 (2): 269-71.
37. Rajabali NA, Tsuyuki RT, Sookram S, Simpson SH, Welsh RC. Evaluating the views of paramedics, cardiologists, emergency department physicians and nurses on advanced prehospital management of acute ST elevation myocardial infarction. Can J Cardiol. 2009; 25: e323-8.
38. Singh S, Bahl VK. Prehospital thrombolysis: a reappraisal. Indian Heart J. 2004; 56: 93-8.
39. Tubaro M, Sonia Petronio A. ST-segment elevation myocardial infarction management in Europe. J Cardiovasc Med (Hagerstown) 2009; 10 (Suppl 1): S3-6.
40. Bright H, Pocock J. Prehospital recognition of acute myocardial infarction. CJEM. 2002; 4: 212-4.
41. Spinler SA. ST-segment-elevation myocardial infarction: guidelines and the challenge of real-world patient care. Pharmacotherapy. 2006; 26: 115S-22S.
42. Welsh RC, Chang W, Goldstein P, Adgey J, Granger CB, Verheugt FW, et al., ASSENT-3 PLUS Investigators. Time to treatment and the impact of a physician on prehospital management of acute ST elevation myocardial infarction: insights from the ASSENT-3 PLUS trial. Heart. 2005; 91: 1400-6.
43. Strauss M, Gitt AK, Becker T, Kleemann T, Schiele R, Darius H, et al., MITRA Plus Study Group. Prehospital cardiac arrest: a marker for higher mortality in patients with acute myocardial infarction and moderately reduced left ventricular function: results from the MITRA plus registry. Clin Res Cardiol. 2008; 97: 748-52.
44. Wilson BH, Severance HW Jr, Raney MP, Pressley JC, McKinnis RA, Hindman MC, et al. Out-of-hospital management of cardiac arrest by basic emergency medical technicians. Am J Cardiol. 1984; 53: 68-70.
45. Crampton R. Prehospital advanced cardiac life support; evaluation of a decade of experience. Top Emerg Med. 1980; 1: 27-36.
46. Dadkhah S, Fisch C. Prehospital diagnostics used to reduce time to treatment in patients with acute coronary syndromes. Md Med. 2001; Suppl: 104-5.

47. Every NR, Weaver WD. Prehospital treatment of myocardial infarction. CurrProblCardiol. 1995; 20: 1-50.
48. Ferguson JD, Brady WJ, Perron AD, Kielar ND, Benner JP, Currance SB, et al. The prehospital 12-lead electrocardiogram: impact on management of the out-of-hospital acute coronary syndrome patient. Am J Emerg Med. 2003; 21: 136-42.
49. Myers RB. Prehospital management of acute myocardial infarction: Electrocardiogram acquisition and interpretation, and thrombolysis by prehospital care providers. Can J Cardiol. 1998; 14: 1231-40.
50. Patel RJ, Vilke GM, Chan TC. The prehospital electrocardiogram. J Emerg Med. 2001; 21: 35-9.
51. Racht EM. Prehospital 12-lead ECG. An evolving standard of care in EMS systems. Emerg Med Serv. 2001; 30: 105-7.
52. Vaisanen O, Makijarvi M, Silfvast T. Prehospital thrombolysis perfomed by a ship's nurse with on-line physician consultation. Resuscitation. 2005; 64: 233-6.
53. Swor R, Anderson W, Jackson R, Wilson A. Effects of EMS transportation on time to diagnosis and treatment of acute myocardial infarction in the emergency department. Prehosp Disaster Med. 1994; 9: 160-4.
54. Edmond JJ, Juergens CP, French JK. The pharmaco-invasive approach to STEMI: when should fibrinolytic-treated patients go to the 'cath lab'? Postgrad Med J. 2009; 85: 331-34.
55. Mehler PS,Sabel A, Trantanella A, Krantz MJ. Variation in prehospital and discharge quality of care among acute myocardial infarction patients at a safety net hospital. CritPathwCardiol. 2009; 8: 127-30.
56. Pels K,Schröder J, Witzenbichler B, Müller D, Morguet A, Pauschinger M, et al. Prehospital versus periproceduralabciximab in ST-elevation myocardial infarction treated by percutaneous coronary intervention. Eur J Emerg Med. 2008; 15: 324-29.
57. Brown JP, Mahmud E, Dunford JV, Ben-Jehuda O. Effect of prehospital 12-lead electrocardiogram on activation of the cardiac catheterization laboratory and door-to-balloon time in ST-segment elevation acute myocardial infarction. Am J Cardiol. 2008; 101: 158-61.
58. Campbell PT, Patterson J, Cromer D, Wall K, Adams GL, Albano A, et al. Prehospital triage of acute myocardial infarction: wireless transmission of electrocardiograms to the on-call cardiologist via a handheld computer. J Electrocardiol. 2005; 38: 300-9.
59. Goldberg RJ,Kramer DG, Yarzebski J, Lessard D, Gore JM.Prehospital transport of patients with acute myocardial infarction: a community-wide perspective. Heart Lung. 2008; 37: 66-74.

History of Medicine

Personal and collective protective equipment used in chemical rescue operations in the years 1945-2000. PART II

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Summary:

The paper describes the process of rescue system formation in Poland in 1999 and details its main tasks. Moreover, the description of the equipment and measures for protection against contamination due to the effects of mass destruction weapons was presented, as well as the contamination detection equipment. A number of measures for deactivation, decontamination and disinfection methods, installations designed to eliminate contamination and one of the variants of its development have been discussed as well.

Key words: structure of chemical rescue system, protective measures against contamination, types of protective clothing.

The effects of chemical warfare during the years 1914-1918 and the number of incidents on a mass scale associated with accidents in the developing chemical industry and rail transport, as well an increase in the possibilities of transferring chemical weapons by neighboring countries, gave rise to the structures of chemical first aid rescue in Poland.

The origins of chemical first aid rescue in Poland go back to the 1930's. On the basis of the Decree by the Ministry of Social Welfare and also Social Insurance agencies – headquarters were set up, next to the Polish Red Cross, with organizational structures responsible for the preparation and readiness-for-action in the field of emergency, arising from 'gas exposure'. Permanent and mobile first aid/sanitary rescue points were established. These resulting organizational structures of rescue of a non-military nature, worked closely with the Military Anti-Gas Warfare Institute (Pol: Wojskowy Instytut Przeciwgazowy). In the post-WW 2 period, as a result of its statutory and first-aid obligations, inter alia, of a chemical nature, it was taken over by the Civil Defense organization (Pol: Obrona Cywilna). Meanwhile, in the industrial companies, where there existed a high risk rate of toxic poisonings/accidents, full-time and out-sourced chemical first-aid teams were used, among others, on the premises of the Nitrogen Works in Puławy (Pol: Zaklady Azotowe w Puławach), Płock Petrochemistry (Pol: Petrochemia –Płock), Nitrogen Plants in Tarnów (Pol: Zakłady Azotowe w Puławach) and the Chemical Plant in Brzeg (Pol: Zakłady Chemiczne w Brzegu).

On the basis of the Ordinance of the Council of Ministers dated 29 January 1937r., concerning peacetime preparations for anti-aircraft and anti-gas defense of Poland, the Minister of Social Welfare, on 27 January 1939, issued its Instruction No.1/5-9, concerning the organization of emergency first-aid in self-defense for anti-aircraft and anti-gas attack, at all levels, i.e., from the citizens' to the central authorities'.

The Polish Red Cross was named responsible for the implementation of this Instruction, which defined the necessary equipment to carry out

the elimination of contamination, including gas masks, individual packages of anti-mustard gas defense and necessary medical supplies. Scientific studies from those years pointed to the responsibility of the employers in their workplaces in the case of chemical caustic burns and poisoning.

Civilizational development, which accelerated in the 20th century, caused an evolution in industry, including chemical-related issues. This sector has become today one of the most developed industries, characterized by a huge diversity of production (including cosmetics, cleaning products, rubber footwear, paints, varnish, medicines, fertilizers, other agricultural protective chemicals, construction materials, tires, etc.)

Chemical products of all sorts are used so widely, that they are increasingly posing new threats to life and human health, property and the natural environment.

This catalogue of risks has had an influence on the increase in the number and size of disasters and accidents related to the production, transport, storage and use of chemical agents. Therefore, a need arose to organize structures, set up for the elimination of the consequences of such accidents, training people (rescue workers) and equipping them in specialized equipment, thus allowing these rescuers to perform necessary rescue operations.

Chemical first-aid rescue organizations (on the basis of the Decree of the Minister of Internal Affairs and Administration dated 29 December 1999 concerning the detailed rules for the organization of a national system of first aid-gas related rescue), includes the formation of planning and organizational teams and the implementation of techniques aimed at the rescue of life and preservation of health, due to direct threats caused by toxic industrial discharge or other threats of a chemical-related nature. As a result, a legally-based chemical rescue system has been put in place, as earlier this field was based solely on specialized rescue units in chemical industry plants and individual pieces of dedicated equipment in the PSP (State Fire Department units.)

The organization for chemical rescue includes, in particular, the following:

- dentifying risks, assessing and forecasting their development and the effects on human beings and the environment;
- the analysis of occurred accidents and chemical disasters;
- the saving of human life and animals at risk from harm caused by hazardous substances;
- the identification of chemical substances posing a threat during the resulting event;
- forecasting the spread of environmental contamination and evaluation of the extent of risk and any change to its size being of the danger to the public;

- the adaptation of equipment and techniques for rescue operations to the place of an event and the nature of the substances posing a threat;
- the pumping away and displacement of dangerous substances to new or replacement tanks;
- the barricading, or sealing-off of the escape of any dangerous substances;

- stopping the emission of toxic industrial pollutants;
- the setting up of water curtains;
- the neutralization of hazardous chemical substances;

- the application of sorbents for the absorption of dangerous substances;
- proper protective damning of threatened aquatic areas due to spills of toxic hydrophobic substances;
- the collection of substances dangerous to the surface of the water or soil.

These activities are carried out in a particular manner , understood as - chemical rescue operations – defined as a combination of steps taken in order to save lives and health of human beings and the environment during elimination of direct threats posed by toxic industrial emissions or other dangerous chemical materials.

The threat to individual countries, whole regions and, in special circumstances , of total global systems, has occurred due to the uncontrolled proliferation of weapons of mass destruction and their means of delivery. Important proposals to international organizations and individual states has arisen in particular due to the aftermath of events in the USA since September 2001, and due to the Iraqi conflict, as well as other contemporary international crises. Still, in some countries, works are continuing in the development of the potential of weapons of mass destruction and missile programs systems that will make the territory of Poland vulnerable in the coming years, placing it within range of ballistic missiles from outside Europe. This risk increases due to the real possibility of terrorist organizations and criminals coming into possession of such weapons and their means of delivery. Also, the danger still remains associated with the effects of accidents and catastrophes in chemical and nuclear facilities.

The primary task of a defense system is countering threats, including primarily defending territory against any aggression and ensuring the integrity of its borders, the protection of State bodies and public institutions and ensuring their continuous operation, along with the protection of the public and ensuring its survival in conditions of crisis or conflict. In time of peace, of primary importance is the possession of adequate forces and resources necessary to carry out specific tasks and to ensure the safety and the provision of civil authorities' assistance, mainly in the situation of non-military threats (such as natural disasters and disaster relief).

The nature of the new threats to international order and natural disasters occurring in Poland, including extraordinary threats to the environment caused by the forces of nature and civilizational development covering natural disasters (floods, drought, high winds) and technical failures (failures of nuclear power plants, chemical plants, etc., as well as disasters occurring in the transport of these materials), place before the needs of chemical rescue teams the means of ensuring the possibility of an effective response for these types of threats.

In order to prevent the effects of natural disasters or their elimination, there might be the necessity of utilizing the skills of separate specialized forces and resources of the Polish Army, placing them at the disposal of local government administrations.

To deal with the effects of threats, the armed forces of the Republic of Poland must necessarily have a well organized, chemical rescue subsystem that will safeguard the legal and organizational structures of the Ministry of National Defense. Using trained and available human resource potential, organizational and technical abilities, a chemical rescue sub-unit within the Armed Forces of the Republic of Poland can, within the framework of cooperation with the structures of a non-military crisis response, support the activities of a national first-aid rescue system.

All this makes for the current system of chemical emergency planning being in a state of ongoing modifications and updating (see annexes 1 and 2). Improvements to equipment, guaranteeing getting the job done and the security of its rescue workers, is an ongoing matter.

Thus, modern first-aid chemical rescue operations are conducted within the system by:

- specialized chemical first aid rescue units within the State Fire Department structures;
- fire protection units integrated into the system in terms of their technical and equipment capabilities, with particular attention made to personal protection equipment;

- a dedicated force and other entities within the scope of the decision to include in the system or in accordance with civil law or contractual arrangement, a system of ongoing cooperation with units such as the Chemical Rescue Squad in Tarnów, a dedicated force of the military, police and Civil Defense.

Each of these institutions, carving out such specialized units must take into account its equipment and technical capabilities, their level of training and time to reach full operational readiness.

Immediately after the end World War II, research focused on the pesticide family. After the war, no country has used its own arsenal of classic chemical warfare weapons. However, phytotoxic (herbicides) were used. The Americans used them to destroy the heart of vegetation in the jungles during the Vietnam War. Combat chemical substances, mainly sulfur mustard gas, were used by developing countries, mostly by Iraq. In the 1980s, the problem of the chemicalization of biological weapons came into the spotlight, in which substances such as poisons (ex. botulism) and other toxins were applied to chemical weapons. This has led to a glaring change in the poisonous characteristics of this weaponry: from micrograms for pesticide family inclusions, to nanograms of toxins.

A completely new threat was developing in nuclear technology, whose effect was the emergence of mines and plant enrichment of nuclear fuel used in the construction of nuclear weapons and power generation. Any use of these above mentioned weapons, or potential accidents in nuclear power plants, has caused a need for the reassessment in the requirements for equipment used in first-aid chemical rescue operations. A new group of equipment emerged, dosimetric equipment, whose task is to detect radioactive contamination.

The main focus for its use will be to carry out measurements derived from radioactive contamination from nuclear weapons. Also, the equipment and measures to eliminate contamination, and the assurance of maintaining individual and collective protection, requires constant modification to existing designs and new technical solutions.

Principles of radiometry and roentgen radiometry have been implemented to control the degree of radioactive contamination. Beta-gamma radiometry serves to measure the degree of radioactive contamination of people, equipment, stocks of materials, animals, food and water. Ionometric counters are used in radiometry, which are located in the probe. Past electronic systems based on transistors, running on batteries, have allowed for compact design and construction. Errors in measuring, however, were up to 30% depending on sub-range measurements. On the adjacent (Figure 1), please see a radiometer model DP-11B, one of many used in the past.

Figure 1: A DP-11B Radiometer.

Figure 2: Checking for radioactive contamination with a roentgen radiometer Model DP-75 unit.

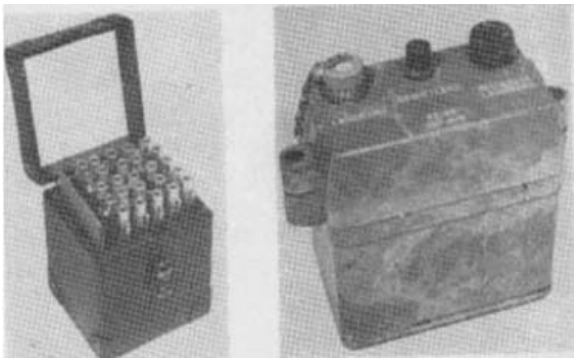

Figure 3: A KD -65 unit and charger no. PZ-65

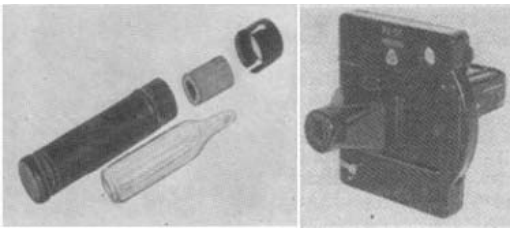

Figure 4: Field-type Colorimeter model CP-56 and chemical dosimeter DP-70.

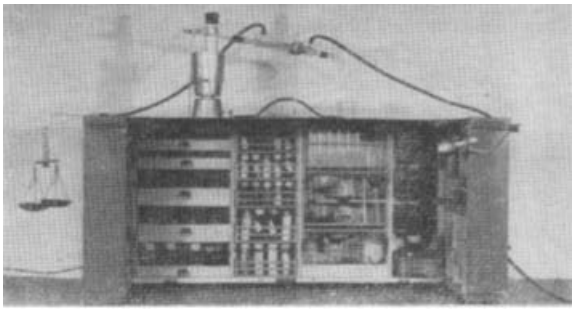

Figure 5: Chemical field laboratory type PChL-54.

In the 1980s, a roentgen radiometer was developed, Type DP-75, which had better measuring parameters, gauging and incorporating more modern design solutions (measuring range of 0.05 to 200 R/h).

This unit is still used by the military and civil defense units as a device and as an instrument of general application in each sub-unit. In order to obtain accurate data received by emergency workers, soldiers and the population, dosimeters are used for individual irradiation measurements.

Records were kept in formal books documenting radiation levels, with a maximum admissible dose considered to be 50 R.

Two types of dosimeters were used: A chamber ionization type dosimeter DS-50, without the possibility of direct readings, in a set with a DP-23 p type dosimeter and a DKP-50 type with direct reading, in a set with a KD-65 type dosimeter and chemical dosimeters, type DP-70. A DKP-50 unit in a KD-65 container and charger type PZ 65.

These instruments have the following measuring ranges:

- 50-800 roentgen units (R) chemical dosimeters
- 0-50, dosimeters with direct reading DKP is 50.

To read chemical dosimeters, field type PK-56 colorimeters are used (Fig. 3). Readings consisted of determining the change in the color of ampoules

containing silver compounds, contained in a metal container. This type of dosimeter was hardware for a single use.

Dosimetric equipment from this period was characterized by a large uncertainty in measurements (up to 30%) and a limited period of use (DP-70, up to 48 months).

In the 1960s, vehicles and shelters began to be equipped in on-board roentgenometers

Types (DP-3B, DP-5, the DPS-68) with a measuring range from 0.1 to 500 R/hr. Equipment at the time did not assure accuracy of background radiation measurement in case of contamination resulting from accidents in nuclear power facilities. This was equipment that ensured the measurement of contamination resulting from the use of nuclear weapons.

For the detection of chemical warfare substances, diagnostic chemical instruments and field laboratories were used. Special indicative reactive test papers were used, along with sentinel tubes and chemical reagents.

For the detection of industrial toxic substances (TŚP) sentinel tubes were used, for which the diameter of the tubes and indicators were different, therefore, it was not possible to use the military type PCHR-54 equipment for these applications (to detect TŚP). Thus, for chemical first aid rescue, special instrumentation was used as produced by the Fabryka Sprzętu Ratunkowego i Lamp Górniczych FASER plant in Tarnowskie Góry. Unlike the military, manual and semi-automatic collector type pumps were used (type PCHR-54 and PPCHR)

Field chemical laboratories (type PCHL-54) equipped with reagents, solvents, decontaminants, indicative reactive test papers, sentinel tubes, manual pumps and laboratory glassware allowed for leading field analysis of toxic chemicals from the pesticidal and burning (caustic) groups. Lack of presentation of the reagents required a large effort by the laboratory specialist in conducting his field analysis. Some reagents used to have a short shelf-life (6 months). One must note here, however, that each unit at the regiment level had such a unit.

This served the needs for many assignments, such as defining any toxic chemicals in the air or at the surface of the terrain, on the equipment and associated hardware, in the water, soil, food for the determination of the presence of active chlorine in disinfectors and other qualitative and quantitative analysis. In the 1960s, 1970s and the

Figure 6: 18 An armored toxic measurement vehicle type-BRDM-2rs5.

1980s, diagnostic type armored scout vehicles were introduced into service. These included the Gaz-69, Fug, BRDM-1rs and BRDM-2rs and the UAZ-469Brs. Specialized vehicles for civil defense on a ŻUK chassis were also developed. Equipment mounted on the above mentioned vehicles was predominantly of Soviet production (DP-3B, DP-5, GSP-1 and 11, GSA-12, meteorological sets). As for that time, this equipment served the needs and requirements adequately to the threats. The equipment was envisioned to take part in a possible war when weapons of mass destruction would have possibly been used. This

Figure 7: Individual IPP antichemical contamination pack

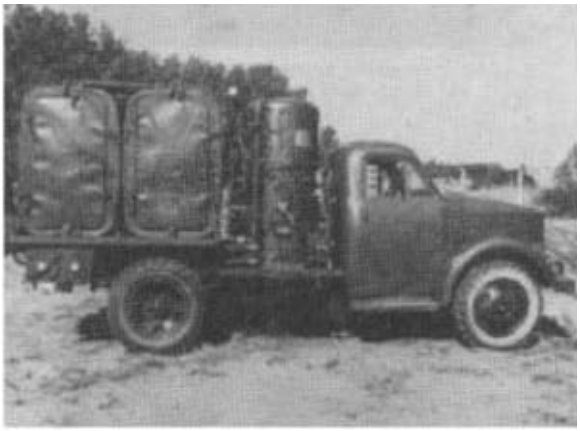

Figure 8: DDA type disinfectant-bathing decontamination set-up unit

Figure 9: 21 Heating unit type UG 65/66/72.

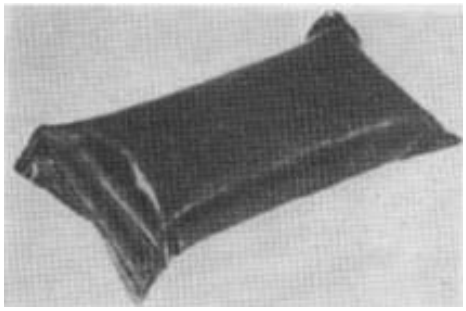

Figure 10: A PChW-013decontamination pack.

equipment did not have the capability of detecting contamination of a biological and/or toxic industrial-generated nature.

In view of the growing threat of the use of weapons of mass destruction in an armed conflict during the second half of the 20th century in Poland, the military and civil defense units were equipped with ways and means to eliminate contamination, which could have been used for chemical first-aid rescue purposes.

Sanitary health treatment was viewed as being of a partial or total nature. Combat related contamination of a chemical or biological nature used anti-chemical packets (IPP). The pack consisted of a pouch, two dishes (small and large) with disinfectant solutions (sodium creslate in a solution of borax, monochloramine in di-chloroethane), four dosages of amyl nitrite) and tissues.

Accordingly, each soldier received this pack allowing him to decontaminate his body, uniform and equipment, with a surface area of approximately 1 m^2. In addition, absorptive packages of silica gel PS-075 were included.

Total health/sanitary treatment was carried out using a disinfectant-bathing set-up, type DDA , and heating equipment type UG-65, 66, and 72 with a range of field-bathing features and tents type NS-62. There was a recommendation of the use of this bath. Stationary special bathing facilities were also used. Average capacity for de-contamination of this sort was 95 people per hour. Typically, the field-bathing activities were usually

Spread out into two linear configurations, thus increasing the capacity by a factor of 2. (See the schematic in annex 3).
At the station, decontamination also occurred, including the disinfection and deactivation of soldiers' contaminated weaponry.

Special treatment for equipment/hardware was also divided into partial and total. In order to carry out partial treatment of equipment, a series of special packets of disinfectants (PChW-013, PChW-012, PChW-04 and deactivation (SFM-006), were used. Calcium hypochlorite was used as a disinfectant, which required the preparation of an aqueous solution. To conduct special

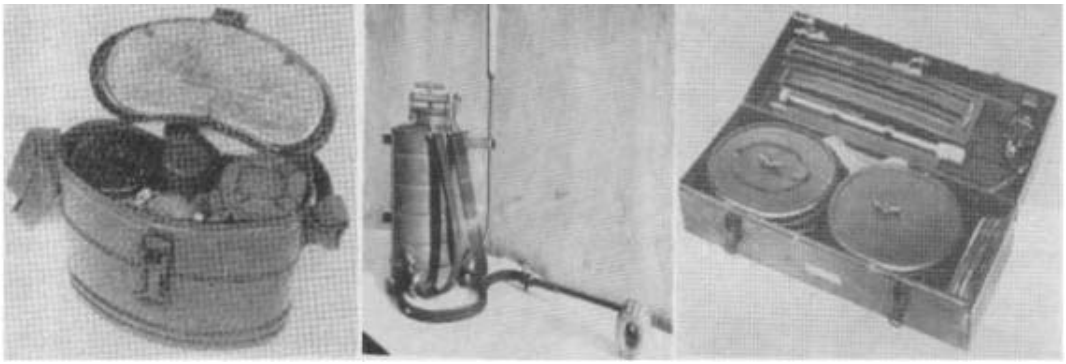

Figure 11: 23 A Heavy machine gun/mortar decontamination pack. Back pack type decontamination unit and an individual vehicle stored pac.k

Figure 12: A KD -65 unit and charger no. PZ-65

Figure 13: A KD -65 unit and charger no. PZ-65

treatment autonomously, each piece of equipment was fitted with a simple, handy decontamination packet. Some of them were developed in Poland (IZS, E-266, EZS, EZCz). Imported equipment had other sets available (for example, the DK-4, for heavy machine gun/mortar units and artillery pieces). To decontaminate, disinfectants were used and solvents. These solvents included dichloroethane, gasoline, kerosene, alcohol and diesel oil.

As decontaminates, sodium hydroxide, ammonium hydroxide, caustic soda, mono-chloramines, chlorinated lime, basic calcium hypochlorite, sulfuryl chloride and dichloroethane were used. For deactivation, water and solvents were used (dichloroethane, gasoline, diesel oil) and surface activated substances (including sulfanol, gardionol SF substances, OP-7, OP-10). For disinfection purposes, besides the above, also formaldehyde, phenol and cresol were used.

The decontamination of uniforms, shoes and equipment, by individual means of protection against contamination was accomplished by the boiling of a solution of sodium carbonate or by way of a vapor-ammonia solution and vapor-ammonia solution-air method. Disinfection was carried out by an installation to disinfect uniforms of types BU-2 and 4 and AGW-3u and installations of the disinfectant-bathing systems utilizing ammonia generators. Effective decontamination of uniforms and products from leather was doubtful at best, as the decontaminants degraded the quality of the decontaminated products. For example, the decontamination procedure for woolen articles, as an example, using the vapor-ammonia solution method, lasted from 1 to 4 hours.

The means of decontamination and disinfection of sites was per the following:

1) The chemical method - based on a chemical reaction that occurs between stable toxic substances and a decontaminate, destroying pathogens by using decontaminates or disinfectants.

2) The mechanical method – in which a contaminated or infected layer of soil or snow is removed, or by isolating the layers.

In this past period, decontaminates were used in their powder form and in aqueous solutions. Thus, specialized chemical warfare military units received specialized installations while the civil defense units had planned to use various fertilizer distributing equipment with decontaminates loaded into the hoppers of the vehicles (the military moved away from this arrangement back in the 1960s).

In this period, Poland greatly enhanced its ability in the field of elimination of contamination. Equipment and methods were put into service that were locally produced. The direction was to eliminate the results of contamination by weapons of mass destruction and its risk in the 'cold war' period.

Equipment and the methods used by specialized chemical warfare units can be used in broader chemical rescue and first-aid situations, and the elimination of disaster from the TŚP, as demonstrated by the use of specialized military units after a rail accident where chlorine was released.

References:

1. J. Ligocki (red.) Konwencja o Zakazie Broni Chemicznej a polski przemysł chemiczny, IPO; Warszawa 1996.
2. Konwencja o Zakazie Prowadzenia Badań, Produkcji, Składowania i Użycia Broni Chemicznej oraz o Zniszczeniu Jej Zapasów, Haga 1997.
3. US Congressional Report „Issues Involving Destruction Technologies" – GAO/T-NSIAD-94-159, Waszyngton 1997.
4. Regulamin obrony przeciwgazowej, Ministerstwo Spraw Wojskowych: Warszawa 1934.
5. Niezbędne wiadomości z O.P. GAZ., Referat spraw O.P.L.G. Ministerstwa Komunikacji, Warszawa 1934.
6. Vademecum obrony przeciwlotniczej i przeciwgazowej ludności cywilnej ze szczególnym uwzględnieniem zasad ratownictwa przeciwgazowego – wyd. II Zakład Ubezpieczeń Społecznych, Warszawa 1936.
7. Broń chemiczna faszystowskich Niemiec – Dowództwo Wojsk Chemicznych Armii Czerwonej, Moskwa 1942.
8. Z. Jaśtak Skażenia promieniotwórcze, chemiczne i biologiczne – wyd. II Wydawnictwo Ministerstwa Obrony Narodowej, Warszawa 1969.
9. Bezpieczeństwo i ergonomia pracy tom 2 – Centralny Instytut Ochrony Pracy Warszawa 1997.
10. R. Jaworski, J. Kamola - Ochrona wojsk przed skażeniami – Przegląd Wojsk Lądowych nr 7/2001, Warszawa.
11. I. Nowak, R. Jaworski – Sprzęt i środki obrony przeciwchemicznej na przełomie wieków – Przegląd Wojsk Lądowych nr 6/2002, Warszawa.
12. R. Jaworski, H. Praski – Badania laboratoryjne sprzętu i środków OPBMR – Przegląd Wojsk Lądowych nr 6/2004, Warszawa.
13. S. Lipiński (red.) Skuteczne ratownictwo – fachowy poradnik dla służb ratowniczych - tom III, Warszawa 2006.
14. Zasady postępowania ratowniczego – poradnik dla ratowników na potrzeby pierwszej fazy akcji ratowniczej podczas zdarzeń z materiałami niebezpiecznymi, Główny Inspektorat Ochrony Środowiska, Warszawa 2004

VIth Nationwide Scientific and Training Conference : „Military Medicine and Pharmacy"

Krzysztof Barczewski, WOFiTM Celestynów, Poland

At the initiative of Military Centre of Pharmacy and Medical Technique, as well Polish Pharmaceutical Association, at assistance of Regional Board of Directors of Polish Government Forests In Osieck surrounded by Masovian Landscape Park. on 14-16th September 2011 VIth Nationwide Scientific and Training Conference titled "Military Pharmacy and Medicine Forum" has been held.

The main conference organizers were Military Centre of Pharmacy and Medical Technique and Polish Pharmaceutical Association. The neigbourhood of forest inspectorate gave the specific settings for the subsequent days of conference.

Leitmotif of conference was: „Salus Aegrafi Suprema Lex" (Patient's health is the most valuable basset).

Conference opening ceremony has been done by Commander of Military Centre of Pharmacy and Medical Technique (MCPh&MT)płk, drr .med., Radosław Ziemba. In the opening remarks he mentioned, that current worldwide crisis does not allow to finance science and higher education to the level, which can be satisfied for teaching personel, especially scientists, medicine doctors and pharmacists. Without effective, constant development of science, modern state can not exists.

Leading subjects of the conference have been connected with:

- multiple organ injuries and organization of network of Injury Centres Network In Poland ;
- crisis management and bioterrorism ;
- relations with industry (medical, and pharmaceutical),
- selective methods to increase pharmacotherapeutic effectiveness in specific forms of medicines;
- progress in vaccines manufacturing worldwide as well new trends in utilization TSP i Nśch.

Płk Ziemba welcomed heartly distinguished guests; especially: representative of Army General Headquarter - gen. dyw. Zbigniew Galc, representative of Heath Sernice Inspectorate of Polish Army - płk Tadeusz Nierebiński, dr Kryspina

Figure 14: Conference opening ceremony

Czerny- Szeredyńską (granddaughter of MCPh&MT patron), Chief of Health Service of Polish Airforce płk. Marian Szymański, gen. bryg. rez. Andrzej Trybusz - former Chief of Directorate of Military Heath Services, Chancellor of Military Technical Academy WAT gen. dyw. rez. Jan Klejszmit, płk. rez. Prof. MD Krzysztof Klukowski.

On the list of guests of honour there have been also:

- prof. dr hab. n. farm. Zbigniew Fijałek – Director of National Drug Institute, Master of Pharmacy,
- Grzegorz Cessak – Chairman of The Office for Registration of Medicinal Products, Medical Devices and Biocidal Products,
- prof. dr hab. n. med. Jan Talar – Dean of Heath Care Faculty, Elbląg's of Arts and Economic Subjects College,
- prof. dr hab. n med. Zbigniew Baj – Dean of Military Medical Faculty of Medical University In Łódź,
- gen. bryg. dr inż. Tomasz Bąk - - Director of Center for Studiem on Terrorism WSIiZ in Rzeszów,
- dr n. farm. Grzegorz Kucharewicz - Chairman of General Pharmacists Council, Master of pharmacy; Elżbieta Piotrowska -- Rutkowska – Chairman of Regional Pharmacists Council in Lodz; Master of Pharmacy,

- Alina Fornal – Chairman of Regional Pharmacists Council In Warsaw,
- prof. dr hab.n.farm.JanPłachetek - V-ce President of General Board of Polish Pharmaceutical Association In Warsaw;
- mgr inż. Wojciech Fonder – Director of Regional Directorate of Polish Government Forests in Warsaw,
- mgr inż. Artur Dawidziuk – Forest Inspector In Celestynów Forests Inspectorate,

- kmdr mgr farm. Bożena Szubińska – Chairman of Council for Women Radyin SZRP,
- płk dr n. med. .dr n. farm. Wiesław Piechota – Country Consultant for Defence (pharmacy affairs),

- prof. dr hab. n. med. Jerzy Nowak-Chairman of Pharmacology Departament Medical Universrity In Lodz,
- prof. dr hab. n. farm. Marian Mikołaj Zgoda - Chairman of Applied Pharmacy Medical University in Lodz,

- mgr inż. Krzysztof Pawlak – Direktor of Warsaw Herbal Faktory,
- dr hab. inż. Marcin Struszczyk – V-ce Director of Technology and Safety Institute „Moratex" w Łodzi,

- lawyer. Oskar Luty – Polish Bar,
- lic. Jerzy Gzik – Manager for Crisis and Safety Departament of the City Hall Lodz.

During opening cremony participants honored with one minute silence memory of soldiers killed in military missions in different parts of the Word.

Figure 15: From the left: płk dr n.med Radosław Ziemba, gen. brig. res. dr n. med. Zbigniew Teter, gen. dyw. rez. Jan Klejszmit, prof. dr hab. n. med. Krzysztof Klukowski, gen. bryg. dr n. med. Andrzej Trybusz, prof. dr hab. n. med. Józef Kocur, gen. div. Zbigniew Galec.

Three days program covered wide range of medical and pharmaceutical subjects presented in six profiled session as well jubilee session of Regional Directorate of Polish Government Forests.

Session I: Relationship with pharmaceutical and medical industry – tenders, sales contacts, acceptable forms of cooperation.

Figure 16: Presentation of military medical equipment done by mjr lek. med. Robert Matusik.

Session II: Use of modern medical equipment In emergency care and therapy.

Session III: Technology of medicines forms.

Session IV: Terrorism threat and crisis management.

Session V: Addictive habit-forming drugs: chemistry, pharmacology, clinics.

Session VI: Progress In technique and technology of manufacturing medical articles and therapeutics.

Jubilee session: ***Jubilee of 90th Anniversary of Regional Directorate of Polish Government Forests In Warsaw (1920-2010) in International Year of Forests 2011***.

In addition to high quality and professional lectures, participants had an opportunity to visit exhibition of modern military medical equipment.

VI Nationwide Scientific and Training Conference has been closed at 16.09.2011. After closure remarks of conference the ceremony of certificates presentation to the participants has been held.

Figure 17: The conference room: Conference participants during a series of lectures.

Medals of Polish Pharmaceutical Association have been awarded to:

- prof. dr hab. n. farm. Marian Mikołaj Zgoda;
- płk dr n. med. Radosław Ziemba;
- dr n. farm. Jan Hołyński;
- mjr mgr farm. Dariusz Ludian.

In recognition of Commander of MCPh&MT płk dr n. med. Radosław Ziemba achievements, he has been awarded medal of 90th Aniversary of Polish Goverment Forests.

VI Nationwide Scientific and Training Conference gave the opportunity to the participants to acquaint with wide spectrum of subjects of matters regarding modern pharmacy and medicine.. Allowed participants to enlarge their knowledge, as well pointed the directions for further research. It can be summarized with paraphrase of citation of prof. Zygmunt Bauman, sociologist of postmodernism exposed on European Culture Congress In Wroclaw. – "….culture is a knife applied to the future"., but in pharmaceutical version "…pharmacy is a knife applied to human health capabilities". On the next year eventually organized conference will celebrate 210 th Anniversary of birth of Szymon Fabian – honorary member of Warsaw Pharmaceutical Association.