THE IMMUNE STATUS OF THE MILITARY (BIOMEDICAL AND ADMINISTRATIVE ASPECTS)

Kazan Federal University1, No. 1 Branch of the FGBU "n5 CMCH of A. A. Vishnevsky" 2
Izhevsk state medical academy3,
Institute of improvement of doctors of Ministry of Health CH R 4
Kazan medical University5

Received on 14-07-2016 Accepted on 11-08-2016

Abstract

Introduction. The soldiers - a special category of employed persons who are subject to strict professional selection, planning and screened systematically sent to the preventive treatment and get prompt medical attention. On the other hand, the military experience significant physical and emotional stress, are exposed to a complex environment factors maximal expression - extreme weather conditions, high chemical load, background radiation, etc.

Materials and methods. We analyzed the results of the analysis of peripheral blood from 72 healthy male military personnel aged 36 ± 2.7 years. Determined the total number of erythrocytes, hemoglobin, platelet count, leukocyte terms leukocyte formula, erythrocyte sedimentation rate, as well as parameters characterizing the immune status of: the number of lymphocytes, of which - T lymphocytes, CD4 + - T-lymphocyte helper cells, CD8 + - T suppressor lymphocytes, immunoregulatory index is calculated; B-lymphocytes, serum immunoglobulins A, G, M; the number of circulating immune complexes; picked phagocytic activity of neutrophils.

Results of the study. In this paper, we highlighted features of peripheral blood and immune status of persons in the military. Noting the views expressed voltage active humoral immunity, which allows you to assign the survey group 2 step changes in the immune classification R.V. Petrov status.

Discussion. Investigation of the features of tension links of immunity in different occupational groups, in particular military personnel, will improve the existing professional selection criteria to optimize the preclinical diagnosis of diseases, improve the efficiency of primary prevention hygiene.

Key words: soldiers, immunological status, deficiency in cellular and phagocytic immunity, primary prevention.

Introduction: An integrated effect of production environment factors on the workers results in changes in the homeostatic parameters [15, 17, 20, 22, 25, 30]. The impact of factors causes the development of secondary
immunodeficiency states [1, 2, 4, 8, 10, 13, 14]. The study of immune parameters in the various environmental, occupational conditions holds promise [16, 18, 19, 21, 28, 29]. Early identification of the investigated disorders ensures their hygienic prevention [3, 5, 6, 7, 11]. Analysis of immunological polymorphism, frequency and distribution of immunopathological conditions allow us to determine the immunological background of the working population in order to create a unified database of records for effective immunological monitoring, targeted prevention and medical care [9, 12, 23, 24, 26, 27].

**Objective** of this research is to determine the features of the immunological status in military servicemen.

**Methods**

We analyzed the copied results of peripheral blood evaluation and immunological study of 22 healthy male contract soldiers. The average age of the test objects was 36±2.7 years.

The examination scheme included the determination of the total number of red blood cells, hemoglobin, erythrocyte sedimentation rate, platelets, white blood cells, and leukocyte counts, as well as indicators characterizing the immune status: cellular link - lymphocytes, T-lymphocytes, specific subpopulations of lymphocytes - CD4+ - T-helper cells, CD8+ - T-suppressors, immunoregulatory index; humoral link - B-lymphocytes, serum concentrations of immunoglobulins A, G, M; active immunity link - the number of circulating immune complexes; and phagocytic link - phagocytic activity of neutrophils.

**Results**

Analysis of hematologic status revealed no deviations from the standard reference values - the average values of hemoglobin (148.3 ± 5.9 g/l), erythrocytes (4.6 ± 0.1, 10^{12}/l), erythrocyte sedimentation rate (6.3 ± 1.4 mm/h) were within the normal range. There was only significant (P=0.004) reduction in the number of monocytes (3.8 ± 0.6% as compared to 3-11% of reference values).

Analysis of soldiers’ immunograms revealed a significantly (P=0.003) lower relative content of band neutrophils (0.8 ± 0.1% as comp. 1-6%), against the normal total number of white blood cells, which corresponds to a reference range (6.0 ± 0.3, 10^{9}/l). There is a slight increase in lymphocytes (39.4 ± 3.4% as compared to the average normal 19-37%), a increased proportion of T-lymphocytes (63.4 ± 1.9% as compared to 60.6 ± 1.5%) and a reduced share of B-lymphocytes (13.7 ± 1.3% as compared to 16.6 ± 1.7%). While the individual subpopulations of T-lymphocytes differ from the normal: T-helper cells are significantly (P = 0.008) reduced (36.6 ± 2.1% as compared to 47.0 ± 2.8%), T-suppressor are otherwise increased (25.5 ± 2.1% against 13.5 ± 1.0%, P=0.0003). The immunoregulatory index is
significantly (P=0.04) reduced (1.4 ± 0.2 as compared with 3.0 ± 0.7). Humoral immunity of the test objects - elevated concentration of serum immunoglobulins A, M, G (2.6 ± 0.3 g/l as compared to 1.85 ± 0.054 g/l; 2.3 ± 0.6 g/l as compared to 1.13 ± 0.042 g/l; 12.6 ± 1.3 g/l as compared to 11.8 ± 0.24 g/l, respectively). Significant excess was determined only in IgA (P=0.03).

The individual assessment of immunoglobulins revealed deviation from the normal range in Ig G equal to 4.8%, in Ig A - 9.5%, and in Ig M- 19.1%.

Active immunity - the circulating immune complexes in this group of examined was significantly higher than the reference range (5.5 ± 0.88 g/l as compared to 0.1-4 g/l, P=0.003). The phagocytic activity of neutrophils was decreased (44.4 ± 6.7% as compared to 55.0 ± 2.0%).

Table 1. Peripheral blood and immune status indicators in military servicemen.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Group (22 persons)</th>
<th>Reference values</th>
<th>Significance level (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>М±m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hemoglobin, g/l</td>
<td>148.3±5.9</td>
<td>137.5±10.0</td>
<td>0.55</td>
</tr>
<tr>
<td>Red blood cells, 10¹²/l</td>
<td>4.6±0.1</td>
<td>4.6±0.5</td>
<td>0.99</td>
</tr>
<tr>
<td>ESR, mm/h</td>
<td>6.3±1.4</td>
<td>8.0±0.8</td>
<td>0.41</td>
</tr>
<tr>
<td>White blood cells, 10⁹/l</td>
<td>6.0±0.3</td>
<td>6.4±0.6</td>
<td>0.85</td>
</tr>
<tr>
<td>Band neutrophils (%)</td>
<td>0.8±0.1</td>
<td>3.5±0.4</td>
<td>0.00003</td>
</tr>
<tr>
<td>Segmented neutrophils (%)</td>
<td>55.2±3.8</td>
<td>59.5±6.0</td>
<td>0.85</td>
</tr>
<tr>
<td>Eosinophils (%)</td>
<td>2.3±0.3</td>
<td>2.8±0.3</td>
<td>0.53</td>
</tr>
<tr>
<td>Basophils (%)</td>
<td>0</td>
<td>0.5±0.05</td>
<td>-</td>
</tr>
<tr>
<td>Lymphocytes (%)</td>
<td>39.4±3.4</td>
<td>33.7±1.8</td>
<td>0.19</td>
</tr>
<tr>
<td>Monocyes (%)</td>
<td>3.8±0.6</td>
<td>7.1±0.6</td>
<td>0.004</td>
</tr>
<tr>
<td>CD3⁺, % (T-lymphocytes)</td>
<td>63.4±1.9</td>
<td>60.6±1.5</td>
<td>0.37</td>
</tr>
<tr>
<td>CD4⁺, % (Th)</td>
<td>36.3±2.1</td>
<td>47.0±2.8</td>
<td>0.008</td>
</tr>
<tr>
<td>CD8⁺, % (Ts)</td>
<td>25.5±2.1</td>
<td>13.5±1.0</td>
<td>0.0003</td>
</tr>
<tr>
<td>IRI (Th/Ts)</td>
<td>1.4±0.2</td>
<td>3.0±0.7</td>
<td>0.04</td>
</tr>
<tr>
<td>B-lymphocytes</td>
<td>13.7±1.3</td>
<td>16.6±1.7</td>
<td>0.24</td>
</tr>
<tr>
<td>NPA, %</td>
<td>44.4±6.7</td>
<td>55.0±2.0</td>
<td>0.19</td>
</tr>
</tbody>
</table>
Summary

1. Professional activities of military servicemen is characterized by physical and emotional stress, maximal expression of a complex of production environment factors - extreme weather conditions, high chemical load, radiation, noise, vibration, electromagnetic radiation.

2. Stress was revealed in humoral immunity of the test objects - elevated concentration of serum immunoglobulins A, M, G (2.6 ± 0.3 g/l as compared to 1.85 ± 0.054 g/l; 2.3 ± 0.6 g/l as compared to 1.13 ± 0.042 g/l; 12.6 ± 1.3 g/l as compared to 11.8 ± 0.24 g/l, respectively).

3. The individual assessment of immunoglobulins revealed significant deviation from the normal range in Ig G equal to 4.8%, in Ig A - 9.5%, and in Ig M - 19.1%.

4. Analysis of active immunity revealed that the circulating immune complexes in this group of examined was significantly higher than the reference range (5.5 ± 0.88 g/l as compared to 0.1-4 g/l, P=0.003). The phagocytic activity of neutrophils was decreased (44.4 ± 6.7% as compared to 55.0 ± 2.0%).

5. We revealed a deficit of cellular and phagocytic immunity, and stress state of active and humoral immunity in military servicemen. According to the classification by R.V. Petrov, the examined group of persons can be assigned with stage 2 changes of the immune status.

Conclusion

This study presents the collected data on the evaluation indicators of the immune status of military servicemen. We analyzed the results of peripheral blood of 72 healthy military servicemen aged 36 ± 2.7 years. We determined the total number of red blood cells, hemoglobin, erythrocyte sedimentation rate, platelets, white blood cells, and leukocyte counts, as well as indicators characterizing the immune status: cellular link - lymphocytes, t-lymphocytes, specific subpopulations of lymphocytes - cd4+ - t-helper cells, cd8+ - t-suppressors, immunoregulatory index; humoral link - b-lymphocytes, serum concentrations of immunoglobulins a, g, m; active immunity link - the number of circulating immune complexes; and determined the phagocytic activity of neutrophils.

The conducted analysis showed a deficit of cellular and phagocytic immunity, and stress state of active and humoral immunity in military servicemen. According to the classification by R.V. Petrov, the examined group of persons can be
assigned with stage 2 changes of the immune status, which has yet no clinical signs. Changes in immune status to stage 3-4 increase the risk of clinical signs in the form of infectious, allergic, autoimmune, and other syndromes. The conducted analysis of the immunological resistance of the military servicemen allows us to classify this group of servicemen as “group at risk”, and recommend the repeated immunological examination, individual consultations and correction of immunosuppressive states.

Investigation of the stress features of the immune components in different occupational groups, in particular, military personnel, will ensure improvement of the existing professional selection criteria, optimization of the preclinical diagnosis of diseases, and improvement of the efficiency of primary prevention.

Acknowledgements

The team of authors expresses its gratitude to the Kazan Federal University for the opportunity to conduct this study.

References


**Corresponding Author:**

Z.T.Kugaev*1,