Altered cytokine expression of peripheral blood lymphocytes in polymyositis and dermatomyositis

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Magdolna Aleksza and Andrea Szegedi participated equally in this work, therefore they are both considered as first authors of this article.
Abstract

Objective To investigate the intracellular and soluble cytokine levels and T cell subsets in peripheral blood of patients with active and inactive polymyositis (PM) and dermatomyositis (DM).

Methods The frequencies of T and B lymphocytes, Thelper and T cytotoxic cells and the frequency of IFN-γ, IL-4 and IL-10 expression of CD4+ or CD8+ cells were determined by flow cytometry. We measured the concentrations of soluble cytokines with commercial ELISAs.

Results In active DM we observed decreased percentage of T (CD3+) and T cytotoxic (CD8+) lymphocytes, decreased IFN-γ expression of CD4+ and CD8+ cells, but an increased B and IL-4 producing CD4+ lymphocyte frequencies. These prominent changes disappeared in the inactive stage of the disease. In PM we could not detect a significant change in these lymphocyte subsets and in the intracellular cytokine expression either in the active or in the inactive form. We calculated the frequency of IL-4+/IFN-γ+ Thelper cells and found in active DM a significantly increased Th2/Th1 frequency, while in inactive DM a significantly decreased Th2/Th1 frequency was observed, compared to the control population.

Conclusion We can state that a difference between PM and DM seems to exist in the level of peripheral blood lymphocytes and their intracellular cytokine content. We suppose that our findings provide further evidence for the difference in the pathogenesis of PM and DM.

Keywords: polymyositis, dermatomyositis, cytokine, lymphocyte subsets, peripheral blood
Introduction

Polymyositis (PM) and dermatomyositis (DM) are idiopathic inflammatory myopathies of unknown origin, although immunological mechanisms may be involved in their pathogenesis (1,2). Some data suggest that these two diseases may be pathogenetically similar (3-7), other reports provide evidence that the origin of the two diseases is essentially different.

In PM T cell mediated cytotoxicity rather than humoral immunity may be the main effector mechanism, since immunohistochemical studies on muscle biopsies have shown that the majority of T cells in the endomysium surrounding and invading single myofibres are CD8+ T cells (8, 9, 1). Cytotoxic granules of CD8+ T cells release perforin and serine esterases, which contribute to muscle cell death. Oligoclonal expansions of CD8+ T cells were found in the blood and within muscle biopsies in PM, but not in DM (10-12). On the other hand in DM humorally mediated damage to muscle blood vessels seems to be more important in the pathogenesis. Inflammatory infiltrates mainly consist of activated B cells and are concentrated in the interstitial and perivascular areas (13, 14). Deposition of the membrane attack complex of complement is frequently seen in the muscle vessels in DM, and the vessel injury appears to be complement mediated (15). The pattern of perifascicular atrophy of muscle fibers is characteristic and attributes to ischemic effects.

Cytokines have important functions in inflammatory processes, and are likely to participate in the pathogenesis of idiopathic inflammatory myopathies. The role of cytokines in these diseases is however, poorly understood. Studies of serum levels of cytokines have revealed elevated levels of serum IL-1 receptor antagonist in patients with active PM and DM, but serum levels of tumor necrosis factor-α and IL-1β were low (16). Immunohistochemical investigations of cytokines showed that in muscle tissue cytokine expression is dominated by IL-1α, IL-1β, and TGFβ1-3 (17). Local release of T cell-derived cytokines was not remarkable in inflammatory myopathies. To detect the cytokine secretion of peripheral blood mononuclear cells ELIspot assay was used previously in one study, but no data are available in the literature on intracellular cytokine production measured by flow cytometry in PM and DM (9).

To gain better insight into the pathogenesis of these myopathies we investigated cytokine levels in the sera of patients with PM and DM and we also used flow cytometric assay to detect the peripheral blood lymphocyte subsets and the intracellular cytokines produced in these cells. Our further aim was to investigate the proportion of Thelper 1
(CD4+/IFN-γ+), Thelper 2 (CD4+/IL-4+), Tcytotoxic 1 (CD8+/IFN-γ+), and Tcytotoxic 2 (CD8+/IL-4+) lymphocytes in PM and in DM. Patients both in the active and in the inactive state of the disease were tested.

**Patients, Materials and Methods**

**Patients and controls**

Individuals enrolled in this study were patients suffering from polymyositis (PM, 37 women, 13 men, age: 45.9±13.7 years, min-max: 20-69) or dermatomyositis (DM, 33 women, 16 men, age: 46.9±13.5 years, min-max: 13-73) followed up in our outpatient department. Their diagnosis was defined on the basis of the international criteria of Boham and Peter (18) and the disease activity assessment was based on the clinical symptoms, muscle strength and laboratory parameters (serum creatinine kinase (CK) and lactate dehydrogenase (LDH) activity, Table 1). The number of active PM (aPM) patients was 13 (8 women, 5 men, age: 43.1±14.1 years), while 37 PM patients were in the inactive stage (iPM) of the disease (29 women, 8 men, age: 46.9±13.6 years) at the initiation of the study. The number of active and inactive DM (aDM; iDM) patients was 29 (18 women, 11 men, age: 46.5±13.5 years) and 20 (15 women, 5 men, age: 47.4±13.6 years), respectively. The healthy controls were members of the clinical staff (24 women, 8 men, age: 30.9±9.1 years, min-max: 20-56 years). Informed consent was obtained from each control and patient.

**Phenotypic characterization of whole blood lymphocytes**

Heparinized whole blood was incubated in the presence of saturating concentrations of directly labelled monoclonal antibodies (mAb) for 30 minutes at room temperature in the dark. The erythrocytes were lysed and the samples were fixed according to the Coulter QPREP (Coulter, Hialeah, FL) protocol. The applied monoclonal antibodies were FITC-labelled anti-CD3 mAb, FITC-labelled CD8 mAb (Sigma, St. Louis, MO), PE-labelled anti-CD4 mAb, PerCP-labelled anti-CD19 mAb, FITC-labelled anti-CD3/PE-labeled anti-HLA-DR mAb (Immunotech, Nyon, CH), and CyChrome-labelled anti-CD69 mAb (Pharmingen, BD Biosciences, San Jose, CA). The samples were measured by a Coulter EPICS XL flow cytometer (Coulter, Hialeah, FL) and analyzed by the System II. 3.0 software. Lymphocytes were gated on their forward and side scatter properties and the rate of B, Thelper, Tcytotoxic, resting and activated T cells was determined within the defined lymphocyte gate based on their antigen positivity.

**Measurement of intracellular cytokine expression of Thelper and Tcytotoxic lymphocytes in whole blood**


As resting lymphocytes do not contain substantial amount of cytokines we stimulated T cells in whole blood by phorbole myristate acetate (PMA, 25 ng/ml, Sigma) and ionomycin (1 μg/ml, Sigma) for 4 hours at 37°C. Activation was done in the presence of Brefeldin-A (SIGMA, 10 μg/ml) which inhibits intracellular transport so cytokines produced during the activation will be retained inside the cells. After the stimulation of the Thelper and T cytotoxic cells samples were marked by quantumred-labelled anti-CD4 or anti-CD8 (Sigma) mAb for 30 min., at room temperature, in the dark. Then FACS Lysing Solution (Becton Dickinson, BD Biosiences, San Jose, CA) was used for 10 min. in order to lyse the erythrocytes and to fix the whole blood leukocytes. After a washing step the plasma membrane of the cells was permeabilized by the FACS Permeabilizing Solution (Becton Dickinson) for another 10 min. The fixed and permeabilized leukocytes were labelled by anti-IFN-γ-FITC and anti-IL-4-PE (Becton Dickinson) or anti-IL-10-PE (Caltag, Burlingame, CA) mAb for 30 min. at room temperature in darkness. The samples were measured by a Coulter EPICS XL flow cytometer. Data of about 5,000 Thelper or T cytotoxic lymphocytes were collected in each sample. These cells were gated based on their side scatter/forward scatter and CD4 or CD8 positivity. The rate of IFN-γ, IL-4 and IL-10 positive cells was determined among the CD4+ and CD8+ T cells.

Measurement of autoantibodies

Anti-ENA and anti-Jo-1 (Hycor) antibodies were detected by ELISA kits. We detected ANF antibodies in HEp-2 cells by an indirect immunofluorescence technique.

Measurement of serum cytokine concentrations by ELISA

We measured the levels of circulating cytokines (IFN-γ, IL-4 and IL-10) in serum of patients and controls. Serum samples were collected on every experimental day and were stored at -80°C until testing with commercial cytokine ELISAs (OptEIA™ system, Pharmingen) according to the manufacturers’ instructions.

Statistical analysis

The differences between the healthy controls and the PM/DM patients were calculated by the Student’s unpaired t-test, correlation between parameters was assessed by the Pearson regression using the Statistica for Windows software. Significant difference was defined as P<0.05.

Results

Distribution of lymphocyte subpopulations in whole blood of patients suffering from active or inactive dermatomyositis or polymyositis
We observed remarkable differences concerning the lymphocyte phenotypization only in the case of DM. Patients in the active state of this disorder (aDM) showed significantly decreased percentage of CD3+ (P<0.01) and CD8+ (P<0.01) cells, and a significantly increased percentage of CD19+ cells (P<0.01) compared to healthy controls and also compared to the inactive state of DM. (Table 2).

Beside the regular lymphocyte subtypes we also determined the percentage of activated T cells in our samples based on the HLA-DR or CD69 expression of CD3-positive T cells. Independent of the activity of the disorders we observed significantly elevated frequencies only in the CD3+/HLA-DR+ cells both in DM and PM compared to the controls (Control vs active DM P<0.01; vs inactive DM P<0.01; vs active PM P<0.01; vs inactive PM, P<0.01; Table 2 and Table 3).

**Intracellular cytokine expression in peripheral lymphocytes of patients with dermatomyositis**

The frequencies of IFN-γ+ Th1 cells was significantly lower (P<0.01) in active DM than in the controls or in DM patients with inactive disease (aDM: 10.56 ± 7.1 %, iDM: 22.66 ± 10.01, control: 22.06 ± 10.01 %). Furthermore the frequency of IFN-γ+ Tc1 lymphocytes was also significantly decreased in active DM compared to the controls (aDM: 24.44 ± 16.52 % vs 43.4 ± 8.45%, P<0.01) (Figure 1/A).

The percentage of IL-4+ Th2 cells was remarkably increased in active DM and decreased in inactive DM compared to the controls (aDM: 1.01 ± 0.66 %, iDM: 0.33 ± 0.3 %, control: 0.62 ± 0.54 %) and the difference between the values of the active and inactive states was significant (P=0.05) (Figure 1/B.). In CD8+ cells we could not detect any measurable change in the intracellular IL-4 expression.

The frequencies of IL-10 containing CD4+ and CD8+ T cells were higher both in active and inactive DM, but these differences were significant only in the case of inactive DM (CD4+/IL-10+: control: 2.8±4.1%, inactive DM: 6.5±5.6% P=0.04; CD8+/IL-10+: control: 3.7±4.3%, inactive DM: 8.8±6.7%, P=0.01).

The calculated Th/Th2 frequencies was significantly lower in aDM, and significantly higher in iDM than in the controls (Figure 2).

**Intracellular cytokine expression in peripheral lymphocytes of patients with polymyositis**

The frequency of IFN-γ and IL-4 positive Thelper and Tcytotoxic cells did not differ significantly compared to the healthy controls (Figure 1/A and 1/B). Though the percentage of IL-10 positive Th and Tc lymphocytes – independent of disease activity – were higher in the patients than in the controls, these differences were not significant (data are not shown).
Levels of soluble cytokines in serum of dermatomyositis and polymyositis patients

Besides the intracellular levels of cytokines we determined the cytokine patterns in the sera of PM/DM patients using commercially available ELISA systems. Probably due to the high individual variations and the low cytokine levels hardly any significant differences could be observed between patients and controls.

In the case of DM and PM – independent of disease activity - the concentrations of IFN-γ, IL-4 and IL-10 were non-significantly elevated compared to the controls (data are not shown).

Discussion

This study was performed to gain further insight into the pathogenesis of idiopathic inflammatory myopathies. The most important finding in our work was the pronounced difference in the frequency of the peripheral blood lymphocyte subsets and also in the intracellular cytokine content of these cells between patients with active and inactive PM/DM.

In active DM we could detect not only a significantly decreased CD3+ and CD8+ T lymphocyte frequency, but also a significantly increased CD19+ B lymphocyte frequency. The percentage of activated T cells (CD3+/HLADR+) was significantly increased in both DM and PM, but in active PM no other alterations in the frequency of peripheral blood lymphocytes was detected. In the inactive state of DM the above mentioned deviations in the lymphocyte subsets disappeared and the frequencies of the CD3+, CD8+ and CD19+ cells became normal, whereas the frequency of the activated T lymphocytes was permanently high. In inactive PM the number of the activated T cells also remained increased without any other alterations compared to the control population. Iannone et al. also studied the peripheral blood mononuclear cell subsets in patients with PM and DM and in agreement with our findings they detected a normal percentage of total CD3+ CD8+ cells in PM, in contrast to DM patients who showed a significantly lower percentage of total CD3+ CD8+ subset than controls (19). They also found that the number of activated T cells was significantly increased in both PM and DM, although for the detection of activated T cells they used the CD3+CD25+ double positive staining, while we utilized the CD3+HLADR+ double positive staining. Concerning the frequency of B lymphocytes our results also show good correlation with data in the literature. In adults with idiopathic inflammatory myopathies, elevation in the proportion of B cells in patients with DM has been reported and increased frequency of B cells was also detected in new onset, untreated patients with juvenile DM (20, 21). Eisenstein and colleagues observed that the increased percentage of peripheral blood B cells normalized
in children with improving juvenile DM, and this change correlated with change in disease activity (22).

The intracellular cytokine content of the peripheral blood lymphocytes also showed striking differences between patients with DM and PM. In active DM an altered Th1 and Tc1 lymphocyte frequency was observed as the percentage of IFN-γ containing CD4+ and CD8+ T lymphocytes was significantly decreased compared to the control population. This prominent change disappeared in the inactive state of the disease. On the other hand in active DM a remarkable increase in the frequency of CD4+/IL-4+ cells was observed, but in inactive DM these changes disappeared and we detected a decrease in the IL-4+/CD4+ cell number compared to the controls. The frequency of IL-4 producing cytotoxic T lymphocytes did not show difference between patients and controls.

Studies of lupus-prone mice and humans indicate that immune abnormalities may be more closely associated with changes in the frequency of type2: type1 cytokine secreting cells, than with changes in the absolute number of cells producing any single cytokine (23). For this reason we calculated the frequency of IL-4/IFN-γ secreting cells and while in active DM a significantly increased Th2/Th1 frequency was detected, in inactive DM a significantly decreased Th2/Th1 frequency was measured compared to the control population. Such alterations were not detected in PM.

We also studied the number of IL-10 producing T helper and T cytotoxic cells. In DM and in PM we observed an increase in the percentage of IL-10 secreting cells, although this was significant only in inactive DM. The reason for this contradiction between the number of IL-4 and IL-10 producing T cells may be due to the fact that IL-10 is not a pure type-2 cytokine. IL-10 is produced by both Th1 and Th2 lymphocytes and is an important immune-regulatory cytokine. IL-10 has the ability to downregulate several major functions of Th1 cells and macrophages and can control also the Th2 mediated inflammatory processes. We detected higher levels of IL-10 secreting T cells in DM than in PM, but the difference was not so remarkable between the two diseases as was observed in the number of IL-4+ or IFN-γ+ cells.

Lundberg and colleagues performed indirect immunohistochemistry studies of muscle tissue sections with a panel of 16 different cytokine-specific monoclonal antibodies in 15 untreated patients with PM, DM and inclusion body myositis (IBM) (17). They concluded that the cytokine expression in muscle tissue of patients with inflammatory myopathy is dominated by IL-1α, IL-1β and TGFβ-1-3. INF-γ staining was detected in 6 of 15 patients,
IL-10 was observed in 5 patients, but IL-4 was absent in all patients and they assumed that local release of T cell derived cytokines may not be a requirement for tissue injury in the inflammatory myopathies. There did not appear to be a qualitative difference in cytokine expression patterns in PM, DM and IBM. Their results are not in contradiction with our findings, since in autoimmune diseases the cytokine content of lymphocytes is not necessarily the same in the peripheral blood and in the affected tissues. It is usually accepted that thyroid autoimmunity is an autoimmune disease mediated by Th1 cells, but recent results show a major difference in the balance of Th1 and Th2 cytokines secreted by cultures of thyroid and peripheral blood lymphocytes (24).

To study the cytokine content of the peripheral blood mononuclear cells Hagiwara and colleagues utilized the ELIspot technique and demonstrated in DM that active patients had significantly fewer peripheral blood mononuclear cells spontaneously secreting IFN-γ than did normal controls (9). Moreover they showed that subjects with active DM had fewer cells secreting IFN-γ than did patients with inactive disease. Their results are consistent with our findings in the case of DM as they also detected an altered type1 cytokine pattern. They did not investigate the number of IL-4 containing cells but detected the frequency IL-6 producing cells. They showed a modest, but statistically significant increase in the number of cells secreting IL-6 in patients with DM. They also found an altered type2/type1 cytokine frequency in DM, similar to our results, but they counted this frequency from the IL-10/IFN-γ rate. Instead of IL-10 we used IL-4 in our calculation, since type1 T cells also produce IL-10. In the case of PM our results are in contrast to the findings of Hagiwara and colleagues, since they found that the number of cells producing IFN-γ was decreased also in PM, and patients with PM exhibited an increased IL-10 (type 2) and decreased IFN-γ (type 1) production. On the other hand, they also found differences between the cytokine production of the peripheral blood mononuclear cells of patients with DM and PM. They observed that DM can be distinguished from the other myopathies, by the significantly reduced frequency of IL-2 (type 1) and the increased frequency of IL-6 (type 2) producing peripheral blood mononuclear cells when compared to other myopathies and normal controls. The reason of the partial discrepancy between their and our results may be because we used different methods for cytokine determinations.

Serum levels of cytokines did not show significant difference between DM, PM and controls and did not correlate with results of the intracellular cytokine staining. It is not surprising, as serum cytokine levels cannot be used to determine the number of cells secreting
type 1 or type 2 cytokines in vivo due to their short serum half life, rapid uptake, utilization, presence of blocking factors in the serum and other source of production (25-27).

Kikuchi and colleagues showed that the percentage of activated B cells (RP105) in the peripheral blood of patients with PM was low, in contrast patients with DM showed increased RP105 negative B cell populations (5). They concluded that in DM B cell activation might be pathogenetically different from that in PM and we think that this B cell activation may be the result of the increased Th2: Th1 frequency observed in our study.

Acknowledgements: This work was supported by the National Scientific Research Program of the Welfare Ministry of Hungary (OTKA T037430 and OTKA T030336)
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<th>ADM (n=29)</th>
<th>iDM (n=20)</th>
<th>P values</th>
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<tbody>
<tr>
<td><strong>Age (mean+SD) (min-max) (years)</strong></td>
<td>46.5 ± 13.5 13-70</td>
<td>47.4 ± 13.6 24-73</td>
<td>n.s.</td>
</tr>
<tr>
<td>Male/female</td>
<td>11/18</td>
<td>5/15</td>
<td></td>
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<tr>
<td><strong>CK (U/l)</strong></td>
<td>1371 ± 2254</td>
<td>74 ± 35</td>
<td>P=0.01</td>
</tr>
<tr>
<td><strong>LDH (U/l)</strong></td>
<td>764 ± 527</td>
<td>362 ± 84</td>
<td>P&lt;0.01</td>
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<tr>
<td>Anti-ENA positivity</td>
<td>4/29</td>
<td>2/20</td>
<td>n.s.</td>
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<tr>
<td>Anti-Jo-1 positivity</td>
<td>1/29</td>
<td>0/20</td>
<td>n.s.</td>
</tr>
<tr>
<td>ANF HEp-2 positivity</td>
<td>4/29</td>
<td>9/20</td>
<td>n.s.</td>
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<tr>
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<th>APM (n=13)</th>
<th>iPM (n=37)</th>
<th>P values</th>
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<tbody>
<tr>
<td><strong>Age (mean+SD) (min-max) (years)</strong></td>
<td>43.1 ± 14.1 20-69</td>
<td>46.9 ± 13.6 18-69</td>
<td>n.s.</td>
</tr>
<tr>
<td>Male/female</td>
<td>5/8</td>
<td>8/29</td>
<td></td>
</tr>
<tr>
<td><strong>CK</strong></td>
<td>1000 ± 1873</td>
<td>169 ± 235</td>
<td>P=0.01</td>
</tr>
<tr>
<td><strong>LDH</strong></td>
<td>1028 ± 1430</td>
<td>394 ± 143</td>
<td>P=0.01</td>
</tr>
<tr>
<td>Anti-ENA positivity</td>
<td>5/13</td>
<td>4/37</td>
<td>P=0.03</td>
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<tr>
<td>Anti-Jo-1 positivity</td>
<td>4/13</td>
<td>2/37</td>
<td>P=0.01</td>
</tr>
<tr>
<td>ANF HEp-2 positivity</td>
<td>3/13</td>
<td>4/37</td>
<td>n.s.</td>
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</table>

Table 1.

Autoantibody positivities in active and inactive polymyositis (aPM and iPM) and dermatomyositis (aDM and iDM).
Patients with aDM (n=29) | Patients with iDM (n=20) | Controls (n=32) | P values | ADM vs control | iDM vs control | aDM vs iDM |
<table>
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<tbody>
<tr>
<td>CD3+ cells (%)</td>
<td>64.8 ± 11.4</td>
<td>71.8 ± 7.1</td>
<td>70.3 ± 7.2</td>
<td><strong>P&lt;0.01</strong></td>
<td>n.s.</td>
<td><strong>P&lt;0.05</strong></td>
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<tr>
<td>CD4+ cells (%)</td>
<td>48.3 ± 10.1</td>
<td>49.2 ± 10.9</td>
<td>45.2 ± 7.6</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
</tr>
<tr>
<td>CD8+ cells (%)</td>
<td>15.1 ± 7.1</td>
<td>20.9 ± 9.3</td>
<td>19.6 ± 5.9</td>
<td><strong>P&lt;0.01</strong></td>
<td>n.s.</td>
<td><strong>P&lt;0.05</strong></td>
</tr>
<tr>
<td>CD19+ cells (%)</td>
<td>16.8 ± 10.7</td>
<td>11.1 ± 4.3</td>
<td>11.7 ± 4.1</td>
<td><strong>P&lt;0.01</strong></td>
<td>n.s.</td>
<td><strong>P&lt;0.05</strong></td>
</tr>
<tr>
<td>CD3+ and HLADR+ cells (%)</td>
<td>6.4 ± 4.1</td>
<td>7.4 ± 5.7</td>
<td>3.0 ± 2.3</td>
<td><strong>P&lt;0.01</strong></td>
<td><strong>P&lt;0.01</strong></td>
<td>n.s.</td>
</tr>
<tr>
<td>CD3+ and CD69+ cells (%)</td>
<td>1.4 ± 0.9</td>
<td>1.3 ± 0.7</td>
<td>1.0 ± 0.8</td>
<td>n.s.</td>
<td>n.s.</td>
<td>n.s.</td>
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</table>

Table 2.

T cell subpopulations and activated T cells of peripheral blood (mean ± SD) in controls and in patients with active (aDM) and inactive dermatomyositis (iDM). The samples were measured by flow cytometry and lymphocytes were identified based on their scatter properties.
<table>
<thead>
<tr>
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<th>Patients with aPM (n=13)</th>
<th>Patients with iPM (n=37)</th>
<th>Controls (n=32)</th>
<th>P values</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>APM vs control</td>
</tr>
<tr>
<td>CD3+ cells (%)</td>
<td>66.2 ± 9.4</td>
<td>70.4 ± 8.1</td>
<td>70.3 ± 7.2</td>
<td>n.s.</td>
</tr>
<tr>
<td>CD4+ cells (%)</td>
<td>42.3 ± 12.4</td>
<td>46.9 ± 9.8</td>
<td>45.2 ± 7.6</td>
<td>n.s.</td>
</tr>
<tr>
<td>CD8+ cells (%)</td>
<td>21.6 ± 10.2</td>
<td>20.6 ± 6.4</td>
<td>19.6 ± 5.9</td>
<td>n.s.</td>
</tr>
<tr>
<td>CD19+ cells (%)</td>
<td>13.8 ± 7.4</td>
<td>10.9 ± 7.4</td>
<td>11.7 ± 4.1</td>
<td>n.s.</td>
</tr>
<tr>
<td>CD3+ and HLA-DR+ cells (%)</td>
<td>13.6 ± 14.3</td>
<td>9.4 ± 7.8</td>
<td>3.0 ± 2.3</td>
<td><strong>P&lt;0.01</strong></td>
</tr>
<tr>
<td>CD3+ and CD69+ cells (%)</td>
<td>1.5 ± 1.0</td>
<td>1.2 ± 0.9</td>
<td>1.0 ± 0.8</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Table 3.

T cell subpopulations and activated T cells of peripheral blood (mean ± SD) in controls and in patients with active (aPM) and inactive polymyositis (iPM). The samples were measured by flow cytometry and lymphocytes were identified based on their scatter properties.
Intracellular IFN-γ (Fig.1/A) and IL-4 (Fig.1/B) expression of stimulated peripheral Thelper and Tcytotoxic cells of patients with dermatomyositis (DM) and polymyositis (PM). The samples were measured by flow cytometry and lymphocytes were identified on their scatter properties and CD4/CD8 positivities.
Figure 2.

Calculated Th2/Th1 frequency (Th2: IL-4+/CD4+; Th1: IFN-γ+/CD4+) in active and inactive polymyositis (aPM, iPM) and dermatomyositis (aDM, iDM).
References


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