EDITORIAL TEAM

Editor-in-chief:
Puspa Wardhani

Editor-in-chief Emeritus:
Prihatini
Krisnowati

Editorial Boards:
Maimun Zulhaidah Arthamin, AAG Sudewa, Rahayuningsih Dharma, Mansyur Arif, July Kumalawati, Nurhayana Sennang Andi Nanggung, Aryati, Purwanto AP, Jusak Nugraha, Sidarti Soehita, Endang Retnowati Kusumowidagdo, Edi Widjajanto, Budi Mulyono, Adi Koesoema Aman, Uleng Bahrun, Ninik Sukartini, Kusworini Handono, Rismawati Yaswir, Osman Sianipar

Editorial Assistant:
Dian Wahyu Utami

Language Editors:
Yolanda Probahoesodo, Nurul Fitri Hapsari

Layout Editor:
Akbar Fahmi

Editorial Adress:
d/a Laboratorium Patologi Klinik RSUD Dr. Soetomo Jl. Mayjend. Prof. Dr Moestopo 6–8 Surabaya, Indonesia
Telp/Fax: (031) 5042113, 085-733220600 E-mail: majalah.ijcp@yahoo.com, jurnal.ijcp@gmail.com
Website: http://www.indonesianjournalofclinicalpathology.or.id

Accredited No. 36a/E/KPT/2016, Tanggal 23 Mei 2016
CONTENTS

RESEARCHS

Molecular Aspect Correlation between Glycated Hemoglobin (HbA1c), Prothrombin Time (PT) and Activated Partial Thromboplastin Time (APTT) on Type 2 Diabetes Mellitus (T2DM)  
(Aspek molekuler Hubungan Kadar Hemoglobin Terglikasi (HbA1c), Prothrombin Time (PT) dan Activated Partial Thromboplastin Time (APTT) di Diabetes Melitus Tipe 2)  
Indranila KS ................................................................................................................................. 1–6

Platelet-Lymphocyte Ratio (PLR) Markers in Acute Coroner Syndrome  
(Platelet Lymphocyte Ratio (PLR) Sebagai Petanda Sindrom Koroner Akut)  
Haerani Harun, Uleng Bahrun, Darmawaty ER ........................................................................ 7–11

The Mutation Status of Kras Gene Codon 12 and 13 in Colorectal Adenocarcinoma  
(Status Mutasi Gen Kras Kodon 12 dan 13 di Adenocarcinoma Coloectral)  
Gondo Mastutik, Alphania Rahniayu, Anny Setijo Rahaju, Nila Kurniasari, Reny I’tishom .......... 12–17

Creatine Kinase Related to the Mortality in Myocardial Infarction  
(Creatine Kinase terhadap Angka Kematian di Infark Miokard)  
Liong Boy Kurniawan, Uleng Bahrun, Darmawaty Rauf, Mansyur Arif ................................. 18–21

Application of DNA Methylation on Urine Sample for Age Estimation  
(Penggunaan Metilasi DNA Dalam Perkiraan Umur Individu di Sampel Air Kemih)  
Rosalinda Avia Eryatma, Puspa Wardhani, Ahmad Yudianto ..................................................... 22–26

Lipid Profile Analysis on Regular and Non-Regular Blood Donors  
(Analisis Profil Lipid di Pendonor Darah Reguler dan Non-Reguler)  
Waode Rusdiah, Rachmawati Muhiddin, Mansyur Arif ............................................................. 27–30

Percentage of CD3+ T Lymphocytes Expressing IFN-γ After CFP-10 Stimulation  
(Persentase Limfosit T-CD3 yang Mengekspresikan Interferon Gamma Setelah Stimulasi Antigen CFP-10)  
Yulia Nadar Indrasari, Betty Agustina Tambunan, Jusak Nugraha, Fransiska Sri Oetami ........ 31–35

Characteristics of Crossmatch Types in Compatibility Testing on Diagnosis and Blood Types Using Gel Method  
(Ciri Inkompatibilitas Uji Cocok Serasi Metode Gel terhadap Diagnosis dan Golongan Darah)  
Irawaty, Rachmawati AM, Mansyur Arif .................................................................................... 36–41

Diagnostic Values of Mycobacterium Tuberculosis 38 kDa Antigen in Urine and Serum of Childhood Tuberculosis  
(Nilai Diagnostik Antigen 38 kDa Mycobacterium tuberculosis Air Kemih dan Serum di Tuberkulosis Anak)  
Agustin Iskandar, Leliawaty, Maimun Z. Arthamin, Ery Olivianto ........................................... 42–49

Erythrocyte Indices to Differentiate Iron Deficiency Anemia From β Trait Thalassemia  
(Indeks Eritrosit Untuk Membedakan Anemia Defisiensi Besi Dengan Thalassemia β Trait)  
Yohanes Salim, Ninik Sukartini, Arini Setiawati ........................................................................ 50–55
HbA1c Levels in Type 2 Diabetes Mellitus Patients with and without Incidence of Thrombotic Stroke
(Kadar HbA1c Pasien Diabetes Melitus Tipe 2 Dengan dan Tanpa Kejadian Strok Infark Trombotik)
Dafina Balqis, Yudhi Adrianto, Jongky Hendro Prayitno ................................................................. 56–60

Comparative Ratio of BCR-ABL Genes with PCR Method Using the Codification of G6PD and ABL
Genes in Chronic Myeloid Leukemia Patients
(Perbandingan Angka Banding Gen BCR-ABL Metode PCR Menggunakan Baku Gen Glucosa-6-
Phosphate Dehidrogenase dan Gen Abelson Kinase di Pasien Chronic Myeloid Leukemia)
Tonggo Gerdina Panjaitan, Delita Prihatni, Agnes Rengga Indrati, Amaylia Oehadian .................. 61–66

Virological and Immunological Response to Anti-Retroviral Treatment in HIV-Infected Patients
(Respons Virologis dan Immunologis Terhadap Pengobatan Anti-Retroviral di Pasien Terinfeksi HIV)
Umi S. Intansari, Yunika Puspa Dewi, Mohammad Juffrie, Marsetyawan HNE Soesatyo,
Yarni W Subronto, Budi Mulyono .................................................................................................... 67–73

Comparison of sdLDL-C Analysis Using Srisawasdi Method and Homogeneous Enzymatic Assay
Method on Hypertriglyceridemia Condition
(Perbandingan Analisa sdLDL-C metode Srisawasdi dan Homogeneous Enzymatic Assay di Kondisi
Hipertrigliseridemia)
Gilang Nugraha, Soebagijo Poegoeh Edijanto, Edhi Rianto ............................................................. 74–79

Pattern of Bacteria and Their Antibiotic Sensitivity in Sepsis Patients
(Pola Kuman dan Kepekaan terhadap Antibiotik di Pasien Sepsis)
Wahyuny, Nurahmi, Benny Rusli ....................................................................................................... 80–83

LITERATURE REVIEW

Antibiogram
(Antibiogram)
Jeine Stela Akuailing, IGAA Putri Sri Rejeki .................................................................................. 90–95

CASE REPORT

Pancreatic Cancer in 31 Years Old Patient with Normal Serum Amylase Level
(Kanker Pankreas di Pasien Usia 31 Tahun Dengan Kadar Amilase Serum Normal)
Melda F. Flora, Budiono Raharjo, Maimun Z. Arthamin .................................................................... 96–101

Thanks to editors in duty of IJCP & ML Vol 23 No. 1 November 2016
Kusworini Handoono, Prihatini, Purwanto AP, July Kumalawati, Jusak Nugraha, Ida Parwati,
Adi Koesoema Aman, Edi Widjajanto, AAG. Sudewa, Nurhayana Sennang AN
PERCENTAGE OF CD3+ T LYMPHOCYTES EXPRESSING IFN-γ AFTER CFP-10 STIMULATION

(Persentase Limfosit T-CD3+ yang Mengekspresikan Interferon Gamma Setelah Stimulasi Antigen CFP-10)

Yulia Nadar Indrasari1, Betty Agustina Tambunan1, Jusak Nugraha1, Fransiska Sri Oetami2

ABSTRACT

Tuberculosis (TB) is an infectious disease, caused by Mycobacterium tuberculosis. Cytokine IFN-γ production is the main effector mechanism of T lymphocytes. The development of an effective vaccine against TB infections has to consider the factors regulating the production of IFN-γ. CFP-10 is an antigen secreted by Mycobacterium tuberculosis, known as a component of a potential vaccine for TB. The purpose of this study was to compare the cellular immune response that is the percentage of CD3+ T-lymphocytes expressing IFN-γ in patients with new cases of pulmonary TB, latent TB, and healthy people. This study used a true experimental design in the laboratory in vitro in cultured PBMC of patients with 8 new cases of pulmonary TB, 7 latent TB and 7 healthy people in the Pulmonary Hospital Surabaya. Examination of the percentage of CD3+ T-lymphocytes expressing IFN-γ was done by Flow cytometry (BD FACSCalibur). Results were analyzed by Kruskal-Wallis and one way ANOVA. The mean percentage of CD3+ T-lymphocytes expressing IFN-γ in patients with new cases of pulmonary TB after stimulation of CFP-10 antigen (4.36%) was higher than before stimulation (3.50%) (P value=0.015). The mean percentage of CD3+ T-lymphocytes expressing IFN-γ in latent TB after CFP-10 antigen stimulation (3.96%) was higher than before stimulation (2.50%) but was not significant (P value=0.367). The mean percentage of CD3+ T-lymphocytes expressing IFN-γ in healthy people after stimulation (1.66%) was lower than before stimulation (2.89%) but was not significant (P value=0.199). Based on the results of this study, it can be concluded that there is an increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ in patients with new cases of pulmonary TB after stimulation of CFP-10 antigen. This indicates that CD3+ T-lymphocytes expressing IFN-γ play a role in the protection against TB infection.

Kata kunci: CD3+, IFN-γ, TB paru parus baru, flow cytometry, CFP-10

ABSTRACT

Tuberculosis (TB) is an infectious disease, caused by Mycobacterium tuberculosis. Cytokine IFN-γ production is the main effector mechanism of T lymphocytes. The development of an effective vaccine against TB infections has to consider the factors regulating the production of IFN-γ. CFP-10 is an antigen secreted by Mycobacterium tuberculosis, known as a component of a potential vaccine for TB. The purpose of this study was to compare the cellular immune response that is the percentage of CD3+ T-lymphocytes expressing IFN-γ in patients with new cases of pulmonary TB, latent TB, and healthy people. This study used a true experimental design in the laboratory in vitro in cultured PBMC of patients with 8 new cases of pulmonary TB, 7 latent TB and 7 healthy people in the Pulmonary Hospital Surabaya. Examination of the percentage of CD3+ T-lymphocytes expressing IFN-γ was done by Flow cytometry (BD FACSCalibur). Results were analyzed by Kruskal-Wallis and one way ANOVA. The mean percentage of CD3+ T-lymphocytes expressing IFN-γ in patients with new cases of pulmonary TB after stimulation of CFP-10 antigen (4.36%) was higher than before stimulation (3.50%) (P value=0.015). The mean percentage of CD3+ T-lymphocytes expressing IFN-γ in latent TB after CFP-10 antigen stimulation (3.96%) was higher than before stimulation (2.50%) but was not significant (P value=0.367). The mean percentage of CD3+ T-lymphocytes expressing IFN-γ in healthy people after stimulation (1.66%) was lower than before stimulation (2.89%) but was not significant (P value=0.199). Based on the results of this study, it can be concluded that there is an increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ in patients with new cases of pulmonary TB after stimulation of CFP-10 antigen. This indicates that CD3+ T-lymphocytes expressing IFN-γ play a role in the protection against TB infection.

1 Department of Clinical Pathology, Faculty of Medicine - Dr. Soetomo Hospital, Surabaya, Indonesia. E-mail: ynadar.indrasari82@gmail.com
2 Ministry of Health Indonesia, Research and Development
lower than before stimulation (2.89%) but not significant (P value=0.199). Changes in the percentage of CD3+ T-lymphocytes expressing IFN-γ after stimulation of CFP-10 antigen were not significantly different between groups (P value=0.143). Based on this study, it could be concluded that there were an increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ in new cases of pulmonary TB after stimulation of CFP-10 antigen. This showed that CD3+ T-lymphocytes expressing IFN-γ played a role in protection against pulmonary tuberculosis infection.

**Key words:** CD3+, IFN-γ, new cases of pulmonary TB, flow cytometry, CFP-10

### INTRODUCTION

Tuberculosis (TB) is a contagious infectious disease caused by *Mycobacterium tuberculosis* bacteria. Tuberculosis is also considered as one of the most deadly infectious diseases in the world (ranking second after HIV), thus becoming a primary global health problem. The incidence of tuberculosis (TB) cases in 2013 was estimated at 9 million, or about 126 cases per 100,000 population with the proportion of Asia (56%), Africa (29%), Middle East (8%), Europe (4%) and America (3%). Six (6) countries with the largest TB incidence rates in 2013 were India (2 million-2.3 million), China (900,000-1.1 million), Nigeria (340,000–880,000), Pakistan (370,000–650,000), Indonesia (410,000–520,000) and South Africa (410,000–520,000). Indonesia is currently ranked fourth in the world after India, China and South Africa.

Previous researches on immune response to *Mycobacterium tuberculosis* bacteria in TB patients and individuals with a positive tuberculin reaction focused on the role of T lymphocytes as a major component of adaptive immune response. The adaptive immune response is mediated by T and B lymphocytes. The adaptive immune response mediated by T lymphocytes plays a very important role in the elimination of *Mycobacterium tuberculosis*. The development of effective vaccines against TB infection considers factors that regulate IFN-γ production. Early secreted antigenic target of 6-kDa (ESAT-6) and culture filtrate protein (CFP-10) have recently been proven as antigens secreted by *Mycobacterium tuberculosis* bacteria, but not derived from *bacillus Calmette-Guerin* (BCG) of *Mycobacterium bovis*, a cellular immune response to those specific antigens has a good association with TB infection. The secreted antigens are produced in the early phase of infection and induce protective immunity, as well as stabilize bacterial load in lung rapidly. These antigens (Ag85, ESAT-6, and culture filtrate protein (CFP-10)) have been known as components of potential vaccine for TB.

Many people infected with *Mycobacterium tuberculosis* are healthy people with tuberculin reaction and immune protection (latent TB). Patients with active TB have an ineffective immunity and quite severe clinical manifestation. Therefore, an understanding of how TB latent can control TB infection is needed so it does not develop further. This understanding is also expected to provide an important description about the mechanisms of protective immunity against TB infection and it useful for effective TB vaccine development. This research aimed to examine the cellular immune response of CD3+ T lymphocytes after CFP-10 stimulation in new cases of pulmonary TB, latent TB, and healthy people.

### METHODS

This research was a pure in vitro experimental laboratory study on cultured peripheral blood mononuclear cells (PBMC). The research was conducted from May to December 2015. The samples of the research were divided into three sample groups stimulated by CFP-10 antigens of *Mycobacterium tuberculosis*, namely Group 1 consisted of eight new pulmonary TB cases, Group 2 consisted of seven latent TB cases and Group 3 consisted of seven healthy people.

Blood samples in heparin tubes, were processed, then isolated and PBMC cultured using a CO₂ incubator. Cultured PBMC samples were then divided into two different treatment groups namely one group with CFP-10 stimulation and without CFP-10 stimulation. Following that, the percentage of IFN-γ expressed on CD3+ T-lymphocytes in those three sample groups was examined using flow cytometry FACSCalibur in the Clinical Pathology Laboratory, Dr. Soetomo Hospital, Surabaya.

Next, the normality test of data distribution was performed using Shapiro Wilk test. Kruskal-Wallis one-way ANOVA test was then carried out to analyze the difference in the percentage of CD3+ T lymphocytes expressing IFN-γ before and after CFP-10 stimulation between the cultured PBMC group of new pulmonary TB cases, latent TB cases, and healthy people. The level of significance was then determined using the value of P, less than 0.05.
RESULTS AND DISCUSSION

New cases of pulmonary tuberculosis were mostly found in the age group of 26–34 years (37.5%). Meanwhile, latent TB cases were mostly found in the age group of 26-34 years (57.1%). TB cases in healthy people (100%) were found in the age group of 20-25 years.

The results of Kruskal-Wallis test, showed that there was no significant difference in the percentage of CD3+ T-lymphocytes expressing IFN-γ before CFP-10 stimulation between the groups of new pulmonary TB cases, latent TB cases and healthy people (P=0.620). Similarly, the results of ANOVA test showed that there was no significant difference in the percentage of CD3+ T-lymphocytes expressing IFN-γ after CFP-10 stimulation between the groups of new pulmonary TB cases, latent TB cases and healthy people (P=0.198).

In addition, the results of paired t test showed that there was a significant increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ after CFP-10 stimulation in the group of new pulmonary tuberculosis cases (P=0.015) as seen in Table 2.

Similarly, a research conducted by Winkler et al5 also showed that there was an increased frequency of CD3+ T-lymphocytes expressing IFN-γ, IL-2 and TNF-γ in patients with active pulmonary tuberculosis compared to controls after PPD (purified protein derivative) stimulation. Increased cytokine responses generated from Th1 lymphocytes to PPD stimulation showed a shift of naïve cellular subpopulations towards specific T lymphocyte activation for Mycobacterium in order to produce IFN-γ.5

A research conducted by Abramo et al6, showed that patients with active pulmonary TB generated higher levels of MIG (monokine induced by IFN-γ) and IFN-γ as well as a higher frequency of cells producing MIG (monokine induced by IFN-γ) levels, compared to the control group (post-BCG vaccine) after stimulation by fusion protein, ESAT-6/CFP-10, specific to Mycobacterium tuberculosis. Similar results were also obtained on PPD (purified protein derivative) stimulation.6

On the other hand, the analysis results of Wilcoxon test showed that there was no significant increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ after CFP-10 stimulation in the group of latent tuberculosis (P = 0.367) as seen in Table 2. This condition was thought due to the number of memory T lymphocyte clones which was less in recognizing CFP-10 antigens. So, the proliferation of T lymphocytes and the increase in the number of IFN-γ were not too high.

Table 1. Characteristics of research subjects

<table>
<thead>
<tr>
<th>Characteristics of research subjects</th>
<th>New pulmonary TB cases (n=8)</th>
<th>Latent TB (n=7)</th>
<th>Healthy people (n=7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>5 (62.5%)</td>
<td>2 (28.6%)</td>
<td>2 (28.6%)</td>
</tr>
<tr>
<td>Females</td>
<td>3 (37.5%)</td>
<td>5 (71.4%)</td>
<td>5 (71.4%)</td>
</tr>
<tr>
<td>Group of Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-25 years old</td>
<td>1 (12.5%)</td>
<td>2 (28.6%)</td>
<td>7 (100%)</td>
</tr>
<tr>
<td>26-34 years old</td>
<td>3 (37.5%)</td>
<td>4 (57.1%)</td>
<td>-</td>
</tr>
<tr>
<td>35-44 years old</td>
<td>2 (25%)</td>
<td>1 (14.3%)</td>
<td>-</td>
</tr>
<tr>
<td>45-54 years old</td>
<td>2 (25%)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 2. Changes in the percentage of CD3+ T lymphocytes expressing IFN-γ before and after CFP-10 stimulation in each group

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>The percentage change of CD3+ T lymphocytes expressing IFN-γ</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before CFP-10 stimulation</td>
<td>After CFP-10 stimulation</td>
</tr>
<tr>
<td>New pulmonary TB cases</td>
<td>8</td>
<td>3.50±2.33</td>
<td>4.36±2.37</td>
</tr>
<tr>
<td>Latent TB</td>
<td>7</td>
<td>2.50±3.25</td>
<td>3.96±4.13</td>
</tr>
<tr>
<td>Healthy People</td>
<td>7</td>
<td>2.89±2.79</td>
<td>1.66±1.22</td>
</tr>
<tr>
<td>P</td>
<td></td>
<td>0.620</td>
<td>0.198</td>
</tr>
</tbody>
</table>

Note: * significant, α = 0.05
Table 3. Changes in the percentage of CD3+ T lymphocytes expressing IFN-γ after CFP-10 stimulation among the groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>The percentage change of CD3+ T lymphocytes expressing IFN-γ after CFP-10 stimulation</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>New pulmonary TB cases</td>
<td>8</td>
<td>0.52 0.86 0.89</td>
<td></td>
</tr>
<tr>
<td>Latent TB</td>
<td>7</td>
<td>0.26 1.45 5.28</td>
<td>0.143</td>
</tr>
<tr>
<td>Healthy people</td>
<td>7</td>
<td>-0.40 -1.23 3.00</td>
<td></td>
</tr>
</tbody>
</table>

The analysis results of Wilcoxon test on the group of healthy people showed that there was no significant increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ after CFP-10 stimulation (P=0.199) as shown in Table 2. This was because the T lymphocyte memory had not yet been formed in healthy people who had never been exposed to Mycobacterium tuberculosis, so T lymphocyte proliferation response to CFP-10 antigen exposure tended to be low. The results of this research were similar to the study conducted by Tsao et al\(^\text{7}\) stating that there were no increased levels of serum IFN-γ in healthy subjects. The research conducted by Tsao et al\(^\text{7}\) focused on the correlation between IFN-γ level and IL-2 receptor-γ in bronchoalveolar lavage liquid (BAL) and serum with a clinical grade and management of pulmonary tuberculosis. The results of the research stated that patients with a higher-grade of pulmonary TB (with advanced lung lesions, fever, or weight loss) showed an increase of IFN-γ and also soluble interleukin-2 receptor-γ (SIL-2R-γ) derived from epithelial lining fluid level (ELF) samples compared to those of lower-grade pulmonary TB patients. A similar correlation was also found in soluble interleukin-2 receptor-α (SIL-2R-α) serum levels in this research, but not in IFN-γ.\(^\text{7}\)

In addition, the analysis of Kruskal-Wallis test showed that there was no significant difference in changes in the percentage of CD3+ T-lymphocytes expressing IFN-γ before and after CFP-10 stimulation between groups (P=0.143) as shown in Table 3. The results of this research were different from the results of a study conducted by Borgsträm et al\(^\text{8}\) stating that there was a significant increased production of IFN-γ in patients with active TB compared to healthy people after stimulation of specific antigens of Mycobacterium tuberculosis, ESAT-6 and CFP-10 (P<0.05). The significant increased production of IFN-γ in patients with active TB after the stimulation was also correlated with the proliferative response of T lymphocytes. This was apparently due to the long exposure to Mycobacterium tuberculosis in those active pulmonary tuberculosis patients, but who did not yet showed clinical symptoms because the immune response of those patients to Mycobacterium tuberculosis was able to neutralize, thus, T lymphocyte memory had been formed despite newly clinically diagnosed as new pulmonary TB cases.\(^\text{8}\)

The individual variations of the percentage of CD3+ T-lymphocytes expressing IFN-γ between groups in this research were wide enough. As a result, it may cause changes in the percentage of CD3+ T-lymphocytes expressing IFN-γ between the groups were not significantly different. An increase in the percentage of CD3+ T-lymphocytes expressing IFN-γ was only found in the group of new pulmonary TB cases. It indicated that clones of CMT lymphocytes (central memory T cells) transforming into T lymphocyte memory after CFP-10 stimulation did not survive longer than EMT lymphocytes (effector memory T cells). In the group of latent tuberculosis, intracellular Mycobacterium tuberculosis bacteria were not exposed to the immune system (dormant) so that there was no immunological activation.\(^\text{9}\)

Early secreted antigenic target of 6-kDa (ESAT-6) and culture filtrate protein 10 (CFP-10) of Mycobacterium tuberculosis are considered as potent antigens of human T lymphocytes and also as potential tuberculosis vaccine candidates. ESAT-6 and CFP-10 secretion were required for virulence and pathogenicity of Mycobacterium tuberculosis and bacterial growth within the macrophages. A research conducted by Wang et al\(^\text{10}\) evaluated both ESAT-6 and CFP-10 effects on the capacity of human T lymphocytes in producing IFN-γ and T lymphocyte proliferation response to the activation of T-cell receptor (TCR) showed that recombinant ESAT-6 could inhibit the production of IFN-γ by T lymphocytes, but not to CFP-10.\(^\text{10}\)

CONCLUSION AND SUGGESTION

Based on the results of this research, it could be concluded that the percentage of CD3+ T-lymphocytes expressing IFN-γ increased after CFP-10 stimulation in cultured PBMC group of new pulmonary TB cases. There was no difference in changes in the percentage
of CD3+ T lymphocytes expressing IFN-γ before and after CFP-10 stimulation between the cultured PBMC group of new pulmonary TB cases, latent TB cases and healthy people. Thus, it could be said that CFP-10 effects on the capacity of T lymphocytes in producing IFN-γ were less. Therefore, further research on the effector T lymphocyte response and cytokine responses generated after ESAT-6 stimulation or ESAT-6/CFP-10 protein fusion is needed to determine the activities of fusion immunogenic antigens, ESAT-6/CFP-10 as TB vaccine candidates.

REFERENCES