Secretion of IFN-γ and IL-17 after Stimulation of ESAT-6-CFP10 (EC610) Fusion Antigen from PBMC in Groups Active TB and Latent TB

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Submission date: 11-May-2023 06:07PM (UTC+0700)
Submission ID: 2090312254
File name: ecretion_of_IFN-_and_IL-17_after_Stimulation_of_ESAT-6-CFP10.pdf (420.03K)
Word count: 6153
Character count: 32432

Secretion of IFN-γ and IL-17 after Stimulation of ESAT-6-CFP10 (EC610) Fusion Antigen from PBMC in Groups Active TB and Latent TB

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Keywords: Tuberculosis, IL-17,PBMC, EC610 Antigen

Abstract: Tuberculosis is an infectious disease that is transmitted by the bacteria Mycobacterium tuberculosis. The immune system has an important role in the pathogenesis of TB. The protective response to TB involves the secretion of proinflammatory cytokines, namely Th1 cells that produce IFN-γ and Th 17 which produce IL-17, which plays a very important role in the body's defense system, especially in dealing with intracellular bacterial infections. The EC610 fusion antigen is a specific M.TB antigen which has antigenicity to T cells so that T cells secrete cytokines. The study aimed to determine the immune response of proinflammatory cytokines against Mycobacterium tuberculosis infection by looking at the secretion of IFN-γ and IL-17 levels after stimulation of the ESAT 6-CFP 10 (EC610) fusion antigen in active and latent TB patients. This type of research was a quasi experiment in vitro. The research was conducted at the Palembang Lung Special Hospital. The research subjects were 21 samples of active TB and 28 samples of latent TB. PBMC blood samples were isolated using Ficoll-Paque, induced with ESAT-6 - CFP-10 Fusion Antigen (EC610) for 24 - 72 hours at 37 ° C. IFN-γ and IL-17 were measured by ELISA Reader. Analysis used the Mann Whitney test ρ <0.05. IFN-γ levels and IL-17 levels in active TB were higher than latent TB, but statistically there was no significant difference between IFN-levels (ρ = 0.769) and IL-17 levels with a value of ρ = 0.000, meaning that there was a significant difference between both groups. The cut-off points were IFN-γ (6850 pg / mL) and IL-17 (85 pg / mL) using Receiver Operating Curve (ROC) curve analysis. As a conclusions, IFN levels were not different and IL-17 levels were different. This shows that IL-17 levels play a role in the protective immune response against Mycobacterium tuberculosis during the progression of TB disease.

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Andriani, N., Kurniati, N., Saleh, M., Salim, E., Hafy, Z., Nugraha, J., Rahadiyanto, K. and Tanoerahardjo, F.
Secretion of IFN- and IL-17 after Stimulation of ESAT-6-CFP10 (EC610) Fusion Antigen from PBMC in Groups Active TB and Latent TB.
DOI: 10.5220/0010491602890297
In *Proceedings of the 1st Jenderal Soedirman International Medical Conference in conjunction with the 5th Annual Scientific Meeting (Temilnas) Consortium of Biomedical Science Indonesia (JIMC 2020)*, pages 289-297
ISBN: 978-989-758-499-2

1 INTRODUCTION

Tuberculosis is an infectious disease that is transmitted by the bacteria Mycobacterium Tuberculosis which attacks various organs, especially the lungs. Tuberculosis transmission occurs through droplets of patients infected with the bacteria Mycobacterium tuberculosis (Ministry of Health of the Republic of Indonesia,2014).

Tuberculosis is a health problem that is of global concern today. Indonesia is a country with the second highest number of new cases in the world after India. The number of new cases of TB BTA + in Indonesia was 156,723 with the distribution of cases in several provinces, especially in South Sumatra, the number of new cases of TB BTA + was 5674 cases (Ministry of Health of the Republic of Indonesia, 2017).

According to the Palembang Health Office in 2015, the number of tuberculosis cases in Palembang was 1305 from the total population. Based on gender, the number of cases in males is higher than in females. Based on the age group, most tuberculosis cases were found at the age of 25-34 years at 18.07%, age 45-54 years at 17.25% and age 35-44 years at 16.81% (Ministry of Health of the Republic of Indonesia, 2016).

At this time, experts suspect that there is an immune system disorder in tuberculosis sufferers. Helper-1 (Th1) cells play a very important role in the body's defense system, especially in dealing with intracellular bacterial infections. One of the cytokines produced by Th1 cells is IFN-γ which plays an important role in eliminating Mycobacterium tuberculosis. IFN-γ serves to strengthen the potential of phagocytes from macrophages infected with Mycobacterium tuberculosis by stimulating the formation of phagolysosomes. IFN-γ also stimulates the formation of free radicals to destroy bacterial components *Mycobacterium tuberculosis,* namely DNA and bacterial cell walls(Widjaja J.T et al, 2010)

Recent studies have shown that IL-17 plays an important role in the initial immune response against Mycobacterium tuberculosis infection by forming granulomas. Interleukin 17 (IL-17) is a pro-inflammatory cytokine produced by Th 17 which has an important role in the pathogenesis of TB. IL-17 is important for modulator of inflammation and recall memory response. The role of IL-17 as a proinflammatory cytokine can recruit neutrophils and induce an optimal Th1 response to stimulate IFN-γ production and stimulate chemokines. However, IFN-γ has the effect to suppress IL-17(Saraiva and O'Garra, 2010; Javan et al, 2016).

Research over the last decade has resulted in the development of Interferon-gamma realease assays (IGRA) to detect Mycobacterium tuberculosis infection. Based on the principle that individual T cells that have TB infection can respond to re-stimulation with the specific antigen Mycobacterium tuberculosis. This test measures the production of cytokines secreted by T lymphocytes that have been sensitized by the specific antigen Mycobacterium tuberculosis(CDC, 2011). The Food and Drug Administration (FDA) has approved two IGRA testing techniques, QuantiFERON-TB and T-SPOT.TB to detect Mtb infection (Pai M et al., 2014).

QuantiFERON (QFT) is a measurement of IFN-γ secreted from T cells previously exposed to Mycobacterium tuberculosis when stimulated in vitro with specific antigen Mycobacterium tuberculosis ESAT-6, CFP-10 and TB 7.7 using the enzyme-linked immunosorbent assay (ELISA) method. This test is used to detect the amount of IFN-γ against a specific antigen produced from the subject's T cells exposed to M. tuberculosis with using a peptide cocktail that simulates the proteins ESAT-6, CFP-10 and TB7.7. Antigen exposure generates an immune response to aid screening for Latent TB (Pratomo and Setyanto, 2013)

The T-SPOT.TB test is an in vitro diagnostic test based on the enzyme-linked immunospot (ELISPOT) method. This test is used to count the number of effector T cells that respond to stimuli with a combination of peptides that stimulate ESAT-6 and CFP10 antigens. The immune response to Mycobacterium tuberculosis infection is mainly mediated through T cell activation. Activation of T cells will fight Mycobacterium tuberculosis both CD4 + and CD8 + which produce several cytokines including IFN-γ and IL-17 after stimulated by antigen ESAT-6 and CFP10. Peripheral blood mononuclear cells (PBMC) were separated from whole blood, washed and counted before adding to assay. Isolated PBMCs (white blood cells) are placed into microtiter orifices where they are exposed to phytohemagglutinin (PHA) control (a mitogenic stimulator that demonstrates cell functio), nil control, and tuberculosis-specific antigen. PBMCs are incubated with antigens to allow stimulation of sensitized T cells to produce cytokines(Oxford Imunotec,2017).

A study conducted by Eunkyoung et al, 2016.On patients with active TB and latent TB infection by detecting whole blood levels of IFN-γ with IL-17 in study subjects with TB before receiving treatment using the QuantiFERON method found that IFN-γ

and IL-17 were lower in active TB patients rather than latent TB.

Another study using T-SPOT (ELISPOT) in vitro conducted by Cowan J et al with research subjects TB patients with new cases before receiving OAT treatment found that there was a significant increase in IFN-γ and IL-17 levels in active TB patients and latent in PBMC. Research conducted by Marin ND using TB patients who were given OAT in the first 2 weeks stated that the levels of IFN-γ and IL 17 in active TB patients were higher than latent TB by ELISPOT (enzyme-linked immunospot) method in PBMC.

Based on previous research regarding the measurement of cytokine secretion, the researchers were interested in measuring the secretion of proinflammatory cytokines in vitro, namely IFN-γ and IL-17 after stimulation of the ESAT 6 - CFP 10 (EC610) fusion antigen in PBMC groups of active TB and latent TB. Measurement of cytokines using the T-SPOT and QuantiFERON methods in this study was used for screening latent TB. Research using PBMC is still limited, especially in Indonesia, so this research is expected to have a novelty in evaluating the pathogenesis of tuberculosis, especially to see the immune response to Mycobacterium tuberculosis infection.

2 MATERIAL AND METHODS

This type of research is a quasi experimental study or quasi experimental study in vitro with a non-equivalent post test only design. The research was conducted at the Palembang Lung Special Hospital in the period August 2018 - January 2019 This research has received a certificate of ethical approval from MoehammadHoesin Hospital and Sriwijaya University Medical Faculty.

The number of research samples was divided into two groups, namely the first group of latent TB came from nurses in Palembang Paru Hospital without clinical symptoms of TB who served more than 6 months in the outpatient and inpatient unit of Palembang City Lung Hospital who had direct contact with pulmonary TB patients, TST examination. positive with induration> 10 mm and negative smear examination and or radiological examination did not show lung abnormalities (normal). The second group of active TB was diagnosed by pulmonary specialist doctors at the Palembang City Lung Hospital as new TB cases, there were BTA examination results, radiological examinations / chest X-rays showing a picture of active TB and anti-tuberculosis drug therapy (OAT) for less than 1 month. The research subjects were selected by purposive sampling. Pulmonary TB patients receiving corticosteroid therapy or immunosuppressant drugs with complaints of respiratory infections such as bronchitis and allergies, suffering from liver disorders, kidney disorders, diabetes mellitus, hepatitis B and HIV infection were not included in the study (exclusion criteria).

The study sample was a supernatant after stimulation of the ESAT-6-CFP 10 antigen (EC610) with the following research stages as a 16 ml venous blood sample and put into five heparin anticoagulant tubes. Then one tube of the sample was treated with stimulation of the ESAT-6-CFP 10 antigen contained in TB 1 and TB 2 tubes which were incubated for 16-24 hours using the QuantiFERON method. Four sample tubes were isolated by Peripheral Blood Mononuclear Cells (PBMC) using Ficoll-Paque and induced with ESAT-6 - CFP-10 Fusion Antigen for 24 - 72 hours using the T-SPOT method. Then the levels of IFN-γ and IL-17 were checked with an ELISA reader. The difference in mean levels of IFN-γ and IL-17 was analyzed statistically by the Mann-Whitney test with a significance level (ρ <0.05). To get the cut-off-point, the Receiver Operating Curve (ROC) curve analysis will be used.

3 RESULTS

The research subjects were 49 people who met the inclusion criteria of the researcher. The research subjects were divided into 2 patients, namely active TB and latent TB. Active TB was 21 new TB patients collected since January 2018, while 28 people with latent TB had contact history of TB patients consisting of 23 nurses and 5 family of patients. who has TB.

The characteristics of the research subjects included gender, age, education, BCG status, BMI, chest X-ray, QFT results, and laboratory experiment results were depicted inTable 1 and Table 2.

The latent TB group, as many as 28 people were tested for TST and IGRA which were used to screen for the LatentTB group. Obtained TST induration varied. The results of TST induration in the Latent TB group can be seen in the Table 3 and IGRA using QuanTIFERON in the Latent TB Group can be seen in the Table 4.

The value of ρ <0.05 was 0.000, which means that there was a significant difference between IL-17 levels between the two groups after stimulation with EC610 Fusion Antigen.

Table 1. Demographic Data of Research Subjects

Characteristics	Active TB	Latent TB
	n (%)	n (%)
Number of Subjects	21 (100)	28 (100)
Gender		
Women	13 (61,90)	21 (75,0)
Male	8 (38,10)	7 (25,0)
	39,10±10,4	36,32±8,773
Junior High School	3 (14,3)	0 (0,0)
Senior High School	12 (57,1)	7 (25,0)
Diploma	2 (9,5)	12 (42,9)
S1	4 (19,0)	9 (32,1)
BCG status		
Yes	14 (66,7)	20 (71,4)
No	1 (4,8)	0 (0,0)
Unknown	6 (28,6)	8 (28,6)
IMT		
Normal	11 (52,4)	19 (67,9)
Fat	1 (4,8)	4 (14,3)
Obesity	0 (0,0)	3 (10,7)

Table2. Laboratory Data

Characteristics	TB Active	TB Laten
	n (%)	n (%)
Thoracic Photo		
Normal	0 (0,0)	28 (100)
Minimal lesions	15 (71,4)	0 (0,0)
Moderate lesions	6 (28,6)	0 (0,0)
BTA examination		
Negative	6 (28,6)	28 (100)
Positive	15 (71,4)	0
BTA +1	13 (61,9)	
BTA +2	1 (4,8)	
BTA +3	1 (4,8)	
Qualitative Examination Results		
IFN-γ results T-SPOT		
Negative	4 (19.0)	22 (78.6)
Positive	17 (81.0)	6 (21.4)
IL-17 results T-SPOT		
Negative	3 (14.3)	24 (85.7)
Positive	18 (85.7)	4 (14.3)

Table 3. Results of TST Induration in the Latent TB Group

Diameter of Induration TST (mm)	n (%)
10	9(32.1)
11	1(3.6)
12	3(10.7)
15	3(10.7)
16	3(10.7)
18	2(7.1)
20	3(10.7)
21	1(3.6)
22	2(7.1)
27	1(3.6)
Total	28(100.0)

Table 4. IGRA (QuantiFERON) examination results in the Latent TB Group

Result of QFT	n (%)
Negative	15 (53,6)
Positive	13 (46,4)

Table 5. IFN-γ and IL-17 levels in patients with Active TB and Latent TB

IFN-γ	ClinicalStatus	N	Median (Min-Max)
EC610 Fusion Antigen	Active TB	21	6700 (2000-9100)
	Latent TB	28	6000 (2500-9000)
IL-17			
EC610 Fusion Antigen	Active TB	21	160 (80-210)
	Latent TB	28	60 (40-90)

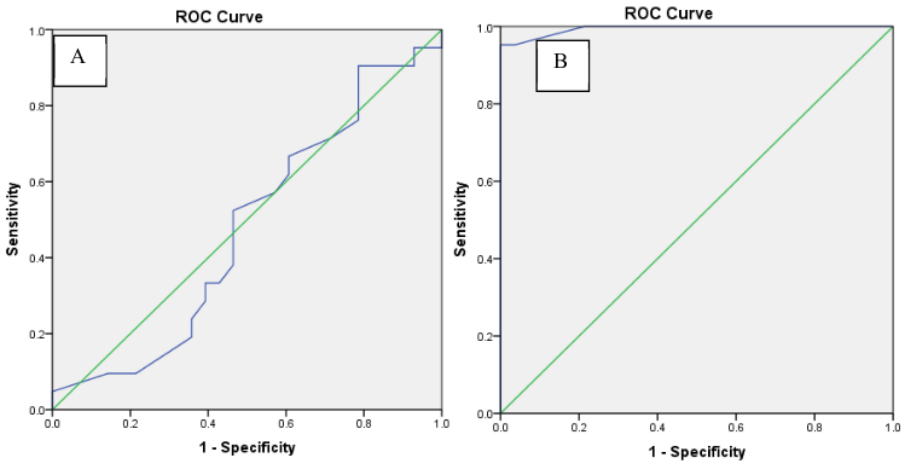

Figure 1. Analysis of the ROC curveCurve IFN-γ (A)and CurveIL-17 (B) using cut-off-point IFN-γ 6850 pg / mL and cut-off-point IL-17 85 pg / mL.

The sensitivity value of IFN-γ levels was 80.95% with a specificity of 78.57%. Postive Predictive Value (PPV) of 98.63%. Negative Predictive Value (NPV) of 17.84%. Meanwhile, the sensitivity value of IL-17 levels was 85.71% with a specificity of 85.71%. Postive Predictive Value (PPV) of 85.71%. Negative Predictive Value (NPV) of 85.71%.

Table 5 informs that IFN-γ levels were higher in active TB, namely 6700 (2000-9100) pg / mL while latent TB was 6000 (2500-9000) pg / mL but statistically there was no significant difference between the two groups after stimulation of Fusion Antigen EC610 with a value of ρ> 0.05, namely 0.769.IL-17 levels were higher in active TB, namely 160 (80-210) pg / mL and latent TB 60 (40-90) pg / mL.

The area under the ROC curve of IFNγ levels to predict active TB and latent TB is 0.475 (95% CI = 0.311 to 0.639) while the IL-17 level to predict active TB and latent TB is 0.994 (95% CI = 0.980 s / d 1,000) (Figure 1). The ROC curve also shows that the IFNγ level has a very low diagnostic value while the IL-17 level is categorized as <85pg / mL and> 85 pg / mL has a good diagnostic value because the curve moves away from the 50% line and approaches the 100% line. This suggests that IL-17 levels can be used as a predictor or diagnosis of active TB and latent TB.

4 DISCUSSION

The proportion of subjects in this study based on gender was found to be more women than men in active TB and latent TB. As for several factors, namely social and economic factors (financial conditions) that cause women of childbearing age to suffer from tuberculosis (TB) are more common, these are found in Afghanistan, Pakistan and Iran(Dotulong J.F.J et al, 2015)

The active TB and latent TB groups in this study were found in the age range between 25-36 years. This result is in accordance with the provisions of the Ministry of Health of the Republic of Indonesia, which is mostly found in the 25-34 year age group. productive age is very dangerous to the level of transmission because patients easily interact with other people, high mobility allows it to be transmitted to other people and the environment. In this study, there were in the range of 25-36 years of age who were classified as having a regular job every day outside the home, especially the latent TB group because they were nurses / hospital staff. This makes it easy for patients to interact with other people, thereby increasing the risk of contracting TB (Dotulong J.F.J et al, 2015)

Based on the level of education in this study, the most active TB was obtained with a high school background while latent TB with a recent diploma education. Higher education does not always behave

well. Therefore education is not an indicator of healthy life behavior (Marieta K.S, 2014).

Most of the patients with Active TB and Latent TB have received BCG immunization when they were children. However, BCG immunization does not fully protect children from tuberculosis attacks. The factors that cause someone to be infected with TB include household contact with tuberculosis patients, low nutritional status so that the body's immune system is not optimal, high humidity that makes tuberculosis bacteria thrive and an unclean environment(Rachim R, 2014).

Body Mass Index (BMI) is a way of directly assessing nutritional status using height and weight. In this study most were found in BMI which was classified as normal. The increase in BMI in TB patients is a good marker of decreasing the likelihood of relapse (relapse) from TB infection and a sign that the TB infection process is reduced (Priyantomoet al , 2014).

In this study all latent TB with TST induration ≥ 10 mm (positive). The tuberculin test is done to find out whether a person has immunity to TB bacilli or not so it is very good for detecting TB infection. If the tuberculin test result is positive or abnormal, it means that the person is infected with TB bacilli and there are antibodies to the TB bacilli that can become active. Positive tuberculin test results should be confirmed by chest X-ray and sputum examination. If the chest X-ray is normal, then latent TB therapy can be done, but if the chest X-ray is abnormal and shows TB, it can be included in active Mycobacterium tuberculosis (Kenyorini et al,. 2012).

Chest X-ray laboratory data shows abnormal results of active pulmonary TB which is common with minimal lesions and normal latent TB. This is related to one's immunity and the virulence of Mycobacterium tuberculosis. The lower the immunity and virulence of a person against Mycobacterium tuberculosis, the more damage there is to the radiological image (chest X-ray) (Afif E et al , 2013).

In this research, BTA examination was mostly found in BTA +1. There are several factors that affect the results of the sputum BTA examination including too few germs due to sputum extraction (not according to operational procedures (SOP), methods and methods of examination that are not in accordance with the SOP, and the effect of anti-tuberculosis drug treatment. Coughing is effective in removing sputum can help find BTA germs on sputum examination in the pulmonary TB group (Ors et al.,2007)

Two commercial kits that can be used to test for M. Tuberculosis are QuantiFERON and T-SPOT. The basic principle of this examination is that the cells produced by TCD4 lymphocytes if these cells are incubated with M. Tuberculosis antigen when the examination uses QuantiFERON, whereas when using T-SPOT, the number of spots formed in the membrane is calculated which indicates the presence of IFN-producing TCD4 lymphocytes. states that this examination cannot distinguish between active and latent TB infections so that in order to be able to diagnose TB in addition to the results of the IGRA examination, it still takes into account the clinical situation, laboratory results and other examinations (CDC, 2010).

Where in this study the latent TB group was declared if the TST or IGRA results were positive, both (TST and IGRA) were positive. QuantiFERON in this study was used for screening latent TB. In measuring the levels of IFN and IL-17 in this study using T-SPOT. This QFT and T-SPOT examination must be accompanied by other supporting examinations such as Latent TB, TST examination and active TB must be BTA examination and chest X-ray to detect TB. QFT and T-SPOT are indirect markers of M. tuberculosis exposure and indicate a cellular immune response to M. tuberculosis.

4.1 Secretion of IFN-γ after EC610 Stimulation in Active TB and Latent TB

IFN-γ is a pro-inflammatory cytokine produced by activated T cells due to an immune response to a specific antigen stimulus. These cytokines play an important role in the activation of macrophages to eliminate Mycobacterium tuberculosis by recruiting phagocytic cells to eliminate Mycobacterium tuberculosis. IFN-γ strengthens the phagocyte potency of macrophages by stimulating phagolisosome fusion which can destroy M. tuberculosis bacteria(Widjaja JT et al, 2010; Wahyuniati N, 2017)

In this study, IFN-γ levels after stimulation with EC-610 antigen were higher in patients with active TB than latent TB but statistically there was no significant difference between the two groups.. These results are in line with Setiawan and Nugraha that active TB levels of IFN-γ were higher than latent TB but there was no statistically significant difference. IFN-γ levels are higher because there is a protective immune response against infection with TB germs. And the results of IFN-γ levels showed no significant difference between active TB and latent TB. This is

due to the nutritional status of active TB sufferers who tend to be malnourished so that the immune response does not function optimally. Patients who have been diagnosed with TB but did not immediately seek anti-TB treatment. This condition results in a decrease in immune response, so that the IFN-γ level is not too high (Setiawan H and Nugraha J, 2016). The development of recent research is that IFN-can induce the autophagy mechanism in cells infected with mycobacteria. The induction of autophagy will deliver mycobacteria into the lysosome and there will be a phagolysosome fusion which functions as an anti-microbial so that the bacteria will be killed (Wahyuniati N, 2017)

The results of this study differ from previous studies possibly because the sample in this study were new TB patients who had received OAT <1 month where the inflammatory response was still increasing in the early phase of TB infection. When the initial TB infection, the immune system will respond by carrying out an inflammatory reaction that occurs within 2-10 weeks after exposure to bacteria by forming a body defense system called granuloma, thusrecruiting immune cells to eliminate bacteria by increasing the production of proinflammatory cytokines. TB patients who consume OAT <1 month, the possibility of developing M. tuberculosis bacteria will decrease because the patient's immune system increases so that macrophage activation occurs which is marked by increased production of cytokines. The increase in proinflammatory cytokines, namely the levels of IFN-γ and IL-17 can also occur due to the influence of memory T cells that have been previously described (in vivo) and then stimulated with a more specific EC610 antigen so that the expression of IFN-IL and IL-17 levels increases. The effect of the strength of antigen presentation is thought to determine the antigenity that affects stimulation of T cell proliferation and cytokine production(Wibowo R.Y et al.,2017).

Low IFN-γ levels in latent TB are due to the reduced number of effector memory T-cells secreting IFN-in individuals with latent TB infection, due to the absence of M. tuberculosis replication and antigen load. This suggests that IFN-γ secreting T-cells predominatse during active TB disease (Biselli R et al.,2010)

4.2 Secretion of IL-17 after EC610 Stimulation in Active TB and Latent TB

IL-17 is a pro-inflammatory cytokine that plays a role in the pathogenesis of TB. The role of IL-17, among others, is to induce an optimal Th1 response and form granulomas, which are protective immunity against MTB infection. IL-17 also plays a role in attracting and activating neutrophils (Torado E and Cooper M.A, 2010).

IL-17 levels in this study in patients with active TB and latent TB showed a significant difference in the two groups where the IL-17 levels in active TB were higher than latent TB. This study is in line with Luo et al. Stated that IL-17 levels were increased in active TB compared to latent TB. In the early phase of active TB, Th17 will produce IL-17 which will recruit neutrophils to the infected site. In addition, as TB disease progresses, there is an increase in the production of IL-17 in peripheral blood for aprotective immune response against M.Tuberculosis (Luo et al., 2017)

Based on the results of previous studies, an increase in IL-17 levels in TB patients stimulated with an antigen increased IL-17 production, in response to M. tuberculosis. IL-17 plays a significant role in the protection induced by the ESAT-6 antigen. However IL-17 production in the lungs is generally immunosuppressive to IFN-γ. Thus, T cells in the presence of ESAT-6 reduce the proliferation and production of Th1 cytokines, but increase IL-17 production. ESAT-6 plays a role in changing the function of T cells to suppress protective immunity and eliciting a potential immunopathological response. During tuberculosis, IL-17 is a strong inflammatory cytokine capable of inducing chemokine expression that promotes cell recruitment and granuloma formation during infection. A balance between Th1 and Th17 responses is needed to control bacterial growth and limit immunopathology (Wang X et al, 2013). In this study, there was a shift in the response towards the excessive production of IL-17 which could lead to the recruitment of large numbers of neutrophils and tissue damage. Thus, regulation of Th1 and Th17 responses during tuberculosis is essential for enhancing anti-mycobacterial immunity and preventing widespread immunopathology. In this study, T cells inhibited and suppressed the proliferation of IFN-γ production. It can be seen from the mean increase in IFN-levels which were not too high and statistically insignificant. IL-17 as an initial response to M. tuberculosis plays a role in granuloma formation and controlling bacterial growth. Therefore, the role of IL-17-secreting cells during active TB patient disease represents the highest proportion of T lymphocytes to produce IL-17 to the site of infection (Jurado et al.,2012).

By using the ROC curve, it can be seen that IFN-γ levels have very low values to predict or diagnose

active TB and latent TB. Another study by Khan et al (2013) based on the ROC analysis of IFN-γ levels can be used for tuberculosis biomarkers

The level of IL-17 in this study has a very good value for predicting or diagnosing active TB and latent TB because the curve moves away from the 50% line and approaches 100%. This suggests that IL-17 levels can be used as a predictor or diagnosis of active TB and latent TB. This is in accordance with Seyedhosseini et al., (2019) from the area under curve (AUC) value, it is known that IL-17 is more specific in differentiating TB infection (Seyedhosseiniet al.,2019)

Based on the analysis of the ROC curve and the results of the study, IL-17 levels can be used to diagnose active TB and latent TB, but must be investigated for TB because the cytokine IL-17 is not only in tuberculosis but can occur in other inflammatory reactions.

5 CONCLUSION

IFN-γ levels and IL-17 levels after stimulation of ESAT-6-CFP-10Fusion Antigen (EC610) were higher in active TB than in latent TB. But statistically, there was no difference in the meaning of IFN-γ levels in the two groups and IL-17 levels were significantly different in the two groups.
This shows that IL-17 levels play a role in the protective immune response against Mycobacterium tuberculosis during the progression of TB disease.

The author's suggestion for further research can see the effect of the duration of use of OAT treatment with the secretion pattern of IFN-γ and IL-17 stimulated by EC610 and compare active TB and latent TB with healthy groups.

ACKNOWLEDGEMENTS

Thanks to Dr.dr. Francisca SrioetamiTanoehardjo, SpPK., M.Si at the National Health Research and Development Center, Kemenkes RI, Jakarta for her support and assistance in procuring the EC610 fusion antigen

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