

# CORRELATION OF INTERLEUKIN-23 SERUM LEVELS IN MEN WITH ACNE VULGARIS: A PRELIMINARY STUDY

*by* Santoso Santoso

---

**Submission date:** 18-Apr-2023 11:17AM (UTC+0700)

**Submission ID:** 2068015642

**File name:** 29955-65980-1-PB.pdf (526.92K)

**Word count:** 3036

**Character count:** 15697



Maria Hotmaida Carolina Munthe<sup>1</sup>, Novi Kusumaningrum<sup>2\*</sup>, Amallia Nuggetsiana Setyawati<sup>3</sup>, Astika Widy Utomo<sup>4</sup>, Santoso<sup>3</sup>

## CORRELATION OF INTERLEUKIN-23 SERUM LEVELS IN MEN WITH ACNE VULGARIS: A PRELIMINARY STUDY

Maria Hotmaida Carolina Munthe<sup>1</sup>, Novi Kusumaningrum<sup>2\*</sup>, Amallia Nuggetsiana Setyawati<sup>3</sup>, Astika Widy Utomo<sup>4</sup>, Santoso<sup>3</sup>

<sup>1</sup>Undergraduate Program, Faculty of Medicine, Diponegoro University, Semarang, Indonesia

<sup>2</sup>Department of Dermatology and Venereology, Faculty of Medicine, Diponegoro University, Semarang, Indonesia

<sup>3</sup>Department of Biochemistry, Faculty of Medicine, Diponegoro University, Semarang, Indonesia

<sup>4</sup>Department of Pharmacology and Therapy, Faculty of Medicine, Diponegoro University, Semarang, Indonesia

\* Corresponding author: Email: [novi.zamrudi@gmail.com](mailto:novi.zamrudi@gmail.com)

### ABSTRACT

**Background:** Acne vulgaris (AV) is an inflammatory condition of pilosebaceous unit that is common in adolescents and young adults. The pathogenesis of AV is multifactorial, one of which is inflammation. Interleukin-23 (IL-23) is an important role in the activity of T helper 17 (Th17) cells that produce IL-17 in chronic inflammation. **Objective:** To determine the correlation between IL-23 serum levels and AV severity in men. **Methods:** This is an analytical observational preliminary study with a cross-sectional design involving 15 male subjects with AV who were divided into groups of AV severity based on Lehmann's criteria. The subjects were examined for IL-23 serum levels. Data were analyzed using Spearman's Rho non-parametric correlation test to determine the correlation between variables. **Results:** Mean IL-23 serum levels in men with AV was  $111,05 \pm 115,27$  pg/ml, with mild AV was  $210,57 \pm 122,038$  pg/ml, moderate AV was  $103,65 \pm 91,15$  pg/ml and severe AV was  $18,94 \pm 15,76$  pg/ml. There is a significant correlation between IL-23 serum levels and AV severity in men. ( $p = 0,001$ ). IL-23 serum levels decreased with increasing AV severity ( $r = -0,756$ ). **Conclusion:** There is a strong negative correlation between IL-23 serum levels and AV severity in men.

**Keywords:** Acne Vulgaris, Lehmann's Criteria of Acne Vulgaris Severity, Interleukin-23

### INTRODUCTION

Acne vulgaris (AV) is a chronic inflammation of pilosebaceous follicles generally found in teenagers and early adulthood.<sup>1,2</sup> AV is marked by the appearance of comedones, papules, cysts, and pustules with a predilection on the face, neck, chest, and back.<sup>3,4</sup>

As much as 85% of the population had AV, most commonly found on the age of 15-25 years. Prevalence of AV on age 15-44 years is 34% of males and 27% of females, respectively. AV usually resolve quicker in males compared to females. However, males tend to have a worse presentation.<sup>5,6</sup> AV severity can be assessed by their clinical presentation using a consensus made by the Indonesian Society of Dermatology and Venereology according to Lehmann's gradation system which groups AV into three grades: mild, moderate and severe.<sup>7</sup>

The exact mechanisms for AV pathogenesis is still unknown, but there are four main contributing factors: follicular hyperproliferation, increased sebum production, bacterial colonization, and

inflammatory process.<sup>8</sup> The process of inflammation leading to AV is related to host immune response which targets *Propionibacterium acnes*, a commensal bacteria in human skin found in pilosebaceous follicles.<sup>9</sup>

*Propionibacterium acnes* can induce IL-17 secretion by Th17 lymphocytes, which is a subset of T cell that produces IL-17. IL-17 is a proinflammatory cytokine that has a prominent role in the pathogenesis of several skin diseases including AV. This cytokine is also increased along with AV severity. This indicates that AV can be mediated by Th17 lymphocytes.<sup>10-12</sup>

IL-23 have a role in the differentiation and expansion of Th17 cells from naive CD4<sup>+</sup> T cells.<sup>13</sup> IL-23 is also produced by the innate immune system such as dendritic cells and macrophages. This cytokine can facilitate the development of Th17 cells that produces IL-17 and other mediators which stimulates epidermal cells to produce cytokines and chemokines that attract and activate the innate immune system. A vicious cycle of inflammation involving IL-23/IL-17 axis causing a recurrent inflammation.<sup>14</sup>



Maria Hotmaida Carolina Munthe, Novi Kusumaningrum,  
Amalia Nuggetsiana Setyawati, Astika Widy Utomo, Santoso

Based on the effects of IL-23 on the immune system, this cytokine has a dominant role in the pathogenesis of AV through the IL-23/IL-17 axis. The purpose of this preliminary study is to identify a correlation between IL-23 serum levels and AV severity in men.

## METHOD

This is an analytical observational preliminary study with a cross-sectional design conducted in September 2020. Consecutive sampling was done involving 15 males subjects with AV in Semarang. The inclusion criteria for the subjects are as follows: men aged 15-25 years old, suffers from AV which is classified into mild, moderate, and severe grade based on Lehmann's criteria, and willing to be a research subject by signing an informed consent papers. The subjects were divided into three groups based on the grade of AV severity of mild, moderate and severe with a sample size of 5 subjects per group.

Physical examination of the subjects face was done by a dermatologist to determine the grade of AV severity based on Lehmann's criteria. Three milliliters of venous blood was sampled from the subjects, which were then centrifuged to obtain the serum components for examination of IL-23 serum levels using the ELISA method at GAKI Laboratory, Semarang.

The data were analyzed with a computer statistical analysis program. Correlation between IL-23 serum levels and grade of AV severity was analyzed with Spearman's Rho correlation test and a significant difference is determine if  $p < 0,05$ .

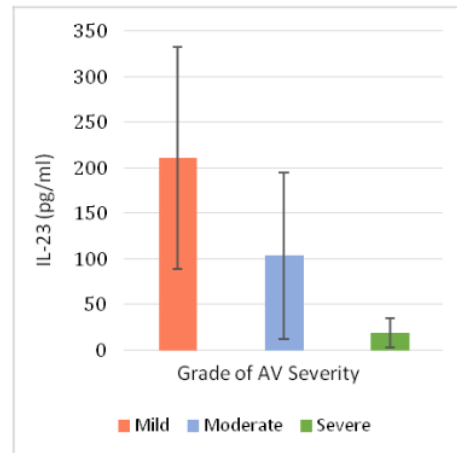
## RESULTS

This research involves 15 subjects, with 5 subjects in each category (mild, moderate, severe) (33,3%) as described in Table 1.

**Table 1.** Research subjects characteristics

Variable	F	%	Mean $\pm$ SD	Median (min - max)
Age			20,27 $\pm$ 1,75	20 (17 - 23)
IL-23 (pg/ml)			111,05 $\pm$ 115,27	60,47 (7,31 - 377,5)
Grade of severity				
Mild	5	33,3		
Moderate	5	33,3		
Severe	5	33,3		

The subject's mean age was  $20,27 \pm 1,75$  years old with the minimal age was 17 years old and the maximum age was 23 years old. Mean of IL-23 serum levels for all subjects was  $111,05 \pm 115,27$  pg/ml, with the minimum level was 7,31 pg/ml and the maximum level was 377,5 pg/ml.



**Figure 1.** IL-23 serum levels based on grade of AV severity

IL-23 serum levels in subjects with mild grade of AV severity was  $210,57 \pm 122,038$  pg/ml, with the minimum level was 60,47 pg/ml and the maximum level was 377,5 pg/ml. IL-23 serum levels in subjects with moderate grade of AV severity was  $103,65 \pm 91,15$  pg/ml, with the minimum level was 10,36 pg/ml and the maximum level was 236,40 pg/ml. IL-23 serum levels in subjects with severe grade of AV severity was  $18,94 \pm 15,76$  pg/ml, with the minimum level was 7,31 pg/ml and the maximum level was 45,88 pg/ml.

**Table 2.** Correlation test of IL-23 serum levels and AV severity

Variable	P	r
Grade of AV Severity IL-23	0,001	-0,756

Spearman's Rho correlation test showed that there was a significant correlation between IL-23 serum levels and grade of AV severity in males ( $p = 0,001$ ). A correlation coefficient of more than 0,5 indicates a strong negative correlation between



Maria Hotmaida Carolina Munthe, Novi Kusumaningrum,  
Amalia Nuggetsiana Setyawati, Astika Widy Utomo, Santoso

IL-23 serum levels and grade of AV severity ( $r = -0,756$ ).

There was an inverse correlation between the two variables, such that a decrease in IL-23 serum levels correlates with an increase in grade of AV severity.

## DISCUSSION

This preliminary study was conducted on 15 male research subjects in Semarang who were grouped based on the grade of AV severity into mild, moderate and severe AV severity groups based on Lehmann's criteria. Blood sample was taken from the subjects to examine the IL-23 serum levels. IL-23 levels have been extensively studied in relation to autoimmune conditions and chronic inflammation, but no previous studies have examined the association between IL-23 serum levels and AV conditions and severity.

Based on the research done by Purwaningdyah and Tjekyan, it was found that the occurrence of AV was higher in males than females.<sup>5,15</sup> This can be caused by the role of androgen hormones in men which can increase sebum production, leading to a more severe AV in males. In addition, women tend to have a higher awareness to seek medical attention in dealing with AV conditions.<sup>15</sup>

The age range of subjects in this study was 17-23 years. A study by Ayudianti et al showed that most AV patients were in the 15-24 year age group.<sup>3</sup> The incidence of AV is closely related to hormonal activity, where there is an increase in androgen hormones at puberty and then decreases after reaching its peak between the ages of 18-20 years.<sup>16</sup> Androgen hormones can stimulate sebaceous glands to produce more sebum thus propagate the occurrence of AV.<sup>17</sup>

The results of the study showed that the mean IL-23 serum level in men suffering from AV was  $111,05 \pm 115,27$  pg/ml, with the IL-23 serum levels at mild AV severity was  $210,57 \pm 122,038$  pg/ml, moderate AV was  $103,65 \pm 91,15$  pg/ml and severe AV was  $18,94 \pm 15,76$  pg/ml. Data analysis showed a  $p$  value of  $p = 0,001$ , which indicates that there is a significant correlation between IL-23 serum levels and AV severity in men. The correlation coefficient value obtained  $r = -0,756$  which indicates a strong negative correlation, that is, if there is an increase in the grade of AV

severity, there is a decrease in IL-23 serum levels in men. These results differ from the research hypothesis, namely that there is a positive correlation between IL-23 serum levels and AV severity in men.

IL-23 cytokine is known to have a major role in inducing differentiation of CD4<sup>+</sup> T cells into Th17 cells which produces IL-17, so that IL-17 levels are comparable to IL-23 which affects their production.<sup>13</sup> Based on a study by Istiyarini et al and Ebrahim et al, it was found that there was a significant correlation between IL-17 levels and AV severity, where an increase in serum IL-17 correlates with an increase in AV severity.<sup>10,12</sup> This is in contrast with the results of this study which showed that a decrease in IL-23 serum levels is followed by an increase in AV severity in the subjects.

IL-17 is not only produced by Th17 cells, but also by the cells of the innate immune system such as mast cells and neutrophils granulocytes.<sup>14</sup> A research by Kelhala et al showed that Th17 pathways also contributes to an inflammatory response in AV.<sup>18</sup> Inflammation mediated by Th17 can be caused by a number of exogenous factors such as vitamin D3, UV radiation, or other cytokines like IL-9. So that apart from the role of IL-23, innate immune cells and the factors mentioned above also influence the production of IL-17.<sup>17</sup>

A study by Ibrahim et al showed a significant increase in serum IL-12 in subjects with AV when compared with healthy control.<sup>19</sup> During chronic inflammation, dendritic cells and macrophages produced IL-23 which drives Th17 differentiation. Dendritic cells and macrophages also produces IL-12 that stimulates Th1 cells to produce IFN- $\gamma$ . Th17 differentiation is suppressed by IFN- $\gamma$  by reducing IL-23 receptors, thus disrupting the IL-23/IL-17 axis. This may cause a decrease in IL-23 levels.<sup>13</sup>

Various factors of the research subjects can also influence the results of this study. These include psychological stress conditions, obesity, and excessive fat and carbohydrates intake that can increase the release of proinflammatory cytokines.<sup>20,21</sup> However, this conditions was not explored further in this study. In addition, the assessment of AV severity in the subjects was carried out by physical examination to calculate the number and type of facial lesions. This could also





Maria Hotmaida Carolina Munthe, Novi Kusumaningrum,  
Amalia Nuggetsiana Setyawati, Astika Widy Utomo, Santoso

bias the study because AV lesions in other locations such as back and chest in the subjects were not taken into account.

The calculating method of AV lesions by Lehmann's criteria describes the grade of AV severity by the number and type of AV lesions, so the grade of inflammation in the lesions is difficult to determine. According <sup>37</sup>a study by Maulinda et al, it was shown that there was no significant difference between IL-17 serum levels in the papulopustular and comedonal AV type. Comedones which are clinically non-inflammatory lesions have also undergo <sup>38</sup>an inflammatory process with the discovery of proinflammatory cytokines such as IL-1 $\alpha$ , TNF- $\alpha$  and CD4<sup>+</sup> T cells in comedone lesions.<sup>22</sup> So that the grade of AV severity assessed based on the type of AV lesion cannot reflect the grade of inflammation that occurs.

As it is a preliminary study, references regarding the correlation between IL-23 serum levels and AV severity are limited. Due to COVID-19 pandemic, physical examination of the subjects was done using photographs which could affect the assessment of the AV severity. In addition, the limited sample size of this study cannot fully represent the male population. This study did not examine IL-17 serum levels, the onset of AV in subject <sup>41</sup>and other confounding factors that could affect IL-23 serum levels AV and inflammatory conditions in the subjects.

## CONCLUSION

In conclusion, there was a strong negative correlation between IL-23 serum levels and AV severity in men. In <sup>2</sup>this study, it is necessary to further investigate the relationship between IL-23 serum levels and the grade of AV severity in men by using a larger number of samples and a wider population scope. In addition, it is necessary to investigate the involvement of other factors that can influence AV inflammatory conditions in men.

## Ethical Approval

<sup>20</sup> This study received Ethical Clearance from the Health Research Ethics Commission, Faculty of Medicine, Diponegoro University with ethical clearance number No. 217/EC/KEPK/FK-<sup>35</sup>DIP/2020.

## Conflicts of Interest

There are no conflict of interest in this study.

## Funding

No specific funding was provided for this article. The researcher bore all costs related to research.

## Acknowledgments

This work was supported by <sup>39</sup>Department of Dermatology and Venereology, Faculty of Medicine, Diponegoro University.

## REFERENCES

- Williams HC, Dellavalle RP, Garner S. Acne vulgaris. *Lancet*. 2012; 379(9813): 361–72.
- Toyoda M, Morohashi M. Pathogenesis of acne. *J Electron Microsc*. 2001; 34(1): 29–40.
- Ayudianti P, Indramaya DM. Studi Retrospektif: Faktor Pencetus Akne Vulgaris. *Berk Ilmu Kesehat Kulit dan Kelamin*. 2014; <sup>24</sup>(1): 41–7.
- Dawson AL, Dellavalle RP. Acne vulgaris. *WJ*. 2013; 346(7907): 1–7.
- Tjekyan RMS. Kejadian dan Faktor Resiko Akne Vulgaris. *Media Med Indones*. 2009; 43: 37–43.
- Billman JD. Management of acne vulgaris. *PharmaNote*. 2009; 25(3).
- Wasitaatmadja SM, Arimuko A, Norawati L, Bernadette I, Legiawati L. Pedomatan Tata Laksana Akne di Indonesia. Edisi 2. Jakarta: <sup>23</sup>PERDOSKI; 2016. 3p.
- Tahir CM. Pathogenesis of acne vulgaris: simplified. *J Pakistan Assoc Dermatologists*. 2010; 20: 93–7.
- Agak GW, Qin M, Nobe J, Kim MH, Krutzik SR, Tristan GR, et al. Propionibacterium acnes induces an IL-17 response in acne vulgaris that is regulated by vitamin A and vitamin D. *J Invest Dermatol*. 2014; 134(2): 366–73.
- Murlistyarini S, Kumala Y, Megasasi Y, Rahadini E. Levels of IL-12, IL-17, and IL-37 in acne vulgaris. *Turkish J Immunol*. 2018; 6(2): 52–6.
- Kistowska M, Meier B, Proust T, Feldmeyer L, Cozzio A, Kuendig T, et al. Propionibacterium acnes promotes Th17 and Th17/Th1 responses in acne patients. *J Invest Dermatol*. 2015; 135(1): 110–8.



Maria Hotmaida Carolina Munthe, Novi Kusumaningrum,  
Amalia Nuggetsiana Setyawati, Astika Widy Utomo, Santoso

12. Ebrahim AA, Mustafa AI, El-Abd AM. Serum interleukin-17 as a novel biomarker in patients with acne vulgaris. *J Cosmet Dermatol*. 2019; 6): 1975–9.
13. Iwakura Y, Ishigame H. The IL-23/IL-17 Axis in Inflammation. *J Clin Invest*. 2006; 116(5): 1218–22.
14. Schön MP, Erpenbeck L. The Interleukin-23/Interleukin-17 Axis Links Adaptive and Innate Immunity in Psoriasis. *Front Immunol*. 2018; 9: 1–13.
15. Purwaningdyah RA, Jusuf K, Karmila N. Profil Penderita Akne Vulgaris pada Siswa-Siswi di SMA Shafiyatul Amaliyyah Medan. *e-jurnal Fak Kedokt USU*. 2013; 1(1): 1–8.
16. Nazaya M, Praharsini IGAA, Rusyati LMM. Profil Gangguan Kualitas Hidup Akibat Akne Vulgaris Pada Mahasiswa Fakultas Kedokteran Universitas Udayana Tahun 2015. *E J Med*. 2018; 7(8): 1–5.
17. Al-Kubaisy W, Abdullah NN, Kahn SM, Zia M. Sociodemographic Characteristics of Acne among University Students in Damascus, Syria. *Epidemiol Res Int*. 2014; 2014(December 2009): 1–4.
18. Kelh  la HL, Palatsi R, Fyhrquist N, Lehtim  ki S, V  rynen JP, Kallioinen M, et al. IL-17/Th17 Pathway Is Activated in Acne Lesions. *PLoS One*. 2014; 9(8).
19. Ibrahim A, Mohammed S, Farouk G, Mohammed AE, Younes S, Elakhras AI. Assessment of IL-12 Serum Level in Patients with Inflammatory Acne Vulgaris and its Correlation with its Severity. *J Turkish Acad Dermatology*. 2014; 8(2): 1–6.
20. Rosyanti L, Devianti R, Hadi I, Syahrianti S. Kajian Teoritis: Hubungan Antara Depresi dengan Sistem Neuroimun (Sitokin-HPA Aksis) “Psikoneuroimunologi.” *Heal Inf J Penelit*. 2017; 9(2): 35–52.
21. Prihaningtyas RA, Widjaja NA, Irawan R, Hanindita MH, Hidajat B. Dietary Intakes and High Sensitivity CRP (hsCRP) in Adolescents with Obesity. *Carpathian J Food Sci Technol*. 2019; 11(5): 83–8.
22. Maulinda S, Hindritiani R, Ruchiatan K, Suwarsa O. Perbandingan Kadar Interleukin-17 Serum Pasien Akne Vulgaris Tipe Papulopustular dengan Komedonal. *Maj Kedokt Bandung*. 2016; 48(3): 160–3.

# CORRELATION OF INTERLEUKIN-23 SERUM LEVELS IN MEN WITH ACNE VULGARIS: A PRELIMINARY STUDY

---

## ORIGINALITY REPORT

---

24%

SIMILARITY INDEX

15%

INTERNET SOURCES

20%

PUBLICATIONS

10%

STUDENT PAPERS

---

## PRIMARY SOURCES

---

- 1

Ni Luh Putu Martini, Irna Nursanti, Giri Widakdo. "Aplikasi Web Cek Riska sebagai Upaya Meningkatkan Pengetahuan Ibu Mendeteksi Dini Risiko Tinggi Kehamilan", Jurnal Keperawatan Silampari, 2020

Publication

2%
  - 2

Aprilina Dwi Sulistyowati, Dwi Retno Adiwinarni, Kristiana Etnawati. "The relationship between serum malondialdehyde levels and severity of acne vulgaris on male", Journal of the Medical Sciences (Berkala Ilmu Kedokteran), 2014

Publication

2%
  - 3

Fitri Meutia Donytasari, Nelva Karmila Jusuf, Imam Budi Putra. "Correlation between Sebum Level and Follicular Fluorescence in Acne Vulgaris Patients", Open Access Macedonian Journal of Medical Sciences, 2022

Publication

1%
-

4	MP Nugrahanti, D Armalina, DL Partiningrum, F Fulyani. "The effect of ranitidine administration in graded dosage to the degree of liver damage: A study on Wistar rats with acute methanol intoxication", Human & Experimental Toxicology, 2020 Publication	1 %
5	repository.unair.ac.id Internet Source	1 %
6	sites.kowsarpub.com Internet Source	1 %
7	jddonline.com Internet Source	1 %
8	karyailmiah.unisba.ac.id Internet Source	1 %
9	Submitted to Higher Education Commission Pakistan Student Paper	1 %
10	www.jpapad.com.pk Internet Source	1 %
11	www.mdpi.com Internet Source	1 %
12	www.docstoc.com Internet Source	1 %
13	Submitted to Tarumanagara University Student Paper	



1 %

14

[mafiadoc.com](http://mafiadoc.com)

Internet Source

1 %

15

[scholar.unand.ac.id](http://scholar.unand.ac.id)

Internet Source

1 %

16

Submitted to Universitas Prima Indonesia

Student Paper

1 %

17

W. Lew. "Increased expression of interleukin-23 p19 mRNA in erythema nodosum-like lesions of Behçet's disease", British Journal of Dermatology, 3/2008

Publication

1 %

18

[bji-fk.ejournal.unsri.ac.id](http://bji-fk.ejournal.unsri.ac.id)

Internet Source

1 %

19

Abdollah JAFARZADEH. "Association of the CagA status of *Helicobacter pylori* and serum levels of interleukin (IL)-17 and IL-23 in duodenal ulcer patients", Journal of Digestive Diseases, 05/2009

Publication

1 %

20

Submitted to Udayana University

Student Paper

<1 %

21

[repository.umsu.ac.id](http://repository.umsu.ac.id)

Internet Source

<1 %

22	"RHEUMATOID ARTHRITIS ? TREATMENT", APLAR Journal of Rheumatology, 8/2006 Publication	<1 %
23	Eden Etcheverria. "Recognizing and treating five common dermatologic conditions seen in primary care", Journal of the American Academy of Physician Assistants, 2020 Publication	<1 %
24	Submitted to Cardiff University Student Paper	<1 %
25	"Abstracts", Journal of Investigative Dermatology, 2015. Publication	<1 %
26	Submitted to Rush University Student Paper	<1 %
27	Submitted to University of the Philippines - Main Library Student Paper	<1 %
28	Vaccaro, Mario, Serafinella P. Cannavò, Selene Imbesi, Mariateresa Cristani, Olga Barbuzza, Valeria Tigano, and Sebastiano Gangemi. "Increased serum levels of interleukin-23 circulating in patients with non-segmental generalized vitiligo", International Journal of Dermatology, 2014. Publication	<1 %

- |    |  |      |
|----|--|------|
| 29 | Zhang, Z.. "After interleukin-12p40, are interleukin-23 and interleukin-17 the next therapeutic targets for inflammatory bowel disease?", International Immunopharmacology, 200704<br>Publication                | <1 % |
| 30 | Hanan M. Saleh, Moustafa A. Deif, Rania M. El - Hussein. "Assessment of serum interleukin - 19 in acne vulgaris patients of different clinical severities", Journal of Cosmetic Dermatology, 2021<br>Publication | <1 % |
| 31 | pdfs.semanticscholar.org<br>Internet Source  | <1 % |
| 32 | scindeks.ceon.rs<br>Internet Source  | <1 % |
| 33 | www.researcherslinks.com<br>Internet Source  | <1 % |
| 34 | Antonino Castellaneta. "Monitoring the operationally tolerant liver allograft recipient :", Current Opinion in Organ Transplantation, 02/2010<br>Publication   | <1 % |
| 35 | Mochamat Mochamat, Marta Przyborek, Birgit Jaspers, Henning Cuhls, Rupert Conrad, Martin Mücke, Lukas Radbruch.<br>"Development of Care Pathway for  | <1 % |

# Assessment and Treatment of Fatigue in Palliative Care", Indian Journal of Palliative Care, 2023

Publication

36

N. J. Kotloski, D. T. Nardelli, S. H. Peterson, J. R. Torrealba, T. F. Warner, S. M. Callister, R. F. Schell. "Interleukin-23 Is Required for Development of Arthritis in Mice Vaccinated and Challenged with Borrelia Species", Clinical and Vaccine Immunology, 2008

Publication

<1 %

37

dokumen.pub

Internet Source

<1 %

38

idoc.pub

Internet Source

<1 %

39

ijoems.com

Internet Source

<1 %

40

J.A. ODaly. "Chapter 1 Psoriasis, a Systemic Disease Beyond the Skin, as Evidenced by Psoriatic Arthritis and Many Comorbidities – Clinical Remission with a Leishmania Amastigotes Vaccine, a Serendipity Finding", IntechOpen, 2012

Publication

<1 %

41

David, A.. "Interleukin-23 serum levels in patients affected by peripheral arterial disease", Clinical Biochemistry, 201202

Publication

<1 %

---

42	Laura A. Lucaciu, Maria Ilieș, Ștefan C. Vesa, Radu Seicean, Shahida Din, Cristina Adela Iuga, Andrada Seicean. "Serum Interleukin (IL)-23 and IL-17 Profile in Inflammatory Bowel Disease (IBD) Patients Could Differentiate between Severe and Non-Severe Disease", Journal of Personalized Medicine, 2021	<1 %
----	--	------

---

Publication

43	Therwa Hamza, John B. Barnett, Bingyun Li. "Interleukin 12 a Key Immunoregulatory Cytokine in Infection Applications", International Journal of Molecular Sciences, 2010	<1 %
----	--	------

---

Publication

---

Exclude quotes	Off
Exclude bibliography	Off

Exclude matches	Off
-----------------	-----