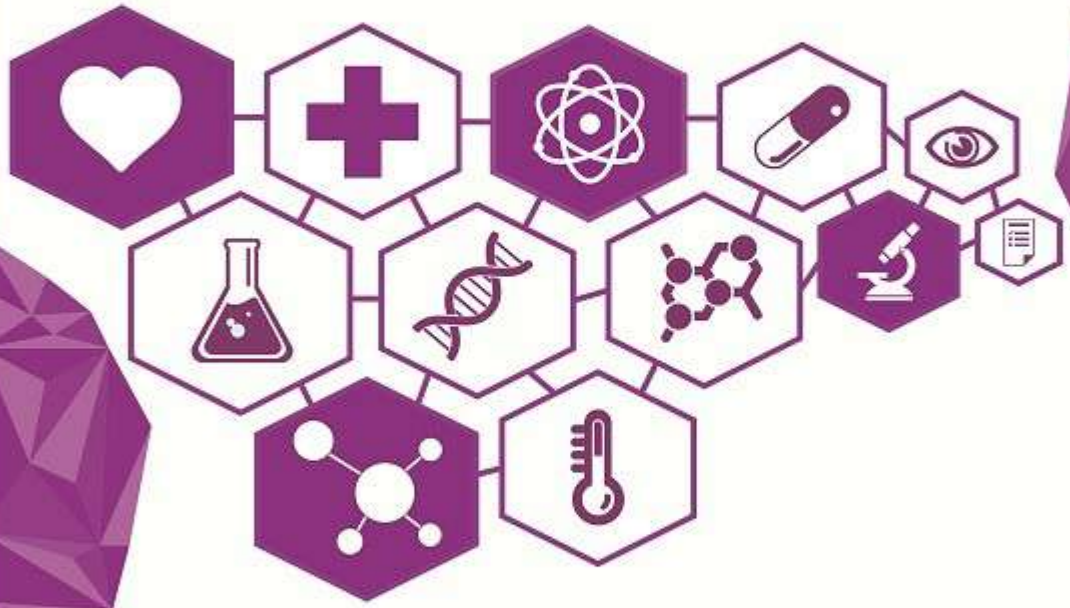
e-ISSN: 2620-8636

BIOMOLECULAR and health SCIENCE JOURNAL



Volume 4, Number 2, October 2021

Published by:
Faculty of Medicine, Universitas Airlangga

Editorial Team

Prof. In Seok Moon

Editorial Board

Yonsei University, Korea

- - 55953868500 -

Prof. Sohkichi Matsumoto, D.D.S., Ph. D

Editorial Board

Niigata University, Japan

- - 35414579600 -

Yoshio Yamaoka, MD, Ph.D

Editorial Board

Oita University, Japan

- 55183784100 -

Hoda Michel Malaty, M.D., M.P.H., Ph.D., F.A.C.G

Editorial Board

Baylor College of Medicine, Houston, Texas, United States

- - 7005911149 -

Prof. Delvac Oceandy, MD., Ph.D

Editorial Board

University of Manchester, Manchester, United Kingdom

- - 6506557120 -

Prof. Maria Lucia Inge Lusida, MD. Ph.D

Editorial Board

Universitas Airlangga, Indonesia

- - 7801547112 -

Prof. Maria Lucia Inge Lusida, MD. Ph.D

Editorial Board

Universitas Airlangga, Indonesia

- - 7801547112 -

Prof. Mei-Ling Tsai, MD., Ph.D
Editorial Board
National Cheng Kung University, Taiwan, Province of China

- - 57154844500 -

Shamsul Ansari Ph.D
Editorial Board
Maharajgunj Medical Campus, Institute of Medicine, Nepal

- - 55523204000 -

Prof. Indah Setyawati Tantular, MD, Ph.D
Editorial Board
Universitas Airlangga, Indonesia

- - 6603308132 -

Prof. Kuntaman, MD, Ph.D
Editorial Board
Universitas Airlangga, Indonesia

- - 8700386400 -

Prof. Nasronudin, MD
Editorial Board
Universitas Airlangga, Indonesia

- - 55516591900 -

Prof. Retno Handajani, MD. Ph.D
Editorial Board
Universitas Airlangga, Indonesia

- - 6603094707 -

Prof. Usman Hadi, MD
Editorial Board
Universitas Airlangga, Indonesia

- - 55804160500 -

Instruction For Author

Guide for authors	Authorship form
Online Submission	Submission Package

Focus and Scope	Publication Ethics
Article Processing Charge	Peer Reviewers

Peer Reviewer Process	Open Access Statement
Plagiarism	Archiving
ORCID ID Policy	Copyright
Repository Policy	License Term

Meet Our Editorial Team

Prof. Muhammad Miftahussurur, MD., Ph.D
Editor in Chief
Universitas Airlangga, Indonesia
56323903000

Prof. Budi Santoso, MD., Ph.D
Honorary Editor
Universitas Airlangga, Indonesia
57201498069

Prof. Hein Van Poppel
Editorial Board
KU Leuven, Belgium
7006019341

Read More

National Accreditation

BIOMOLECULAR and health SCIENCE JOURNAL
Published by Faculty of Medicine Universitas Airlangga

Vol. 4 No. 2 (2021): Biomolecular and Health Science Journal

Current Issue

Vol. 4 No. 2 (2021): Biomolecular and Health Science Journal

Published: 2021-10-30

Original Article

Immunomodulator Effect of Lemongrass Extract (Cymbopogon nardus L.) to Increase Immune Cells as a Precaution Against SARS-CoV-2

Putri Ayu Ika Setiyowati , Rofiatun Solekha , Sri Bintang Sahara Mahaputra Kusuma Negara , Reny Rosalina

73-77

Abstract : 827

PDF : 454

PDF

DOI : 10.20473/bhsj.v4i2.26619

Risk Factor Characteristics Of Patients With Uterine Prolapse In Gynecology Outpatient Clinic In Dr. Soetomo Hospital, Surabaya

Vemaniarti Lian Pravitasari , Eighty Mardiyan Kurniawati , Pirlina Umiastuti

78-80

Abstract : 425

PDF : 266

PDF

DOI : 10.20473/bhsj.v4i2.30789

Prenatal Risk Factors on Children's Cerebral Palsy Case at RSIA Bunda Jakarta

Banatul Banatul Lariza , Kurnia Dwi Artanti , Taufiq Taufiq Hidayat

81-85

Abstract : 264

PDF : 195

PDF

DOI : 10.20473/bhsj.v4i2.27449

The Effect of Simvastatin and Virgin Coconut Oil (VCO) Combination Therapy as Triglyceride

Plasma Lowering Agent in White Dyslipidemic Male Rat (Rattus norvegicus)

Jefferson Caesario , Soebagijo Adi , Ema Qurnianingsih

86-89

PDF

DOI : 10.20473/bhsj.v4i2.29762

Association between Smoking Habit and Pulmonary Tuberculosis at Dr. Soetomo General Academic Hospita

Balivia Andi Permata Hapsari , Prastuti Asta Wulaningrum , Rimbun Rimbun

90-94

PDF

DOI : 10.20473/bhsj.v4i2.30641

Analgesic Effect Study of Young Coconut Water (Cocos nucifera L.) on Mice (Mus musculus) Induced with Pain using Acetic Acid

Dini Indah Berlianti , Danti Nur Indiastuti , Gondo Mastutik , Shaohong Lai

95-98

PDF

DOI : 10.20473/bhsj.v4i2.30176

Antibacterial mechanism of Kratom (Mitragyna speciosa) methanol extract on Streptococcus pneumoniae and Eschericia coli bacteria

Hotimah Masdan Salim , Marinda Dwi Puspitarini , Yuani Setiwati , Michio Shimabukuro

99-103

PDF

DOI : 10.20473/bhsj.v4i2.28933

Caregiver Burden And Psychosocial Factors In Mothers With Autism Spectrum Disorder Children

Izzatul Fithriyah , Magdeline Elizabeth Carrasco

104-107

PDF

DOI : 10.20473/bhsj.v4i2.28875

Factors Associated with Acid Fast Bacilli and Sputum Culture Conversion in Patients with Multidrug-Resistant Tuberculosis in Surabaya

Naomi Rahmasena , Isnin Anang Marhana , Muhammad Yamin Sunaryo Suwandi , Tutik Kusmiati , Tuksin Jearanaiwitayakul

108-113

PDF

DOI : 10.20473/bhsj.v4i2.29763

Gram Negative Bacteria (Escherichia coli) Win Against Gram Positive Bacteria (Staphylococcus

aureus) in The Same Media

Neisya Intan Cahyaningtyas Agung Putri , Ramadhani Ramadhani , Eddy Bagus Wasito 114-117

Abstract : 389 PDF : 317

PDF DOI : 10.20473/bhsj.v4i2.30177

Case Report

A 40-year-old Woman with Hypercalcemia Crisis Caused by Bone Metastasis in Stage IV Breast Cancer

Wiharjo Hadisuwarno , Merlyna Savitri , Ami Ashariati , S. Ugroseno Yudho Bintoro , M. Noor Diansyah , Putu Niken Ayu Amrita , Pradana Zaky Romadhon 118-121

Abstract : 369 PDF : 187

PDF DOI : 10.20473/bhsj.v4i2.29633

Facial Abscess due to Staphylococcus aureus in Patient with Type 2 Diabetes Mellitus: Case Report

Dian Galuh Maharani , Hermina Novida 122-124

Abstract : 325 PDF : 220

PDF DOI : 10.20473/bhsj.v4i2.30029

Review Article

A Systematical Review of The Effect of Ketogenic Diet on Bcl-2 (B-cell lymphoma-2) Expression as An Apoptosis Marker in Cancer Treatment

Vania Islamey Kusuma , Reny I'tishom , Ema Qurnianingsih , Purwo Sri Rejeki 125-130

Abstract : 806 PDF : 554

PDF DOI : 10.20473/bhsj.v4i2.30173

The Pathophysiology and Outcomes of Diabetic Patients with Coronavirus Disease 2019 (COVID-19)

Victor Perdana Kusuma , Deasy Ardiany 131-136

Abstract : 608 PDF : 353

PDF DOI : 10.20473/bhsj.v4i2.30030

Instruction For Author

ORIGINAL ARTICLE

Analgesic Effect Study of Young Coconut Water (*Cocos nucifera L.*) on Mice (*Mus musculus*) Induced with Pain using Acetic Acid

Dini Indah Berlianti[1], Danti Nur Indiastuti[2*], Gondo Mastutik[3], Shaohong Lai[4]

[1]Faculty of Medicine, Universitas Muhammadiyah Surabaya, Surabaya, Indonesia
[2]Department of Anatomy, Histology and Pharmacology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
[3]Department of Anatomical Pathology, Faculty of Medicine Universitas Airlangga, Surabaya, Indonesia
[4]Faculty of Medicine, Graduate School of Medicine, Oita University University, Yufu, Japan

ARTICLE INFO

Article history:
Received 10 August 2021
Received in revised form 17 September 2021
Accepted 8 Oktober 2021
Available online 31 October 2021

Keywords:
Young Coconut Water,
Cocos nucifera L.,
writhing reflex, analgesic.

) Corresponding author:
danti-n-i@fk.unair.ac.id

ABSTRACT

Introduction: Pain signals tissue damage that is capable of reducing thequality of life. Non-Steroidal Anti-inflammatory Drugs (NSAIDs) are known as effective analgesic drugs which have various side effects, therefore natural minerals are used as an alternative medicine for pain and inflammation, one of which is known to be coconut water. Hence this research was conducted to find out the differences of the analgesic effect between young coconut water (*Cocos nucifera L.*) with non-selective and COX-2 selective NSAID on mice induced with pain from acetic acid 0.6% 1 ml/100gBW of mice.
Methods: True experimental, conducted at the Pharmacology Laboratory in Faculty of Medicine of Airlangga University involving the sample of 48 mice (6 groups). The recorded data was tested using the oneway ANOVA methodology before then continued with the posthoc test of LSD.
Results: The addition of young coconut water (*Cocos nucifera L.*) with the dosage of 3 ml/100gBW, 4 ml/100gBW, and 4.5 ml/100gBW of mice doesn't give any significant analgesic effect even though the analgesic protection percentage increases accordingly to its dosage (12.32%, 18.72%, 26.88%), but non-selective and COX-2 selective NSAID give significant analgesic effect ($p<0.05$) on mice induced with pain from acetic acid 0.6% 1 ml/100gBW of mice.
Conclusion: There are differences in the analgesic effect of young coconut water (*C. nucifera L.*) with non-selective and COX-2 selective NSAID on mice induced with pain from acetic acid 0.6% 1 ml/100gBW of mice.

Introduction

Pain signals tissue damage that is capable of reducing the quality of life and becoming the primary cause of disability.[1] Tissue damage will cause arachidonic acid to be formed, and then the cyclooxygenase enzyme (COX) is converting it to be the pain mediator, called the prostaglandin, which will stimulate nociceptive to deliver pain to be perceived by the thalamus.[2]

Non-Steroidal Anti-inflammatory Drugs (NSAIDs) are the drugs used to tend to pain and inflammation that have high effectiveness.[3,4] NSAID works on the inhibition of cyclooxygenase enzyme.[5] NSAID is classified into non-selective (e.g. aspirin and ibuprofen), and COX-2 selective (e.g. celecoxib and meloxicam). Aspirin and celecoxib are capable to work on peripheral pain stimulation that's delivered by nerve fiber C, for example on the chemical pain stimulation from acetic acid as an irritant.[6] However, NSAID has harmful side effects, which generally affect the digestive and cardiovascular systems.[5] Therefore, we need alternative medicine which has minimalistic side effects compared to NSAID.

Humans have been using herbs and natural minerals as an alternative medicine to tend to pain. One of them is the coconut, *Cocos nucifera L.* (Arecaceae).[7] According to studies, the extract of coconut coir is capable of inhibiting the writhing reflex on mice.[8] Matured coconut water (*C. nucifera L.*) that is consumed with the dosage of 4 ml/100 g BW of mice for 6 weeks can give an analgesic effect on mice.[9] Coconut water also has an anti-inflammation effect, and it has been proved that young coconut water is

more potent than matured coconut water.[10] The analgesic and antiinflammation effects inside the coconut water are caused by its content, namely the flavonoid and salicylic acid which will inhibit the forming process of prostaglandin.[10] Salicylic acid (2-hydroxybenzoic acid) acts as the fitohormon on coconut that has the analgesic effect (Inhibition of enzyme COX-1&2), antipyretic, and antiinflammation.[11,12] Young coconut water possesses much more salicylic acid concentration compared to matured coconut water.[10]

Hence why, the plan for research in order to learn the differences of the analgesic effect between young coconut water (*C. nucifera L.*) with non-selective and COX-2 selective NSAID on mice induced with pain from acetic acid 0.6% 1 ml/100gBW of mice with writhing reflex methodology was arranged.

Methods

Ethical Clearance

This research has been approved by the Ethical Committee of Faculty of Medicine Universitas Airlangga.

Research Design

This research is using a true experimental design where the total sample was divided into six treatment groups. Group 1 (P1) was given aquadest as K(-), group 2 (P2) aspirin (non-selective NSAID) with the dosage 6.5 mg/100gBW of mice as K(+)1, group 3 (P3) was given celecoxib (COX-2 selective NSAID) with the dosage 2.6 mg/100gBW as K(+)2, group 4 (P4) was given young coconut water with the dosage 3 ml/100gBW, group 5 (P5) was given young coconut water with the dosage 4 ml/100gBW, and group 6 (P6) was given young coconut water with the dosage 4.5 ml/100gBW of mice. Each treatment was given 30 minutes before the intraperitoneal injection of acetic acid 0.6% 1ml/100g BW of mice as pain induction. This was based on how long the drug's onset of work until it evokes the desired effect, for instance on aspirin whose onset starts at the 20-minute mark.[13] The young coconut water (*C. nucifera L.*) is around 5-6 months old with the consistency of fruit flesh that is still soft and has a white with a little clear color. Male Mus musculus has the body weight of 26-35 gr and lives in a group inside a husk cage and was fed Charoen Pokphand 593 with the same water, which was acclimatized first for 14 days. The dosage of young coconut water was determined based on the previous research and the volume capacity of the mice's stomach, which is 1ml for 20g BW (body weight) of mice.[14] The dosage of aspirin and celecoxib were determined by calculating the human-to-animal dosage conversion based on the conversion table by Laurence and Bachrach with the maintenance dosage of aspirin of 500 mg and celecoxib of 200 mg.[15] The result of aspirin conversion was found to be 6.5 mg/100g BW of mice and celecoxib to be 2.6 mg/100g BW of mice. Both medicines were given to the mice with suspension preparations, thus they first needed to be dissolved with CMC Na on water. Suspension and aquadest given to mice were corresponding to the result of calculation for average mice bodyweight that is 30 g which were then calculated with the average volume of coconut water given, thus obtaining the given volume of 1.15ml/30gBW for treatment K(+)1, K(+)2, dan K(-). Given suspension volume was calculated for each mouse according to their BW. Trial and error were done to see if the dosage volume that was given and the injected acetic acid gave the desired reaction.

Settings

The research was conducted at the Pharmacology Laboratory in the Faculty of Medicine of Airlangga University.

Time Frame

The research was conducted since March 2020 until October 2020.

Variables

The independent variables in this research are the giving of young coconut water (*C. nucifera L.*) with the dosage 3 ml/100g, 4 ml/100g, and 4.5 ml/100gBW of mice, aspirin suspension, celecoxib suspension, and aquadest according to the dosage calculated on the mice with the given volume 1.15 ml/30g BW. The dependent variables in this research are the amount of abdomen writhing based on the writhing reflex methodology. The control variables in this research are the male mice (*Mus musculus*) which received the same treatment and induced with acetic acid 0.6% 1 ml/100 g BW of mice.

Population, Samples, and Sampling

The population used for this research is the male mice (*Mus musculus*). The sample needed for this research was determined through the simple random sampling technique with calculation using Federer formula, and another sample was also added as an anticipation measure for sample error. The sample needed was 48 male mice Mus musculus.

Instruments

The research instruments used during the acclimatization process of mice were the body weight scale, cage, and food. During the process of treatment given, the instruments used were young coconut water (*C. nucifera L.*) with the dosage 3 ml/100g, 4 ml/100g, and 4.5 ml/100gBW of mice, aspirin 6.5 mg/100gBW of mice, celecoxib 2.6 mg/100gBW of mice, aquadest 1.15 ml, and a pipette. The instruments used during writhing reflex test and its data collecting process were acetic acid 0.6 % 1 ml/100g BW of mice, stopwatch, stationery, camera, tripod, and the writhing result table on writhing reflex.

Data Analysis

The data acquired was the amount of writhing reflex (stretching or extension movement of its back leg, contraction of abdominal muscle, or its back arch). The amount of writhing from each group was recorded every 5 minutes for as long as 60 minutes since the time they were given the treatment, before then calculating the average of each group. The data was calculated and analyzed using the comparison test using the one way ANOVA (Analysis of Variance) method; so that it was necessary to first conduct the normality test and homogeneity test. If the test result using the one way ANOVA method provides a result with a rather significant difference, then it will be followed by a posthoc test of Least Significant Difference (LSD). All tests were conducted using the IBM SPSS Statistics Subscription application version 25.

Results

The average writhing calculation was acquired as shown in table 1.

Table 1. Writhing average

Treatment	Average at the Minute-											
	5'	10'	15'	20'	25'	30'	35'	40'	45'	50'	55'	60'
P1	11.50	10.38	8.25	8.25	7.38	7.50	6.25	6.00	4.88	3.63	2.63	1.50
P2	7.63	7.00	5.13	2.75	3.13	2.38	1.63	2.13	1.50	0.75	1.00	0.63
P3	8.13	7.88	6.00	5.25	4.63	3.25	2.63	1.38	1.25	1.00	0.63	0.25
P4	11.75	11.88	8.75	6.25	5.88	5.75	4.13	4.38	3.63	2.38	1.63	2.13
P5	10.13	8.75	7.88	7.25	6.38	6.13	4.50	3.63	2.88	2.63	2.00	1.38
P6	9.88	9.00	7.13	5.50	4.88	4.63	4.13	3.13	2.00	2.88	2.50	1.50

Normality and homogeneity tests were conducted on the acquired data, from which we obtain the significance (sig.) value each of ($p>0.05$) which indicates that the data was distributed normal and homogeneous. The data was calculated using the one way ANOVA method whose results are shown in Table 2.

Based on the result of the correlation test shown above, the significance value $p=0.03$ ($p<0.05$) was obtained. This shows that there is a significant difference between each group. And then, it was followed by further correlation test using the Posthoc method of LSD to see the significant difference between groups.

The interpretation of the analgesic effect can be seen through protection percentage, which is a calculation to see the inhibition of the writhing amount in percentages (%) on each treatment if compared to the writhing amount in control negative group K(-). The following formula was used:

% Protection Percentage = 100%-(P/K×100)%

P: Cumulative writhing amount for each treatment

K: Cumulative writhing amount for K(-) treatment

Table 2. Correlation Test Result with ANOVA One Way Method

Treatment	Average	ANOVA (p)
P1	78.13±25.21	0.03
P2	35.63±16.88	
P3	42.25±19.95	
P4	68.5±24	
P5	63.5±27.42	
P6	57.13±26.38	

Table 3. Analgesic Protection Percentage

Treatment	% Protection Percentage
P1	0%
P2	54.4%
P3	45.92%
P4	12.32%
P5	18.72%
P6	26.88%

Discussion

Based on Table 1, the result of average mice writhing from group P2, P3, P4, P5, and P6 have less value compared to the result of mice writhing from group P1. Based on the results of Table 2, there are significant differences in the research with significance value ($p<0.05$) between each group. The test results using the posthoc method show the significant differences in the test results between P2 (K(+)1) and P3 (K(+)2) towards group P1 (K(-)). Based on Table 3, the result of analgesic protection in percentage (%) shows that the biggest inhibition value is found on group P2 (K(+)1), followed by group P3 (K(+)2) and group P6 (young coconut water with the highest dosage) with the values respectively being 54.4%, 45.92%, and 26.88%.

The analgesic test results of aspirin and celecoxib are parallel with the researches that have been conducted, wherein aspirin possesses analgesic effects and is capable to give a relatively high percentage of inhibition for mice writhing.[16,17,18] Aspirin is an acetylsalicylate acid compound that is capable of inactivating the work of cyclooxygenase enzyme irreversibly and inhibits the expression of factor NFκB so that the transcription process of inflammatory mediator gen decreases.[15,19] Celecoxib as COX-2 selective NSAID also possesses analgesic effects that are just as effective as those of non-selective.[20] Enzyme COX-2 plays the main role in producing inflammatory prostanoid mediators.[15]

The result of giving young coconut water doesn't statistically show any significant analgesic effect, but there is an increase of protection percentage along with the increase of the amount of dosage given. The biggest protection percentage was found at the given dosage of 4.5 ml/100gW, with the mice's stomach filling percentage of 90%, which if implemented on human then the consumption of young coconut water with the same capability to give an equal protection percentage is as much as 810 ml. This refers to the capacity of human's stomach which is established to be 900 ml.[21,22] The result of this research isn't parallel with the result of previous ones conducted. According to studies, coconut water is capable of giving significant analgesic effects when given for six weeks at maximum with the dosage 4 ml/100gBW through the hot plate, tail flick, formalin-induced paw licking, and writhing reflex methods with the dependent variable that is the duration of the giving of coconut water, which are set to be two, four, and six weeks.[9] Young coconut water has

an antiinflammatory effect on inflammation and edema in the subplantar tissue of a rat's leg using plethysmometer, it's because young coconut water has flavonoid content that can inhibit the synthesis of prostaglandin as inflammatory mediator, which is also the mediator for pain.[10,23]

This difference may be caused by the influence from the duration of the coconut water giving to the final condition of the test animals, and is related to one of the contents in the coconut water, which is salicylic acid, whose long-term effect can affect the metabolism of connective tissue through the changes of composition, biosynthesis, or the metabolism of mucopolysaccharides in connective tissue on ground substance that is capable of suppressing the spread of inflammatory process, so that when given in longer duration it will give better end results.[15] Aside from the water in the coconut, previous researches also explains that the aqueous extract and hydromethane extract from *C. nucifera L*. also possess analgesic effects that are effective when experimented on animals.[8,24,25] Coconut water is safe for consumption, and the only general symptoms we may experience when consuming coconut water is the sensation of the stomach being full which resulted from consuming too much in a relatively short period time, other than that, there are no recorded side effects.[26,27]

Conclusion

Young coconut water (*C. nucifera L.*) with non-selective and COX-2 selective NSAID given on mice that were induced with acetic acid 0.6% 1 ml/100g BW of mice have differences because the young coconut water given in this research didn't show an analgesic effect as significant as aspirin and celecoxib did, despite the writhing protection increasing accordingly to each addition of dosage given. More research regarding the analgesic effect of young coconut water will be needed using various variables.

Acknowledgement

We utter our utmost gratitude for the doctors and staffs of Pharmacology Department Universitas Airlangga and all involved parties that helped the process of this research.

Conflict of Interest

The author stated there is no conflict of interest

References

1. Henschke N, E. The epidemiology and economic consequences of pain. [Serial online] 2015 [cited 2019 May 28]. Available from: https://www.ncbi.nlm.nih.gov/pubmed/25572198.
2. Guyton, A.C. and Hall, J.E. Guyton & Hall Buku Ajar Fisiologi Kedokteran. 13th ed. Singapore: Elsevier Saunders; 2016.
3. Davis, J., Lee, H., Kim, J., Advani, S., Peng, H., Banfield, E., Hawk, E., Chang, S. and Frazier-Wood, A. Use of non-steroidal anti-inflammatory drugs in US adults: changes over time and by demographic. Open Heart. 2017;4(1):e000550.
4. Wongrakpanich, S., Wongrakpanich, A., Melhado, K. and Rangaswami, J. A Comprehensive Review of Non-Steroidal Anti-Inflammatory Drug Use in The Elderly. Aging and Disease. 2018;9(1):143.
5. Katzung, Bertam and Trevor, Anthony. Basic & Clinical Pharmacology 14th ed. US: The McGraw-Hill Companies; 2019.
6. Gawade, S. Acetic acid induced painful endogenous infliction in writhing test on mice. Journal of Pharmacology and Pharmacotherapeutics. 2012;3(4):348.
7. Lima, E., Sousa, C., Meneses, L., Ximenes, N., Santos Júnior, M., Vasconcelos, G., Lima, N., Patrocínio, M., Macedo, D. and Vasconcelos, S. Cocos nucifera (L.) (Arecaceae): A phytochemical and pharmacological review. Brazilian Journal of Medical and Biological Research. 2015;48(11):953-964.
8. Alviano, Daniela S., Rodrigues, K.F., and Matheus, M.E. Antinociceptive and free radical scavenging activites of Cocos nucifera L. (Palmae) husk fiber aqueous extract. J Ethnopharmacol. 2004;92(2-3):269-273.
9. Ajeigbe, K., Ndaman, Z., Amegor, O., Onifade, A., Asuk, A., Ibironke, G. and Olaleye, S. Anti-Nociceptive and Anti-Inflammatory Potential of Coconut Water (Cocos nucifera L.) in rats and mice. Australian Journal of Basic and Applied Science. 2011;5(9):1116-1122.
10. Rao, S. and Najam, R. Coconut water of different maturity stages ameliorates inflammatory processes in model of inflammation. Journal of Intercultural Ethnopharmacology. 2016;5(3):244.
11. Fadeyi O.O, Obafemi C.A., Adewunmi C.O., Iwalewa E.O. Antipyretic,Analgesic, anti-inflammatory and cytotoxic effects of four derivates of salicylic acid and anthranilic acid in mice and rats. African Journal of Biotechnology. 2004;3(8):426-431.
12. Yong, Jean W. H., Ge, Lia, and Ng, Yan Fei. The chemical composition and biological properties of coconut (Cocos nucifera L.) water. Molecules. 2009;14(12):5144-5164.
13. Cooper, S.A., and Voelker, M. Evaluation of Onset Pain Relief from Micronized Aspirin in a Dental Pain Model. Inflammopharmacol. 2012;20(4):233-242.
14. Susilowati, Agnes Efi. Pengaruh Pemberian Ekstrak Bunga Rosella (Hibiscus sabdariffa L.) terhadap Kerusakan Sel-sel Hepar Mencit (Mus musculus) Akibat Paparan Parasetamol. Skripsi: Universitas Sebelas Maret. 2009.
15. Goodman, L., Gilman, A., Brunton, L., Hilal-Dandan, R. and Knollmann, B. Goodman & Gilman's The Pharmacological Basis Of Therapeutics. New York: McGraw Hill Education; 2018.
16. Ferreira, S. H., Moncada, S., and Vane, J. R. Prostaglandins and the mechanism of analgesia produced by aspirin-like drugs. British journal of pharmacology. 1997;120(4 Suppl):401–400.
17. Kitahara, M., Seki, K., Midorikawa, T., Arita, J. and Uchiyama, A. The Analgesic Effect of Aspirin on Inflammatory Pain in Rats Is Affected by Pain Intensity and Administration Timing. Yakugaku Zasshi. 2020;140(1):91-97.
18. Wick, JY. Aspirin: a history, a love story. Consult Pharm. 2012;27(5):322-9.
19. Ritter, James M., Flower, Rod J., Henderson, G., Loke Y. K., MacEwan, D., and Rang, Humphrey P. Rang & Dale's Pharmacology, 9th edition. Elsevier Health; 2019.
20. Singh, G., Fort, J., Goldstein, J., Levy, R., Hanrahan, P., Bello, A., Andrade-Ortega, L., Wallemark, C., Agrawal, N., Eisen, G., Stenson, W. and Triadafilopoulos, G. Celecoxib Versus Naproxen and Diclofenac in Osteoarthritis Patients: SUCCESS-I Study. The American Journal of Medicine. 2006;119(3):255-266.
21. Ferrua, M. J., and Singh, R. P. Modeling the fluid dynamics in a human stomach to gain insight of food digestion. Journal of food science. 2010;75(7):R151–R162.
22. Radcliffe, Donald V., 1998, 'Stomach', Compton's Encyclopedia Online v3.0, The Learning Company.
23. Calixto J.B., Medeiros R., Fernandes E.S., Ferreira J., Cabrini D.A., and Campos M.M. Kinin B1 receptors: key G-protein-coupled receptors and their role in inflammatory and painful processes. Br J Pharmacol. 2004;143(7):803-18.
24. Baheti, A.M., Khandelwal, K.R., Kumbhar, P., and Shikha, B.A. Antino-ciceptive activity of anterdhum padhati mashi (APM) of Unripe Co-cos nucifera(Palmae) husk. Pharmacologyonline. 2009;1:445-448.
25. Naskar, S., Mazumder, U., Pramanik, G., Saha, P., Haldar, P. and Gupta, M. Evaluation of antinociceptive and anti-inflammatory activity of hydromethanol extract of Cocos nucifera L.. Inflammopharmacology. 2012;21(1):31-35.
26. Chuku, L. C. and Kalagbor, G. I. Protein and Mineral Element Content of Coconut (Cocos nucifera) Water from Different Species. American Journal of Advanced Drug Delivery, 2014;2(4):451-453.
27. Kalman, D. S., Feldman, S., Krieger, D. R., and Bloomer, R. J. Comparison of coconut water and a carbohydrate-electrolyte sport drink on measures of hydration and physical performance in exercise-trained men. Journal of the International Society of Sports Nutrition. 2012;9(1):1.

SERTIFIKAT

Kementerian Riset dan Teknologi/
Badan Riset dan Inovasi Nasional

RISTEK-BRIN

Petikan dari Keputusan Menteri Riset dan Teknologi/
Kepala Badan Riset dan Inovasi Nasional
Nomor 200/M/KPT/2020
Peringkat Akreditasi Jurnal Ilmiah Periode III Tahun 2020
Nama Jurnal Ilmiah

Biomolecular and Health Science Journal

E-ISSN: 26208636

Penerbit: Universitas Airlangga

Ditetapkan sebagai Jurnal Ilmiah

TERAKREDITASI PERINGKAT 2

Akreditasi Berlaku selama 5 (lima) Tahun, yaitu
Volume 1 Nomor 2 Tahun 2018 sampai Volume 6 Nomor 1 Tahun 2023

Jakarta, 23 Desember 2020
Menteri Riset dan Teknologi/
Kepala Badan Riset dan Inovasi Nasional
Republik Indonesia,

Bambang P. S. Brodjonegoro

Lampiran 4. Surat Kelaikan Etik

KOMITE ETIK PENELITIAN KESEHATAN
FAKULTAS KEDOKTERAN UNIVERSITAS AIRLANGGA
SURABAYA

KETERANGAN KELAIKAN ETIK
("ETHICAL CLEARANCE")

No. 262/EC/KEPK/FKUA/2020

KOMITE ETIK PENELITIAN KESEHATAN FAKULTAS KEDOKTERAN UNIVERSITAS AIRLANGGA SURABAYA, TELAH MEMPELAJARI SECARA SEKSAMA RANCANGAN PENELITIAN YANG DIUSULKAN, MAKA DENGAN INI MENYATAKAN BAHWA PENELITIAN BERJUDUL :

"UJI EFEK ANALGESIK AIR KELAPA MUDA (Cocos nucifera L.) PADA MENCIT (Mus musculus) YANG DIINDUKSI NYERI DENGAN ASAM ASETAT"

"The Analgesic Effect Test of Young Coconut Water (Cocos nucifera L.) on Mice (Mus musculus) Induced by Pain with Acetic Acid"

PENELITI UTAMA :
Dini Indah Berlianti

PEMBIMBING / PENELITI LAIN :
Dosbing 1: Danti Nur Indiastuti, dr., M.Ked
Dosbing 2: Dr. Gondo Mastutik, drh., M.Kes

UNIT / LEMBAGA / TEMPAT PENELITIAN :
Laboratorium Farmakologi FK UNAIR

DINYATAKAN LAIK ETIK.

Surabaya, 19 Oktober 2020
KETUA

Prof. Dr. H. Eddy Bagus Wasito, dr, MS., Sp.MK (K)

Pernyataan Laik Etik ini berlaku selama kurun waktu tanggal 19Oktober 2020 sampai dengan tanggal 19 Oktober 2021