Bali Medical Journal (/)

Open Access & Peer Reviewed Multidisciplinary
Journal Of Medical Sciences

Search

Advanced Search (https://www.balimedicaljournal.org/index.php/bmj/search/search)

Home (https://www.balimedicaljournal.org/index.php/bmj/index) > Editorial Board & Reviewer (https://www.balimedicaljournal.org/index.php/bmj/pages/view/editorialboard)

Editor-in-Chief

Associate Editor

Editorial Board for Regional America

Editorial Board for Regional Australia

john@svigos.com.au (mailto:john@svigos.com.au)
Ashford Hospital & Faculty of Health Sciences, University of Adelaide, Australia

dr Deasy Ayuningtyas Tandio MPH-MBA (https://orcid.org/0000-0001-7847-2831).
(orcidID) (https://orcid.org/0000-0001-7847-2831)
deasytandio@yahoo.com
James Cook University Australia Master of Public Health Master Of Business Administration, Indonesia

Editorial Board for Regional Europa

Prof. Harald Hoekstra
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=36038081900)
jsvigos@iprimus.com.au
Universitair Medisch Centrum Groningen, Division of Surgical Oncology, Groningen the Netherland

Editorial Board for Regional Asia

Prof Huang Qin (http://accu.cqu.edu.cn/web/eallprof/559.jhtml)
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=7409535321)
qhuang@cqu.edu.cn
Chairman Dept. of Neurosurgery, Guangdong 999 Hospital Guangzhou China

Assoc. Prof. Mohammad Amin Bahrami
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=55524082200)
aminbahrami1359@gmail.com
Head of healthcare management department, Shahid Sadoughi University of Medical Sciences, Yazd,Iran

Dr. Tanveer Beg, PhD
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=6505772852)
tbmirza@jazanu.edu.sa
Assistant Professor, Department of Biology, Faculty of Science, Jazan University, Jazan, Saudi Arabia.

Editorial Board Members

Prof. Andi Asadul Islam
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=55504893500), (Google Scholar) (https://scholar.google.co.id/citations?user=vWs1RdMAAAAJ&hl=id&oi=sra)
undee@med.unhas.ac.id
Faculty of Medicine Hasanudin University, Makasar-Indonesia

Prof. Dr. dr. Abdul Hafid Bajamal, Sp.BS
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=57192378862)
hfbajamal@gmail.com
Faculty of Medicine Airlangga University, Surabaya-Indonesia

Dr. dr. I Wayan Sudarsa, Sp.B(K) Onk, FINACS, FICS.
(Scopus ID (https://www.scopus.com/authid/detail.uri?authorId=57205145862)), (Google Scholar (https://scholar.google.co.id/citations?hl=id&user=SdInHKwAAAAJ)), (Researchgate (https://www.researchgate.net/scientific-contributions/2157636099_I_Wayan_Sudarsa))

dr. I.B. Amertha P. Manuaba, SKed, MBiomed. (https://scholar.google.co.id/citations?user=KzCQgA0AAAAJ&hl=en)
(Scopus ID) (https://www.scopus.com/authid/detail.uri?authorId=57195520004), (Google Scholar) (https://scholar.google.co.id/citations?user=KzCQgA0AAAAJ&hl=en), (Orcid) (https://orcid.org/0000-0001-6647-9497), (Researcher ID (https://www.researcherid.com/rid/P-9169-2016)) (Researchgate) (https://www.researchgate.net/profile/Amertha_Manuaba)
AmerthaManuaba@gmail.com / Amertha_Manuaba@unud.ac.id
Biomedicine Magister Program, Udayana University, Indonesia

Editorial inquiries to be addressed to: editor@balimedicaljournal.org (mailto:%20editor@balimedicaljournal.org)

Clarivate Analytics
WEB OF SCIENCE™ (https://mjl.clarivate.com/search-results?issn=2089-1180&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal)

ELSEVIER Scopus (https://suggestor.step.scopus.com/progressTracker/?trackingID=6F5DA196E346B072)

DOAJ DIRECTORY OF OPEN ACCESS JOURNALS (https://doaj.org/toc/2302-2914)

sinta S1 Science and Technology Index (http://sinta2.ristekdikti.go.id/journals/detail?id=2513)

Full Indexing List (/index.php/bmj/pages/view/indexing)

In Press (/index.php/bmj/issue/view/30)

Submit An Article (/index.php/bmj/login)

Scopus Citedness (/index.php/bmj/pages/view/scopus)

(//clustrmaps.com/site/1a4xh?utm_source=globe)

(/index.php/bmj/)

Published by:
(http://www.discoversys.ca/)

For Indonesian Physician Forum and Indonesia College of Surgeons, Indonesia

Bali Medical Journal, Bali-Indonesia

62 (0361) 224206

62 361 222510

editor@balimedicaljournal.org (mailto:editor@balimedicaljournal.org)

Contact
(https://www.balimedicaljournal.org/index.php/bmj/pages/view/contact)

Journal Information
(https://www.balimedicaljournal.org/index.php/bmj/pages/view/journalinfo)

Editorial Board
(https://www.balimedicaljournal.org/index.php/bmj/pages/view/editorialboard)

Abstracting & Indexing
(https://www.balimedicaljournal.org/index.php/bmj/pages/view/indexing)

Privacy Statement
(http://discoversys.ca/privacy.html)

Home
(https://www.balimedicaljournal.org/index.php/bmj/index)

Last Issue
(https://www.balimedicaljournal.org/index.php/bmj/issue/current)

Archive
(https://www.balimedicaljournal.org/index.php/bmj/issue/archive)

Author Guidelines
(https://www.balimedicaljournal.org/index.php/bmj/pages/view/authorguidlines)

Open-Access Licence
(https://www.balimedicaljournal.org/index.php/bmj/pages/view/OAlicence)

DOAJ DIRECTORY OF OPEN ACCESS JOURNALS (/)

Bali Medical Journal

Bali International Medicine Journal

2089-1180 (Print); 2302-2914 (Online)

Homepage (http://www.balimedicaljournal.org)

Publisher: DiscoverSys

Society/Institution: Sanglah General Hospital

Country of publisher: Indonesia

Platform/Host/Aggregator: OJS

Date added to DOAJ: 10 May 2013

Record Last Updated: 7 Aug 2020

LCC Subject Category: Medicine: Medicine (General)

Publisher's keywords: pregnancy, surgery, medicine

Language of fulltext: English

Full-text formats available: PDF

PUBLICATION CHARGES

Article Processing Charges (APCs): (http://www.balimedicaljournal.org/index.php/bmj/pages/view/journalinfo) No

Submission Charges: (http://www.balimedicaljournal.org/index.php/bmj/pages/view/journalinfo) No

EDITORIAL INFORMATION

Double blind peer review (https://www.balimedicaljournal.org/index.php/bmj/pages/view/authorguidlines)

Editorial Board (http://www.balimedicaljournal.org/index.php/bmj/pages/view/editorialboard)

Aims and scope (http://www.balimedicaljournal.org/index.php/bmj/pages/view/journalinfo)

Instructions for authors (http://www.balimedicaljournal.org/index.php/bmj/pages/view/authorguidlines)

Time From Submission to Publication: 3 weeks

More

Tables of Contents

− Volume

10 count ↑

8 ✖

+ Issue

− Year

2019 ✖

− Month

Dec ✖

share | embed

Clear search filters ✖

sort ↓ by Relevance

search all Search this Journal's Articles

Volume: 8 ✖ **Year:** 2019 ✖ **Month:** Dec ✖

64 results found 100 per page

First Prev Page 1 of 1 Next

Diagnostic test of thorax computed tomography scanning in lung tumors against cytopathological results at Zainoel Abidin Hospital, Banda Aceh, Indonesia period June - August 2018 (/article/00c4f906396e4da68c63cf5cbab6ae3b)

Indrita Iqbalawaty, Muhammad Yani, Nurul Machillah, Fajriah Fajriah, Asnawi Abdullah, Teuku Muhammad Ilzana, Cut Rizka Rahmi, Teuku Muhammad Khaled, Dara Purnamasari

Bali Medical Journal (/toc/2089-1180). 2019;8(3):930-933 DOI 10.15562/bmj.v8i3.1690 (https://doi.org/10.15562/bmj.v8i3.1690)

Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1690)

The effect of intraarterial heparin flushing to autism symptoms when used to treat the concomitant cerebral venous thrombosis: a case series (/article/03be3f206ea94a5183306a6c7396b77e)
Erwin Setiawan, Ristaniah Soetikno, Nelly Amalia Risan, Shelly Shelly, Tugas Ratmono, Ardianto Pramono, Rachmanto Heryawan Surya Adiputra, Terawan Agus Putranto
Bali Medical Journal (/toc/2089-1180). 2019;8(3):713-718 DOI 10.15562/bmj.v8i3.1609 (https://doi.org/10.15562/bmj.v8i3.1609)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1609)

Management of penetrating injury in Jombang Public Hospital district: a case report (/article/07c30e2f5677420c802dd432265ef004)
Reynard Budy Setiawan, Hanafi Sayogo, Fakhri Surahmad, Edwin Danardono
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1563 (https://doi.org/10.15562/bmj.v8i3.1563)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1563)

The association between Caveolin-1 expressions with clinicopathological characteristic of breast cancer (/article/110f24939c914927ad32905d52cad9d2)
Pande Made Krisna Ekassiana, I Gede Putu Supadmanaba, Desak Made Wihandani, Putu Anda Tusta Adiputra
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1587 (https://doi.org/10.15562/bmj.v8i3.1587)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1587)

Effectiveness of nasal irrigation with isotonic saline against interleukin-8 levels and quality of life in chronic rhinosinusitis patients (/article/1c5c4bae84034cf997c8ea13c71d3025)
Eka Arie Yuliyani, Sari Wulan Dwi Sutanegara, I Made Muliartha
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1582 (https://doi.org/10.15562/bmj.v8i3.1582)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1582)

Predisposing factors of kidney function recovery after postrenal obstruction (/article/1dfb58322f21484c9097e63a1e57e895)
Jufriady Ismy, Lea Darman Syamaun Husen, Imam Hidayat
Bali Medical Journal (/toc/2089-1180). 2019;8(3):798-802 DOI 10.15562/bmj.v8i3.1616 (https://doi.org/10.15562/bmj.v8i3.1616)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1616)

The histopathological features and bacterial counts after exposure to Streptococcus pneumoniae serotypes 2,3,4 and 19 F in the lung of Balb/c mice (/article/1fb211e9b32a4b3c8131530b0ad42bef)
Ni Made Adi Tarini, I Nyoman Mantik Astawa, I Dewa Made Sukrama, I Wayan Wita, Ni Wayan Winarti
Bali Medical Journal (/toc/2089-1180). 2019;8(3):892-896 DOI 10.15562/bmj.v8i3.1585 (https://doi.org/10.15562/bmj.v8i3.1585)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1585)

Developing Indonesian version of childbirth self-efficacy inventory (Cbsei)-C32 (/article/20c6763aa051478192ecbae704d54237)
Farida Kartini, Ova Emilia, Djaswadi Dasuki, Yayi Suryo Prabandari
Bali Medical Journal (/toc/2089-1180). 2019;8(3):859-866 DOI 10.15562/bmj.v8i3.1538 (https://doi.org/10.15562/bmj.v8i3.1538)

Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1538)

Association of serum interleukin-10 (IL-10) with the severity of acne vulgaris (/article/24fd7f2fbe454b1a8aaa305d9e426a22)
Tissan Rahmayani, Imam Budi Putra, Nelva K Jusuf
Bali Medical Journal (/toc/2089-1180). 2019;8(3):753-756 DOI 10.15562/bmj.v8i3.1514 (https://doi.org/10.15562/bmj.v8i3.1514)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1514)

High incidence of varicocele among young men in Public Police Hospital Denpasar, Bali, Indonesia: a descriptive study (/article/3da9e12633cb4a2aa09729d22fdbf0b1)
Ryuu Damara Parisudha, I Gede Suwedagatha
Bali Medical Journal (/toc/2089-1180). 2019;8(3):803-807 DOI 10.15562/bmj.v8i3.1617 (https://doi.org/10.15562/bmj.v8i3.1617)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1617)

The potential application of conditioned media-mesenchymal stem cells on human oocyte maturation in assisted reproductive technology: a quasi-experimental based-study at Dr. Sardjito General Hospital, Yogyakarta, Indonesia (/article/44b54c224de5454390c4a4409401444c)
Dwi Haryadi, Ahmad Hamim Sadewa, Sofia Mubarika, Djaswadi Dasuki
Bali Medical Journal (/toc/2089-1180). 2019;8(3):741-748 DOI 10.15562/bmj.v8i3.1504 (https://doi.org/10.15562/bmj.v8i3.1504)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1504)

Red guava juice (Psidium guajava linn.) suppress TGF-β protein expression in secondary hyperuricemia mice (Mus musculus) model (/article/461c73e413534bc18c86f9e744a6da2e)
Riska Nur Suci Ayu, Brian Wasita, Paramasari Dirgahayu
Bali Medical Journal (/toc/2089-1180). 2019;8(3):915-920 DOI 10.15562/bmj.v8i3.1449 (https://doi.org/10.15562/bmj.v8i3.1449)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1449)

The ethyl acetate fraction of Moringa oleifera leaves effects on endothelial stress in rat sepsis model (/article/4d1f7a31542943558d033101c32690f7)
Tatar Sumandjar, Bambang Purwanto, Brian Wasita, Dono Indarto, Risya Cilmiaty, Vitri Widyaningsih
Bali Medical Journal (/toc/2089-1180). 2019;8(3):940-943 DOI 10.15562/bmj.v8i3.1679 (https://doi.org/10.15562/bmj.v8i3.1679)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1679)

The influence of maternal age and gestational age to urinary tract infection in Lempake Primary Health Care, East Kalimantan, Indonesia (/article/59f0dde866ff4df692e594055113e222)
Johanes Dwi Meiyanto
Bali Medical Journal (/toc/2089-1180). 2019;8(3):762-766 DOI 10.15562/bmj.v8i3.1595 (https://doi.org/10.15562/bmj.v8i3.1595)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1595)

Post total splenectomy outcome in thalassemia patients (/article/5c2b59019e7d406e91ac1568c3e093f5)
Muntadhar M. Isa, Amir Thayeb, Ahmad Yani, Muhammad Bayu Z. Hutagalung
Bali Medical Journal (/toc/2089-1180). 2019;8(3):947-950 DOI 10.15562/bmj.v8i3.1655 (https://doi.org/10.15562/bmj.v8i3.1655)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1655)

The 3rd Aceh Surgery Update 2019 in Conjugation with The 1st Indonesian General Surgeon Society (PABI) Aceh Chapter Meeting and The 1st Ikatan Alumni Bedah Unsyiah (IABU) Meeting (/article/635eab381eef46bd9346a49893e24ef2)
Yopie Afriandi Habibie
Bali Medical Journal (/toc/2089-1180). 2019;8(3):1-37 DOI 10.15562/bmj.v8i3.1683 (https://doi.org/10.15562/bmj.v8i3.1683)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1683)

Correlation between heart failure score and estimation glomerulus filtration rate based on cystatin C in children (/article/66c4175b1ac5427b9ee92a8d2845e3f4)
Linda Silvana Sari, Eka Gunawijaya, Bagus Ngurah Putu Arhana, Ni Putu Venny Kartika Yantie
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1583 (https://doi.org/10.15562/bmj.v8i3.1583)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1583)

Relationship between intake of fruits and vegetables toward hypertension among elderly in Yogyakarta (/article/691ab050ae48437b8b545423bfb60003)
Alfan Ridha, Diffah Hanim, Suminah Suminah
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1483 (https://doi.org/10.15562/bmj.v8i3.1483)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1483)

Reproductive health promotion through traditional art media reduced the of premarital sex intention among adolescent population in Gianyar, Bali (/article/6ec6c38e02d24edca9eab8949a382dfb)
Ni Putu Widarini, Fatwa Sari Tetradewi, Ova Emilia
Bali Medical Journal (/toc/2089-1180). 2019;8(3):886-891 DOI 10.15562/bmj.v8i3.1562 (https://doi.org/10.15562/bmj.v8i3.1562)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1562)

Albumin and leukocyte: pre-operative factors for advanced management in pleural empyema? (/article/700da95d3bd8406cbdf5d7fc83145aa8)
Yopie Afriandi Habibie, Khalis Hamdani
Bali Medical Journal (/toc/2089-1180). 2019;8(3):926-929 DOI 10.15562/bmj.v8i3.1696 (https://doi.org/10.15562/bmj.v8i3.1696)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1696)

High-sensitivity C-reactive protein as a 6-month predictor of mortality and rehospitalization in patients with heart failure (/article/7644b182f9ff435d9ddbd422d258fa6f)
Memorison Tarigan, Zainal Safri, Refli Hasan
Bali Medical Journal (/toc/2089-1180). 2019;8(3):783-789 DOI 10.15562/bmj.v8i3.929 (https://doi.org/10.15562/bmj.v8i3.929)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/929)

Mitogen-activated protein kinase 3 (MAPK3) and human epidermal growth factor receptor 2 (HER2) on recurrent intracranial meningiomas: a case report (/article/7a9ae6dfd4704e3580dd33462a8a6cdd)
Ridha Dharmajaya, Abdurrahman Mouza
Bali Medical Journal (/toc/2089-1180). 2019;8(3):749-752 DOI 10.15562/bmj.v8i3.1509 (https://doi.org/10.15562/bmj.v8i3.1509)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1509)

Introducing the tolerogenic macrophage therapy as an alternative approach to manage systemic lupus erythematosus: a case series (/article/7fd168b09c0f4e9f969b429768a01292)
Terawan Agus Putranto, Djoko Wibisono, Nyoto Widyo Astoro, Martina Lily Yana, Endra Tri Prabowo, Denny Irwansyah, Nurhadiyanta Nurhadiyanta, Yudo Rantung, Taruna Ikrar, Fred Fandrich
Bali Medical Journal (/toc/2089-1180). 2019;8(3):726-732 DOI 10.15562/bmj.v8i3.1621 (https://doi.org/10.15562/bmj.v8i3.1621)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1621)

A network meta-analysis on comparative efficacy of statins focusing for prevention of contrast-induced acute kidney injury in chronic kidney disease patients undergoing percutaneus coronary intervention (/article/879176ae33b34bffb940b119d039c829)
Ilham Akbar Rahman, Yeni Purnamasari, Vicky Nanu Rewa, Hasyim Kasyim, Abd Rahman Umar, Firdaus Kasim
Bali Medical Journal (/toc/2089-1180). 2019;8(3):779-787 DOI 10.15562/bmj.v8i3.1593 (https://doi.org/10.15562/bmj.v8i3.1593)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1593)

Three-weeks moderate aerobic exercise in increasing production of endogenous antioxidant enzyme and lowering oxidative stress level among sedentary men (/article/8f25d47e13824dd4aa92cd0d2a0731d8)
I Putu Adiartha Griadhi, Tjokorda Gde Bagus Mahadewa, I Putu Eka Widyadharma
Bali Medical Journal (/toc/2089-1180). 2019;8(3):921-925 DOI 10.15562/bmj.v8i3.1535 (https://doi.org/10.15562/bmj.v8i3.1535)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1535)

Optimising the effect of activated carbon on the microrheological properties of erythrocyte in rats with experimentally developed obesity (/article/9236a9fb3bc14c1fad60df19720da244)
Evgeniy Vladimirovich Kulikov, Svetlana Yurevna Zavalishina, Yuri Anatolyevich Vatnikov, Alexander Anatolyevich Strizhakov, Stanislav Gennadievich Drukovsky, Dmitry Anatolyevich Lozovoy, Yuliya Yurevna Voronina, Irina Anatolyevna Popova, Irina Viktorovna Bondareva, Natalia Borisovna Sambros, Abdelaziz Norezzine, Tatyana Ivanovna Glagoleva, Svetlana Alexandrovna Shemyakova
Bali Medical Journal (/toc/2089-1180). 2019;8(3):827-833 DOI 10.15562/bmj.v8i3.1112 (https://doi.org/10.15562/bmj.v8i3.1112)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1112)

The out of pocket payments in low and middle-income countries and the affecting factors: a systematic review and meta-analysis (/article/9344fa26cd6846c3bb9af222386de10f)
Esmat Nemati, Shirin Nosratnejad, Leila Doshmangir, Vahideh Zarea Gavgani
Bali Medical Journal (/toc/2089-1180). 2019;8(3):733-740 DOI 10.15562/bmj.v8i3.958 (https://doi.org/10.15562/bmj.v8i3.958)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/958)

Cerebrospinal fluid contents and risk of shunt exposure in hydrocephalus (/article/9922a2f1e6384896b14044ba394086b0)

Muhamad Thohar Arifin, Febriyanto Purnomo, Zainal Muttaqin, Yuriz Bakhtiar, Erie Andar, Dody Priambada, Happy Kurnia, Ajid Risdianto, Krisna Tsaniadi, Gunadi Kusnarto, Jacob Bunyamin
Bali Medical Journal (/toc/2089-1180). 2019;8(3):841-843 DOI 10.15562/bmj.v8i3.1667 (https://doi.org/10.15562/bmj.v8i3.1667)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1667)

Type IA urethral duplication: a case report (/article/9aa430ca9f0241d7971d23abaf750a7a)
Miftah Adityagama, Yonas Immanuel Hutasoit
Bali Medical Journal (/toc/2089-1180). 2019;8(3):767-771 DOI 10.15562/bmj.v8i3.1602 (https://doi.org/10.15562/bmj.v8i3.1602)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1602)

Tuberculous peritonitis: a case report (/article/9b7033a3178745f790056ba9e960ccde)
Prathita Amanda Aryani, Atya Shabrina Monika, Mudianto Mudianto, I Wayan Wisnu Brata
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1557 (https://doi.org/10.15562/bmj.v8i3.1557)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1557)

Physiological peculiarities of thrombocyte activity of candidates into masters of sports in athletics of preadult age (/article/a9b62573c4f0491c8aa4987ff86487be)
Ilya Nikolayevich Medvedev
Bali Medical Journal (/toc/2089-1180). 2019;8(3):818-822 DOI 10.15562/bmj.v8i3.1090 (https://doi.org/10.15562/bmj.v8i3.1090)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1090)

Concomitant injuries in maxillofacial fractures from head and neck division of surgery department at Dr. Sutomo General Hospital, Surabaya, Indonesia in 2015-2016 period (/article/af38d855ba87427da204fb3259c1cab8)
Marjono Dwi Wibowo
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1552 (https://doi.org/10.15562/bmj.v8i3.1552)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1552)

Association between expression of ALDH1 and TGFb2 genes, histological and clinical findings in breast cancer (/article/b158cc63cdeb47d2b7eb8c03e8811665)
Yasan Sadeghian, Esmaeil Samizadeh, Mohammad Ali Ali Mohammadi-vajari, Mohammad Hossein Lashkari, Ehsan Sadeghian, Seyedeh Nasim Hosseini, Mehdi jafari, Tahereh Sorbi
Bali Medical Journal (/toc/2089-1180). 2019;8(3):813-817 DOI 10.15562/bmj.v8i3.835 (https://doi.org/10.15562/bmj.v8i3.835)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/835)

Physical rehabilitation of middle-aged women with vegeto-vascular dystonia in Russia (/article/b172db5094604f488b90b940361d70ed)
Svetlana Vasilyevna Shmeleva, Elena Nikolaevna Latushkina, Alexandra Stanislavovna Scheglova, Ekaterina Igorevna Dubrovinskaya, Angela Valerievna Romanova, George Ramazovich Dushevin, Yanina Vasilevna Shimanovskaya
Bali Medical Journal (/toc/2089-1180). 2019;8(3):808-812 DOI 10.15562/bmj.v8i3.1122 (https://doi.org/10.15562/bmj.v8i3.1122)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1122)

Identification factors affecting adolescent's reproductive health behavior: a qualitative study (/article/b183922f5968470eb8f25a77bc3ba176)
Endang Triyanto, Yayi Suryo Prabandari, Kwartarini Wahyu Yuniarti, Sri Werdati
Bali Medical Journal (/toc/2089-1180). 2019;8(3):852-858 DOI 10.15562/bmj.v8i3.1539 (https://doi.org/10.15562/bmj.v8i3.1539)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1539)

Comparison of Protein-C levels in diabetes melitus type 2 patients with and without ulcers at Haji Adam Malik Hospital Medan Indonesia May-July 2017 (/article/b46d73a29bb044a1b6fa32e9a737f683)
Zulfahmi Zulfa, Andri I Mardia, Savita Handayani, Santi Syafril, Dairion Gatot
Bali Medical Journal (/toc/2089-1180). 2019;8(3):790-794 DOI 10.15562/bmj.v%vi%i.913 (https://doi.org/10.15562/bmj.v%vi%i.913)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/913)

The effect of tomato juice on the expression of matrix metalloproteinase-2 (MMP-2) and type-1 collagen on the vaginal wall of the menopausal rats (/article/b4ef41095df347df862ae2fee9c9ee80)
Juminten Saimin, Hendy Hendarto, Soetjipto Soetjipto
Bali Medical Journal (/toc/2089-1180). 2019;8(3):707-712 DOI 10.15562/bmj.v8i3.1277 (https://doi.org/10.15562/bmj.v8i3.1277)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1277)

Platelets level response after three days therapy in children with acute Immune Thrombocytopenic Purpura (ITP): a 10 years' experience at the tertiary hospital (/article/b88550fb8e104237a78894cf4606d676)
Ketut Ariawati, I Made Karma Setiyawan
Bali Medical Journal (/toc/2089-1180). 2019;8(3):897-901 DOI 10.15562/bmj.v8i3.1558 (https://doi.org/10.15562/bmj.v8i3.1558)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1558)

The relationship of hormonal receptor, HER-2, and KI-67 changes after administration of anthracycline-based neoadjuvant chemotherapy with the results of histopathological grading in stage III breast cancer patients at Saiful Anwar Malang Regional Public H (/article/c62f12e999bd4f23982536dd996c5066)
Risal Wintoko, Hery Susilo
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1555 (https://doi.org/10.15562/bmj.v8i3.1555)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1555)

The 3rd Live Surgery Workshop International Society of Reconstructive Urology (ISORU), 2nd International Live Surgery Workshop Indonesia Genitourinary Reconstructive Society (InaGURS), and 12th Malang Continuing Urology Education (MCUE) (/article/c77a0dbb7d144a9fbf963035c4f21781)
Paksi Satyagraha
Bali Medical Journal (/toc/2089-1180). 2019;8(3):1-31 DOI 10.15562/bmj.v8i3.1592 (https://doi.org/10.15562/bmj.v8i3.1592)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1592)

Rhabdoid adrenocortical carcinoma with brain metastasis: a case report (/article/c8a20e6854e34d3396082ffda73f66e5)
I Wayan Yudiana, Made Moniaga Prawira, Ida Bagus Putra Pramana, Pande Made Wisnu Tirtayasa, Kadek Budi Santosa, Gede Wirya Kusuma Duarsa, Anak Agung Gede Oka
Bali Medical Journal (/toc/2089-1180). 2019;8(3):908-914 DOI 10.15562/bmj.v8i3.1606 (https://doi.org/10.15562/bmj.v8i3.1606)

Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1606)

The erection conundrum: risk factors for erectile dysfunction among middle-aged and elderly men in Lamongan, East Java, Indonesia (/article/cabe1f352f744e499a68976c47387116)
Yudhistira Pradnyan Kloping, Budi Himawan, Dimas Rio Balti
Bali Medical Journal (/toc/2089-1180). 2019;8(3):793-797 DOI 10.15562/bmj.v8i3.1614 (https://doi.org/10.15562/bmj.v8i3.1614)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1614)

Effect of iodine status on nutritional status of school-age children in artisanal and small scale gold mining area (/article/cbd9eb9426554ca0a66f3ce50192dd2d)
Ardiana Ekawanti, Deasy Irawati, Ima Arum Lestarini, Rifana Cholidah
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1597 (https://doi.org/10.15562/bmj.v8i3.1597)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1597)

Correlation between Loss of Cervical Lordosis and Degenerative Diseases of the Sub-axial Cervical Spine Columns (/article/cc24acac9dfd4ae5911cbef2207151ed)
Elysanti Dwi Martadiani, Made Widhi Asih, Nyoman Srie Laksminigsih, Anastasia Tjan, Nyoman Widyasari
Bali Medical Journal (/toc/2089-1180). 2019;8(3):878-885 DOI 10.15562/bmj.v8i3.1560 (https://doi.org/10.15562/bmj.v8i3.1560)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1560)

Graft procedure on urethroplasty, in comparison with flap procedure: a literature review (/article/cdf5e709cbbb4678905d346346ead2cd)
Gede Wirya Kusuma Duarsa, Putu Kurnia Darma Pratama, I Made Nugraha Gunamanta Sabudi, Donny Oktavius
Bali Medical Journal (/toc/2089-1180). 2019;8(3):772-775 DOI 10.15562/bmj.v8i3.1601 (https://doi.org/10.15562/bmj.v8i3.1601)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1601)

The functional outcome in short-term follow up after Total Knee Replacement (TKR) in Kandou Hospital, Manado, Indonesia (/article/d2b3745bdc7f4de7a45457671f2fc739)
Rangga Rawung, Tomi Juliandi
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1570 (https://doi.org/10.15562/bmj.v8i3.1570)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1570)

EGFR nanovaccine in lung cancer treatment (/article/d8aad20e5da3418bab3dd6c6a8b6676e)
Putu Bagus Anggaraditya, Putu Anda Tusta Adiputra, I Ketut Widiana
Bali Medical Journal (/toc/2089-1180). 2019;8(3):844-851 DOI 10.15562/bmj.v8i3.1494 (https://doi.org/10.15562/bmj.v8i3.1494)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1494)

Management of urethral stricture due to prostate cancer and colorectal cancer radiotherapy: a systematic review (/article/da41c1e9a8bb44db96b223acc1d38462)
Sirin Salsabila, Muhammad Adi Satrio Lazuardi, Kharisma Ogit Rosandy
Bali Medical Journal (/toc/2089-1180). 2019;8(3):788-792 DOI 10.15562/bmj.v8i3.1612 (https://doi.org/10.15562/bmj.v8i3.1612)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1612)

Diagnostic test using monofilament compared to electroneuromyography (ENMG) for detection of peripheral neuropathy in leprosy at Sanglah General Hospital, Bali-Indonesia (/article/dae3e39ca8344b18a6d336074dd24cf0)
Luh Made Mas Rusyati, Putu Arie Sasmita, Made Swastika Adiguna
Bali Medical Journal (/toc/2089-1180). 2019;8(3):902-907 DOI 10.15562/bmj.v8i3.1527 (https://doi.org/10.15562/bmj.v8i3.1527)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1527)

Viral and non-viral causes in patients with hepatocellular carcinoma in Arifin Achmad General Hospital Riau Province during 2013-2017 (/article/dc127b843caa4e9682468b43112f8c04)
Arfianti Arfianti, Zulfatta Dwi Putra, Ekral Delhaldita, Ligat Pribadi Sembiring, Hendra Asputra
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1584 (https://doi.org/10.15562/bmj.v8i3.1584)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1584)

Factors influencing smoking behavior and intensity of santri in Asrama Perguruan Islam (API) Islamic boarding school, Tegalrejo, Magelang, Central Java, Indonesia (/article/e1b8856f43564666b8577d19d53c202e)
Punik Mumpuni Wijayanti, Yayi Suryo Prabandari, Djauhar Ismail, Atik Triratnawati
Bali Medical Journal (/toc/2089-1180). 2019;8(3):867-870 DOI 10.15562/bmj.v8i3.1544 (https://doi.org/10.15562/bmj.v8i3.1544)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1544)

Management of 14 hours penile fracture: a case report (/article/e468e3fef28f4ef8873ba9f5ad7b886e)
Johannes Cansius Prihadi, Kevin Anthony Glorius Tampubolon, Dicky Dicky
Bali Medical Journal (/toc/2089-1180). 2019;8(3):776-778 DOI 10.15562/bmj.v8i3.1594 (https://doi.org/10.15562/bmj.v8i3.1594)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1594)

Diagnostic validity of CAVeA2T2 score in predicting failure of radiocephalic arteriovenal fistula in terminal stage renal failure patients at Sanglah Hospital, Bali, Indonesia (/article/e584623f6cd1431c96f460f70337d7fd)
Ardi Juanda, Ketut Putu Yasa, I Gede Raka Widiana
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1571 (https://doi.org/10.15562/bmj.v8i3.1571)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1571)

Protective effect of rotavirus immunization in acute diarrhea due to rotavirus infection: a prospective cohort study (/article/e6dc8e5748bc43d6a52879c7cf1731bf)
Anak Agung Wiwin Indayani, I Putu Gede Karyana, Made Gede Dwi Lingga Utama, I Gusti Lanang Sidiartha, Ida Bagus Subanada, Anak Agung Ketut Putra Widnyana
Bali Medical Journal (/toc/2089-1180). 2019;8(3):934-939 DOI 10.15562/bmj.v8i3.1586 (https://doi.org/10.15562/bmj.v8i3.1586)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1586)

The effect of bioabsorbable (fibrillar) and fibrin glue on the number of macrophages and fibroblasts in Wistar rats with gastric perforation compared to the omental patch method (/article/ea815655caeb423dab8f4300559c0c7a)
Resdiyanto Resdiyanto, Muhammad Shobachun Niam, Harun Al Rasyid, Setyo Sugiharto, Lulik Inggarwati, Hery Susilo
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1561 (https://doi.org/10.15562

/bmj.v8i3.1561)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1561)

Comparing the effect of Angiotensin-Converting Enzyme Inhibitors versus Angiotensin Receptor Blockers in heart failure patients with type 2 diabetes mellitus: a systematic review (/article/edc2783aac5741f8821fbc40ab652112)
Ratih Puspita Febrinasari, Bambang Irawan Martohusodo, Erna Kristin, Ricvan Dana Nindrea, Iwan Dwiprahasto
Bali Medical Journal (/toc/2089-1180). 2019;8(3):757-761 DOI 10.15562/bmj.v8i3.1534 (https://doi.org/10.15562/bmj.v8i3.1534)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1534)

The frequent of fish intake can increase the chance of Child intelligence of aged 9-10 years in Surakarta (/article/eff52337290f4fecabd391aed8902777)
Muhammad Umar Syarifuddin Al-Lawi, Kusnandar Kusnandar, Adi Magna Patriadi Nuhriawangsa
Bali Medical Journal (/toc/2089-1180). 2019;8(3):778-782 DOI 10.15562/bmj.v8i3.1275 (https://doi.org/10.15562/bmj.v8i3.1275)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1275)

Colorectal cancer in young adults: two case reports (/article/f4b3cefba5344e1080a1c1e1c0748188)
Muhammad Yusuf, Bellinda Paterasari
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1551 (https://doi.org/10.15562/bmj.v8i3.1551)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1551)

Penile glans necrosis following penile sclerosing lipogranuloma repair: a rare case (/article/f5e0fb3593774eceafab35d796f73ddb)
Boyke Soebhali
Bali Medical Journal (/toc/2089-1180). 2019;8(3):944-946 DOI 10.15562/bmj.v8i3.1622 (https://doi.org/10.15562/bmj.v8i3.1622)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1622)

Validity and Reliability of the Disaster Preparedness Knowledge Instrument for Health Cadres in Volcanic Disaster-Prone Areas (/article/f72c21dee1be4f999a5d8138710ff9c2)
Ridlwan Kamaluddin, Laksono Trisnantoro, Syahirul Alim
Bali Medical Journal (/toc/2089-1180). 2019;8(3):871-877 DOI 10.15562/bmj.v8i3.1543 (https://doi.org/10.15562/bmj.v8i3.1543)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1543)

Optimisation of hand sanitiser gel formula of Tekelan leaves extract (Chromolaena odorata) using simplex lattice design method (/article/f7a5681dc0ca41d6a0acc28a8179ed39)
Ni Wayan Riyani Martyasari, Yayuk Andayani, Wahida Hajrin
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1598 (https://doi.org/10.15562/bmj.v8i3.1598)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1598)

Profiles of IgM, IgG and IgE immune responses of mice against p14, p31 and p71 proteins following immunization with crude cystic fluid of Cysticercus bovis (/article/f7b28c248b1b4022a7c72c19bc2e0504)
Ida Bagus Made Oka, I Made Dwinata, I Nyoman Sadra Dharmawan, I Made Damriyasa, Nyoman Mantik Astawa

Bali Medical Journal (/toc/2089-1180). 2019;8(3):719-727 DOI 10.15562/bmj.v8i3.1581 (https://doi.org/10.15562/bmj.v8i3.1581)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1581)

The characteristics of neurocognitive function in farmers exposed to chronic pesticides at Banjar Tengah Kelod, Kerambitan, Tabanan, Bali, Indonesia (/article/fb2e6240bcc8446fa78b1e7409de188f)
Dewa Putu Gde Purwa Samatra, Ni Luh Putu Dirasandhi Semedi Putri
Bali Medical Journal (/toc/2089-1180). 2019;8(3):703-706 DOI 10.15562/bmj.v8i3.1533 (https://doi.org/10.15562/bmj.v8i3.1533)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1533)

Correlation between the level of interleukin-6 serum and blood peripheral leukocyte in patients with severe traumatic brain injury (/article/fc38f41550774bac9a5df1f6cf52ed1f)
Edwin Calvin Bangun, Eko Prasetyo, Maximillian Christian Oley
Bali Medical Journal (/toc/2089-1180). 2019;8(3) DOI 10.15562/bmj.v8i3.1548 (https://doi.org/10.15562/bmj.v8i3.1548)
Abstract | Full Text (https://balimedicaljournal.org/index.php/bmj/article/view/1548)

64 results found 100 per page

First Prev Page 1 of 1 Next

ORIGINAL ARTICLE

Bali Medical Journal (*Bali Med J)* 2019, Volume 8, Number 3: 662-666
P-ISSN.2089-1180, E-ISSN: 2302-2914

Published by DiscoverSys

The histopathological features and bacterial counts after exposure to *Streptococcus pneumoniae* serotypes 2,3,4 and 19 F in the lung of Balb/c mice

Ni Made Adi Tarini[1]*, I Nyoman Mantik Astawa[2], I Dewa Made Sukrama[1], I Wayan Wita[3], Ni Wayan Winarti[4]

ABSTRACT

Background: Pneumococci cause mild or severe infections that begin with colonization in the nasopharyngeal area. Intranasal transmission is a natural route of bacterial infection in the host. This study aims to determine the type of serotype that can infect and provide an overview of inflammation in the lungs of mice after exposure to 107 bacteria S. pneumoniae serotypes 2, 3, 4, 19F and ATCC 6030 intranasally in animals try Balb / c mice.

Methods: True experimental study was conducted using Randomized Posttest Only Control Group Design among 30 Balb/c mice divided into 3 groups. The intervention used in this study was carried out twice, namely at 24 hours and 48 hours with 50 µl suspension of *Streptococcus pneumoniae* bacterial inoculum via intranasal drop by drop. Lung histopathology and CFU analysis of infected mice were evaluated. TNF-α was examined using ELISA. Data were analyzed using SPSS software version 17 for windows.

Results: The results showed that *S. pneumoniae* serotype 3 could infect Balb / c mice and found about 5x104 CFU (SD ± 7x104 CFU) at 101 dilutions and was still detected at 104 dilutions i.e. 0.5 CFU (SD ± 0.7 CFU) at 24 hours post-infection as well at 48 hours post-infection, accompanied by infiltration of neutrophil cells in the lung tissue at the same time. The TNF-α levels did not significantly differ between the treatment group (P>0.05)

Conclusion: The results of this study indicate that not all *S. pneumoniae* serotypes can infect experimental animals.

Keywords: Animal models, Intranasal challenge, *Streptococcus pneumoniae, Colony Forming Unit*/CFU

Cite this Article: Tarini, N.M.A., Astawa, I.N.M., Sukrama, I.D.M., Wita, I.W.W., Winarti, N.W. 2019. The histopathological features and bacterial counts after exposure to *Streptococcus pneumoniae* serotypes 2,3,4 and 19 F in the lung of Balb/c mice. *Bali Medical Journal* 8(3): 662-666. DOI: 10.15562/bmj.v8i3.1585

[1]Department of Microbiology, Faculty of Medicine, Universitas Udayana, Bali, Indonesia
[2]Faculty of Veterinary Medicine, Universitas Udayana, Bali, Indonesia
[3]Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Udayana, Sanglah General Hospital, Bali, Indonesia
[4]Department of Anatomical Pathology, Faculty of Medicine, Universitas Udayana, Sanglah General Hospital, Bali, Indonesia

***Corresponding to:**
Ni Made Adi Tarini; Department of Microbiology, Faculty of Medicine, Universitas Udayana, Bali, Indonesia;
nmatarini@unud.ac.id

Received: 2019-08-21
Accepted: 2019-11-25
Published: 2019-12-01

INTRODUCTION

Streptococcus pneumoniae is a significant cause of bacterial pneumonia, meningitis, bacteraemia, and otitis media. Infectious disease by *Streptococcus pneumoniae* is a disease that can cause high mortality rates among vulnerable groups, such as infants, children, and older people.[1] The infection caused by the *Streptococcus pneumoniae* begins with the colonization of these bacteria in the nasopharynx which is the initial contact between the bacteria and the host where the transmission of these bacteria through the respiratory droplet.[2] If the host's immune system is susceptible to infection, then this bacteria will be able to attack the mucosal surface around the nasopharynx and then invade the lungs, pass through the central nervous system and also as a reservoir to transmit these bacteria horizontally to the population.[3,4]

The respiratory tract is continuously exposed to the environmental antigens, which can be dangerous for the host. Bronchial and tracheal epithelium are major mechanical barriers to incoming pathogens and, together with alveolar macrophages and dendritic cells, work as the first line of defences to prevent infection.[5] The *S. pneumoniae* expresses several virulence factors which are used to avoid the immune response from the host.[6] The immunological response to *S. pneumoniae* begins with the introduction of bacteria by alveolar macrophages and epithelial cells, which actively secrete chemokines and cytokines to stimulate infiltration of monocytes, neutrophils, and lymphocytes into the lungs.[6] Neutrophils are the primary defence of host against *S. pneumoniae*, as effector cells that clear pathogens and contribute to the pro-inflammatory and immunopathological conditions of increased lung damage caused by the recruitment of high neutrophils into the lungs.[7] The initial immune response to *S. pneumoniae* infection is dominated by phagocytes, although the relative contribution of neutrophils and macrophages is not determined. However the role of Tumor Necrosis Factor (TNF) is widely reported

as an important component in host defence against intranasal pneumococcal infection.[8] TNF-α is a proinflammatory cytokine that activates the immune and inflammatory response, which has a beneficial and harmful response to the host when an infection occurs.[9]

The model of infection in mice closely resembles the natural route of S. pneumoniae infection. Animal models such as mice can be used to test alternative vaccination strategies, test new adjuvants used for vaccines, antibiotic efficacy, natural and adaptive immune mechanisms, used for screening and testing virulence factors.[10] There are various ways to inoculate *S. pneumoniae* bacteria to the experimental animals such as mice to make these experimental animals infected. The target of infection in the organ will also determine the exposure technique in experimental animals.[11] Intranasal exposure is the most commonly used for exposure, which has the advantage that this route closely resembles to the route of pneumonia infection in humans. About more than 80% of mice will produce infection at one time of exposure, slightly less virulent compared with peritoneal exposure making it easier to detect effects protection from immune cells.[10]

The biggest obstacle in developing a model of infection with experimental animals is that not all virulent serotypes in humans are also virulent in animals.[12] In this study, intranasal exposure to *S. pneumoniae* serotypes 2,3,4 and 19F is carried out to determine the presence of pulmonary infection and to describe the immunological response in animals trying to Balb/c mice. The initial data obtained in this study is expected to encourage further research shortly.

METHODS

Research Design

A true experimental research study using the Randomized Posttest Only Control Group Design was conducted. The minimum sample size in this study was divided into 3 sample groups. Observation after treatment in this study was carried out twice, namely at 24 hours and 48 hours. The number of samples was 15 per observation time interval so that the total sample of Balb / c mice in this study was 30

Preparation of Mice

The samples used in this study were 6-week-olds Balb / c mice weighing 25-30 grams originating from the Animal Unit Laboratory, Department of Pharmacology, Faculty of Medicine, Universitas Udayana, Bali, Indonesia. Animals were kept in individual cages measuring 15x25x35 cm, conditioned by a light-dark cycle every 12/12 hours (light from 8 AM to 8 PM and dark from 8 PM to 8 AM) and the room temperature was allowed at 22 ± 2°C and humidity around 50 ± 10%. All of animals are given free access to food and water and left in this situation for 2 weeks before intervention.

BACTERIAL PREPARATION

S. pneumoniae serotype 2,3,4 originating from the Jakarta Eijkman Institute and serotype 19F isolated from clinical specimens at Sanglah Hospital Denpasar Clinical Microbiology Laboratory stored in the -80oC freezer. The bacteria were planted on 5% goat blood agar and incubated at 37°C at 5% CO2 incubator for 18 - 24 hours. Bacterial colonies were taken and put into 200 PBl PBS to make bacterial suspensions, then put into TSB (Tryptisoy Broth) medium and incubated at 37°C in an incubator of 5% CO2 in 6 hours. Then a 0.5 MacFarland bacterial suspension (1.8 x 107) was made.

Infection

The mice were given anaesthesia Ketamine 40 mg/kg and Xylazine 5 mg/kg through intramuscular injection; then the mice were exposed with 50 µl suspension of bacterial inoculum through intranasal drop by drop. These mice were bound by straps from their front teeth and allowed the suspension of bacterial inoculums to be aspirated by the mice for 10 minutes before the mice were returned to the cage to be restored. Mice were randomly selected as controls and treated. For survival rate, the mice were evaluated every 24 hours during 14 days.

Histopathology of Lung dan CFU Analysis

The lung histopathology and CFU analysis of infected mice were evaluated at 24- and 48-hour intervals. Mice were given anaesthesia Ketamine 40 mg/kg and Xylazine 5 mg / kgBW through intramuscular injection; then lung samples were taken for Hematoxylin and Eosin (H&E) staining and culture. Lung tissue for HE staining is cut 15 µm with a microtome at -18 to -25 degrees Celsius. These tissues were allowed to dry at room temperature for 20 minutes then the tissue was stained with haematoxylin and eosin (H&E) and fixed with DPX mountant (BDH) for long time storage. Pieces of tissue that have been stained are seen under a 400x magnification light microscope. The pulmonary lung of the mice was crushed and homogenized with sterile PBS, and then a serial dilution was made for CFU analysis of bacteria. Serial dilution of lung tissue is planted in 5% agar blood media, incubated at 37°C, 5% CO2 for 24 hours and then bacteria are counted.

TNF Alpha Analysis

Each blood mice were taken in the retro-orbital

region after being infected with *S. pneumoniae* bacteria at intervals of 24 and 48 hours. Before drawing blood of mice, the mice were anaesthesia first. The blood obtained was centrifuged at 1500 rpm for 30 minutes, took the supernatant into a 1.5 ml microcentrifuge tube and stored at -80oC as long as the examination had not been carried out. TNF alpha examination was carried out by the ELISA method.

Statistical analysis

This study was analyzed with SPSS version 25 for Windows using mean, standard deviation, and international units of parameters assessed quantitatively.

RESULTS

Thirty Balb/C mice used in this study were healthy for 2 weeks before 107 CFU were exposed to five *S. pneumoniae* bacterial serotypes namely Serotypes 2, 3, 4, 19F and *S. pneumoniae* ATCC 6030. After intranasal bacteria exposure, Balb / C mice were harvested in 24 hours, 48 hours and 14 days after infection. After 48 hours after infection, some mice showed signs of infection wherein the mouse was weak and bent over (Table 1).

On examination of the number of bacteria (bacterial load) of the lung tissue after 24 hours of treatment, the highest number of bacteria in the lung tissue after exposure to *S. pneumoniae serotype 3* bacteria was $5x10^4$ CFU (SD ± $7x10^4$ CFU) at 10^1 dilutions and still detected at 10^4 dilution i.e. 0.5 CFU (SD ± 0.7 CFU). The number of bacteria in the lungs was also shown in exposure to *S. pneumoniae* ATCC 6030 bacteria. After determining the serotype in *S. pneumoniae* ATCC bacteria using Polymerase Chain Reaction (PCR) technique, *S. pneumoniae* ATCC bacteria were serotype 3. Data

Table 1. The number of bacteria in the lung tissue (CFU), the number of PMN in the lung tissue (HE) and the TNF alpha level (ng/µl) after 24 hours, 48 hours, and 14 days after exposure to *S. pneumoniae* serotype 2 (1), 3 (2), 4 (3), 19F (4), ATCC 6030 (5), and control.

Sample	Bacterial load (dilution) (CFU)				Histopathology	TNF-α (ng/µl)	P-value
	10^1	10^2	10^3	10^4			
After 24 hours							
1	$5x10^3$±$7x10^3$	$1.8x10^1$±$2.5x10^1$	1.5±2	0.5±0.7	+	8.7±0.14	>0.05
2	$5x10^4$±$7x10^4$	$1.2x10^1$±$1.5x10^1$	2.5±3.5	0.5±0.7	++	9.0±0.0	
3	8±11	0	0	0	+	11.03±0.15	
4	0	0	0	0	++	9.54±0.8	
5	$5x10^4$± $7x10^4$	$5x10^2$± $7x10^2$	$5x10^1$± $7x10^1$	$1.2x10^1$± $1.6x10^1$	+	10.4±0.4	
After 48 hours							
1	$1x10^5$±0.0	$1x10^4$±0.0	$1x10^3$±0.0	$5.8x10^1$±$6x10^1$	+	8.04±1.3	>0.05
2	$5x10^1$±$7x10^1$	9±12	1±1.4	0	++	8.04±1.3	
3	0	0	0	0	+	8.04±1.3	
4	0	0	0	0	+	8.04±1.3	
5	$5x10^4$±$7x10^4$	$5x10^2$±$7x10^2$	$5x10^1$±$7x10^1$	$1.2x10^1$± $1.6x10^1$	++	8.04±1.3	
After 14 days							
1	0	0	0	0	+++	7.52	>0.05
2	0	0	0	0	+	8.04±1.3	
3	0	0	0	0	+++	8.04±1.3	
4	0	0	0	0	+++	8.76	
5	0	0	0	0	+++	6.49	
Control	0	0	0	0	+	9.8	

CFU: Colony forming units; +: 1-5 cells/field; ++: 6 – 10 cells/field; +++: > 10 cells/field, micro-abscess

Published by DiscoverSys | *Bali Med J* 2019; 8(3): 662-666 | doi: 10.15562/bmj.v8i3.1585

on the number of bacteria in the lungs of mice after 24 hours of exposure can be seen in Table 1.

The bacterial growth in lung tissue samples after 48 hours of exposure to S. *pneumoniae* was demonstrated in mice exposed to *S. pneumoniae* serotypes 2, 3 and ATCC 6030, respectively $1x10^5$ CFU (SD ± 0.0), $5x10^1$ (SD ± $7x10^1$) and $5x10^4$ (SD±$7x10^4$) at dilution 10^1. The number of bacteria in the lungs can still be detected until dilution 10^4. Data on the number of bacteria in the lungs of mice after 48 hours of exposure can be seen in Table 1.

The exposure of *S. pneumoniae* bacteria in mice also shows the infiltration of neutrophil cells (PMN) in the lung tissue of mice which can be seen by H&E staining. The amount of neutrophil infiltration in lung tissue varies with the S. pneumoniae serotype. At 24 hours after exposure to *S. pneumoniae*, the bacteria showed neutrophil infiltration in lung tissue and the number of neutrophil cells was most indicated on serotype 3 exposure (Table 1). On the 14th day of infection, *S. pneumoniae* ATCC 6030 which is serotype 3 showed micro-abscess (Table 1). In the staining of HE can be seen neutrophil infiltration in the area of bronchioles and perivascular after 24 hours after infection with *S. pneumoniae*, especially serotype 3.

The results of the TNF alpha in this study did not differ significantly from each treatment group ($P>0.05$), but there was a fact that there was a decrease in the amount of TNF-alpha in the blood in mice with micro pulmonary abscesses 14 days after being infected by *S. pneumoniae* serotypes 2 and 3, 7.52 ng/µl and 6.49 ng/µl (Table 1).

DISCUSSION

The intranasal technique (IN) used in this study in infecting mice is because the procedure is straightforward. Based on the previous studies, intranasal infection (IN) is straightforward and fast to do without sophisticated and invasive surgical techniques as well as mimic the route of infection naturally. For this reason, IN infection is the most commonly used method and applicable in this study.[9]

The results in this study are almost the same with the previous studies, where serotype 3 can infect the lungs of mice 24 hours after infection with bacterial concentrations of 107 CFU. Research by Saeland et al. showed that the occurrence of pulmonary infections and bacteremia in intranasal exposure was from the serotypes 1, 3, 6A, and 8 with high bacterial concentrations (107-108 CFU).[3] Likewise, as shown in the study of Calboa et al., all mice had a lung infection and bacterium with 100% mortality after being infected with 107 CFU *S. pneumoniae* serotype 3.[13] In experimental animals such as mice, host resistance to *S. pneumoniae* is most often studied after being infected with highly encapsulated serotypes, such as 2 and 3 and causing high mortality.[8]

After being infected with *S. pneumoniae*, in the early stages these bacteria will be recognized by alveolar macrophages, epithelial cells, dendritic cells and B cells in the alveoli, which emit cytokines and pro-inflammatory chemokines that produce neutrophil and monocyte explosions.[7] Neutrophils begin to accumulate in the lungs around 12 to 16 hours after infection with *S. pneumoniae*.[14] Following the previous results, the neutrophil counts increase 12 hours after pneumococcal infection and gradually decrease up to 14 days after infection.[15] A similar result was also found in our study whereas the neutrophil infiltration of the lungs appeared 24 h post-infection. The role of neutrophils is indispensable for the process of cleaning *S. pneumoniae* in lung tissue, with several specific procedures, including adhesion to blood vessel walls, chemotaxis, phagocytosis, and killing of microbes.[13] Histological analysis of lung tissue sections from mice infected with *S. pneumoniae* showed inflammation and infiltration of inflammatory cells centered around the bronchioles and perivascular areas. The focus of inflammation is limited to certain perivascular bronchioles and regions close to these bronchioles 24 hours after infection. Inflammation presents itself as bronchial wall hypertrophy, severe inflammatory cell infiltration around the bronchioles and some pulmonary oedema.[14]

In this study shows that TNF-alpha results between the treatment groups were not significantly different. Tumor necrosis factor-alpha (TNF alpha) is a proinflammatory cytokine that activates an immune response to infection, invasion, injury, or inflammation. Previous studies have also shown that TNF-alpha has an important role in protecting hosts from systemic infection with *S. pneumoniae*.[16] In our study, experimental animals did not show systemic infections but only showed localized infections in the lungs where serum was taken 24- and 48-hours post-infection. This result indicated that the value of serum TNF alpha does not increase significantly. This is supported by previous studies, serum TNF-alpha levels began at 3 days after infection, respectively, together with an increase in the number of bacteria in the lungs.[17]

CONCLUSION

Experimental animals such as mice are the most commonly used experimental animals in studying the pathogenesis of *S. pneumoniae* infection. Each strain of mice gives different immunological and

pathological responses when exposed by various serotypes or strains of S. pneumoniae bacteria. In this study, it was shown that S. pneumoniae serotype 3 could infect Balb/c mice compared to other serotypes.

CONFLICT OF INTEREST

There is no competing interest regarding the manuscript.

ETHICAL CLEARANCE

Ethics approvals have been obtained prior to the study being conducted from Ethics Committee, Faculty of Medicine, Universitas Udayana, Bali, Indonesia.

FUNDING

None.

AUTHOR CONTRIBUTION

All of the authors are equally contributed to the study from the conceptual framework, data gathering, data analysis, until reporting the results of study.

ACKNOWLEDGEMENTS

We would like to thank the staff of the laboratory of Clinical Microbiology at Sanglah Hospital Denpasar, staff of Department Clinical Microbiology, Faculty of Medicine, Udayana University and Staff of Laboratory Animal Unit Department Pharmacology, Faculty of Medicine, Udayana University for their support in this study.

REFERENCES

1. Adetifa IM, Antonio M, Okoromah CA, Ebruke C, Inem V, Nsekpong D,. Pre-vaccination nasopharyngeal pneumococcal carriage in a Nigerian population: epidemiology and population biology. PLoS One. 2012;7(1):e30548
2. Drijkoningen JJ, Rohde GG.. Pneumococcal infection in adults: burden of disease. Clin Microbiol Infect. 2014;20 Suppl 5:45-51.
3. Saeland E, Vidarsson G, Jonsdottir I. Pneumococcal pneumonia and bacteremia model in mice for the analysis of protective antibodies. Microb Pathog. 2000;29(2):81-91.
4. Richards L, Ferreira DM, Miyaji EN, Andrew PW, Kadioglu A.. The immunising effect of pneumococcal nasopharyngeal colonisation; protection against future colonisation and fatal invasive disease. Immunobiology. 2010;215(4):251-63.
5. Nieto PA, Riquelme SA, Riedel CA, Kalergis AM, Bueno SM.. Gene elements that regulate Streptococcus pneumoniae virulence and immunity evasion. Curr Gene Ther. 2013;13(1):51-64.
6. Peñaloza HF, Salazar-Echegarai FJ, Bueno SM. Interleukin 10 modulation of neutrophil subsets infiltrating lungs during Streptococcus pneumoniae infection. Biochem Biophys Rep. 2017;13:12-16
7. Peñaloza HF, Nieto PA, Muñoz-Durango N, Salazar-Echegarai FJ, Torres J, Parga MJ, et al. Interleukin-10 plays a key role in the modulation of neutrophils recruitment and lung inflammation during infection by *Streptococcus pneumoniae*. Immunology. 2015;146(1):100-12.
8. Kirby AC, Raynes JG, Kaye PM. The Role Played by Tumor Necrosis Factor during Localized and Systemic Infection with Streptococcus pneumoniae . J Infect Dis. 2005;191(9):1538-47.
9. Jeong DG, Jeong ES, Seo JH, Heo SH, Choi YK.. Difference in Resistance to Streptococcus pneumoniae Infection in Mice Lab Anim Res. 2011;27(2):91-8.
10. Briles DE, Hollingshead SK, Jonsdottir I. Animal Models of Invasive Pneumococcal Disease. In: Siber GR, Klugman KP, Makela PH. Pneumococcal Vaccines : The Impact of Conjugate Vaccine. ASM Press. 2008;47–58.
11. Chiavolini D, Pozzi G, Ricci S. Animal models of Streptococcus pneumoniae disease. Clin Microbiol Rev. 2008;21(4):666-85.
12. Kadioglu A, Andrew PW.. Susceptibility and resistance to pneumococcal disease in mice. Brief Funct Genomic Proteomic. 2005;4(3):241-7.
13. Calbo E, Garau J.. Of mice and men: innate immunity in pneumococcal pneumonia. Int J Antimicrob Agents. 2010;35(2):107-13.
14. Kadioglu A, Gingles NA, Grattan K, Kerr A, Mitchell TJ, Andrew PW.. Host cellular immune response to pneumococcal lung infection in mice. Infect Immun. 2000;68(2):492-501.
15. Asami T, Ishii M, Namkoong H, Yagi K, Tasaka S, Asakura T. Anti-inflammatory roles of mesenchymal stromal cells during acute Streptococcus pneumoniae pulmonary infection in mice. Cytotherapy. 2018;20(3):302-313.
16. Jeong DG, Seo JH, Heo SH, Choi YK, Jeong ES. Tumor necrosis factor-alpha deficiency impairs host defense against Streptococcus pneumoniae. Lab Anim Res. 2015;31(2):78-85.
17. Takashima K, Tateda K, Matsumoto T, Iizawa Y, Nakao M, Yamaguchi K.. Role of tumor necrosis factor alpha in pathogenesis of pneumococcal pneumonia in mice. Infect Immun. 1997;65(1):257-60.