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23

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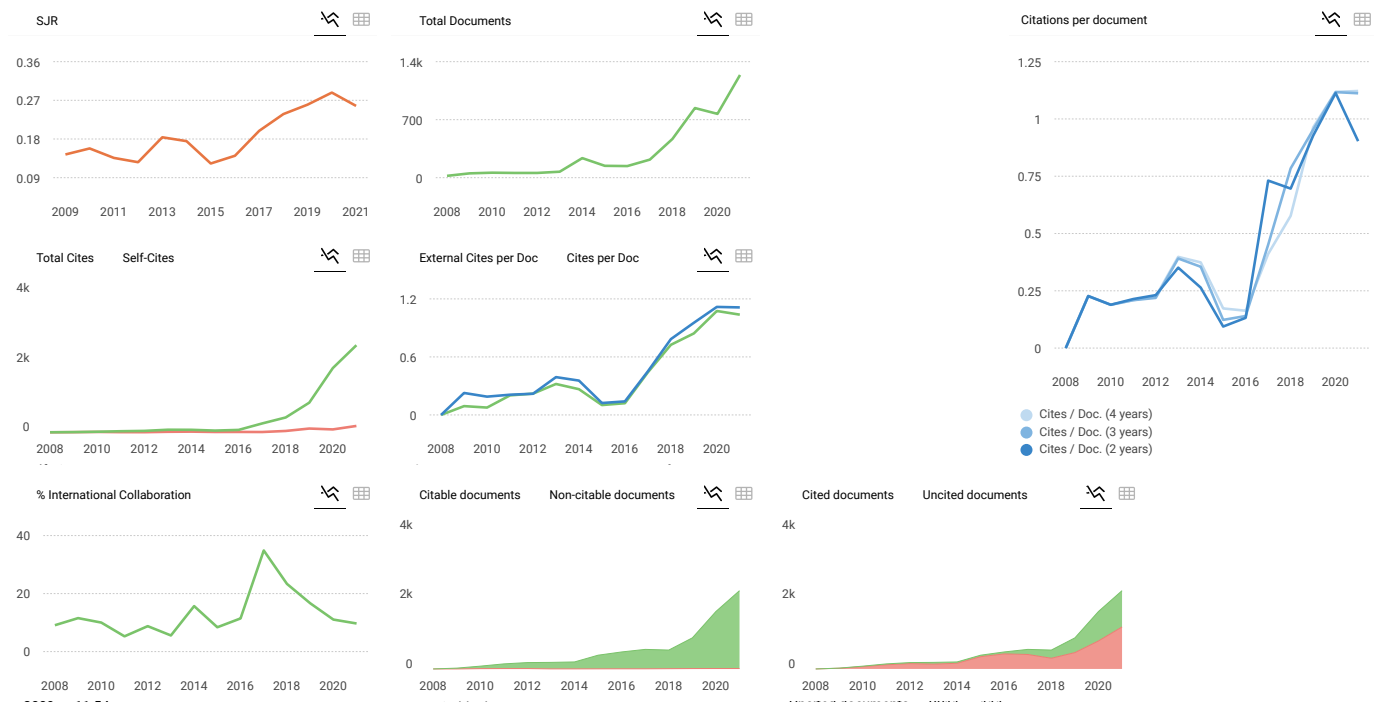
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#### **Effect of Anatomical and Physiological Factors on Ultrasonic Breast Imaging Reporting and Data System Score in Iraqi Women Presenting with Breast Lumps**

Ahmed Fakhir Hameed, Sameh S. Akkila, Khalida I. Noel, Saad Alshahwani (Author)

1214-1218



PDF

#### **Evaluation of Anatomy Course Teaching and Learning Outcomes for Iraqi Pharmacy Students: Internet-based Learning versus Blended Learning During the Pandemic**

Sinan Farhan, Ahmed Al-Imam, Marek A. Motyka (Author)

782-788



PDF

#### **Mandibular Canal Location and Cortical Bone Thickness in Males and Females of Different Age Groups: A Cone-beam Computed Tomography Study**

Sherif Shafik El-Bahnasy, Magdy Youakim, Mohamed Shamel, Hisham.El Shiekh (Author)

1117-1122



PDF

#### **Anomalous Origin of the Superior Thyroid Artery from the Internal Carotid Artery**

Adegbenro Omotuyi John Fakoya, Neha Subedi, Jennifer Beniquez Martir, Byron Chique Carreras, Abayomi Gbolahan Afolabi, Thomas McCracken (Author)

95-97

 PDF

## Genetics

### **The Role of Apa-I Vitamin D Receptor Gene Polymorphism in Type 2 Diabetes Mellitus**

Mutiara Indah Sari, Rusdiana Rusdiana, Milahayati Daulay (Author)

129-133

 PDF

### **Fibroblast Growth Factor Receptor 4 Gly388Arg Gene Polymorphism and Non-Hodgkin Lymphoma Susceptibility and Prognosis in Egyptian population: Case-control Study**

Wafaa M. Abdelghany, Shahira Kamal Anis Botros, Osman Mohamed Mansour, Mahmoud A. Ayoub, Abdallah M. Almuslimani, Naglaa M. Hassan (Author)

143-150

 PDF

### **Role of CALLA/CD10 Expression in Progression of Melanocytic Tumors: A Study in Egypt**

Maha Elsayed Mohammed Salama, Dina Ahmad Khairy (Author)

164-168

 PDF

### **Glutathione Peroxidase-1 Pro198Leu Variant in Tuberculosis-infected Type2 Diabetes Mellitus Patients at Pulmonary Polyclinic Medan**

Nurfida Khairina Arrasyid, Milahayati Daulay, Mutiara Indah Sari (Author)

403-406

 PDF

### **Association between Three Variants in the PRKAA2 gene, rs2796498, rs9803799, and rs2746342, with 10-year ASCVD Risk on Newly Diagnosed T2DM in Yogyakarta, Indonesia**

Dita Maria Virginia, Mae Sri Hartati Wahyuningsih, Dwi Aris Agung Nugrahaningsih (Author)

541-547

 PDF

### **The Effects of Polymorphisms in One-carbon Metabolism Genes on Manifestation of Ichthyosis Vulgaris**

Olena Fedota, Mr. Iurii Sadovnychenko, Lilia Chorna, Larysa Roshcheniuk, Vitalii Vorontsov, Pavlo Ryzhko, Ivanna Haybonyuk, Serhii Belyaev, Igor Belozorov, Halyna Makukh (Author)

291-297

 PDF

### **Modulation of Insulin Gene Expression with CRISPR/Cas9-based Transcription Factors**

Bakhytzhan Alzhanuly, Zhussipbek Y. Mukhatayev, Dauren M. Botbayev, Yeldar Ashirbekov, Nurlybek D. Katkenov, Nurlan T. Dzhaynakbaev, Kamalidin O. Sharipov (Author)  
876-881

 PDF

### **Micro-RNA Biogenesis Genes (AGO1 and GEMIN4) Single Nucleotide Variants of Bad Prognosis and Poor Therapeutic Response in Egyptian Chronic Myeloid Leukemia Patients: Case-control Study**

Wafaa Abd Abdelghany, Mohamed Emam, Usama Elnagar, Rehab Helmy, Osama H. Korayem, Naglaa M. Hassan (Author)  
378-386

 PDF

### **The Prevalence and Prognostic Impacts of Nucleophosmin Mutations in Adult Patients with De Novo Acute Myeloid Leukemia**

Naglaa Mostafa Hassan, Noha El-Sayed, Khaled Aboul-Enein , Lamyaa Nabeeh Al-Fadally, Reem Nabil (Author)  
632-638

 PDF

### **The Impact of Luteinizing Hormone/Chorionic Gonadotropin Hormone Receptor Gene Polymorphism rs68073206 in Men with Non-obstructive Azoospermia: A Case-control Study**

Abdul-Rahim A. Ali, Omar F. Abdul-Rasheed, Ula M. Al-Kawaz (Author)  
894-900

 PDF

### **Role of Interferon-Gamma +874 A/T Single-Nucleotide Polymorphism and Tuberculosis Susceptibility of Pediatric Population in North Sumatera, Indonesia**

Rini Savitri Daulay, Rina Amalia C. Saragih, Ridwan Muchtar Daulay, Ratna Akbari Ganie, Gino Tann, Bambang Supriyatno (Author)  
1057-1060

 PDF

### **Transcriptional Activity of Neurotrophins Genes and Their Receptors in the Peripheral Blood in Patients with Thyroid Diseases in Bukovinian Population of Ukraine**

Iryna Kamyshna, Aleksandr Kamyshnyi (Author)  
208-216

 PDF

### **Association between Serum Brain-derived Neurotrophic Factor and 25-OH Vitamin D Levels**



### **with Vitamin D Receptors Gene Polymorphism (rs2228570) in Patients with Autoimmune Thyroiditis and Hypothyroidism**

Iryna Kamyshna, Larysa Pavlovysh, Aleksandr Kamyshnyi (Author)  
659-664

 PDF

### **Matrix Metalloproteinase-2, COL1A1, and COL3A1 mRNA Expression in Aponeurosis Musculus obliquus Externus Abdominis of Adult Inguinal Hernias**

Nizar Nizar, Afriwardi Afriwardi, Yanwirasti Yanwirasti, Alsen Arlan (Author)  
318-323

 PDF

### **Polymorphism of Thyroid Hormones Receptor, Angiotensin-Converting Enzyme, and High Blood Pressure in Childbearing Age Women with Hyperthyroidism**

Agus Wibowo, Pramudji Hastuti, Vinayanti Susanti (Author)  
387-392

 PDF

### **Association of Vitamin D Receptor Polymorphism (rs2228570, rs1544410, rs7975232, and rs731236) and Macrophage Migration Inhibitory Factor -173 G/C (rs755622) with the Susceptibility of Active Pulmonary Tuberculosis in Makassar, Indonesia**

Najdah Hidayah, Irawaty Djaharuddin, Ahyar Ahmad, Rosdiana Natzir, Ilhamjaya Patellongi, Agussalim Bukhari, Irda Handayani, Andi Tenriola, Subair Subair, Handayani Halik, Muhammad Nasrum Massi (Author)  
838-848

 PDF

### **Effect of *Batissa violacea celebensis* Martens, 1897, Extract on $\beta$ -Catenin Gene in Mice (*Mus musculus*) Induced by Azoxy methane and Dextran Sulfate Sodium using Polymerase Chain Reaction-restriction Fragment Length Polymorphism Method**

Sri Anggarini Rasyid, Sanatang Sanatang, Satriani Syarif, Sugireng Sugireng, Titi Purnama, Suwarny Suwarny, Yayan Kurniansyah Saputra (Author)  
964-970

 PDF

### **Genetic Polymorphism of Cyp2a6 and Cyp2a13 Genes and Environmental Tobacco Smoke Induced Lung Cancer Risk in Indonesian Female Never Smokers**

Noni Soeroso, Rozaimah Zain-Hamid, Syamsul Bihar, Setia Putra Tarigan, Fannie Rizki Ananda (Author)  
1219-1225

 PDF

### **von Willebrand Factor Gene Polymorphism in Preeclampsia Pregnant at Medan, Indonesia**

Dewi Indah Sari Siregar, Muhammad Fidel Ganis Siregar, Gontar Alamsyah Siregar, Syah Mirsya Warli

(Author)

1047-1051



PDF

### **Association of Polymorphism +874 T/A Interferon Gamma Gene with Susceptibility to Pulmonary Tuberculosis in Medan, Indonesia**

Sri Melinda Kaban, Bintang Yinke Magdalena Sinaga, Tetty Aman Nasution (Author)

515-519



PDF

### **Association of Lipids' Metabolism with Vitamin D Receptor (rs10735810, rs222857) and Angiotensinogen (rs699) Genes Polymorphism in Essential Hypertensive Patients**

Yuliya Repchuk, Larysa Sydorчук, Larysa Fedoniuk, Zoia Nebesna, Valentyna Vasiuk, Andrii Sydorчук, Oksana Iftoda (Author)

1052-1056



PDF

### **Genetic Variation of a -176g>c Interleukin-6 Correlated with White Blood Cells Count in Obesity of Indonesia**

Dwi Eni Danarsih, Pramudji Hastuti, Agus Kristianto (Author)

324-327



PDF

### **Role of Glutathione S-transferase Mu 1 and Glutathione S-transferases Theta 1 Polymorphism in the Risk of Developing Type 2 Diabetes Mellitus at Universitas Sumatera Utara Hospital, Medan**

Tala ZZ, Mutiara Indah Sari (Author)

1240-1244



PDF

### **Relationship between Superoxide Dismutase Manganese Gene Polymorphism and Eye Tumors**

Rodiah Rahmawaty Lubis, Cut Adeya Adella, Lokot Donna Lubis (Author)

229-232



PDF

### **Genetic Polymorphism of ITGA2 C807T Collagen Receptor Encoding Gene of Aspirin Therapy among Javanese-Indonesian Healthy Respondents**

Vitarani Dwi Ananda Ningrum, Rochmy Istikharah, Ahmad H. Sadewa (Author)

1067-1073



PDF

### **Tumor Necrosis Factor-alpha -308G/A Polymorphism Associated with Increased Risk for Pulmonary Tuberculosis in Medan City, Indonesia**

Bintang Yinke Magdalena Sinaga, Zainuddin Amir (Author)

7-11



PDF

### **The Polymorphism in Interleukin-6-597 G/A Gene and their Levels on Type 2 Diabetic Patients**

Zaimah Z Tala, Nurfida Khairina Arrasyid, Sanny Sanny, Mutiara Indah Sari (Author)

57-60



PDF

### **Impact of Genetic Polymorphism of Myeloid Differentiation Primary Response Gene 88, Enhancer of Zeste Homolog 2, and B-cell Lymphoma 2 like 11 in Patients with Diffuse Large B Cell Lymphoma Treated with Rituximab, Cyclophosphamide, Doxorubicin, Vincristin**

Hussam Zawam, Noha E. Ibrahim, Rasha Salama, Mai Samir, Walaa Abdelfattah, Doaa M. El Demerdash, Dina Sabry, Sahar A. Tabak, Rasha A. Khairy (Author)

98-105



PDF

## **Biochemistry**

### **Benefits of Nigella sativa Extract Protecting Ovary Due to Cisplatin Chemotherapy**

Khairani Sukatendel, M. Fidel Ganis Siregar, Muharam Natadisastra, Iqbal Pahlevi Adiputra Nasution, Syafruddin Ilyas, M. Rhiza Tala, Putri Chairani Eyanoer, Poppy Anjelisa Z. Hasibuan (Author)

680-687



PDF

### **Acute Toxicity Study of Porang (Amorphophallus oncophyllus) Flour Macerated with Strobilanthes crispus in Wistar Rats**

Rizka Qurrota A'yun, Uswatun Hasanah, Hamam Hadi, Mustofa Mustofa, Eva Nurinda, Yulinda Kurniasari, Veriani Aprilia (Author)

976-981



PDF

### **Brain Derived Neurotrophic Factor and Serotonin Levels in Autistic Children: Do They Differ**

### **in Obesity?**

Ehab R. Abdelraouf, Hend Rashad, Ayman Kilany, Hala M. Zeidan, Mohamed Elhadidy, Adel Hashish, Neveen Hassan Nashaat, Fateheya M. Metwally (Author)

959-963



PDF

### **Ethanol Extract of Carica papaya Leaf Can Increase Breast Milk in Lactating Rat**

Yanti Herawati, Umi Kalsum, I Wayan Arsana Wiyasa, Lelly Yuniarti, Teguh Wahyu Sardjono (Author)

520-526



PDF

### **Physicochemical Characteristics of Chicken Eggshell Flour Produced by Hydrochloric Acid and Acetic Acid Extraction**

Rosnah Rosnah, Nurpudji A. Taslim, Andi Makbul Aman, Irfan Idris, Suryani As'ad, Agussalim Bukhari, Elly Wahyudin (Author)

428-432



PDF

### **Effect of the Ethanol Extract of Mimosa Leaves on the Blood Glucose, Malondialdehyde, and Histopathological Characteristics of Wistar Rats**

S. Wahjuni, I. A. Raka Astiti Asih, Desmon Tutu Bili, Ni Made Puspawati, Ahmad Fudholi (Author)

1296-1301



PDF

### **Effect of Non-alcoholic Fatty Liver Disease on Some of Bone Biomarkers in Men**

Dalal Al-Akabi, Faris S. Kata (Author)

924-927



PDF

### **Features of the Course of Non-alcoholic Fatty Liver Disease in Experimental Animals at High Altitudes**

Nurgul Toktogulova, Rustam Tuhvatshin (Author)

1092-1096



PDF

### **Evaluation of Lipid Peroxidation under Immobilization Stress in Irradiated Animals in Experiment**

Assem K. Okassova, Oralbek Z. Ilderbayev, Akmaral Zh. Nursafina, Gulmira M. Zharmakhanova, Bibigul B. Rakhimova, Bayan T. Yessilbaeva, Bayan N. Dyussenbekova (Author)

[PDF](#)

### **Insulin-like Growth Factor Initiates Hepatocellular Carcinoma in Chronic Hepatitis C Virus Patients through Induction of Long Non-coding Ribonucleic Acids AF085935**

Role of LncRNA AF085935 in HCC development

Abeer Mostafa, Noha El-Sayed Ibrahim, Dina Sabry, Wael Fathy, Amany Y. Elkazaz (Author)  
222-228

[PDF](#)

### **Antiproliferative Effect of Mesenchymal Stem Cells on Human Breast Carcinoma: New Insight on FOXO/lncRNA-AF085935 Axis**

Sahar H. Ahmed, Abeer Mostafa, Amany A. Abou-Elalla (Author)  
748-752

[PDF](#)

### **The Effect of Uncomplicated Knee Arthroscopy on C-reactive Protein and Erythrocyte Sedimentation Rate**

Andrew Hannah, Graeme Ethan Hancock , James Edward Stoddard, Paul Mark Sutton (Author)  
299-302

[PDF](#)

### **Evaluation of Proximate and Mineral Composition of Biscuit Formulated Using Chayote (*Sechium edule*) and Mung Bean (*Vigna radiata*) Flours**

Jamaludin M. Sakung, Siti Nuryanti, Afadil Afadil, Sri Hastuti Virgianti Pulukadang, Maryam Maryam, Mar'atun Mar'atun (Author)  
373-377

[PDF](#)

### **Bovine Serum as an Alternative to Control Serum for Total Protein Levels**

Bambang Supriyanta, Martha Atik Martsiningsih, Steven Soenjono, Audrey Amy Andreansyah, Budi Setiawan (Author)  
1292-1295

[PDF](#)

### **Organoleptic Properties, Proximate Compositions, and Antioxidant Activity of Carrot – Navel Orange Marmalade**

Dzul Fadly, Nur Afni Rahmatiya Abdul, Yuges Saputri Muttalib, Bohari Bohari (Author)  
488-492

[PDF](#)

### **Hazards of Chronic Exposure to Nonylphenol: Concomitant Effect on Non-alcoholic Fatty Liver Disease in Male Albino Rats**

Rania Elsyade, Eman El Sawaf, Dalia Gaber (Author)

548-555



PDF

### **Beet (Beta vulgaris) Suppressed Gene Expression and Serum Fatty Acid Synthase in High Fat and Fructose-induced Rats**

Salma Nadiyah, Pramudji Hastuti, Sunarti Sunarti (Author)

303-307



PDF

### **Beet (Beta vulgaris) Improve Blood Glucose and AKT2 Gene Expression in High Fat and Fructose-induced Rats**

M. Windi Dona Fitri, Arta Farmawati, Sunarti Sunarti (Author)

882-886



PDF

### **Exosomes of Adipose-derived Stem Cells Conditioned Media Promotes Retinoblastoma and Forkhead-Box M1 Protein Expression**

Sinta Murlistyarini, Lulus Putri Aninda, Sri Widyarti, Agustina Tri Endharti, Teguh Wahyu Sardjono (Author)

422-427



PDF

### **miRNA-17-5p Target Prediction and its Role in Senescence Mechanism through p21 Interference**

Sinta Murlistyarini, Teguh Wahyu Sardjono, Lukman Hakim, Sri Widyarti, Didik Huswo Utomo, Galuh Wening Permatasari, Tinny Endang Hernowaty (Author)

455-462



PDF

### **Bone Marrow-derived Mesenchymal Stem Cells Reverse Hepatic Fibrosis, Improved Vascularity, and Attenuate the Apoptosis in Carbon Tetrachloride-induced Hepatic Fibrosis Experimental Rats**

Zainab Altaib, Walaa S. Sabbah, Eman K. Rashwan, Ashraf Albrakati, Abeer Mostafa (Author)

698-706



PDF

## **Histology**

### **Light optical and Ultrastructural Characteristics of the Maral Liver with Chronic Dicrocoeliasis**

Darzhigitova Albina Koshanovna, Shapekova Nelya Lukpanovna, Karlygash Aubakirova, Ainur Koigeldinova, Tynykulov Marat Korganbekovich, Kaisagaliyeva Gulzhakhan (Author)

202-207



PDF

### **Histological Changes of Stomach and Intestine Induced by Energy Drink (Tiger) in Adult Male Rats**

Maha Al Sammak, Ahmed Hisham Qassim, Omer R. Hamdi (Author)

735-740



PDF

### **The Effectiveness of Sechium edule Jacq. Swartz Extract Changes in the Histopathology of Aspirin-Induced Rat Gastritis Model**

Hendrika Silitonga, Gontar A. Siregar, Rosita Juwita Sembiring, Marline Nainggolan (Author)

1252-1257



PDF

### **Semen Analysis and Insight into Male Infertility**

Batool Mutar Mahdi (Author)

252-256



PDF

### **Effect of Cadmium Chloride on the Histological Structure of Lung in Adult Male Mice with and without Parsley Oil**

Maha Alsammak (Author)

676-679



PDF

### **The Role of Vitamin C in Amelioration of Hepatorenal Toxicity of Cefotaxime in Adult Albino Rats (Histological Study)**

Maha Al Sammak, Rana M. Ahmed, Nadwa Alazzo (Author)

845-848



PDF

### **Histology of hematoxylin-eosin and immunohistochemical diabetes rat pancreas after giving combination of moringa leaves (Moringa oleifera) and clove flower (Syzygium aromaticum) extracts**

Purnama Ningsih, Sitti Rahmawati, Baharuddin Hamzah, Tri Santoso, Nurbaya Nurbaya, Muhammad

Fakhrul Hardani, Ririen Hardani (Author)

257-262



PDF

### **Experimental Study Comparing Structural Changes Induced by Biologic Versus Synthetic Mesh Implants in Nephropexy**

Aigerim Nurkassiyevna Abatova , Maida Maskhapovna Tussupbekova, Nurkassi Tulepbergenovich Abatov, Ruslan Muratovich Badyrov, Yevgeniy Konstantinovich Kamyshanskiy (Author)

284-290



PDF

### **The Effect of Intravenously and Intra-arterially Delivered Human Umbilical Cord Blood Mononuclear Cell on Cortical Neurogenesis of Post-Ischemic Stroke Rat Brain**

Sastia Winda Astuti, Isabella Kurnia Liem, Yetty Ramli (Author)

1245-1251



PDF

### **A Histologic and Histomorphometric Analysis of Bone Tissue Regeneration with Perforated Bone Allograft in Rabbit Femur Defect**

B. E. Tuleubaev, E. K. Kamyshansky, Saginova Dina Saginova, E. R. Tashmetov, A. A. Koshanova (Author)

12-18



PDF

### **The Effect of Duration of Use of Depomedroxyprogesterone Acetate on the Thickness of the Vaginal Epithelium of Mice**

Nora Veri, Cut Mutiah, Dewita Dewita, Henniwati Henniwati, Fazdria Fazdria, Lia Lajuna, T Salfiyadi Salfiyadi (Author)

73-77



PDF

### **Cytopathology of Saliva in COVID-19 Patients: Preliminary Study on Five Patients of COVID-19**

Mohammad Zulkarnain, Rostika Flora, Nyiyayu Fauziah, Citra Dewi, Eny Rahmawati, Yusri Yusri, Lisa Dewi, Benny Darory, Danny Kusuma Aerosta, Krisna Murti (Author)

68-72



PDF

## **Physiology**

### **Can Early Electrical Stimulation Accelerates the Neural Regeneration by Increasing the**



### **Expression of BDNF and GDNF in Distal Part of Injured Peripheral Nerve? An Animal Experimental Study**

Agus Roy Rusly Hariantana Hamid, Sri Maliawan, DPG Purwa Samatra, I Nyoman Mantik Astawa, I Made Bakta, I Made Jawi, Ida Bagus Putra Manuaba, I Dewa Made Sukrama, David Sontani Perdanakusuma (Author)

1006-1010



PDF

### **Morphofunctional and Hematological Characteristics of Health in Students from the Northern and Southern Regions of Kazakhstan**

Saule Bazarbaeva, Aigul Dinmukhamedova, Gulnara Tleubergenova, Zhanar Rakhimzhanova, Kamila Sembekova, Sholpan Karbayeva, Elmira Kuandykova (Author)

753-759



PDF

### **Improvement of Walking Analysis using the Sciatic Function Index for Sciatic Nerve Function in Injured Rat Model Treated with Low-Intensity Aerobics**

Ria Margiana, Kamila Alawiyah, Khoirul Ima, Rizni Fitriana, Arif Rahmat Widodo, Theresa Devi Wibowo (Author)

1162-1168



PDF

### **Effect of Artificial Carbon Dioxide-Rich Water Immersion on Peripheral Blood Flow in Healthy Volunteers: Preliminary Study about Artificial Carbon Dioxide-Rich Water**

Andi Rizky Arbaim Hasyar, Haerani Rasyid, Irfan Idris, Irawan Yusuf (Author)

527-531



PDF

### **Environmental Enrichment Ameliorates Anxiety-Like Behavior in Rats without Altering Plasma Corticosterone Level**

Muthmainah Muthmainah, Winda Atika Sari, Nanang Wiyono, Dhoni Akbar Ghazali, Ratih Dewi Yudhani, Brian Wasita (Author)

1074-1080



PDF

### **Features of Physical Development in Adolescents Aged 12-14 Years: Assessment and Analysis**

Nurgulim Akhmad, Dinara Baigamysova, Altyn Abilova, Ardana Balapanova, Umit Keldigulova, Gulzhan Alzhanbekova, Meiramkul Okhanova (Author)

1104-1108



PDF

### **Light Environment Effect in the Sperm and Ribonucleic Acid Quality and Body Weight of Male *Mus musculus***

Evi Hanizar, Yung-Sen Huang, Tri Agus Siswoyo, Mohamad Syaifudin Aswan (Author)

644-650



PDF

### **Impact of Obesity on Physical Activity**

Titis Nurmasitoh, Umatul Khoiriyah, Ika Fidianingsih, Adika Zhulhi Arjana, Ninda Devita (Author)

988-992



PDF

### **Effect of Dawood Fasting on the Increased Level of Antioxidant Enzymes**

Utami Mulyaningrum, Anif Firrizki Muttaqina, Adhitama Noor Idninda, Ndilalah Pulungan, Irena Agustiningtyas, Ika Fidianingsih (Author)

1-6



PDF

## **Immunology**

### **Protective Effect of Eugenol against Acetaminophen-Induced Hepatotoxicity in Human Hepatocellular Carcinoma Cells via Antioxidant, Anti-Inflammatory, and Anti-Necrotic Potency**

Florenly Florenly, Liena Sugianto, I Nyoman Ehrich Lister, Ermi Girsang, Chrismis Novalinda Ginting, Ervi Afifah, Hanna Kusuma, Rizal Rizal, Wahyu Widowati (Author)



PDF

### **Association of Urinary Interferon Gamma Protein-10 Levels and Low Levels of Cluster of Differentiation 4 Serum in Patients with Tuberculosis-Human Immunodeficiency Virus Coinfection**

Dwitya Elvira (Author)

707-710



PDF

### **Moringa Leaf Powder (*Moringa oleifera*) Decrease of Inflammation Plasma Cytokine of Pregnant Rats with Diabetes Mellitus**

Harry Kurniawan Gondo (Author)

1043-1046



PDF

### **Mesenchymal Stem Cells Enhance Vascular Endothelial Growth Factor-A, Endothelial Nitric**

### **Oxide Synthetase, and HSP70 Expression in Improving Erectile Dysfunction in Streptozotocin-induced Diabetic Rats**

Ade Indra Mukti, Syafruddin Ilyas, Syah Mirsya Warli, Agung Putra, Nur Rasyid, Delfitri Munir, Kamal Basri Siregar, Muhammad Ichwan, Iffan Alif, Nurul Hidayah (Author)

1174-1180



PDF

### **The Normal Ratio of Th17 and Th1 Post-mesenchymal Stem Cells Coculture with PBMCs of Systemic Lupus Erythematosus Patients**

Azizah Retno Kustiyah, Agung Putra, Taufiqurrachman Nasihun, Rajesh Ramasamy (Author)

169-176



PDF

### **Dynamics of Pro- and Anti-inflammatory Cytokines in Experimental Animals with Non-alcoholic Fatty Liver Disease Under Conditions of Hypobaric Hypoxia**

Nurgul Toktogulova, Rustam Tukhvatshin, Elmira Mainazarova (Author)

822-826



PDF

### **State of Immunological Reactivity of Rat's Body after Exposure to Different Doses of $\gamma$ -Radiation in a Long Period and their Offense of the 1st Generation**

Akerke Chayakova, Marzhan Myrzakhanova, S. O. Rakhyzhanova, Ainur Kydyrmoldina, Elmira Omarkhanova, B. A. Zhetpisbayev, Aigul Utegenova, Akerke Chayakova (Author)

1097-1103



PDF

### **Moderate Dose of Lipopolysaccharide Induces Tumor Necrosis Factor-alpha and Interleukin-6 Production by Human Monocyte-derived Macrophages**

Nuraiza Meutia, Lokot Donna Lubis, Eka Roina Megawati (Author)

468-472



PDF

### **Effectiveness of Mesenchymal Stem Cells and Bovine Colostrum on Decreasing Tumor Necrosis Factor-A Levels and Enhancement of Macrophages M2 in Remnant Liver**

Ezra Endria Gunadi, Yan Wisnu Prajoko, Agung Putra (Author)

1195-1202



PDF

### **Glucocorticoid-induced Changes in the Transcriptional Activity of Genes of the Innate and Adaptive Immune System in the Blood of Patients with Acute Urticaria**

Alina Petruk, Iryna Kamyshna, Mariia Shkilna, Aleksandr Kamyshnyi (Author)

1024-1030



PDF

### **The The Effect of Mango Mistletoes (*Dendrophthoe pentandra*) Leaves Extract on Percentage of CD4+CD28+, CD8+CD28+, and interleukin-2 Levels of Aged Balb/c Mice**

Kusworini Handono, Mirza Zaka Pratama, Inmas Andi Sermoati, Maria Gabriela Yuniati, Ni Putu Sri Haryati, Eviana Norahmawati, Agustina Tri Endharti, Yahya Irwanto, Muhammad Badrus Solikhin, Syaiful Hidayat (Author)

414-421



PDF

### **The Effect of Ascorbic Acid on Interleukin-10 and Tumor Necrosis Factor- $\alpha$ Cytokines in *Rattus norvegicus* with Endometritis**

Muhammad Oky Prabudi, M. F. G. Siregar, I. P. A. Nasution, S. Ilyas (Author)

798-801



PDF

### **Comparative Dose of Intracarotid Autologous Bone Marrow Mononuclear Therapy in Chronic Ischemic Stroke in Rats**

Feda Makkiyah, Wismaji Sadewo, Rahmah Nurriszka (Author)

233-243



PDF

### **The Estimate of Interferon-inducible Protein-10 and Interferon- $\gamma$ in Hemodialysis Patients with Chronic HCV**

Mahmood Abdujabar Altobje, Zeyad Thanoon Al-Rassam (Author)

928-933



PDF

### **Level of Interleukin-35, Interleukin-36, and the Interleukin-35/Interleukin-36 Ratio in Juvenile Idiopathic Arthritis**

Qudus W. Jamal, Ghassaq Alubaidi, Yasmin Humadi (Author)

741-747



PDF

### **COVID-19 Vaccine Hesitancy and Acceptance among Medical Students: An Online Cross-sectional Study in Iraq**

Batool Mutar Mahdi (Author)

955-958

 PDF

### **Hypoxia Mesenchymal Stem Cells Accelerate Wound Closure Improvement by Controlling $\alpha$ -smooth Muscle actin Expression in the Full-thickness Animal Model**

Nur Fitriani Hamra, Agung Putra, Arya Tjipta, Nur Dina Amalina, Taufiqurrachman Nasihun (Author)  
35-41

 PDF

### **Pueraria tuberosa as Dipeptidyl-Peptidase-IV Inhibitor Prevents Streptozotocin-Induced Intestinal Stress**

Shivani Srivastava, Harsh Pandey, Surya Kumar Singh, Yamini Bhusan Tripathi (Author)  
28-34

 PDF

### **The Potential of Nano Curcumin in Preventing the Formation of Artificial Antisperm Antibody in Wistar Rats through Inflammatory Pathway Regulation**

Didit Pramudhito, Suwandi Sugandi, Ida Parwati, Muchtan Sujatno, Soetojo Soetojo (Author)  
114-118

 PDF

## **Pathophysiology**

### **Protective Potential of Ginseng and/or Coenzyme Q10 on Doxorubicin-induced Testicular and Hepatic Toxicity in Rats**

Suzan Khodir, Aliaa Alafify, Essam Omar, Marwa Al-Gholam (Author)  
993-1005

 PDF

### **Myringoplasty with Morphological Rationale of Application of Xenoperitoneum Decellularized Matrix in Experiment**

Dias Yesniyazov, Tussupbekova Maida, Nurkasi Abatov, Yekaterina Yukhnevich, Ruslan Badyrov (Author)  
811-816

 PDF

### **Effect of Stromal Vascular Fraction on Fracture Healing with Bone Defects by Examination of Bone Morphogenetic Protein-2 Biomarkers in Murine Model**

Respati S. Dradjat, Panji Sananta, Rizqi Daniar Rosandi, Lasa Dhakka Siahaan (Author)  
1132-1136

 PDF

### **High-Glucose and Free Fatty Acid-Induced Adipocytes Generate Increasing of HMGB1 and Reduced GLUT4 Expression**

Rita Rosita, Yuyun Yueniwati, Agustina Tri Endharti, Mochamad Aris Widodo (Author)  
1258-1264

 PDF

### **Investigation of Antidiabetogenic Effect of the Iodine-Selenium Concentrate in Animals with Chronic Alloxan Diabetes of Varying Severity**

Fatima S. Abikenova, Gabit Meyramov, Saule Zhautikova, Khamida Abdikadirova, Cymbat Zhienbayeva, Yulia Talaspekova, Irina Baryshnikova, Assima Karipova, Bakhyt Suleimenova (Author)  
535-540

 PDF

### **The Effects of Stromal Vascular Fraction Administration in Stimulating Graft Healing Process after Anterior Cruciate Ligament Reconstruction Surgery in *Rattus norvegicus***

Agung Riyanto Budi Santoso, Edi Mustamsir, Muhammad Luqman Fadli, Krisna Yuarso Phatama, Anindita E. P. Wijaya, Lasa Dhakka Siahaan, Muhammad Alwy Sugiarto, MD. (Author)  
941-945

 PDF

### **The Effect of Environmental Enrichment with Autistic-like Behavior Symptoms on a *Rattus norvegicus* Model**

Amel Yanis, Yanwirasti Yanwirasti, Nurmiati Amir, Ekowati Handharyani (Author)  
78-81

 PDF

## **Nuclear Medicine**

### **Role of Positron Emission Tomography with 2-Deoxy-2-[fluorine-18]fluoro-D-glucose Integrated with Computed Tomography in the Evaluation of Hepatic Metabolic Activity due to Steatosis in Lymphoma Patients and its Impact on Deauville Score**

Marwa Adel, Ashraf Fawzy, Jehan Younes, Shaimaa ElRasad (Author)  
865-870

 PDF

### **Detection of Cardiac Tissues using K-means Analysis Methods in Nuclear Medicine Images**

Yousif Abdallah (Author)  
1272-1276

 PDF

## Pathology

### **Evaluation of Early Renal Allograft Dysfunction from Living Donors among Egyptian Patients (Histopathological and Immunohistochemical Study)**

Maha Emad El-dein, Sawsan A. A. Fadda, Samia M. Gabal, Amr M. Shaker, Wael M. Mohamad (Author)  
328-335

 PDF

### **$\beta$ -Catenin Expression and Its Association with Prognostic Factors in Hepatocellular Carcinoma: A Study on Alpha-fetoprotein, Histologic Grade, and Microvascular Invasion**

Nur Rahadiani, Ignasia Andhini Retnowulan, Marini Stephanie, Diah Rini Handjari, Ening Krisnuhoni (Author)  
887-893

 PDF

### **Evaluation the Effect of Natural Compounds: Vitamin C, Green Tea, and their Combination on Progression of Mg-63 Osteosarcoma Cell Line Cells. (An In Vitro Study)**

Hiam Rifaat Hussien Mohammed, Amr Helmy Moustafa El Bolok, Sherif Farouk Elgayar, Maii Ibrahim Ali Sholqamy (Author)  
1277-1284

 PDF

### **Immunohistochemical Expression of "HE4" in Endometrial Hyperplasia versus Endometrial Endometrioid Carcinoma**

Amany Talaat Abd El-Hamed, Samira Abd-Allah Mahmoud, Ahmed A. Soliman, Dina F. El-Yasergy (Author)  
669-675

 PDF

### **Immunohistochemical Expression of "HCG- $\beta$ " in Colorectal Carcinoma**

Amira Mohamed Bassam, Yousra Raafat, Ahmed Mahmoud Abd Al-Aziz, Rasha Ramadan Mostafa (Author)  
789-797

 PDF

### **Immunohistochemical Study of IMP3 Expression in Laryngeal Squamous Cell Carcinoma**

Wala'a Ahmad Al-Sayed Ashmawy, Ahmed Mahmoud Abd-Elaziz, Amira Mohamed Bassam, Heba Abdelmonem Ibrahim (Author)  
1168-1173

 PDF

### **Assessment of Isocitrate Dehydrogenase 1 Mutation by Immunohistochemistry in Egyptian Patients with High-grade Gliomas**

Essam Ayad, Sylvia Mikhael Ghattas, Rabab Abdel Moneim , Azzam Ismail, Rasha A. Khairy (Author)  
157-163

 PDF

### **Immunohistochemical Expression of Retinoblastoma Gene Product and p53 Protein in Transitional Cell Carcinoma of the Urinary Bladder and its Relationship to Different Clinicopathological Parameters**

Alaa Yahya, Zina A. Rajab Alhamadani, Mohanad Mundher (Author)  
595-609

 PDF

### **Immunohistochemical study of PAX5 expression in lymphoid neoplasms**

Wael Abd El Fattah Mohamed Ibrahim Nassar, Ahmed Mohamed Yehia El Hennawy, Samia Mohamed Ahmed Gabal, Mona Salah El-Din Abd El-Magid (Author)  
499-504

 PDF

### **MGMT Immunohistochemical Expression in Colorectal Carcinoma and its Correlation with Tumor Progression**

MGMT & Histopathology in CRC progression

Mohamed Ahmed, Badawia Bayoumi, Samira Abdallah, Maya Elserafy (Author)  
244-251

 PDF

### **Cluster of Differentiation 274 Antigen Immunohistochemical Expression in Tumor and Peri-tumor Cells of Hodgkin and Non-Hodgkin Lymphoma and Clinicopathological Relation (Single-center Study)**

Walaa Ghanam, Shaimaa M. M. Bebars (Author)  
1011-1018

 PDF

### **The Effects of Glucagon and Insulin Combination toward on Neurodegeneration Following Traumatic Brain Injury in Rat Model**

Akhmad Imron, Bethy Hernowo, Dany Hilmanto, Kahdar Wiriadisastra, Yulius Hermanto (Author)  
982-987

 PDF

### **Activity of Cytochrome p450 as a Steroidogenesis and Oxidation Catalyst of Cholesterol in**



### **Experimental Animals Exposed to Cigarette Smoke**

Arni Amir, M. Saka Abeiasa, Oktavianis Oktavianis (Author)

352-355



PDF

### **Proliferative Activity of Myoepithelial Cells in Mucoepidermoid Carcinoma**

Faisal Mehsen Alali, Bassel Tarakji, Nasser Raqe Alqhtani, Abdullah Bin Nabhan, Ali Alrafedah, Adel Alenzi, Nabil Kochaji (Author)

451-454



PDF

### **Androgen Receptor and ETS-Like Protein-1 Expression of Prostate Cancer Correlates with Gleason Score International Society of Urological Pathology 2014/WHO 2016**

Anandia Putriyuni, Djong Tjong, Yanwirasti Yanwirasti, Ariana Alvarino, Tofrizal Tofrizal (Author)

711-715



PDF

### **Expression of GATA3 and Cytokeratin 14 in Urinary Bladder Carcinoma (Histopathological and Immunohistochemical Study)**

Nora Elzohery, Nourelhoda Sayed Ismael, Rasha Ahmed Khairy, Somia A. M. Soliman (Author)

858-864



PDF

### **Effect of Glutamine on Apoptosis-inducing Factor Expression and Apoptosis of Glomerular Parietal Epithelial Cells of Cisplatin-exposed Rats**

Ihsan Fahmi Rofananda, Jusak Nugraha, Imam Susilo, Miyayu Soneta Sofyan (Author)

367-372



PDF

### **The Expression of Chromogranin A, Syanptophysin and Ki67 in Detecting Neuroendocrine Neoplasma at High Grade Colorectal Adenocarcinoma**

W. A. Gusti Deasy, M. Husni Cangara, Andi Alfian Zainuddin, Djumadi Achmad, Syarifuddin Wahid, Upik A. Miskad (Author)

1142-1147



PDF

### **Diagnostic Value of Dystrophin Immunostaining in the Diagnosis of Duchenne and Becker Muscular Dystrophy Patients**

Shinta Andi Sarasati, Kristy Iskandar, Maria Alethea Septianastiti, Rusdy Ghazali Malueka , Ery Kus Dwianingsih (Author)

1137-1141

 PDF

### **Association between Foxp3 Tumor Infiltrating Lymphocyte Expression and Response After Chemoradiation in Nasopharyngeal Carcinoma**

Lisnawati Lisnawati, Yayi Dwina Billianti, Amelia Fossetta Manatar (Author)

1285-1291

 PDF

### **The Prognostic Significance of c-Met and p53 Immunohistochemical Expression in Gastric and Colorectal Carcinomas**

Amany A. Abou-Bakr, Alshaymaa A. Abdelaziz, Ibrahim A. Malash, Osman Mansour, Ibrahim M. Abdelsalam, Omnia M. Abo-Elazm, Heba A. Ibrahim, Mai S. Mohammed, Rasha Khairy (Author)

134-142

 PDF

### **Immunohistochemical Expression of MUC4 in Different Meningioma Subtypes in Comparison to Some Mesenchymal Non-Meningothelial Tumors**

Kareman Mansour, Dalal Anwar Elwi, Sara Elsayed Khalifa, Heba Abdelmonem Ibrahim (Author)

626-631

 PDF

### **Expression of Anaplastic Lymphoma Kinase in Astrocytic Tumors (Histopathological and Immunohistochemical Study)**

Abdul Hakeem Ibrahim Abdul Hakeem, Randa Said Taha Khaled, Mohamed Sherif Ismail (Author)

911-923

 PDF

### **Interleukin-4 Cytokine as an Indicator of the Severity of Tuberculous Lymphadenitis**

Humairah Medina Liza Lubis, Mohd Nadjib Dahlan Lubis, Delyuzar Delyuzar (Author)

82-86

 PDF

### **Assessment of Intratumoral Heterogeneity in Isolated Human Primary High-Grade Glioma: Cluster of Differentiation 133 and Cluster of Differentiation 15 Double Staining of Glioblastoma Subpopulations**

Ahmad Faried, Wahyu Widowati, Rizal Rizal, Hendrikus M. B. Bolly, Danny Halim, Wahyu S. Widodo, Satrio H. B. Wibowo, Rachmawati Noverina, Firman P. Tjahjono, Muhammad Zafrullah Arifin (Author)

87-94

 PDF

## **Immunohistochemical and Histopathological Study of Anaplastic Lymphoma Kinase and Tyrosine-kinase Receptor Expression in Bronchogenic Carcinoma**

Ahmed Fawzy, Samira Mahmoud Abd Allah, Mostafa Mohammed Salem, Lobna Omar Al Farouk (Author)  
106-113

 PDF

## **Microbiology**

### **Prevalence of Soil-transmitted Helminths Infection in Students of Klungkung, Bali, after Mass Treatment with Albendazole**

Putu Indah Budiapsari, I. Kadek Swastika, Sri Masyeni (Author)  
433-439

 PDF

### **Investigation of Antibiotic Release from Bone Allograft in an Experiment on Rabbits**

Berik Tuleubayev, Alexandr Rudenko (Author)  
833-837

 PDF

### **Naturally Acquired Lactic Acid Bacteria from Fermented Cassava Improves Nutrient and Anti-dysbiosis Activity of Soy Tempeh**

Rio Kusuma, Jaka Widada, Emy Huriyati, Madarina Julia (Author)  
1148-1155

 PDF

### **The Active Surveillance of Staphylococcus aureus using Polymerase Chain Reaction-based Identification Method among Hospitalized-patient of Haji Adam Malik General Hospital, Medan, Indonesia**

Sri Amelia, Dian D. Wahyuni, Rina Yunita, Muhammad F. Rozi (Author)  
622-625

 PDF

### **The Impact of Multidrug-Resistant Organisms Infection on Outcomes in Burn Injury Patients at Sanglah General Hospital, Bali**

Gede Wara Samsarga, I Made Suka Adnyana, Ni Nyoman Sri Budayanti, I Gusti Putu Hendra Sanjaya, Agus Roy Rusly Hariantana Hamid, I Made Darmajaya, I Gusti Ayu Putri Purwanthi (Author)  
463-467

 PDF

### **Effect of Addition of Jelly and Storage Time on the Number of Lactic Acid Bacteria in Yoghurt Processed Products**

Retno Martini Widhyasih, Jusuf Kristianto, Lutfi Rahmawati Lubis, Mega Mirawati, Atik Khodikoh, Rahmi Susanti, Gurid PE Mulyo (Author)

1302-1305



PDF

### **In Vitro Activity of Plazomicin among Carbapenem-resistant Enterobacteriaceae**

Sara Essam, Nada N Nawar, Mohamed ElBashaar, May Soliman , May Abdelfattah (Author)

1203-1207



PDF

### **Setting a Protocol for Identification and Detecting the Prevalence of Candida auris in Tertiary Egyptian Hospitals Using the CDC Steps**

Sahar Mohammed Khairat, Mervat Gaber Anany, Maryam Mostafa Ashmawy, Amira Farouk Ahmed Hussein (Author)

397-402



PDF

### **The The Significance of Differences in Melanocortin 3 Levels and their Relationship with Pulmonary Tuberculosis and Body Mass Index**

Andi Tenriola, Najdah Hidayah, Subair Subair, Muhammad Nasrum Massi, Irda Handayani, Rosdiana Natzir, Irawaty Djaharuddin, Handayani Halik (Author)

583-588



PDF

### **Characterization and Phylodiversity of Implicated Enteric Bacteria Strains in Retailed Tomato (*Lycopersicon esculentum* Mill.) Fruits in Southwest Nigeria**

Yemisi Dorcas Obafemi, Paul Akinniyi Akinduti, Adesola Adetutu Ajayi, Patrick Omoregie Isibor, Theophilus Aanuoluwa Adagunodo PhD (Author)

188-195



PDF

### **Agreement Test of Histopathology in the Diagnosis of Extrapulmonary Tuberculosis with Gold Standard Polymerase Chain Reaction Technique: A Step to Overcome False Diagnosis**

Ali Essa Shaker, Mohammed Abdulmahdi Al Kurtas, Haider Zalzala (Author)

579-582



PDF

### **Intestinal Parasitic Infections in Relation to COVID-19 in Baghdad City**

Israa Abd Al-Khaliq, Ibrahim Mahdi, Abdullateef Nasser (Author)

532-534



PDF

### **Screening of Antimicrobial and Adhesive Activity of Lactobacilli Isolated from the National Food Products from Different Districts of the Karaganda Region (Kazakhstan)**

Zhanerke Amirkhanova, Saule Akhmetova, Samat Kozhakhmetov, Almagul Kushugulova, Rakhat Bodeeva, Zauresh Issina, Marat Tusbayev (Author)

827-832



PDF

### **Linking Gut Microbiota, Metabolic Syndrome and Metabolic Health among a Sample of Obese Egyptian Females**

Nayera E. Hassan, Sahar A. El-Masry, Ayat Nageeb, Mohamed S. El Hussieny, Aya Khalil, Manal Aly, Mohamed Selim, Khadija Alian, Enas Abdel Rasheed, Mai Magdy Abdel Wahed, Darine Amine (Author)

1123-1131



PDF

### **The Effect of Acute and Chronic Infection-Induced by AvrA Protein of Salmonella typhimurium on Radical Oxygen Species, Phosphatase and Tensin Homolog, and Cellular Homolog Expression During the Development of Colon Cancer**

Satuman Satuman, Desi Sandra Sari, Eva Rachmi, Eddy Herman Tanggo, Hari Basuki Notobroto, Ketut Sudiana, Sofia Mubarika, Fedik Abdul Rantam, Soemarno Soemarno, Eddy Bagus Warsito (Author)

343-351



PDF

### **Comparative Evaluation of SARS-CoV-2 Rapid Immunochromatographic Test Assays with Chemiluminescent Immunoassay for the Diagnosis of COVID-19**

Ghada Ismail, Rania Abdel Halim, Marwa Salah Mostafa, Dalia H Abdelhamid, Hossam Abdelghaffar, Nashwa Naguib Omar, Noha Alaa Eldin Fahim (Author)

802-810



PDF

### **In vitro Antifungal Activity of Extracts of Moringa oleifera on Phytopathogenic Fungi Affecting Carica papaya**

Margaret Oniha, Angela Eni, Olayemi Akinola, Emmanuel Adedayo Omonigbehin, Eze Frank Ahuekwe, John Folashade Olorunshola (Author)

1081-1085



PDF

### **Antibacterial kinetics and phylogenetic analysis of Aloe vera plants**

Paul Akinduti , Yemisi D. Obafemi, Patrick O. Isibor, Rapheal Ishola, Frank E. Ahuekwe, O. A. Ayodele, O. S. Oduleye, Olubukola Oziegbe, O. M. Onagbesan (Author)

946-954



### **Effect of Thymoquinone on Th1 and Th2 Balance in Rats Infected with Mycobacterium tuberculosis**

Ery Olivianto, Agustina Tri Endharti, H.M.S. Chandra Kusuma, Sanarto Santoso, Kusworini Handono (Author)

688-692



### **Galactomannan and 1, 3- $\beta$ -D-Glucan Assay in Bronchoalveolar Lavage Fluid for the Diagnosis of Invasive Pulmonary Aspergillosis in Malignant and Non-malignant Patients**

Hadir Ahmed El-Mahallawy, Rana El-Gendi, Doaa Mohammad Ghaith, Iman Kamal Behiry, Soheir Fathy Helal (Author)

362-366



### **The First Record of Zoonotic Genes of Cutaneous Leishmaniasis among Human, Dogs, and Sandflies by Nested Polymerase Chain Reaction and Phylogenetic Analyses**

Rasha Alsaad, May Hameed (Author)

610-621



### **The Effectiveness of Chitosan and Snail Seromucous as Anti Tuberculosis Drugs**

Agnes Sri Harti, Yusup Sutanto, Rahajeng Putriningrum, Tresia Umarianti, Erlina Windyastuti, Mellia Silvy Irdianty (Author)

510-514



### **The Influence of Antibiotics Usage on Extended-spectrum $\beta$ -lactamase-producing Enterobacter Colonization among Intensive Care Unit Patients**

Wayan Suranadi, Dwi Fatmawati, Christopher Ryalino, I Gusti Agung Gede Utara Hartawan, Ferdi Yanto (Author)

52-56



## **Epidemiology**

### **Adherence to Compulsory Vaccination during Coronavirus Disease-19 Pandemic in Egypt**

Nermine N. Mahfouz, Walaa H. Ali, Maged A. El Wakeel, Thanaa M. Rabah, Alzahraa A. Elmowafi, Iman H. Kamel (Author)

217-221



### **The The Impact of the Coronavirus Disease-19 Pandemic on Sexual Behavior of Marriage People in Indonesia**

Jefry Albari Tribowo, Tjahjo Djojo Tanojo, Supardi Supardi , Cennikon Pakpahan, Eko Budi Siswidiyanto, Andri Rezano, Reny I'tishom (Author)

440-445



### **Healthcare Workers Infection Rate in the Era of Coronavirus Disease 2019 - in Tertiary Teaching Hospital**

Mona Mohiedden, Aml M. Said, Ahmed M. Ali, Mohammed M. Abdel Razik, Maha Ali Gad (Author)

651-658



### **Epidemiology Of Pelvic Ring Fractures and Injuries: A Retrospective Study**

Elnara Efendiyeva, Assylzhan Messova, Ayan Myssayev, Aidos Tlemissov, Murat Muratoglu, Yersin Zhunussov (Author)

901-905



## **Pharmacology**

### **Silver Nanoparticle of *Acalypha indica* Linn. Leaf As Bio-larvicide against *Anopheles* sp. Larvae**

Yos Banne, Olfie Sahelang, Steven Soenjono, Elisabeth Natalia Barung, Selfie Ulaen, Rivolta G. M. Walalangi, Zulfiayu Sapiun (Author)

760-765



### **Characterization and Anti-aging Tests of Peel-Off Gel Masks Made from Ethanolic Extract of Yarrow (*Achillea millefolium*)**

Syamsuri Syakri, Isriany Ismail, Nurul Muamanah Amal, Nur Asma Masjidi, Karlina Amir Tahir (Author)

1156-1161



### **Antioxidant and Hypolipidemic Effects of Ipomoea batatas L and Pandanus conoideus Lam Combination on Rats Fed with High Cholesterol Diet**

A. A. Ngurah Subawa, I Wayan Putu Sutirta Yasa, I Made Jawi, Agung Nova Mahendra (Author)  
473-476

 PDF

### **Proximate, Mineral and Vitamin Analysis of Rebon Shrimp Diversification Products as an Indonesian Local Product: Supplementary Food for Malnourished Children**

Sri Sulistyawati Anton, Agussalim Bukhari, Aidah Juliaty A. Baso, Kadek Ayu Erika, Isymiarni Syarif (Author)  
1208-1213

 PDF

### **Protective Activity of Beetroot Extract on Doxorubicin-Induced Hepatic and Renal Toxicity in Rat Model**

Sony Eka Nugraha, Yuandani Yuandani, Rony Abdi Syahputra (Author)  
1037-1042

 PDF

### **Bifidobacteria and Escherichia coli Microbiota of Healthy Indonesian Infants in Andalas Village: Profile of Infant Diet Given Exclusive Breastfed and Formula-fed**

Imelda Fitri, Eryati Darwin, Eva Chundrayetti, Hotmauli Hotmauli, Eliya Mursyida, Titi Lasmini, Nurmi Hasbi (Author)  
639-643

 PDF

### **Exploring the Capability of Indonesia Natural Medicine Secondary Metabolite as Potential Inhibitors of SARS-CoV-2 Proteins to Prevent Virulence of COVID-19: In silico and Bioinformatic Approach**

Bambang Cahyono, Nur Dina Amalina, Meiny Suzery, Damar Nur Wahyu Bima (Author)  
336-342

 PDF

### **The Decreasing of Homeostatic Model Assessment – Insulin Resistance Levels after Given Coffee Arabica Gayo Leaf Extract (Coffea arabica L.) to Type 2 Diabetes Mellitus Rats**

Sake Juli Martina, Aznan Lelo, Dharma Lindarto, Ratna Akbari Ganie, Muhammad Ichwan, Hanifah Yusuf, Syafruddin Ilyas, Iqbal Pahlevi Nasution (Author)  
356-361

 PDF

### **Ramipril Increases Adma Concentration in Acute Myocardial Infarction in Rats Induced by**



### **Isoproterenol**

Gestina Aliska, Alief Dhuha, Rahmatini Rahmatini, Rita Hamdani, Nita Afriani, Tofrizal Tofrizal, Hirowati Ali, Nisa Pratiwi, Vinta Nuranisyah, Liganda Endo Mahata, Dedy Kurnia (Author)

693-697



PDF

### **Anticancer Activities of Sesewanua Leaf Extracts (Clerodendrum fragrans (Vent.) Willd) Against A549 Lung Cancer Cell**

Elisabeth Natalia Barung, Donald Emilio Kalonio, Yos Banne, Norma Tiku Kambuno (Author)

1226-1230



PDF

### **Analysis of Chemical Properties and Antioxidant Activity of Sambiloto (Andrographis paniculata Nees.) Leaf Tea Formula as a Functional Drink in Preventing Coronavirus Diseases and Degenerative Diseases**

Siti Ika Fitriyah, Ariani Ariani, Nurdin Rahman, Nurulfuadi Nurulfuadi, Ummu Aiman, Devi Nadila, Fendi Pradana, Aulia Rakhman, Diah Ayu Hartini (Author)

196-201



PDF

### **Hepatoprotective Activity of Pirdot Leaves (Saurauia vulcani Korth) Ethanol Extract in Laboratory Rats (Rattus norvegicus) and Characterization of Bioactive Compounds Using a Molecular Docking Approach**

Erlintan Sinaga, Syafruddin Ilyas, Salomo Hutahaeen, Panal Sitorus (Author)

1265-1270



PDF

### **Antimicrobial Activity and Polyphenol Profiles of Hydroalcoholic Extracts of Thymus rasitatus Klokov and Thymus eremita Klokov**

Svetlana Ivasenko, Ainur Zhumabekova, Agnieszka Ludwiczuk, Krystyna Skalicka-Wozniak, Alexandr Marchenko, Margarita Ishmuratova, Eva Poleszak, Izabela Korona-Glowniak, Saule Akhmetova, Islambek Karilkhan, Irina Loseva (Author)

313-317



PDF

### **The Role of Bamboo Shoot Gigantochloa Apus Extract in Decreasing the IL-17/IL-10 Ratio Level in the Atherosclerosis Process**

Edy Soesanto, Satriya Pranata, Sri Rejeki, Lalu Muhammad Irham (Author)

817-821



PDF

### **The Level of Preference of Instant Rice Bran Milk Products Innovation with Various Flavor Variants as Functional Food**

Saifuddin Sirajuddin, Masni Masni, Abdul Salam (Author)  
567-571

 PDF

### **Amelioration of Cisplatin-induced Liver Injury by Extract Ethanol of *Pometia pinnata***

Adrian Adrian, Rony Abdi Syahputra, Sukirman Lie, Sony Eka Nugraha (Author)  
665-668

 PDF

### **Synergistic Effect of *Curcuma longa* Extract in Combination with *Phyllanthus niruri* Extract in Regulating Annexin A2, Epidermal Growth Factor Receptor, Matrix Metalloproteinases, and Pyruvate Kinase M1/2 Signaling Pathway on Breast Cancer Stem Cell**

Dedy Hermansyah, Agung Putra, Delfitri Munir, Aznan Lelo, Nur Dina Amalina, Iffan Alif (Author)  
271-285

 PDF

### **The Effect of Gembili Starch (*Dioscorea esculenta*) and *Eubacterium rectal* Supplementation on Skeletal Muscle Peroxisome Proliferator-Activated Receptor $\gamma$ Coactivator 1 $\alpha$ (Pgc-1 $\alpha$ ) Expression in Diabetic Mice Models**

Tri Setyawati, Rio Jati Kusuma, Harry Freitag Luglio, Neni Oktiyani, Sunarti Sunarti, Rosmala Nur, Syaiful Hendra (Author)  
1061-1067

 PDF

### **Efficacof Cinnamon Extract (*Cinnamomum burmannii*) as Supplementation in Lir- psychotic-induced Rats through Oxidative Stress Regulation in Neuronal Cells**

Rachmat Hidayat, Patricia Wulandari, Carla Raymondalexas Marchira, Budi Pratiti (Author)  
177-182

 PDF

### ***Moringa oleifera* Teabags Increase Hemoglobin in Adolescent Females**

Gusti Ayu Tirtawati, Kusmiyati Kusmiyati, Atik Purwandari, Amelia Donsu, Martha Korompis, Wahyuni Wahyuni, Fonnies Kuhu, Femmy Keintjem, Sjenny Tuju, Robin Dompas, Agnes Montolalu (Author)  
393-396

 PDF

### **Incision Wound Healing Test of Ethanolic Extract Gel from *Salaon* (*Parsonia alboflavescens* [Dennst.] Mabb.) Leaves in Male Rats**

Nilsya Zebua, Muharni Saputri, Winda Giovana Sijabat, Inda Aristika Sri Retno Wulandari, Ira Nofriani, Winda Agustiani Zai, Ramadani Arda Arista, Muhammad Suhaimi, Aula Firsas (Author)

776-781



### **The Avocado (*Persea americana* Mill.) Leaf Extract on Streptozotocin-induced Pancreatic Cell Regeneration of White Rats (*Rattus norvegicus*)**

Nurdin Rahman, I. Made Tangkas, Sri Muliyani Sabang, Bohari Bohari, Rukman Abdullah (Author)

849-853



### **Thymol Mitigates Monosodium Glutamate-Induced Neurotoxic Cerebral and Hippocampal Injury in Rats through Overexpression of Nuclear Erythroid 2-Related Factor 2 Signaling Pathway as Well as Altering Nuclear Factor-Kappa B and Glial Fibrillary Acidic Protein Expression**

Rasha Mostafa, Azza Hassan, Abeer Salama (Author)

716-726



### **The Effect of Red Seaweed (*Kappaphycus alvarezii*) Biscuits on Hemoglobin Levels and Body Weight among the First Trimester Pregnant Women**

Salma Salma, Veni Hadju, Jamaluddin Jompa, Stang Stang, Sundari Sundari, Andi Nilawati Usman (Author)

1019-1023



### **The Effect of Coffee Arabica Gayo Leaf Extract (*Coffea arabica* L.) in Increasing Phosphoinositide 3-kinase and Glucose Transporter-4 Expression in the Skeletal Muscle**

Sake Juli Martina, Aznan Lelo, Dharma Lindarto, Ratna Akbari Ganie, Muhammad Ichwan, Hanifah Yusuf, Syafruddin Ilyas, Iqbal Pahlevi Nasution (Author)

906-910



### **The The Prevalence of Potentially Inappropriate Prescribing in the Elderly at the Primary Care Level in Kazakhstan**

Ainash Ibysheva, Gulmira Muldaeva, Leila I. Arystan, Almagul B. Kuzgibekova, Bibigul A. Abeuova, Leila S. Haydargalieva (Author)

572-578



### **Molecular Docking Approach of Natural Compound from Herbal Medicine in Java against**

### **Severe Acute Respiratory Syndrome Coronavirus-2 Receptor**

Yuyun Yueniwati, Mokhamad Fahmi Rizki Syaban, Icha Fariyah Deniyati Faratisha, Khadijah Cahya Yunita, Dedy Budi Kurniawan, Gumilar Fardhani Ami Putra, Nabila Erina Erwan (Author)  
1181-1186

 PDF

### **Alkaloids of *Peganum harmala* L. and their Pharmacological Activity**

Aidos Doskaliyev, Roza Seidakhmetova, D. S. Tutai, Kristina Goldaeva, V.K. Surov, S.M. Adekenov (Author)  
766-775

 PDF

### **The Effect of Levamlodipine in Glucose-Induced Acute Model of Glaucoma in Rabbits**

Waleed K. Abdulsahib (Author)  
505-509

 PDF

### **Sunkist Peel Ethanol Extract Ameliorates Diabetic Nephropathy in Streptozotocin-Induced Diabetic Wistar Rats**

Maya Sari, Chrismis Novalinda Ginting, OK Yulizal (Author)  
1086-1091

 PDF

### **Evaluation of Antioxidant Activity of Botto-Botto Leaf Fraction (*Chromolaena Odorata* L.) Using DPPH and ABTS Methods**

Karlina Amir Tahir, Upik A. Miskad, Khairuddin Djawad, Sartini Djide, Khaerani Khaerani, Maulita Indrisari (Author)  
183-188

 PDF

### **Antibacterial Screening of Endophytic Fungus *Xylaria* sp. derived from *Andrographis paniculata* (Sambiloto)**

Suryelita Suryelita, Riga Riga, Sri Benti Etika (Author); Mariam Ulfah; Muh Ade Artasasta (Author)  
971-975

 PDF

### **The Possible Antidiabetic Effect of *Ficus carica* L. Tablet on Iloxan-Induced Diabetes Model in Rats**

Muhammad Fariez Kurniawan, Fadhilah Alvari Yusuf (Author)  
727-734

 PDF

### **Effect of Enhydra fluctuans on Kidney Function in Alloxan-induced Diabetic Rats**

Rina Delfita, Dahelmi Dahelmi, Djong Tjong, Suhatri Suhatri (Author)

1187-1194

 PDF

### **Formulation and Pharmacological Studies of Leaves of Moringa (Moringa oleifera), a Novel Hepatoprotection in Oral Drug Formulations**

Aristianti Aristianti, Nurkhaeri Nurkhaeri, Vanny Y. Tandiarang, Akbar Awaluddin, Lukman Muslimin (Author)

151-156

 PDF

### **The Effect of Tiwari Onion (Eleutherine americana Merr) Tablet on Blood Pressure Stability in Diagnosed Hypertension Patients**

Widya Warastuti (Author)

556-561

 PDF

### **The Effectiveness of Binahong (Anredera cordifolia (Ten.) Steenis) Extract in Promoting Fertility in Male Wistar Rats after Exposure to Cigarette Smoke**

Achmad Ramadhan (Author)

123-128

 PDF

### **On the Issue of Creating a Cream of Reparative Action for the Treatment and Prevention of Cheilitis**

Alexander Kotenko, Tatyana Yarnykh, Natalya Zhivora, Olga Rukhmakova, Vladimir Kovalev, Marina Buryak (Author)

308-312

 PDF

### **Molecular Docking Analysis of Ficus religiosa Active Compound with Anti-Inflammatory Activity by Targeting Tumour Necrosis Factor Alpha and Vascular Endothelial Growth Factor Receptor in Diabetic Wound Healing**

Yuyun Yueniwati, Mokhammad Fahmi Rizki Syaban, Nabila Erina Erwan, Gumilar Fardhani Ami Putra, Agung Dwi Krisnayana (Author)

1031-1036

 PDF

### **The Effect of Ant Plant on the Increase of CD4 Count in PLHIV in the Papua Province**

Arwam Hermanus Markus Zeth, Nouvy Helda Warouw, Paula Krisanty (Author)

1231-1239



PDF

### **Photoprotective and Inhibitory Activity of Tyrosinase in Extract and Fractions of Terminalia catappa L.**

Maulita Indrisari, Sartini Sartini, Upik A. Miskad, Khairuddin Djawad, Karlina Amir Tahir, Nurkhairi Nurkhairi, Lukman Muslimin (Author)

263-270



PDF

### **Brine Shrimp (*Artemia salina* Leach.) Lethality Test of Ethanolic Extract from Green Betel (*Piper betle* Linn.) and Red Betel (*Piper crocatum* Ruiz and Pav.) through the Soxhletation Method for Cytotoxicity Test**

Nerdy Nerdy, Puji Lestari, Jon Piter Sinaga, Selamat Ginting, Nilsya Febrika Zebua, Vriezka Mierza, Tedy Kurniawan Bakri (Author)

407-412



PDF

### **Antihyperglycemic, Endothelial protection and Toxicity study of Basil Leaves Extract on Diabetic Rats**

Sry Suryani Widjaja, Rusdiana Rusdiana (Author); Maya Savira; Rina Amelia (Author)

589-594



PDF

### **Tyrosinase Enzymes Activities and Sun Protection Factor of Ethanol Extract, Water Fraction, and n-Butanol Fraction of *Chromolaena odorata* L. Leaves**

Karlina Amir Tahir, Upik A. Miskad, Khairuddin Djawad, Sartini Sartini, Natsir M. Djide, Maulita Indrisari, Khaerani Khaerani, Syamsuri Syakri, Anshari Masri, Ahmad Lalo (Author)

493-498



PDF

### **Anti-ulcer Effect of Gastroretentive Drug Delivery System of Alginate Beads Containing Turmeric Extract Solid Dispersion**

Hakim Bangun, Anayanti Arianto, Elfina Rehngenanana (Author)

19-27



PDF

### **Antimicrobial Activity of Ultrasonic Extracts of Two Chemotypes of *Thymus serpyllum* L. of Central Kazakhstan and their Polyphenolic Profiles**

Svetlana Ivassenko, Perizat Orazbayeva, Krystyna Skalicka-Wozniak, Agnieszka Ludwiczuk, Alexandr Marchenko, Margarita Ishmuratova, Ewa Poleszak, Izabela Korona-Glowniak, Saule Akhmetova, Islambek Karilkhan, Irina Loseva (Author)

61-67

 PDF

## Sports Medicine

### **Effect Vladimir Janda Balance Training on Postural Sway and Leg Muscle Strength**

Anggi Setiorini, Denny Agustiniingsih, Junaedy Yunus, Santosa Budiharjo (Author)

477-482

 PDF

### **High-intensity Interval Training Improves Inflammatory Mediators in Obese Women: Based on the Study of the UCP2 Ala55Val Gene**

Susiana Candrawati, Emy Huriyati, Zaenal Muttaqien Sofro, Lantip Rujito, Aulia Nury Faza, Oktavia Nur Rohmawati, Amelinda Rifdah Aqilah (Author)

871-875

 PDF

### **The Impact of Resistance Training on Gene Expression of IGF1 and Athletes' Physiological Parameters**

Mohammed Nader Shalaby, Mona Mostafa Abdo Sakoury, Ellie Abdi, Shaimaa Elgamal, Shaimaa Elrkbwey, Wael Ramadan, Redha Taiar (Author)

934-940

 PDF

### **Arthroscopic Suture Anchor Design Finite Element Study**

Mai Ayoub, Mohamed EL-Anwar, Mazen I. Negm (Author)

562-566

 PDF

### **Characteristics of Patellofemoral Measurement in Indonesian Population Using Magnetic Resonance Imaging**

Sholahuddin Rhatomy, Kurniawan Silalahi, Anggaditya Putra, Nolli Kresonni (Author)

47-51

 PDF

### **The Effect of Physical Activity and Red Dragon Fruit (*Hylocereus polyrhizus*) in Red Blood Cell and Hemoglobin in Trained People**

Novita Sari Harahap, Nurhayati Simatupang, Suprayitno Suprayitno (Author)

42-46

 PDF

## Oncology

### **Electrolytes and Nutritional Element Assessment among Iraqi Cancer Patients Receiving Chemotherapy**

Mohammed Salim Abdulrahman , Hedef D. El-Yassin, Nada A. S. Alwan (Author)

446-450

 PDF

## Pediatrics

### **Reference Range of Complete Blood Count in Healthy Term Newborns 1 Week after Birth**

Harapan Parlindungan Ringoringo (Author)

1565-1569

 PDF

## Expert Opinion

### **The Difficult Way to Publish a Research Paper**

Kuat Oshakbayev, Gulnara Bedelbayeva, Khalit Mustafin, Attila Tordai (Author)

483-487

 PDF

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# The Potential of Nano Curcumin in Preventing the Formation of Artificial Antisperm Antibody in Wistar Rats through Inflammatory Pathway Regulation

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## Abstract

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**BACKGROUND:** Immunological mechanisms of infertility are still poorly understood and controversial, both the cause and treatment. Inflammation, immunology, cell proliferation, cell differentiation, and cell survival are influenced by several proteins, including nuclear factor kappa-B (NFkB), tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), and interleukin-10 (IL-10).

**AIM:** This study aimed to explore the potential of nano curcumin to prevent anti-sperm antibodies (ASA) formation due to the testes' inflammatory process in Wistar rats.

**METHODS:** This research is an experimental study with a pre-post-test approach with control group. The research subjects were rats (*Rattus norvegicus*) of the Wistar strain. The induced animals were grouped into three groups: Group 1 received nano curcumin  $1 \times 80$  mg/kg BW orally, Group 2 received dexamethasone  $1 \times 0.3$  mg/kg BW, and Group 3 received placebo aquadest  $1 \times 1$  mL orally. TNF- $\alpha$ , NF-kB, and IL10 levels in serum were examined with enzyme-linked immunosorbent assay.

**RESULTS:** The nano curcumin treatment showed the ability to reduce the pro-inflammatory cytokine protein TNF- $\alpha$  expression ( $47.3 \pm 2.32$ ) more optimally than dexamethasone treatment ( $54.4 \pm 3.22$ ). Nano curcumin has also shown the ability to reduce the pro-inflammatory cytokine transcription factor, NF-kB ( $32.5 \pm 2.76$ ) more optimally than treatment with dexamethasone ( $44.6 \pm 2.43$ ).

**CONCLUSION:** Nano curcumin can prevent the formation of ASA in testicular trauma through inhibition of the inflammatory response.

## Introduction

Infertility is defined as not getting pregnant after 1 year of regular sexual intercourse without contraception. Both male and female factors can cause infertility [1], [2]. The causes of male infertility can be grouped into congenital disorders, urogenital tract infections, varicocele, endocrine disorders, and genetic and immunological disorders. The prevalence of infertility is 15% in couples after 1 year of regular sexual intercourse without contraception. The etiologies of male infertility were idiopathic semen abnormalities (75%), varicocele (12%), urogenital infection (6%), and immunological factors (3%) [2]. The American Urological Association and the American Medical Reproductive Association recommend evaluating infertility before 1 year if there is a risk factor for male infertility, namely, bilateral cryptorchidism. Moreover, risk factors for female infertility was age over 35 years [2].

A variety of conditions that can affect infertility are cryptorchidism, post-pubertal mumps orchitis, testicular torsion, and trauma. Testicular torsion and testicular trauma cause testicular atrophy, resulting in anti-sperm antibodies (ASA), affecting sperm function and motility [3], [4]. Strong attachments of the Sertoli cells, create the blood testicular barrier (BTB), preventing the immune system from communicating with post-mitotic germ cells. Under certain conditions such as testicular torsion, vasectomy, and trauma to the testicular walls, this can be damaged by BTB resulting in an immune/inflammatory response to the sperm, which is shown as ASA. The clinical importance of cancer clinical trials is after puberty because antigens on germ cells that occur during meiosis occur only after puberty. Pre-pubertal testicular damage such as biopsy, torsion, or trauma will not induce ASA [1].

ASA therapy in two ways, first by suppressing the formation of antibodies, and the second is Assisted

Reproductive Technique by removing antibodies attached to sperm or selecting sperm without antibodies. Corticosteroids that have anti-inflammatory effects have become drugs used to suppress the formation of ASA. There are several opinions regarding the efficacy of corticosteroids to treat ASA with different doses and administration duration [3], [4].

Immunological mechanisms of infertility are still poorly understood and controversial, both the cause and treatment [5], [6]. Inflammation, immunology, cell proliferation, cell differentiation, and cell survival are influenced by several proteins including nuclear factor kappa-B (NFκB), tumor necrosis factor-α (TNF-α), and interleukin-10 (IL-10) [5]. NFκB is a transcription factor that resides in the cytoplasm of every cell and moves to the nucleus when activated. Activation is caused by various agents, including stress, cigarette smoke, bacterial viruses, inflammatory stimuli, cytokines, free radicals, carcinogens, tumor promoters, and endotoxins. On activation, NFκB regulates the expression of more than 400 different genes consisting of enzymes (cyclooxygenase-2, 5-lipoxygenase, and inducible nitric oxide synthase), cytokines (TNF-α, IL-1, IL-6, IL-8, and chemokines), molecules adhesions, cell cycle controlling molecules, viral proteins, and angiogenic factors. NFκB is primarily associated with a wide variety of human diseases, including asthma, atherosclerosis, AIDS, rheumatoid arthritis, diabetes, osteoporosis, Alzheimer's, and cancer. Several substances are known to suppress NFκB, namely, cytokines from T helper 2 (IL-4, IL-13, and IL-10), interferon, endocrine hormones, phytochemicals, corticosteroids, and immunosuppressants [5], [6].

Materials from phytopharmacy can affect the activation of NFκB, and cytokines, namely, curcumin. Curcumin is one of the bioactive compounds from *Curcuma xanthorrhiza* Roxb. which has the formula  $C_{21}H_{20}O_6$  [7], [8]. *Curcuma* is one of the plants used for Indonesian traditional medicine for a long time. In 1995, Singh and Aggarwal first published curcumin to inhibit NFκB through inhibition before inhibitor of kappa B alpha (IκBα) phosphorylation using human monoblastic leukemia cell cultures [8].

The bioavailability of curcumin is low because less absorption (5%) rapidly metabolized and eliminated. Curcumin is produced in nanosize to increase its absorption. Nano curcumin is also soluble in water [9]. From several studies, nano curcumin was found in plasma with maximum levels after 4 h of oral administration [9], [10]. In the *in vitro* study, the results were the same as regular curcumin, but in the *in vivo* study, the level of nano curcumin in rat brain was increased 96% compared to ordinary curcumin. This study is the first study that explores the potential of nano curcumin preparations to prevent ASA formation due to the inflammatory process of the testes in Wistar rats. This study will assess the efficacy of nano curcumin in suppressing inflammatory cytokine responses.

## Methods

### Animal

This research is an experimental study with a pre-post-test approach with control group. The research subjects were rats (*Rattus norvegicus*) of the Wistar strain obtained from the Eureka Research Laboratory, Indonesia and were declared healthy and fit to be research subjects. A total of 30 male rats weighing  $200 \text{ g} \pm 20 \text{ g}$ , aged 10–11 weeks, were placed in cages under controlled conditions (12 h light and dark cycle with a temperature of  $22 \pm 1^\circ\text{C}$  and humidity of 40–60%), food, and drink *ad libitum*. The ethical committee has approved all animal treatments and experimental procedures of the Faculty of Medicine, Universitas Padjadjaran with reference number 126/UN6.C2.1.2/KEPK/PN.

### Nano curcumin

Nano curcumin is obtained from Miso, Seoul, South Korea. An examination with Delsa Nano (Microtrac, Pennsylvania, US) was used at the pharmacology laboratory of Institut Teknologi Bandung, Indonesia, to determine nano curcumin's size. From these measurements, the mean diameter was 723.6 nm.

### Experimental animal treatment

The experimental animals were induced to testicular tract trauma. Previously, the rat was anaesthetized using 10% chloral hydrate (3.5 ml/kg) intraperitoneally. Furthermore, orchidectomy was performed on the left testis. The induced animals were grouped into three groups, namely, Group 1 received nano curcumin  $1 \times 80 \text{ mg/kg BW}$  orally, Group 2 received dexamethasone  $1 \times 0.3 \text{ mg/kg BW}$  orally; and Group 3 received placebo aquadest  $1 \times 1 \text{ mL}$  orally. All treatments were carried out for 7 days.

Furthermore, the rat serum and testicular organ evacuation were carried out with anesthetic using 10% intraperitoneal chloral hydrate (3.5 ml/kg). As much as 1 mL of blood was obtained from the periorbital vein. Then, it was centrifuged at 5000 rpm for 10 min, and the supernatant was separated and stored at  $-20^\circ\text{C}$ . Testicular organs that have been evacuated are inserted into 10% neutral buffer formalin, then the dehydration process is carried out with alcohol with graded concentrations ranging from alcohol concentrations of 96%, 80%, and 70% and xylene I, II, and III. The paraffinization process is carried out and made into paraffin blocks. Then, the paraffin block was cut with a thickness of 5 μm and placed on a coated slide (Biogear®, Singapore).

### Enzyme-linked immunosorbent assay (ELISA) examination

The TNF- $\alpha$ , NF-kB, and IL-10 levels in serum were examined with ELISA TNF- $\alpha$ ; ELISA NF-kB; and ELISA IL10 (Cloud Clone, Hangzhou, PRC), based on the manufacturer's protocol. Briefly, 50  $\mu$ l of standard diluent or serum sample was added to the well, coated with anti-TNF  $\alpha$ ; anti-NF-kB; anti-IL10; and incubated at 37°C for 30 min. After the plates were washed, 100  $\mu$ l of the biotinylated antibody solution was added and incubated for 30 min at 37°C. After 3 times washing, 50  $\mu$ l of avidin-peroxidase complex solution were added and incubated for 15 min at 37°C. After washing, 50  $\mu$ l of tetramethylbenzidine color solution was added and incubated in the dark for 15 min at 37°C. Finally, 50  $\mu$ l stop solution was added to stop the reaction, and the optical density was measured using an ELISA reader (Biorad, Singapore), the wavelength of 450 nm.

### Immunohistochemistry examination

Testicular tissue on coated slides was rehydrated using xylene and alcohol with a concentration of 96%, 90%, 80%, and 70% and rinsed with tap water. The next step was carried out with the retrieval antigen using the heat induced epitope retrieval method, where the slides were inserted into a citrate buffer solution, then heated at 95°C for 60 min. An artificial ASA was then stained 1:1000 (Cloud Clone, Hangzhou, PRC), followed by overnight incubation at 4°C. The next step was staining with a secondary antibody, biotinylated-horseradish peroxidase, incubation for 1 h, at room temperature. Furthermore, chromogen was administered. Next, the dehydration process was again carried out using a concentration of alcohol and xylene. The mounting and assessing the TNF- $\alpha$  expression using ImageJ software will obtain the TNF- $\alpha$  expression percentage.

### Data analysis

All data were presented as mean  $\pm$  standard deviation, and all statistical analyzes were performed with the SPSS 25 (IBM) program. One-way ANOVA followed by *post hoc* analysis was carried out to assess differences in mean expression levels and levels of each protein and clinical data.  $p < 0.05$  was determined as an indication that there was a significant difference in mean levels.

## Results

Table 1 compares various inflammatory cytokine levels, such as TNF- $\alpha$  and NF-kB between

Table 1: TNF- $\alpha$ , NF-kB, and IL-10 level

Variables	Group	Levels (pg/mL) $\pm$ SD	p-value*
TNF- $\alpha$	1	47.3 $\pm$ 2.32	0.001
	2	54.4 $\pm$ 3.22	0.001
	3	87.8 $\pm$ 2.39	
NF-kB	1	32.5 $\pm$ 2.76	0.001
	2	44.6 $\pm$ 2.43	0.001
	3	76.8 $\pm$ 4.32	
IL-10	1	23.5 $\pm$ 1.31	0.001
	2	33.6 $\pm$ 2.21	0.001
	3	46.8 $\pm$ 2.54	

\* $p < 0.05$  versus Group 3, ANOVA followed *post-hoc* Bonferroni. Notes: 1: Nano curcumin; 2: Dexamethasone; 3: Placebo; NFkB: Nuclear factor kappa-B; TNF- $\alpha$ : Tumor necrosis factor- $\alpha$ ; IL-10: Interleukin-10.

the treatment groups. The nano curcumin treatment showed the ability to reduce the pro-inflammatory cytokine protein TNF- $\alpha$  expression more optimally than dexamethasone treatment. Nano curcumin has also shown the ability to reduce the pro-inflammatory cytokine transcription factor, NF-kB, more optimally than treatment with dexamethasone.

Figure 1 shows the comparison of ASA expression in testicular tissue between treatment groups. Treatment with nano curcumin reduced the expression of ASA more optimally than treatment with dexamethasone.

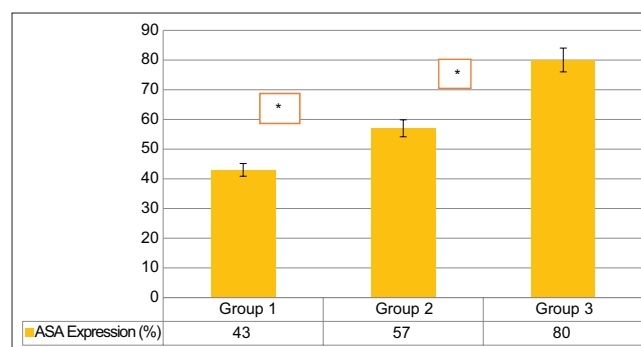


Figure 1: Anti-sperma antibody expression. \* $p < 0.05$  versus Group 3, ANOVA followed *post hoc* Bonferroni; 1: Nano curcumin, 2: Dexamethasone, 3: Placebo

## Discussion

TNF- $\alpha$  is a pro-inflammatory cytokine which will increase its level in inflammation and infection [11]. In this study, the damage was occurred to BTB, the barrier that separates the basal and apical compartments of the Sertoli cells [12], [13], [14]. The basal compartment is a mitosis process, whereas in the apical compartment there is a process of meiosis. TNF- $\alpha$  comes from macrophages and Sertoli cells in the testes, increasing in number when there are inflammation and infection [15]. In the nano curcumin group, there was a decrease in TNF- $\alpha$  level lower than dexamethasone and placebo because nano curcumin inhibited TNF- $\alpha$  by blocking the TNF receptor. Research by Wajant *et al.* founded that expression of TNF- $\alpha$  and TNF- $\alpha$  receptors in the posterior spinal cord was increased in a diabetic rat model [13]. Treatment with curcumin decreases the

expression of TNF- $\alpha$  and TNF- $\alpha$  receptors. Curcumin reduces exercise-induced inflammation with the result of reducing plasma keratin kinases and reducing levels of inflammatory cytokines IL-1 $\beta$ , IL-6, and TNF- $\alpha$  [16]. Research by Bisht *et al.* stated that administration of nano curcumin could reduce 1.5 times the TNF- $\alpha$  level and 2.4 times the IL-6 levels found in hepatocellular injury [17].

NF $\kappa$ B in the inactive state is located in the cytoplasm and binds to I $\kappa$ B protein. Increased NF $\kappa$ B activity is associated with its involvement in various cancers in humans. Almost all of the biological effects of curcumin are through gene regulation by NF $\kappa$ B, namely, proteins associated with apoptosis (B-cell lymphoma [Bcl]-2, Bcl-X, and TNF receptor-associated factor), cell cycle regulators (cyclin D1 and cyclin D2), growth factors (IL, TNF- $\alpha$ , and vascular endothelial growth factor), receptors (CD<sub>40</sub>, CD<sub>44</sub>, CD<sub>86</sub>, CCR<sub>7</sub>, and CXCL), and matrix metalloproteinases (MMP-2 and MMP-9) [18], [19], [20]. Research by Bisht *et al.*, nano curcumin inhibits pancreatic cancer cells through NF $\kappa$ B inhibition [17]. From the information above, it can be concluded that nano curcumin inhibits NF $\kappa$ B activation. In this study's results, nano curcumin played a role in inhibiting the activation of NF $\kappa$ B transcription in testicular trauma that damaged BTB to prevent ASA.

## Conclusion

Nano curcumin can prevent the formation of ASA in testicular trauma through inhibition of the inflammatory response.

## References

- Sabanegh E, Agarwal A. Male infertility. In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. Campbell-Walsh Urology. 10<sup>th</sup> ed. Philadelphia, PA: Saunders-Elsevier; 2012. p. 616-47. <https://doi.org/10.1016/b978-1-4160-6911-9.00021-9>
- Dohle GR, Jungwirth A, Kopa Z, Giwercman A, Diemer T, Hargreave. Male Infertility. The Netherlands: European Association of Urology Guidelines; 2009. p. 6-61. <https://doi.org/10.1016/j.eururo.2012.04.048>
- Cooper TG, Aitken J, Auger J, Baker HW, Barratt CL, Behre HM, *et al.* WHO Laboratory Manual for the Examination of Human Semen and Sperm-Cervical Mucus Interaction. 5<sup>th</sup> ed. Switzerland: WHO Press; 2010. p. 108-30.
- Lombardo F, Gandini L, Dondero F, Lenzi A. Antisperm immunity in natural and assisted reproduction. Hum Rep Update. 2001;7(5):450-6. PMID:11556491
- Oeckinghaus A, Ghosh S. The NF-kappaB family of transcription factors and its regulation. Cold Spring Harb Perspect Biol. 2009;1(4):a000034. <https://doi.org/10.1101/cshperspect.a000034> PMID:20066092
- Ahn KS, Aggarwal BB. Transcription factor NF-kappaB: A sensor for smoke and stress signals. Ann N Y Acad Sci. 2005;1056:218-33. PMID:16387690
- Asadullah K, Sterry W, Volk HD. Interleukin-10 therapy--review of a new approach. Pharmacol Rev. 2003;55(2):241-69. <https://doi.org/10.1124/pr.55.2.4> PMID:12773629
- Lin CL, Lin JK. Curcumin: A potential cancer chemopreventive agent through suppressing NF-kB signaling. J Cancer Mol. 2008;4(1):11-6.
- Tsai YM, Chien CF, Lin LC, Tsai TH. Curcumin and its nano-formulation: The kinetics of tissue distribution and blood-brain barrier penetration. Int J Pharm. 2011;416(1):331-8. <https://doi.org/10.1016/j.ijpharm.2011.06.030> PMID:21729743
- Bisht S, Feldmann G, Soni S, Ravi R, Karikar C, Maitra A, *et al.* Polymeric nanoparticle-encapsulated curcumin ("nanocurcumin"): A novel strategy for human cancer therapy. J Nanobiotechnol. 2007;5:3. <https://doi.org/10.1186/1477-3155-5-3> PMID:17439648
- Huxford T, Ghosh G. A structural guide to proteins of the NF-kappaB signaling module. Cold Spring Harb Perspect Biol. 2009;1(3):a000075. <https://doi.org/10.1101/cshperspect.a000075> PMID:20066103
- Lawrence T. The nuclear factor NF-kappaB pathway in inflammation. Cold Spring Harb Perspect Biol. 2009;1(6):a001651. <https://doi.org/10.1101/cshperspect.a001651> PMID:20457564
- Wajant H, Pfizenmaier K, Scheurich. Tumor necrosis factor signaling. Cell Death Differ. 2003;10(1):45-65. <https://doi.org/10.1038/sj.cdd.4401189> PMID:12655295
- Mosser DM, Zhang X. Interleukin-10: New perspectives on an old cytokine. Immunol Rev. 2008;226:205-18. PMID:19161426
- Mocellin S, Marincola FM, Young HA. Interleukin-10 and the immune response against cancer: A counterpoint. J Leukoc Biol. 2005;78(5):1043-51. <https://doi.org/10.1189/jlb.0705358> PMID:16204623
- Turek PJ. Male reproductive physiology. In: Wein AJ, Kavoussi LR, Novick AC, Partin AW, Peters CA, editors. Campbell-Walsh Urology. 10<sup>th</sup> ed. Philadelphia, PA: Saunders-Elsevier; 2012. p. 591-615. <https://doi.org/10.1016/b978-1-4160-6911-9.00020-7>
- Bisht S, Khan MA, Bekhit M, Bai H, Cornish T, Mizuma M, *et al.* A polymeric nanoparticle formulation of curcumin (NanoCurc™) ameliorates CCl4-induced hepatic injury and fibrosis through reduction of pro-inflammatory cytokines and stellate cell activation. Lab Invest. 2011;91(9):1383-95. <https://doi.org/10.1038/labinvest.2011.86> PMID:21691262
- Cheng CY, Mruk DD. The blood-testis barrier and its implications for male contraception. Pharmacol Rev. 2012;64(1):16-64. <https://doi.org/10.1124/pr.110.002790> PMID:22039149
- Li MW, Mruk DD, Lee WM, Cheng CY. Cytokines and junction restructuring events during spermatogenesis in the

- 
- testis: An emerging concept of regulation. *Cytokine Growth Factor Rev.* 2009;20(4):329-38. <https://doi.org/10.1016/j.cytogfr.2009.07.007>  
PMid:19651533
20. Wong EW, Mruk DD, Lee WM, Cheng CY. Regulation of blood-testis barrier dynamics by TGF-beta3 is a Cdc42-dependent protein trafficking event. *Proc Natl Acad Sci U S A.* 2010;107(25):11399-404. <https://doi.org/10.1073/pnas.1001077107>  
PMid:20534521