

BAB V

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan dari hasil penelitian yang telah dilakukan maka dapat diambil kesimpulan sebagai berikut :

1. Pemberian ekstrak etanol bunga, batang, akar dan daun tanaman *Echinacea purpurea* 500 mg/70 kgBB dapat meningkatkan jumlah limfosit dan menurunkan jumlah neutrofil mencit jantan putih yang diinduksi aktivitas berlebih *swimming test* dengan suhu air $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ dalam waktu 10 menit selama 30 hari.
2. Pemberian pemberian ekstrak etanol bunga, batang, akar dan daun tanaman *Echinacea purpurea* 500 mg/70 kgBB dapat memberikan pengaruh terhadap perubahan fungsi kognitif mencit jantan putih yang diinduksi aktivitas berlebih metode *swimming test* dengan suhu air $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ dalam waktu 10 menit selama 30 hari.
3. Ekstrak etanol bunga dan batang dapat memberikan pengaruh terhadap profil darah yaitu jumlah neutrofil dan jumlah limfosit. Ekstrak etanol batang juga dapat memberikan pengaruh terhadap fungsi kognitif.

5.2 Saran

Berdasarkan dari hasil penelitian yang telah dilakukan, dapat dilakukan penelitian yang lebih lanjut yaitu

1. Menggunakan pelarut selain etanol untuk melihat apakah ekstrak pelarut selain etanol dapat memberikan pengaruh terhadap pengamatan jumlah limfosit, neutrofil serta fungsi kognitif pada tanaman *Echinacea purpurea*.

2. Dilakukan pemaparan metode stres yang lain yang dapat memberikan pengaruh terhadap pengamatan jumlah limfosit, neutrofil serta fungsi kognitif.
3. Dilakukan uji toksisitas terhadap pemberian ekstrak *Echinacea purpurea* yang diinduksi *stressor swimming test*.

DAFTAR PUSTAKA

- Ader, R. Cohen, N., Felten, 1995, **Psyconeuroimunology : Interactions between The Nervous System and Imune System**, Lancet, 345,99-103.
- Ader, R., Felten, D. L., & Cohen, N., 2001, *Psychoneuroimmunology (3rd ed.)*. San Diego, CA: Academic Press
- Altamirano-Dimas. M, Hudson. J.B,Cochrane.D, Nelson. C and Arnason J.T., 2007, *Modulation of immune response gene expression by Echinacea extracts: results of a gene array analysis*, Can, **J. Physiol Pharmacol**, 85:1091–1098.
- American Psychiatric Associaton, 1994, *Diagnostic and Statistical Manual of Mental Disorder*. 4th ed. **American psychiatric association**, washington.
- Anggraeni, R., 2011, *Hubungan antara Kelelahan kerja dengan Stres Kerja terhadap Perawatan di BLUD RSUD Boejasin Pelaihari*, Universitas Lambung Mangkurat.
- Anonim, 2014, *Echinacea-Echinaceaspp*,www.herbaltransitions.compdf
- Anstead MI, Hunt TA, Carlson SL, Burki NK., 1998, *Variability of Peripheral Blood Lymphocyte Beta-2-adrenergic Receptor Density in Humans*, **American Journal of Respiratory and Critical Care Medicine** 157:990–992.
- Badan POM RI, 2013, **Pedoman Teknologi Formulasi Sediaan Berbasis Ekstrak Volume 2**, Jakarta.
- Barnes J., Anderson L.A., Gibbons S., Phillipson J.D., 2005. *Echinacea species (Echinacea angustifolia (DC.) Hell., Echinacea pallida (Nutt.) Nutt., Echinacea purpurea (L.) Moench): A review of their chemistry, pharmacology and clinical properties*. **Journal of Pharmacy and Pharmacology** 57 (8), 929–954.

- Barrett B., 2003, *Medicinal properties of Echinacea: A critical review*, **Phytomedicine** 10 (1), 66–86.
- Beck, K.D. & Luine, V.N, 1999, *Food Deprivation Modulates Chronic Stress Effects On Object Recognition In Male Rats: Role Of Monoamines And Amino Acids*, **Brain Res.** May 29 ; 830(10):56-71.
- Cooper, K.H., 2000, *Antioxidan Revolution*, Tennessee, Thomas Nelson Publisher.
- Departemen Kesehatan RI, 1977, **Materia Medika Indonesia Jilid 1**, Jakarta: Departemen Kesehatan Republik Indonesia.
- Departemen Kesehatan RI, 1979, **Materia Medika Indonesia Jilid 3**, Jakarta: Departemen Kesehatan Republik Indonesia.
- Dhabhar F.S. and Viswanathan K., 2005, *Short Term Stress Experienced at The Time of Immunization Induces a Long-Lasting Increase in Immunological Memory*. **Am J Physiol Regul Integr Comp Physiol** 289:R738–744.
- Ditjen POM RI, 2000, **Parameter Standar Umum Ekstrak Tumbuhan Obat**, Departemen Kesehatan Republik Indonesia.
- Effendi, Z., 2003, *Peranan Leukosit sebagai antiinflamasi Alergik dalam Tubuh*, FK USU.
- EU working group, 2008, *Benefit of physical activity*, **EU physical activity guidelines**, pp 3-5.
- FAO/WHO/UNU, 2001, *Human Energy Requirement*, **Report of a Joint FAO/WHO/ UNUExpert Consultation**, 17-24 October, Rome.
- Farr, S.A., Poon, H.F., Dilek, D.A., Drake J., Banks, W.A., Eyerman, E., Butterfield D.A., Morley, J.E., 2003, *The Antioxidants -lipoic acid and N-acetylcysteine Reverse Memory Impairment and Brain Oxidative Stree in Aged SAMP8 Mice*, **Journal of Neurochemistry** 84 (5):1173-1183.

- Felten, S. Y., & Felten, D., 1994, *Neural-immune Interaction*, **Progress in Brain Research**, 100, 157–162.
- Fereder W., 1991, *Statistic and Society: Data Collection and Interpretation*, 2nd ed., **MarcelDekker, Inc.**, New York.
- Festing MFW, 2003, *Principles: the need for better experimental design*, **Trends Pharmacol Sci**. 24:341-5.
- Fitriyana, 2012, *Pengaruh Pemaparan Bakteri Porphyromonas Gingivalis Terhadap Produksi Superoksid Netrofil*, **skripsi**, Pasca Sarjana.Universitas Jember.
- Fox, J.G., B. J Cohen and Loew, F. M, 1984, *Laboratory Animal medicine*, **Academic press, California**, pp 40.
- Gabriel, 2014, *Pengembangan Metode Pengukuran Fungsi Memori Mencit Putih Jantan Terhadap Pengaruh Hiperaktivitas*, **Skripsi**, sarjana Farmasi, Universitas Katolik Widya Mandala Surabaya.
- Glaser R. and Kiecolt-Glaser JK., 2005, *Stress Induced Immune Dysfunction: Implications for Health*. **Nat Rev Immunol** 5:243–51.
- Goel V, Chang C, Sloma JV, Barton R, Bauer R, Gahler R and Basu TK., 2002, *Alkylamides of Echinacea purpurea Stimulate Alveolar Macrophage Function in Normal Rats*, **J Immunopharmacol**, 2:381–387.
- Gough, P. J., Gomez I. G., Wille P.t., and Raines E. W., 2006. *Macrophage expression of active MMP-9 induces acute plaque disruption in apoE-deficient mice*. **J. Clin. Invest**. 116: 59-69.
- Gunawan, B. Dan Sumadiono, 2007, *Stres dan Sistem Imun Tubuh: Suatu Pendekatan Psiconeuroimunologi*, **Cermin Dunia Kedokteran ed.9** Terjemahan I. Setyawan dkk., EGC:Jakarta.

- Guo R.F., Sun L., Gao H.W., Shi K.X., Rittirsch D., Sarma V.J., Zetoune F.S., Ward P.A, 2006, *In vivo regulation of neutrophil apoptosis by C5a during sepsis*, **J leukoc biol** **80**: 1575-1583.
- Guyton, A.C., 1990, **Fisiologi Manusia dan Mekanisme Penyakit 3rd Ed.** Jakarta : EGC.
- Guyton and Hall., 1997, **Buku Ajar Fisiologi Kedokteran**, Jakarta : EGC.
- Hamid, I.S, 2015, '*Pengenalan, Pemeliharaan dan Manajemen Pemeliharaan Hewan Coba*' In Suryaningtyas, W., Prasetyo, R.V. Dewi, B.D.N., **Penelitian dan Teknik Laboratorium pada Hewan Coba dan Manusia**, Airlangga University Pres (AUP), Surabaya, pp 34.
- Harahap, N.S., 2008, *Pengaruh Aktifitas Fisik Maksimal terhadap Jumlah Leukosit dan Hitung Jenis Leukosit pada Mencit (Mus mucus) Jantan*, **Skripsi**, Pasca Sarjana.Universitas Sumatera Utara Medan.
- Harjanto, 2004, *Pemulihan Stres Oksidatif pada Latihan Olahraga*, **Jurnal Kedokteran YARSI** 12 (3) : 81-87
- Heru, W., 2001, *Peranan Imunomodulator Pada Infeksi Saluran Pernafasan Peranan Echinacea Sebagai Imunomodulator Dalam Infeksi Virus Dan Bakteri*. Hotel borobudur.
- Hollman, P.C.H, M.G.L. Hertog and M.B. Katan, 1996, *Analysis and Health Effects of Flavonoids*, **Food Chemistry**, 57 (1) : 43-46.
- Hoschl C, Hajek T., 2001, *Hippocampal Damage Mediated by Corticosteroids – a neuropsychiatric research challenge Eur., Arch., Psychiatry., Clin. Neurosci.* 251 Suppl. 2, II/81-88.
- ITIS, 2015, *Taxonomy and Nomenclature Mus mucus*, Diakses tanggal 18 Juni 2015, http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=180366.

- Kemeny, M.E., Solomon, G.F., Morley, J.E., & Herbert, T. B., 1992, *Psychoneuroimmunology*, Inc. B.Nemeroff (Eds), **Neuroendocrinology** pp.563-591, Boca Raton, FL: CRC Press.
- Kee, J.L., 2007, *Limfosit T dan B : Pedoman Pemeriksaan Laboratorium dan Diagnostik*. Jakarta : EGC.
- Konig, D., Grathwohl, D., Weinstock, C., Nothn, H., Berg, A, 2000, *Upper Respiratory Tract Infection in Athletes : Influence of Lifestyle Type of Sport, Training Effort and Immunostimulan*, Intake **Exercise Immunology Review 6**.
- Kusnan, D.E.A., 2006, *Keseimbangan Energi dan Kesehatan Fisik Siswa Pukdzki Kodiklat TNI AD Apda Saat Puasa*, **Jurnal Gizi dan Pangan 1(2)** hal 78-72.
- Latu, K.V.L., 2014, *Pengaruh Noise-Induced Stress pada Perubahan Jumlah Limfosit dan Neurofil Mencit Putih Jantan Galur Balb/C*, **Skripsi**, sarjana Farmasi, Universitas Katolik Widya Mandala Surabaya.
- Landmann R., 1992, *Beta-adrenergic Receptors in Human Leukocyte Subpopulations*. **European Journal of Clinical Investigation**, 22:30–36.
- Lazarus R.S., 1990, *Theory-Based Stress Measurement*, **Psychology Inquiry**, 1 (1): 3-13.
- Leon F. and Evans G.L., 2012, *Piracetam for dementia or cognitive impairment (Review)*. **The Cochrane Collaboration**.
- Li T., 1998, 'Growing Echinacea'. **American Botanical Council**, Austin, TX.
- Litman G.W. et al. 1990, 'Respon imun', **Pengantar Imunoasai Dasar**, Pusat penerbitan dan Pencetakan Unair (AUP), Surabaya, pp.1.

- Luan, Y., 2013, *Pengaruh hiperaktivitas sebagai penginduksi stress terhadap perubahan jumlah neutrofil dan limfosit mencit putih jantan*, **Skripsi**, sarjana Farmasi, Universitas Katolik Widya Mandala Surabaya.
- Maisel A.S., Fowler P., Rearden A., Motulsky H.J., Michel M., 1989, *A New Method for Isolation of Human Lymphocyte Subsets Reveals Differential Regulation of Beta-adrenergic Receptors by Terbutaline Treatment*. **Clinical Pharmacology and Therapeutics** 46:429– 439.
- Marliana, S.D., dkk., 2005, *Skrining Fitokimia dan Analisis Kromatografi Lapis Tipis Komponen Kimia Buah Labu Siam (Sechium edule Jacq. Swartz.) dalam Ekstrak Etanol*, **Biofarmasi**, Jurusan Biologi FMIPA UNS, Surakarta
- Mayasari D. dan pratiwi A., 2009, *Hubungan Respon Imun dan Stres dengan Tingkat Kekambuhan Demam Tifoid pada Masyarakat di Wilayah Puskesmas Colomadu Karanganyar*, **Berita Ilmu Keperawatan** ISSN 1979-2697, Vol. 2 No. 1 pp 13-18
- McDougall B., King P.J., Wu B.W., Hostomsky Z., Reinecke M.G., and Robinson W.E., 1998, *Dicaffeoylquinic and Dicaffeoyltartaric Acid are Selective Inhibitors of human Immunodeficiency Virus Type 1 Integrase*. **Antimicrob Agents**. Chemo, 42:140–146.
- McEwen, B.S., Flier, J.S. and Underhill, B.S., 1998, *Protective and Damaging Effets of Stres Mediators*, **N engl j med**, 338(3):171-179.
- Mehta, A. and Hoffbrand, V., 2006, *'Sel Darah Normal II:Granulosit, Monosit dan Sistem Retikuloendotelial*. Jakarta : EGC.
- Miles, L., 2007, *Physical Activity and Helth*, London: **British Nutrition Foundation**

- Mishima S., Saito K., Maruyama H, Inoue M, Yamashita T, Ishida T, Gu Y. 2004 *Antioxidant and Immune Enhancing Effects of Echinacea purpurea*. *Biol Pharm Bull*, 27:1004–1009.
- Morazzoni P., Cristoni A., Di Pierro F., Avanzini C., Ravarino D., Stornello S., Zucca M and Musso T, 2005, *Invitro and In vivo Immune Stimulating Effects of a New Standardized Echinacea angustifolia Root Extract (Polinacea™)*, **Fitoterapia**, 76:401–411
- Mustofa, E. and Handono, K., 2012, '*Hubungan Stres Psikologis Dengan Imunitas Vagina*'. *Pengaruh Stres terhadap Pertumbuhan Candida Albicans*, **UB press**, Malang, pp.49-65
- Muttaqin, A, 2012, *pengantar asuhan Keperawatan Klien dengan Gangguan Sistem persarafan*, **Salemba Medika**, Jakarta, pp 10-16.
- Pellati, F., Benvenuti, S., Magro, L., Melegari, M., Soragni, F., 2004, *Analysis of Phenolic Compounds and Radical Scavenging Activity of Echinacea Spp.* **Journal of Pharmaceutical and Biomedical Analysis** 35, 289–301.
- Pharma, N., 2004. *Antioxidant Supplementation Enhances Neutrophil Oxidative Burst In Trained Runners Following prolonged Exercise*, **IJSNM**, 13.13-33.
- Pullaiah, T., 2006, *Encyclopedia of World Medicinal Plants, Volume 1*, **Daya Books**: Page 841-842.
- Poon B. Y., Ward C. A., Cooper C. B., Giles W. R., Burns A.R., Kubes P, 2001, *4- Integrin Mediates Neutrophil-induced Free Radical Injury to cardiac Myocytes*. **J. Cell Biol**, 152 (5): 857-866
- Rabin, B.S., 1999, *Stres, Immune Function and Health : The connection*. *New York: john wiley & son*, research Vol. 5. **Academic Press**, New York, p. 253–321.

- Rahardjo, M., Rosita dan Sudiarto, 2002, *Pengaruh Penundaan Umur Panen Echinacea purpurea terhadap Produktivitas dan Mutu Simplisia*, **Jurnal Bahan Alam Indonesia** ISSN 1412-2855 Vol. 1, No. 2.
- Rahardjo, M., 2005, *Peluang Pembudidayaan Echinacea (Echinacea Purpurea) Di Indonesia*. Vol 4 No.1 p.1-10
- Ravassard PP, Bastien C, Jean-Christophe CM, Perez CS, Blachon G, Nadine C, dkk, 2009, *Paradoxical (REM) Sleep Deprivation Causes a Large and Rapidly Reversible Decrease in Longterm Potentiation, Synaptic Transmission, Glutamate Receptor Protein Levels, And ERK/ MAPK Activation in The Dorsal Hippocampus, Sleep*;32(2):227–40.
- Regards K., 2015, *Garden World Images*, Diakses tanggal 1 Juli 2015, <http://www.gardenworldimages.co.uk/AboutUs.aspx>
- Saladin, k., 2003, *anatomy and physiology : The Unity of Form and Function 3^{Ed}*, mcgraw-Hill, New york
- Sari, M.D., 2013, *Hubungan Perubahan Stres Oksidatif Marker Malonildialdehyde Dan Redox Enzyme Gluthation Peroxidase Dengan Progresfitas Saraf Optik paska Pemberian Gingko Biloba Pada Penderita Glaukoma Sudut Terbuka Primer*, Ringkasan Disertasi, **Program Studi Dokter Ilmu Kedokteran**, Fakultas Kedokteran, Universitas Sumatera Utara, Medan.
- Shrestha, S., Singh M., Uttam S., and Mishra A., 2014, *Palliative Effect of Piracetam on Valproate Induced Liver Injury*. 5(3) : 260
- Sherwood, L, 2011, '*Darah*', in Yesdelita, N., **Fisiologi Manusia dari Sel ke Sistem**, 6th ed. Jakarta : EGC, pp.421-444.
- Sloane, E, 2003, '*sistem saraf*', in Widyastui, P., **Anatomi dan fisiologi**, Jakarta, EGC 154-200.

- Smith JB, Mangkoewidjojo S., 1988, *Pemeliharaan, Pembiakan, dan Penggunaan Hewan Percobaan di Daerah Tropis*. Jakarta: Penerbit Universitas Indonesia
- Stahl, 1985, *Analisis Obat Secara Kromatografi dan Mikroskopi* diterjemahkan oleh Kosasih Padmawinata dan Iwang Soediro, ITB, Bandung.
- Suckow M.A., Brayton C. and Danneman P., 2001, *The Laboratory Mouse*, Boca Raton, Fla., **CRC Press**.
- Sunarno, Manalu, Nastiti dan Agungpriyono., 2012, *Pengoptimalan Kinerja Motorik pada Penuan Fisiologis dan Penuan Akibat Stres Oksidatif dengan Alanin-Glutamin Dipeptida dan Hubungannya Dengan Perbaikan Fungsi Hipokampus*, **Jurnal Kedokteran Hewan** 6 (1), 56-60
- Sutarto, 2010. *Psikologi Industri dan Organisasi*. Kencana, Jakarta.
- Suwendar., Soemardji, A.A., Suhartono, U., 2012, *Evaluasi Efek Kapsul x Pada Daya Ingat Mencit Galur Swiss Webster*. **Sains.teknologi dan kesehatan**, vol 3 no.1
- Syaifuddin, 2012, '*fisiologi Sistem Saraf*', **Fisiologi Tubuh Manusia**, Salemba Medika, Jakarta p. 111a
- Tagliari, B., Tagliari A.P., Schmitz, F., Cunha, A.A., Dalmaz, C., Wyse, A.T.S., 2010, *Chronic Variable Stress Alters Inflammatory and Cholinergic Parameters in Hippocampus of Rats*, **Neurochem Res** 36:487-493.
- Taliaz DL, Assaf G, Roman H, Sharon C, Alon Z, Abraham, 2011, *Resilience to chronic stress is mediated by hippocampal brain-derived neurotrophic factor*. **J Neurosci.**;31(12):4475–83.
- Torres S. and Nowson C., 2007, *Relationship Between Stress, Eating Behaviour and Obesity*, **Nutritism** ;23(11-12):887–94.

- United States Department of Agriculture, 2014, *Echinacea purpurea*, Diakses pada tanggal 18 Juni 2015, <http://plants.usda.gov/core/profile?symbol=ECPU>
- US Departement of Health and Human Services, 2008, *Physical Activity Guidelines for Americans*, US: **US departement of Health and Human Services**.
- Vernon MW, Sorkin EM, 1991, *Piracetam, An overview of its Pharmacological Properties and a review of its Therapeutic Use in Senile Cognitive disorders*, **Drugs and Aging** ,1 (1):17–35.
- Waegemans T., Wilsher C.R., Danniau A., 2002. *Clinical Efficacy of Piracetam in Cognitive Impairment: A Meta-Analysis. Dementia Geriatr Cogn Disord*, 13:217-224, diakses tanggal 1 Juli 2015, http://www.kalbed.com/Portals/6/37_192Berita%20Terkini_Ef%20Metaanalysis%20Piracetam%20Terhadap%20Fungsi%20Kognitif.pdf
- Wagner, H., 1985, *Immunostimulants from Medicinal Plants*, In **Advances in Chinese medicinal materials research** (Eds.) H.M. Chang; H.W.
- Walesiuk A., Trofimiuk E., Braszko J.J, 2005, *Ginkgo Biloba Extract Diminishes Stress Induced Memory Deficit in Rats Pharmacol, Rev.57 : 176-187.*
- Wardani, N. dan Roosita, K., 2008, *Aktivitas fisik, Asupan Energi, dan Produktivitas Kerja Pria Dewasa: Studi Kasus di Perkebunan Teh Malabar ptpn di Bandung, jawa barat. jurnal gizi dan pangan* 3(2): 71 – 78.
- WHO, 2010, 'physical activity for health'.*Gobal Recimendation on Physical Activity for Health*, pp. 9.
- WHO, 2010, *Physical Activity in Guide to Community Preventive Service*, Diakses tanggal 18 Juni 2015.

WHO,2014, *Herba Echinacea purpurea*, Diakses pada 18 Juni 2015,
[http://apps.who.int/medicinedocs/en/d/Js2200e/16.html#Js2200e.](http://apps.who.int/medicinedocs/en/d/Js2200e/16.html#Js2200e.16)

16.

Widyastuti, P., 2003, *Manajemen stres*, Jakarta : EGC

Winarsi, H., 2007, '*Dampak Reaktivitas Radikal Bebas terhadap Kesehatan*', **Antioksidan Alami dan Radika Bebas**, Kanisius, Yogyakarta, pp.264.

Zhai Z., Liu Y., Wu L., Senchina D.S., Wurtele E.S., Murphy P.A., Kohut M.L., Cunnick J.E., 2007 *Enhancement of Innate and Adaptive Immune Functions by Multiple Echinacea Species*. **Journal of Medicinal Food** 10 (3), 423–434.