BAB 5
KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan penelitian yang telah dilakukan pada pengaruh pemberian diet tinggi lemak dari minyak jelantah terhadap keberhasilan induksi diabetes mellitus tipe 2 pada tikus wistar jantan, telah diperoleh hasil data sehingga dapat ditarik beberapa kesimpulan. Kesimpulan tersebut dipaparkan sebagai berikut :

1. Sesuai dengan data yang diperoleh, metode dengan pemberian diet tinggi lemak dari minyak jelantah pada tikus wistar jantan tidak dapat menginduksi diabetes melitus tipe 2.
2. Pengaruh pemberian DTL dari minyak jelantah terhadap jumlah sel-β pankreas belum memberikan dampak yang signifikan pada jumlah sel-β dilihat dari hasil uji statistik.
3. Metode yang lebih ekonomis untuk induksi diabetes melitus tipe 2 adalah pemberian diet tinggi lemak tunggal pada tikus wistar jantan.

5.2 Saran

Berdasarkan penelitian yang telah dilakukan, terdapat beberapa permasalahan sehingga peneliti mengajukan beberapa saran. Saran tersebut antara lain :

1. Pada pengujian minyak jelantah, dilakukan pengujian selain uji kalori, seperti pengujian kadar asam lemak jenuh dalam minyak jelantah.
2. Perlu dilakukan karakterisasi minyak jelantah yang digunakan.
3. Parameter uji perlu ditambah, yaitu parameter uji kadar insulin pada setiap kelompok.

DAFTAR PUSTAKA

Ahmed, A., Harraz, M., Ghareib, S., Gabr, S., Nagy, A, And Sattar, A., 2015, Methanolic extract of Marrubium vulgare ameliorates hyperglycemia and dyslipidemia in streptozotocin-induced diabetic rats, *International Journal of Diabetes Mellitus*, **3** : 37-44.

Amalia, N., 2015, Perbedaan Teknik Penggorengan Terhadap Kadar Protein Terlarut dan Daya Terima Keripik Tempe, **13** : 1961 – 2010

Amalia, T.R.N., Purwani, E. Dan Rauf, R., 2015, Perbedaan Teknik Penggorengan Terhadap Kadar Protein Terlarut dan Daya Terima Keripik Tempe.

American Diabetes Association, 2019, Standards of Medical Care in Diabetes 2019 Abridged for Primary Care Providers, *Clinical of Diabetes Journal.Org*, S1–S194.

Ammon, H.P.T., 2019, Boswellic Extracts and 11-Keto-ß-Boswellic Acids Prevent Type 1 and Type 2 Diabetes Mellitus by Suppressing The Expression Of Proinflammatory Cytokines, *Journal of Phytomedicine*, **63** : 153002.

Arianing, I.F., 2018, Pengaruh Waktu Penggunaan Minyak Goreng Kelapa Sawit Terhadap Karakterisasi Trigliserida dan Crude Glycerol, Fakultas Ilmu Kesehatan

Azhari, P., 2017, Pengaruh Pemberian Minyak Jelantah Terhadap Gambaran Histopatologi Ateri Koroneria Tikus Putih (Rattus norvegicus) Jantan Galur Sprague dawley.

Bowe, E.J., Franklin, Z.J., Evans, A.C.H., King, A.J., Persaud, S.J., And Jones, P.M., 2014, Assessing Glucose Homeostasis in Rodent Models, Metabolic Phenotyping Guidelines, *Journal of Endocrinology*, 222, G13-G25.

Buettner, R., Scholmerich, J. And Bollheimer, C., 2007, High-fat Diets: Modeling the Metabolic Disorders of Human Obesity in Rodents, *Journal of Metabolic Disorders in Rodents*, **15** : 4

Castro, U.G.M., Santos, R.A.S., Silva, M.E., Lima, W.G., Santos, M.J.C. and Alzamora, C., 2013, Age-dependent effect of high-fructose and high-fat diets on lipid metabolism and lipid accumulation in liver and kidney of rats, *de Castro et al. Lipids in Health and Disease*, **12** : 136.

Deeds, M.C., Anderson, J.M., Armstrong, A.S., Gastineau, D.A., Haddinga, H.J., Jahangir, A., Eberhardt, N.L., And Kudva, Y.C., Single Dose Streptozotocin-Induced Diabetes: Considerations For Study Design in Islet Transplantation Models, *Laboratory Animals* 2011; **45**: 131–140

Dineshkumar, B., Mitra, A., And Manjunatha, M., 2010, Studies on the anti-diabetic and hypolipidemic potentials of mangiferin (Xanthone Glucoside) in streptozotocin-induced Type 1 and Type 2 diabetic model rats, *International Journal of Advances in Pharmaceutical Sciences*, 75-85.

Engel, H., Xiong, L., Reichenberger, M.A., German, G., Roth, C. And Hirche, C., 2018, Rodent Models of Diet-Induced Type 2 Diabetes Mellitus: a Literature Review and Selection Guide, *Journal of Diabetes & Metabolic Syndrome: Clinical Research & Reviews*

Furman, B.L., 2015, Streptozotocin-Induced Diabetic Models in Mice and Rats, Current *Protocol in Pharmacology*, **5.47**.1-20.

Gheibi, S., Kashfi, K. and Ghasemi, A., 2017, A practical guide for induction of type-2 diabetes in rat: Incorporating a high-fat diet and streptozotocin, *Journal Biomedicine & Pharmacotherapy*, 605–613.

Ghelani, H., Naumovski, V.R. And Nammi, S., 2017, Chronic treatment of (R)-a-lipoic acid reduces blood glucose and lipid levels in high-fat diet and low-dose streptozotocin-induced metabolic syndrome and type 2 diabetes in Sprague-Dawley rats, *Journal of Pharmacology Research And Perspectives*, **5** : 3.

Gotoh, K., Inoue, M., Shiraishi, K., Masaki, T., Chiba, S., Mitsotumi, K., *et al.*, 2012, Spleen-Derived Interleukin-10 Downregulates the Severity of High-Fat Diet-Induced Non-Alcoholic Fatty Pancreas Disease, *Plos One*, **7** : 12.

Goud, B.J., Dwarakanath, V. And Swammy, B.K.C., Streptozotocin - A Diabetogenic Agent in Animal Models, 2015, *International Journal of Pharmacy and Pharmaceutical Research*, Volume ; **3**, Issue ; 1.

Hasibuan, H.A., 2012, Kajian Mutu dan Karakteristik Minyak Sawit Indonesia Serta Produk Fraksinasinya, *Jurnal Standardisasi*, **14** No. 1 Tahun 2012: 13 – 21.

Ighodaro, O.M., Adeousun, A.M., Asejeje, F.O., Soetan, G.O. And Kassim, O.O., 2018, Time course effects of 5,5-dihydroxyl pyrimidine-2,4,6-trione (alloxan) as a diabetogenic agent in animal model, *Alexandria Journal of Medicine,* 2090-5068.

Ilmi, I.M.B., Khomsan, A. Dan Marliyanti, S.A., 2015, Kualitas Minyak Goreng dan Produk Gorengan Selama Penggorengan di Rumah Tangga Indonesia, *Jurnal Aplikasi Teknologi Pangan*, **4** (2).

Jumitera, S., 2016, Identifikasi Golongan Senyawa Kimia, Fakultas Farmasi UMP.

Lenzen, S., 2008, The Mechanisms of Alloxan- and Streptozotocin-Induced Diabetes, Institute of Clinical Biochemistry, Hannover Medical School, 30623 Hannover, Germany, *Diabetologia* (2008) **51**:216–226

Mari, A., Pacini, G., Murphy, E., Ludvik, B., And Nolan, J.J., 2001, A Model-Based Method for Assessing Insulin Sensitivity From the Oral Glucose Tolerance Test, *Diabetes Care*, Volume 24, Number 3, March 2001.

Mahmud, N.R.A., Hastono, A.D, dan Prasetyo, A., 2010, Penentuan Nilai Kalor Berbagai Komposisi Campuran Bahan Bakar Minyak Nabati, Jurusan Kimia , Fakultas Sains dan Teknologi UIN Maliki Malang, Vol. 1, No. 2.

Mawa, J., Rahman, A., Hashem, M.A, and Hosen, J., 2019, Leea macrophylla root extract upregulates the mRNA expression for antioxidative enzymes and repairs the necrosis of pancreatic β-cell and kidney tissues in fructose-fed Type 2 diabetic rats, *Journal of Biomedicine and Pharmacotherapy,* 74-84.

Mutiyani, M., Soeatmadji, D.W., Dan Sunindya, B.R., 2014, Efek Tinggi Karbohidrat dan Diet Tinggi Lemak Terhadap Kadar Glukosa Darah dan Kepadatan Sel Beta Pankreas pada Tikus Wistar, *Indonesian Journal of Human Nutrition*, *Desember 2014*, Vol. 1 No.2 : 106 – 113.

Noriko, N., Elfidasari, D., Perdana, A.T., Wulandari, N. dan Wijayanti, W., 2012, Analisis Penggunaan dan Syarat Mutu Minyak Goreng pada Penjaja Makanan di Food Court UAI, *Jurnal AL-AZHAR INDONESIA SERI SAINS DAN TEKNOLOGI*, Vol. **1**, No. 3.

Novrial, D., 2007, Kerusakan Sel β Pankreas Akibat Induksi Streptozotocin: Tinjauan Patologi Eksperimental, *Mandala of Health*. Vol 3 (2) Mei 2007.

Nuggent, D.A., Smith, D.M. And Jones, H.B., 2008, A Review of Islet of Langerhans Degeneration in Rodent Models of Type 2 Diabetes, *Toxicologic Pathology*, **XX**, No. X, XXXX.

Reinehr, T. and Roth, C,L., 2018, Inflammation Markers in Type 2 Diabetes and the Metabolic Syndrome in the Pediatric Population, *Journal of Pediatric Type 2 and Monogenic Diabetes*, **18**:131.

Riddle, M.C, MD., 2019, Standards Of Medical Care In Diabetes 2019, The *Journal of Clinical and Applied Research and Education*, **42** : 1.

Ross, M.H, and Pawlina, W., 2016, Histology A Text and Atlas with Correlated Cell and Molecular Biology, New York.

Ross, M.H., Kaye, G.I. and Pawlina, W., 2002, Histology A Text and Atlas 4th edition, New York.

Sambandan, G. and Stiolica, A.T., 2019, *Clinical Trials*.

Saravanan, S. and Pari, L., 2015, Role of thymol on hyperglycaemia and hyperlipidemia in high fat diet-induced type 2 diabetic C57BL/6J mice, *European Journal of Pharmacology*, diakses pada 17 November 2019, http://dx.doi.org/10.1016/j.ejphar.2015.05.034.

Siswantika, P.H., Wibowo, N.A., A.N, Shanti, M.R.S. dan Setiawan, A., 2011, Pengaruh Campuran Minyak Goreng Murni dan Jelantah Terhadap Kandungan Energi, Prosiding Seminar Nasional Sains dan Pendidikan Sains VIII UKSW.

Skovso, S., 2014, Modeling type 2 diabetes in rats using high fat diet and streptozotocin, *Journal of Diabetes Investigation*, **5** : 4.

Soelistijo, A., Novida, H., Rudijanto, A., Soewondo, P., Suwastika, K., Manaf, A., Sanusi, H., Lindarto, D., Shahab, A., Pramono, B., Langi, Y.A., Purnamasari, D., Soetedjo, N.N., Saraswati, M.R., Dwipayana, M.P., Yuwono, A., Sasiarini, L., Sugiarto, Sucipto, K.W. dan Zufry, H., 2015, Pengelolaan dan Pencegahan Diabetes Melitus Tipe 2 di Indonesia, *Perkeni*, 6.

Stern, M.P., Williams, K., Haffner, S.M., 2002, Identification of Persons at High Risk for Type 2 Diabetes Mellitus: Do We Need the Oral Glucose Tolerance Test?, *American College of Physician-American Society of Internal Medicine*, Volume 136; No 8.

Sudhakara ,G., Mallaiah, P., Srinivasalu, N., Manjunatha, B., Ramaswamy, R. and Saralakumari, D., 2017, Modulatory Effects of Caralluma Fimbriata Extract Against High-Fat Diet Induced Abnormalities in Carbohydrate Metabolism In Wistar Rats, *Journal of Biomedicine And Pharmacotherapy*, 0753-3322.

Sughartini, N. dan Fajri, M.A., 2016, Gambaran Histopatologi Organ Hati dan Ginjal Mencit Balb/c setelah Pemberian Krim Ekstrak Teh Hijau (Camellia sinensis L.), *Jurnal Farmasi dan Ilmu Kefarmasian Indonesia*, Vol. 3 No. 1 Juli 2016.

Tabassum, A., Zaidi, S.N.F., Yasmeen, K. and Mahboob, T., 2018, Potential Role of Peroxisome Proliferator Activated Receptor Gamma Activation On Serum Visfatin and Trace Elements in High Fat Diet Induced Type 2 Diabetes Mellitus, S0024-3205(18)30289-3.

Tjahjono, K. DK., 2011, Pengaruh Pemberian Asam Lemak Trans terhadap Mediator Proinflamasi, Kadar Gula Darah dan Infiltrasi Netrofil pada Pulau Langerhans, Fakultas Kedokteran Universitas Diponegoro Semarang.

Tsuchitani, M., Sato, J. and Kokoshima, H., 2016, A Comparison of The Anatomical Structure of The Pancreas In Experimental Animals, *Journal of Toxicologic Pathology*, 314-0255

Vetandoust, N., Rami, F., Salehi, A.R., Khosravi, S., Dashti, G., Eslami, G., Momenzadeh, S. and Salehi, R., 2018, Novel High-Fat Diet Formulation and Streptozotocin Treatment for Induction of Prediabetes and Type 2 Diabetes in Rats, *Journal of Biomedical Research*, **7**: 107

Zheng, Y., Ley, S.H. And Hu, F.B., 2018, Global Aetiology and Epidemiology of Type 2 Diabetes Mellitus and Its Complications, **14**.

Zhou, Z., Wang, Y., Jiang, Y., Diao, Y., Strappe, P., Prenzler, P., Ayton, J. And Blanchard, C., 2016, Deep-fried oil consumption in rats impairs glycerolipid metabolism, gut histology and microbiota structure, *Lipids in Health and Disease*, **15**:86.