

BAB 5

KESIMPULAN DAN SARAN

5.1 Kesimpulan

1. Pemberian suplementasi inulin-MCT tidak signifikan dalam menurunkan indeks aterogenik pada mencit obesitas yang diberi makan tinggi lemak-sukrosa.
2. Pemberian suplementasi inulin-MCT secara signifikan menurunkan kadar perlemakan hati pada mencit obesitas yang diberi makan tinggi lemak-sukrosa.

5.2 Saran

1. Dilakukan perpanjangan waktu intervensi dan penambahan jumlah sampel dalam penelitian efek pemberian suplementasi inulin-MCT terhadap efeknya kepada indeks aterogenik sehingga diharapkan agar hasil penelitian dapat terlihat lebih jelas dan menghasilkan kesimpulan yang lebih akurat.
2. Untuk mengamati resiko terjadinya penyakit kardiovaskular akibat aterosklerosis, selain parameter indeks aterogenik, dirasa juga perlu untuk dilakukan pengamatan histologi terhadap pembuluh darah vena koronaria hewan coba.
3. Perlu dilakukan penelitian mengenai optimalisasi dosis inulin-MCT terhadap parameter metabolismik terutama pada indeks aterogenik.

DAFTAR PUSTAKA

- Adam, C.L., Gratz, S.W., Peinado, D.I., Thomson, L.M., Garden, K.E., Williams, P.A., Richardson, A.J. and Ross, A.W., 2016, Effects of Dietary Fibre (Pectin) and/or Increased Protein (Casein or Pea) on Satiety, Body Weight, Adiposity and Caecal Fermentation in High Fat Diet-Induced Obese Rat. *PLoSOne*, **11(5)**: e0155871.
- American Heart Association, 2021, *About Metabolic Syndrome*, Amerika Serikat: American Heart Association.
- Ardies, C.M. (eds). 2014, *Diet, Exercise and Chronic Disease*, CRC Press., Boca Raton, USA.
- Barnes, P.M. and Schoenborn, C.A. 2012, Trends in Adults Receiving A Recommendation for Exercise or Other Physical Activity from A Physician or Other Health Profesional. *NCHS Data Brief*, **86**: 1-8.
- Bao, T., He, F., Zhang, X., Zhu, L., Wang, Z., Lu, H., Wang, T., Li, Y., Yang, S. and Wang, H. 2020, Inulin Exerts Beneficial Effects on Non-Alcoholic Fatty Liver Disease via Modulating gut Microbiome and Suppressing the LipopolysaccharideToll-Like Receptor 4-My-Nuclear Factor- κ B-Nod-Like Receptor Protein 3 Pathway via gut-Liver Axis in Mice, *Frontiers in Pharmacology*, **11**: 55852.
- Bergheanu, S.C., Bodde, M.C. and Jukema, J.W. 2017, Pathophysiology and treatment of atherosclerosis : Current view and future perspective on lipoprotein modification treatment, *Netherlands heart journal: monthly journal of the Netherlands Society of Cardiology and the Netherlands Heart Foundation*, **25(4)**: 231–242.
- Bray, G.A. and Popkin, B.M. 2014, Dietary Sugar and Body Weight: Have We Reached a Crisis in The Epidemic of Obesity and Disease?, *Diabetes Care*, **37**: 950-956.
- Burchfield, J.G., Kebede, M.A., Meoli, C.C., Stöckli, J., Whitworth, P.T., Wright, A.L., Hoffman, N.J., Minard, A.Y., Ma, X., Krycer, J.R., Nelson, M.E., Tan, S.X., Yau, B., Thomas, K.C., Wee, N., Khor, E.C., Enriquez, R.F., Vissel, B., Biden, T.J., Baldock, P.A. and Fazakerley, D.J. 2018, High dietary fat and sucrose results in an extensive and time-dependent deterioration in health of multiple physiological systems in mice, *The Journal of biological chemistry*, **293(15)**: 5731–5745.

- Buzzetti E, Pinzani M, and Tsochatzis E.A. 2015, The multiple-hit pathogenesis of non-alcoholic fatty liver disease (NAFLD), *Metabolism*, **65(8)**: 1038-1048.
- Byrd-Bredbenner, C., Moe, G., Beshgetoor, D. and Berning, J. 2009, *Wardlaw's Prespectives in Nutrition*, McGraw Hill, USA.
- Cai, Gaojun, Shi, Ganwei, Xue, Sheliang, Lu, and Wei. 2017, The atherogenic index of plasma is a strong and independent predictor for coronary artery disease in the Chinese Han population, *Medicine*, **96(37)**: e8058.
- Castro-Barquero, S., Ruiz-León, A.M., Sierra-Pérez, M., Estruch, R. and Casas R. 2020, Dietary Strategies for Metabolic Syndrome: A Comprehensive Review, *Nutrients*, **12(10)**: 2983.
- Chen, H.H., Chao, Y.H., Chen, D.Y., Yang, D.H., Chung, T.W., Li, Y.R. and Lin, C.C. 2016, Oral administration of acarbose ameliorates imiquimod-induced psoriasis-like dermatitis in a mouse model, *International immunopharmacology*, **33**: 70–82.
- Clegg, M.E. 2010, Medium-Chain Triglycerides are Advantageous in Promoting Weight Loss Although not Beneficial to Exercise Performance, *International Journal of Food Sciences and Nutrition*, **61(7)**: 653-679.
- de Souza, R.J., Mente, A., Maroleanu, A., Cozma, A.I., Ha, V., Kishibe, T., Uleryk, E., Budylowski, P., Schünemann, H., Beyene, J., and Anand, S.S. 2015, Intake of Saturated and Trans Unsaturated Fatty Acids and Risk of All Cause Mortality, Cardiovascular Disease, and Type 2 Diabetes: Systematic Review and Meta-Analysis of Observational Studies, *BMJ*, **351**: 1-16.
- Dhingra, D., Michael, M., Rajput, H., and Patil, R.T. 2012, Dietary fibre in foods: a review, *Journal of food science and technology*, **49(3)**:255-266.
- Diederick, M. 2012, ‘Inulin, Gut Microbes, and Health’, in Cho, S.S. and Almeida, N., *Dietary Fiber and Health*, 1st ed., CRC Press, London, pp 169-180.
- Dwivedi, M., Kumar, P., Laddha, N.C. and Kemp, E.H. 2016, Induction of regulatory T cells: A role for probiotics and prebiotics to suppress autoimmunity, *Autoimmunity reviews*, **15(4)**: 379–392.

- Erkkilä, A.T., and Lichtenstein, A.H. 2006, Fiber and cardiovascular disease risk: how strong is the evidence?, *The Journal of cardiovascular nursing*, **21(1)**: 3–8.
- Faigenbaum, A.D., Chu, D.A., Paterno, M.V., and Myer, G.D. 2013, Responding to Exercise Deficit Disorder in Youth: Integrating Wellness Care into Pediatric Physical Therapy, *Pediatric Physical Therapy*, **25(1)**: 2-6.
- Fan, J.G. and Farrell, G.C. 2009, Epidemiology of non-alcoholic fatty liver disease in China, *Journal Hepatology*, **50**: 204–210.
- Fan, J.G., Kim S.U. and Wong V.W. 2017, New trends on obesity and NAFLD in Asia. *Journal Hepatology*, **67(4)**: 862-873.
- Favier, L.A. and Schulert, G.S. 2016, Mevalonate kinase deficiency: current perspectives, *The application of clinical genetics*, **9**: 101–110.
- Ferreira, A.M.D., Barbosa, P.E.B. and Ceddia, R.B. 2003, The Influence of Medium Chain Triglycerides Supplementation in Ultra-Endurance Exercise Performance, *Revista Brasileira de Medicina do Esporte*, **9(6)**: 420-425.
- Finkelstein, E.A., Khavjou, O.A., Thompson, H., Trogdon, J.G., Pan, L., Sherry, B. and Dietz, W. 2012, Obesity and severe obesity forecasts through 2030, *American journal of preventive medicine*, **42(6)**: 563–570.
- Gadde, K.M., Martin, C.K., Berthoud, H.R. and Heymsfield, S.B. 2018, Obesity: Pathophysiology and Management, *Journal of the American College of Cardiology*. **71(1)**: 69-84.
- Ganapathy, V., Thangaraju, M., Prasad, P.D., Martin, P.M. and Singh, N. 2013, Transporters and receptors for short-chain fatty acids as the molecular link between colonic bacteria and the host, *Current opinion in pharmacology*, **13(6)**: 869–874.
- Gistera, A. and Hansson, G. 2017, The Immunology of Atherosclerosis, *Nature Review Nephrology*, **13**: 368-380.
- Godoy-Matos, A.F., Silva Júnior, W.S. and Valerio C.M. 2020, NAFLD as a continuum: from obesity to metabolic syndrome and diabetes, *Diabetology and Metabolic Syndrome*, **12**:60.
- Gualtieri, K.A., Guembarovski, R.L., Oda, J.M.M., Fiori-Lopes, L., Carniero, N.K., Castro, V.D., Neto, J.S. and Watanabe, M.A.E. 2013,

- Inulin: therapeutic potential, prebiotic properties and immunological aspects, *Food and Agricultural Immunology*, **24(1)**: 21-31.
- Guo, Z., Liu, X.M., Zhang, Q.X., Tian, F.W., Zhang, H., He-Ping, Z. and Chen, W. 2012, Effects of inulin on the plasma lipid profile of normolipidemic and hyperlipidemic subjects: a meta-analysis of randomized controlled trials, *Clinical Lipidology*, **7(2)**: 215-222.
- Hartopo, A.B., Arso I.A. dan Setianto B.Y. 2016, Low Plasma Atherogenic Index Associated with Poor Prognosis in Hospitalized Patients with Acute Myocardial Infarction, *Acta Medica Indonesiana*, **48(2)**: 106-113.
- He, K., Shi, J.C. and Mao, X.M. 2014, Safety and efficacy of acarbose in the treatment of diabetes in Chinese patients, *Therapeutics and clinical risk management*, **10**: 505-511.
- Higashi, Y., Noma, K., Yoshizumi, M., and Kihara, Y. 2009, Endothelial Function and Oxidative Stress in Cardiovascular Diseases. *Circulation Journal*, **73(4)**: 411-418.
- Ibrahim, O.O. 2018, Functional Oligosaccharides: Chemicals Structure, Manufacturing, Health Benefits, Applications and Regulations, *Journal of Food Chemistry and Nanotechnology*, **4(4)**: 65-76.
- Ilhamfitri, Yasmir, R., Alia, E., dan Efrida. 2018, Correlation of Atherogenic Index of Plasma with Stenosis Level of Coronary Artery in Acute Coronary Syndrome, *Indonesian Journal of Clinical Pathology and Medical Laboratory*, **25(1)**: 53-57.
- Kathryn, A., Britton and Caroline, S.F. 2011, Ectopic Fat Depots and Cardiovascular Disease, *American Heart Association*, **12(24)**.
- Khan, M.A.B., Hashim, M.J., Mustafa, H., Baniyas, M.Y., Al Suwaidi, S.K.B.M., Al Katheeri, R., Alblooshi, K.F.M., Almatrooshi, M.E.A.H., Alzaabi, M.E.H., Al Darmaki, R.S. and Lootah, S.N.A.H. 2020, Global Epidemiology of Ischemic Heart Disease: Results from the Global Burden of Disease Study, *Cureus*, **12(7)**: e9349.
- Kavanagh, K., Jones, K.L., Sawyer, J., Kelley, K., Carr, J.J., Wagner, J.D., and Rudel, L.L. 2007, Trans Fat Diet Induces Abdominal Obesity and Changes in Insulin Sensitivity in Monkeys, *Obesity (Silver Spring)*, **15(7)**: 1675-1684.
- Kementerian Kesehatan RI, 2018, Definisi Obesitas, Jakarta: Kementerian Kesehatan Republik Indonesia.

- Khazaal, M.S. 2013, Atherogenic Index of Plasma as a Parameter in Predicting Cardiovascular Risk in Males Compared to the Conventional Dyslipidemic Indices (Cholesterol Ratio), *Karbala Journal Medicine*, **6(1)**: 1506-15011.
- Kim, S.J., Nian, C. and McIntosh, C.H. 2007, Activation of lipoprotein lipase by glucose-dependent insulinotropic polypeptide in adipocytes. A role for a protein kinase B, LKB1, and AMP-activated protein kinase cascade, *The Journal of biological chemistry*, **282(12)**:8557–8567.
- Kristiansen, M., Veidal, S.S., Christoffersen, C., Jelsing, J. and Rigbolt, K. 2019, Molecular Characterization of Microvesicular and Macrovesicular Steatosis Shows Widespread Differences in Metabolic Pathways, *Lipids*, **54(1)**:109–115.
- Kwagyan, J. and Randall, O.S. 2018, Cardiovascular Diseases, Obesity, and Lifestyle Changes, *Howard University College of Medicine*, Washington DC, USA.
- Letexier, D., Diraison, F. and Beylot, M. 2003, Addition of inulin to a moderately high-carbohydrates diet reduces hepatic lipogenesis and plasma triacylglycerol concentrations in humans, *The American Journal of Clinical Nutrition*, **77**: 559–564.
- Lee, Y.Y., Tang, T.K., Chan, E.S., Phuah, E.T., Lai, O.M., Tan, C.P., Wang, Y., Ab Karim, N.A., Mat Dian, N.H. and Tan, J.S. 2021, Medium chain triglyceride and medium-and long chain triglyceride: metabolism, production, health impacts and its applications - a review, *Critical reviews in food science and nutrition*, 1–17.
- Lieber, C.S., Leo, M.A., Mak, K.M., Xu, Y., Cao, Q., Ren, C., Ponomarenko, A and DeCarli, L.M. 2004, Acarbose attenuates experimental non-alcoholic steatohepatitis. *Biochemical and biophysical research communications*, **315(3)**:699–703.
- Liu, F., Prabhakar, M., J.J., Long, H., and Zhou, H.W. 2017, Effect of inulin-type fructans on blood lipid profile and glucose level: a systematic review and meta-analysis of randomized controlled trials, *European journal of clinical nutrition*, **71(1)**: 9–20.
- Manjunath, C.N., Rawal, J.R., Irani, P.M., and Madhu, K. 2013, Atherogenic dyslipidemia, *Indian journal of endocrinology and metabolism*, **17(6)**: 969–976.

- Mansouri, A., Gattoliat, C.H. and Asselah, T. 2018, Mitochondrial Dysfunction and Signaling in Chronic Liver Diseases. *Gastroenterology*, **155**(3):629–647.
- Marsono, Y., Putri, R.G. and Arianti, E.D. 2020, The Effects of Replacement of Dietary Fiber with FiberCreme™ on Lowering Serum Glucose and Improvement of Lipid Profile in Hypercholesterolemia-Diabetic Rats and Its Mechanism, *Pakistan Journal of Nutrition*, **19**(4): 204-211.
- McCarty, M. F. and DiNicolantonio, J.J. 2015, Acarbose, lente carbohydrate, and prebiotics promote metabolic health and longevity by stimulating intestinal production of GLP-1, *Open heart*, **2**(1):e000205.
- Mistry, R.H., Gu, F., Schols, H.A., Verkade, H. and Tietge, U.J.F. 2018, Effect of the prebiotic fiber inulin on cholesterol metabolism in wildtype mice, *Scientific Report*, **8**:13238.
- Mitra, S., De, A., and Chowdhury, A. 2020, Epidemiology of non-alcoholic and alcoholic fatty liver diseases, *Translational gastroenterology and hepatology*, **5**(16).
- Morenga, L. T., Mallard, S., and Mann, J. 2013, Dietary Sugars and Body Weight: Systematic Review and Meta-analyses of Randomized Controlled Trials and Cohort Studies, *BMJ*, **345**: 1-25.
- Moussavi Javardi, M.S., Madani, Z., Movahedi, A., Karandish, M. and Abbasi, B. 2020, The correlation between dietary fat quality indices and lipid profile with Atherogenic index of plasma in obese and non-obese volunteers: a cross-sectional descriptive-analytic case-control study, *Lipids Health Disease*, **19**(1).
- Mottillo, S., Filion, K.B., Genest, J., Joseph, L., Pilote, L., Poirier, P., Rinfret, S., Schiffrin, E.L. and Eisenberg, M.J. 2010, The metabolic syndrome and cardiovascular risk a systematic review and meta-analysis, *Journal of the American College of Cardiology*, **56**(14): 1113–1132.
- Nie, Y. and Luo, F. 2021, Dietary Fiber: An Opportunity for a Global Control of Hyperlipidemia, *Oxidative medicine and cellular longevity*.
- Nozaki, Y., Fujita, K., Yoneda, M., Wada, K., Shinohara, Y., Takahashi, H., Kirikoshi, H., Inamori, M., Kubota, K., Saito, S., Mizoue, T.,

- Masaki, N., Nagashima, Y., Terauchi, Y. and Nakajima, A. 2009, Long-term combination therapy of ezetimibe and acarbose for non-alcoholic fatty liver disease, *Journal of hepatology*, **51**(3):548–556.
- O'Connor, J.P., Kanjilal, D., Teitelbaum, M., Lin, S.S., and Cottrell, J.A. 2020, Zinc as a Therapeutic Agent in Bone Regeneration, *Materials*, **13**(10): 2211
- Oddo, V.M., Maehara, M., and Rah, J.H. 2019, Overweight in Indonesia: An Observational Study of Trends and Risk Factors Among Adults and Children, *BMJ Open*, **9**(9): e031198
- Ooi, L.G. and Liang, M.T. 2010, Cholesterol-lowering effects of probiotics and prebiotics: a review of in vivo and in vitro findings, *International journal of molecular sciences*, **11**(6): 2499–2522.
- Parasuraman, S., Raveendran, R. and Kesavan, R. 2010, Blood sample collection in small laboratory animals, *Journal of pharmacology and pharmacotherapeutics*, **1**(2): 87-93.
- Park, S., Na, W., Kim, M., Kim, E., and Sohn, C. 2012, Correlation between Intake of Dietary Fiber and Adherence to the Korean National Dietary Guidelines in Adolescents from Jeonju, *Preventive Nutrition and Food Science*, **17**(4): 254-260.
- Parnell, J.A. and Reimer, R.A. 2009, Weight loss during oligofructose supplementation is associated with decreased ghrelin and increased peptide YY in overweight and obese adults, *American Journal of American Nutrition*, **89**: 1751–1759.
- Penalva, R.A., Huoya, M., Correia, L.C., Feitosa, G.S. and Ladeia, A.M. 2008, Lipid Profile and Severity of Atherosclerotic Disease in Acute Coronary Syndrome, *Arquivos brasileiros de cardiologia*, **91**: 24-29.
- Pérez-Monter, C., Álvarez-Arce, A., Nuño-Lambarri, N., Escalona-Nández, I., Juárez-Hernández, E., Chávez-Tapia, N. C., Uribe, M. and Barbero-Becerra, V.J. 2022, Inulin Improves Diet-Induced Hepatic Steatosis and Increases Intestinal *Akkermansia* Genus Level, *International journal of molecular sciences*, **23**(2):991.
- Pérez-Montes de Oca, A., Julián, M.T., Ramos, A., Puig-Domingo, M. and Alonso, N. 2020, Microbiota, Fiber, and NAFLD: Is There Any Connection?, *Nutrients*, **12**(10): 3100.

- Perumpail, B., Muhammad, A.K., Yoo, E.R., Cholankeril, G., Kim, D. and Ahmed, A. 2017, Clinical epidemiology and disease burden of nonalcoholic fatty liver diseases, *World Journal Gastroenterology*, **23(47)**: 8263–8276.
- Pham, V.T., Seifert, N., Richard, N., Raederstorff, D., Steinert, R.E., Prudence, K. and Mohajeri, M.H. 2018, The effects of fermentation products of prebiotic fibres on gut barrier and immune functions in vitro, *PeerJ*, **6**:e5288.
- Pontzer, H., Raichlen, D.A., Wood, B.M., Mabulla, A.Z.P., Racette, S.B. and Marlowe, F.W. 2012, Hunter-Gatherer Energetics and Human Obesity, *Plos One*, **7(7)**: 1-8.
- Psaltopoulou, T., Ilias, I., and Alevizaki, M. 2010, The Role of Diet and Lifestyle in Primary, Secondary, and Tertiary Diabetes Prevention: A Review of Meta-Analyses, *The Review of Diabetic Studies*, **7(1)**: 26-35.
- Pujari, R. and Benarjee, G. 2021, Impact of Prebiotic on Immune Response: from the Bench to the clinic, *Immunology and Cell biology*, **99**: 255-273
- Rappaport, S.M. 2016, Genetic Factors Are Not the Major Causes of Chronic Diseases. *Plos One*, **11(4)**: e0154387.
- Rebello, C.J., Keller, J.N., Liu, A.G., Johnson, W.D. and Greenway, F.L. 2015, Pilot feasibility and safety study examining the effect of medium chain triglyceride supplementation in subjects with mild cognitive impairment: A randomized controlled trial, *BBA Clinical*, **3**: 123–5.
- Reynolds, A., Mann, J., Cummings, J., Winter, N., Mete, E. and Temorenga, L. 2019, Carbohydrate Quality and Human Health: A Series of Systematic Reviews and Meta-Analyses, *The Lancet*, **393(10170)**: 434-445.
- Riset Kesehatan Dasar, 2018, *Laporan Nasional Riskesdas 2018*, Indonesia: Kementerian Kesehatan Republik Indonesia.
- Roberfroid, M.B. 2005, Introducing inulin-type fructans, *British Journal Nutrition*, **93(1)**: 13-25.
- Ronis, M.J., Baumgardner, J.N., Sharma, N., Vantrease, J., Ferguson, M., Tong, Y., Wu, X., Cleves, M.A. and Badger, T.M. 2013, Medium chain triglycerides dose-dependently prevent liver pathology in a rat

- model of non-alcoholic fatty liver disease, *Experimental biology and medicine (Maywood, N.J.)*, **238**(2):151–162.
- Ryu, S., Chang, Y., Jung, H.S., Yun, K.E., Kwon, M.J. and Choi, Y. 2015, Relationship of sitting time and physical activity with non-alcoholic fatty liver disease, *Journal Hepatology*, **63**: 1229–1237.
- Saklayen, M.G. 2018, The Global Epidemic of the Metabolic Syndrome. *Current hypertension reports*, **20**(2).
- Sihombing, M. and Thandrarini, D.H. 2015, Faktor Risiko Sindrom Metabolik pada Orang Dewasa di Kota Bogor, *Penelitian Gizi dan Makanan*, **(1)**: 21-30
- Slavin, J. 2013, Fibers and Prebiotics: Mechanisms and Health Benefits, *Nutrients*, **5**(40): 1417-1435.
- Saxena, R. (eds). 2018, *Practical Hepatic Pathology : a Diagnostic Approach 2th edition*, Elsevier, Philadelphia, USA.
- Smith, A.M., Collene, A.L. and Spees, C.K. 2015, *Wardlaw's Contemporary Nutrition: A Functional Approach, 5th Edition*, Mc Graw-Hill Education, New York.
- Snel, J.T., Jonker, J., Schoones, H., Lamb, A., de Roos, H., Pijl, J.W.A., Smit, A.E., Meinders, I.M. and Jazet. 2012, Ectopic Fat and Insulin Resistance: Pathophysiology and Effect of Diet and Lifestyle Interventions, *International Journal of Endocrinology*.
- Soliman, G.A. 2019, Dietary Fiber, Atherosclerosis, and Cardiovascular Disease. *Nutrients*, **11**(5): 1155.
- Sung, M., Liao, F.H. and Chien, Y. 2018, Medium-Chain Triglycerides Lower Blood Lipids and Body Weight in Streptozotocin-Induced Type 2 Diabetes Rats, *Nutrients*, **10**(963): 1-12.
- Takeuchi, H., Sekine, S., Kojima, K. and Aoyama, T. 2008, The application of medium-chain fatty acids: edible oil with a suppressing effect on body fat accumulation, *Asia Pacific Journal Clinical Nutition*, **17**(1): 320-323.
- Tchernof, A. and Després, J.P. 2013, Pathophysiology of human visceral obesity: an update, *Physiological reviews*, **93**(1): 359–404.

- Templin, T., Cravo O.H.T., Thomson, B., Dieleman, J. and Bendavid, E. 2019, The overweight and obesity transition from the wealthy to the poor in low- and middle-income countries: A survey of household data from 103 countries, *PLoS medicine*, **16(11)**: e1002968.
- Trumbo, P., Schlicker, S., Yates, A. A., Poos, M., & Food and Nutrition Board of the Institute of Medicine, The National Academies, 2002, Dietary reference intakes for energy, carbohydrate, fiber, fat, fatty acids, cholesterol, protein and amino acids, *Journal of the American Dietetic Association*, **102(11)**: 1621–1630.
- Wang, H. J., Wang, Z. H., Zhang, J. G., Du, W.W., Su, C., Zhang, J., Zhai, F.Y. and Zhang, B. 2014, Trends in Dietary Fiber Intake in Chinese Aged 45 Years and Above 1991-2011, *European Journal of Nutrition*, **68(5)**: 619-622.
- Wang, X.X., Song, P.X., Wu, H., Xue, J.X., Zhong, X. and Zhang, L.Y. 2016, Effects of Graded Levels of Isomaltooligosaccharides on the Performance, Immune Function and Intestinal Status of Weaned Pigs, *Asian-Australasian journal of animal sciences*, **29(2)**: 250–256.
- Weeratunga, P., Jayasinghe, S., Perera, Y., Jayasena, G., and Jayasinghe, S. 2014, Per Capita Sugar Consumption and Prevalence of Diabetes Mellitus – Global and Regional Associations, *BMC Public Health*, **14(186)**: 1-6.
- Westerterp, K.R. and Speakman, J.R. 2008, Physical Activity Energy Expenditure Has Not Declined Since the 1980s and Matches Energy Expenditures of Wild Mammals, *International Journal of Obesity*, **32**: 1256-1263.
- Wijaya, H., Foe, K., Soewandhi, A., Wihadmadyatami, H., Tjahjono, Y. 2021, The effect of supplementation of Isomaltooligosaccharide and emulsified medium-chain triglycerides on blood glucose, b-hydroxybutyrate and calorie intake in male Wistar rats, *Clinical Nutrition Open Science*, **37**:35-46.
- World Health Organization, 2018, *Noncommunicable Diseases: Country Profiles 2018*, Switzerland: WHO.
- World Health Organization, 2019, *Noncommunicable Diseases*, Switzerland: WHO.

World Health Organization, 2021, *Obesity and Overweight*, Switzerland: WHO.

- Xu, Q., Liu, Y., Asquith, M. and Chu, C.Q. 2020, Alpha-Glucosidase Inhibitors Altering the Gut Microbiota and Collagen-Induced Repair Arthritis, *Frontiers in pharmacology*, **10**:1684.
- Xue, C., Liu, Y., Wang, J., Zhang, R., Zhang, Y., Zhang, J., Zhang, Y., Zheng, Z., Yu, X., Jing, H., Nosaka, N., Arai, C., Kasai, M., Aoyama, T. and Wu, J. 2009, Consumption of medium- and long-chain triacylglycerols decreases body fat and blood triglyceride in Chinese hypertriglyceridemic subjects, *European journal of clinical nutrition*, **63**(7): 879–886.
- Yanai, H. 2020, Metabolic Syndrome and COVID-19. *Cardiology research*, **11**(6): 360–365.
- Yao, Y., Cai, X., Fei, W., Ye, Y., Zhao, M. and Zheng, C. 2020, The role of short-chain fatty acids in immunity, inflammation and metabolism, *Critical reviews in food science and nutrition*, **62**(1): 1–12.
- Yee-Ying, L., Teck-Kim, T., Eng-Seng, C., Eng-Tong, P., Oi-Ming, L., Chin-Ping, T., Yong, W., Nur A.A.K., Noorlia, H.M.D. and Joo S.T. 2021, Medium chain triglyceride and medium-and long chain triglyceride: metabolism, production, health impacts and its applications – a review, *Critical Reviews in Food Science and Nutrition*.
- Yu, A.Q., Le, J., Huang, W.T., Li,B., Liang, H.X., Wang, Q., Liu, Y.T., Young, C.A., Zhang, M.Y., and Qin, S.L. 2021, The Effects of Acarbose on Non-Diabetic Overweight and Obese Patients: A Meta-Analysis. *Advances in therapy*, **38**(2), 1275–1289.
- Zhan, Y., Xu, T. and Tan, X. 2016, Two parameters reflect lipid-driven inflammatory state in acute coronary syndrome: atherogenic index of plasma, neutrophil-lymphocyte ratio, *BMC Cardiovascular Disord*, **16**: 96.
- Zhang, Y., Liu, J., Yao, J., Ji, G., Qian, L., Wang, J., Zhang, G., Tian, J., Nie, Y., Zhang, Y.E., Gold, M.S., and Liu, Y. 2014, Obesity: pathophysiology and intervention, *Nutrients*, **6**(11): 5153–5183.

- Zhang, L., Song, P., Zhang, X., Metea, C., Schleisman, M., Karstens, L., Leung, E., Zhang, J., Xu, Q., Liu, Y., Asquith, M. and Chu, C.Q. 2020, Alpha-Glucosidase Inhibitors Altering the Gut Microbiota and Collagen-Induced Repair Arthritis, *Frontiers in pharmacology*, **10**: 1684.
- Zhou, Q., Wu, J., Tang, J., Wang, J.J., Lu, C.H. and Wang, P.X. 2015, Beneficial Effect of Higher Dietary Fiber Intake on Plasma HDL-C and TC/HDL-C Ratio among Chinese Rural-to-Urban Migrant Workers, *International journal of environmental research and public health*, **12**(5): 4726–4738.
- Zhou, S., Wang, Y., Jacoby, J.J., Jiang, Y., Zhang, Y. and Yu, L.L. 2017, Effects of Medium- and Long-Chain Triacylglycerols on Lipid Metabolism and Gut Microbiota Composition in C57BL/6J Mice, *Journal of agricultural and food chemistry*, **65**(31): 6599–6607.