

DAFTAR PUSTAKA

- Abayasekara, D. R., Michael, A. E., Webley, G. E., Flint, A. P. 1993. Mode of action of prostaglandin F2 alpha in human luteinized granulosa cells: role of protein kinase C. *Mol Cell Endocrinol* 97(1-2):81-91.
- Abdennebi, L., Monget, P., Pisselet, C., Remy, J.J., salesse, R., Monniaux, D. 1999. Comparative Expression of Luteinizing Hormone and Follicle-Stimulating Hormone Receptros in Ovarian Follicles from High and Low Prolific Sheep Breeds. *Biol Reprod* 60(4): 845-854.
- Aggarwal, B.B., Kumar, A., Aggarwal, M.S., and Shishodia, S. 2005. Curcumin Derived from Turmeric (*Curcuma longa*): a Spice for All Seasons. *Phytopharmaceuticals in Cancer Chemoprevention*. CRC Press. p: 351
- Aigner, B., Renner, S., Kessler, B., Klymiuk, N., Kurome, M., Wunsch, A., Wolf, E. 2010. Transgenic Pigs as Models for Translational Biomedical Research. *J Mol Med* 88 (7): 653–664.
- Ammon, H.P.T and Wahl, M.A. 1991. Pharmacology of *Curcuma longa*. *Planta Medica* 57:1
- Anonim, 2011. *BKKBN: Jumlah Penduduk Indonesia Bisa Menggeser AS*. <http://metrotvnews.com/read/news/2011/02/09/42128/BKKBN-Jumlah-Penduduk-Indonesia-Bisa-Menggeser-AS>. Rabu, 9 Februari 2011 23:58 WI. Disitasi 29 Oktober 2011.
- Araújo, C.A.C and Leon, L.L. 2001. Biological Activities of *Curcuma longa* L. *Mem Inst Oswaldo Cruz* 96(5): 723-728
- Ascoli, M., Fanelli, F., Segaloff, D.L. 2001. The Lutropin/Choriogonadotropine Receptor, A 2002 Perspective. *Endocr Rev* 23(2): 141-174.
- Babu, P.S., Krishnamurthy, H., Chedrese, P.J., and Sairam, M.R. 2000. Activation of Extracellular-Regulated Kinase Pathways in Ovarian Granulosa Cells by the Novel Growth Factor Type 1 Follicle Stimulating Hormone Receptor. Role in Hormone Signaling and Cell Proliferation. *J Biol Chem* 275(36): 27615-27626.
- Bao, B., Kumar, N., Karp,R.M., Garverick, H.A., and Sundaram, K. 2000. Estrogen Receptor- Expression in Relation to the Expression of Luteinizing Hormone Receptor and Cytochrome P450 Enzymes in Rat Ovarian Follicles. *Biol Reprod*. 63 : 1747–1755

- Beindl, W., Mitteraur, T., Hohenegger, M., Ijzerman, A.P., Nanoff, C., and Freissmuth, M., 1996. Inhibition of Receptor/G Protein Coupling by Suramin Analogues. *Mol Pharmacol* 50(2): 415-423.
- Berndtson, A.K., Weaver, C.J., Fortune, J.E., 1996. Differential Effects of Oxytocin on Steroid Production by Bovine Granulosa Cells. *Mol Cell Endocrinol* 116(2): 191-198.
- Bhate, S. 2003. *Turmeric as Contraceptive*. <http://www.indiadvine.org/audarya/ayurveda-health-wellbeing/260760-turmeric-contraceptive.html>. Cited 24 Maret 2011.
- Bidey, S. 1998. *Handbook in Practical Animal cell Biology: Endocrine Cell Culture*. Cambridge University Press.
- Byers, M., Kuiper, G.G., Gustafsson, J.A., Park-Sarge, O.K. 1997. Estrogen Receptor-beta mRNA Expression in Rat Ovary: Down-regulation by Gonadotropins. *Mol Endocrinol* 11(2): 172-182.
- Cameron, M.R., Foster, J.S., Bukovsky, A., and Wimalasena, J. 1996. Activation of Mitogen-Activated Protein Kinase by Gonadotropins and Cyclic adenosine 5'-Monophosphat in Porcine Granulosa Cells. *Biol Reprod* 55(1): 111-119.
- Chambers, A.E., Stanley, P.F., Randeve, H., and Banerjeel, S. 2011. Microvesicle-mediated Release of Soluble LH/hCG Receptor (LHCGR) from Transfected Cells and Placenta Explants. *Reprod Biol Endocrinol* 9:64
- Chen, L.M., Wang, R. S., Lee, Y.F., Liu, N.C., Chang, Y.J., Wu, C.C., Xie, S., Hung, Y.C., Chang, C. 2008. Subfertility with Defective Folliculogenesis in Female Mice Lacking Testicular Orphan Nuclear Receptor 4. *Mol Endocrinol*. 22(4):858-867.
- Chen, S., Liu., and Segaloff, L. 2000. A Novel Cyclic Adenosine 3',5'-Monophosphate-Responsive Element Involved in the Transcriptional Regulation of the Lutropin Receptor Gene in Granulosa Cells. *Mol Endocrinol* 14(9): 1498-1508
- Chiang, C.H., Cheng, K.W., Igarashi, S., Nathwani, P.S., Leung, P.C. 2000. Hormonal Regulation of Estrogen Receptor Alpha and Beta Gene Expression in Human Granulosa-Luteal Cells In Vitro. *J Clin Endocrinol Metab* 85(10): 3828-3839.

- Chung, W.C and Kermode, J.C. 2005. Suramin Disrupt Receptor –G Protein Coupling by Blocking Association of G Protein Alpha and Beta gamma Subunit. *J Pharmacol Exp Ther* 313(1): 191-198.
- Conley, A.J., Howard, H.J., Slinger, W.D., Ford, J.J. 1994. Steroidogenesis in the Preovulatory Porcine Follicle. *Biol Reprod* 51(4): 655–661.
- Couse, J.F., Yates, M.M., Deroo, B.J and Korach, K.S. 2005. Estrogen Receptor-beta is Critical to Granulosa Cells Differentiation and the Ovulatory Response to Gonadotropins. *Endocrinology* 146(8): 3247-3262.
- Davis, B.J. Lennard, D.E., Lee, C.A., Tiano, H.F., Morham, S.G., Wetsel, W.C. and Langenbach, R. 1999. Anovulation in Cyclooxygenase-2-deficient Mice is Restored by Prostaglandin E2 and Interleukin-1-beta. *Endocrinology* 140(6): 2685-2695.
- Davis, J.S. 1994. Mechanism of Hormone Action: Luteinizing Hormone Receptors and Second-messenger Pathways. *Curr Opin Obstet Gynecol* 6: 254-261
- Davis, J.S., Weakland, L.L., Weiland, D.A., Farese, R.V., and West, L.A. 1987. Prostaglandin F2 Stimulates Phosphatidylinositol 4,5-bisphosphate Hydrolysis and Mobilizes Intracellular Ca²⁺ in Bovine Luteal Cells. *Proc Natl Acad Sci USA* 84: 3728-3732
- DeAngelis, A.M., Roy-O'reilly, M., and Rodriguez, A. 2014. Genetic Alterations Affecting Cholesterol Metabolism and Human Fertility. *Biol Reprod* 91(5): 117
- Denning-Kendall, P.A and Wathes, D.C. 1994. Acute Effects of Prostaglandin F2, Luteinizing Hormone, and Estradiol on Second Messenger Systems and on the Secretion of Oxytocin and Progesterone from Granulosa and Early Luteal Cells of the Ewe. *Biol Reprod* 50, 765-773
- Derecka, K., Zhang, F.P., Ziecik, A.J., Huhtaniemi, I. 1999. Ontogeny of LH Receptor Gene Expression in the Pig Reproductive Tract. *J Reprod Fertil* 115(2): 365–372.
- Dharma, A.P. 1985. *Tanaman Obat Tradisional Indonesia*. Cetakan pertama. PN.Balai Pustaka. Jakarta.
- Diaz, F.J., Anderson, L.E., Wu, Y.L., Rabot, A., Tsai, S.J., and Wiltbank, M.C. 2001. Regulation of Progesterone and Prostaglandin F2 alpha Production in the CL. *Mol Cell Endocrinol* 191(1): 65-80

- Dozier, B.L., Watanabe, K., and Duffy, D.M. 2008. Two Pathways for Prostaglandin F₂ (PGF₂) Synthesis by the Primate Perioovulatory Follicle. *Reproduction* 136(1): 53–63.
- Drummond, A.E., Britt, K.L., Dyson, M., Jones, M.E., Kerr, J.B., O'Donnell, L., Simpson, E.R., and Findlay, J.K. 2002. Ovarian Steroid Receptor and their Role in Ovarium Function. *Mol Cell Endocrinol* 191(1): 27-33.
- Drummond, A.E., Fuller, P.J., 2010. The Importance of ER Signalling in the Ovary. *J Endocrinol* 205(1): 15–23.
- Drummond, A.E., Fuller, P.J. 2012. Ovarian Actions of Estrogen Receptor- : An Update. *Semin Reprod Med* 30(1): 32–38.
- Drummond, A.E., Fuller, P.J., 2010. The importance of ER signalling in the ovary. *J Endocrinol* 205(1): 15–23.
- Dufau, M. L., Liao, M., and Zhang, Y. 2010. Participation of Signaling Pathways in the Derepression of Luteinizing Hormone Receptor Transcription. *Mol Cell Endocrinol* 314(2): 221
- Duffy, D.M and Stouffer, R.L. 2001. The Ovulatory Gonadotropins Surge Stimulates Cyclooxygenase Expression and Prostaglandin Production by the Monkey Follicle. *Mol Hum Reprod* 7(8):731-739
- El-Bahr, S.M. 2013. Curcumin Regulates Gene Expression of Insulin Like Growth Factor, B-Cell CLL/Lymphoma 2 and Antioxidant Enzymes in Streptozotocin Induced Diabetic Rats. *BMC Complement Altern Med* 13: 368.
- Edson, M.A., Nagaraja, A.K., and Matzuk, M.M. 2009 The Mammalian Ovary from Genesis to Revelation. *Endocr Rev* 30(6): 624-712.
- Emmen, J.M.A., Couse, J.F., Elmore, S.A., Yates, M.M., Kissling, G.E., and Korach, K.S. 2005. In Vitro Growth and Ovulation of Follicles from Ovaries of Estrogen Receptor (ER) {alpha} and ER {beta} Null Mice Indicate a Role for ER {beta} in Follicular Maturation. *Endocrinology* 146(6): 2817-2826.
- Ford, J.J and Howard, H.J. 1997. Activin Inhibition of Estradiol and Progesterone Production in Porcine Granulosa Cells. *J Anim Sci* 75(3); 761–766.
- Garg, S.K. 1974. Effect of *Curcuma longa* (Rhizome) on Fertility in Experimental Animals. *Planta Med* 26(3): 225-227.

- Ginther, O.J., Beg, M.A., Bergfelt, D.R., and Kot, K. 2002. Activin A, Estradiol, and Free Insulin-like Growth Factor I in Follicular Fluid Preceding the Experimental Assumption of Follicle Dominance in Cattle. *Biol Reprod* 67(1): 14-19.
- Gonzales-Robayna, I.J., Falender, A.E., Ochsner, S., Firestone, G.L., and Richards, J.S. 2000. Follicle-Stimulating Hormone (FSH) Stimulates Phosphorylation and Activation of Protein Kinase B (PKB/Akt) and Serum and Glucocorticoid-induced Kinase (Sgk): Evidence for A-Kinase Independent Signaling by FSH in Granulosa Cells. *Mol Endocrinol Baltim Md* 14(8): 1283-1300.
- Gruenberg, M.L., Steger, R.W., and Peluso, J.J. 1983. Follicular Development, Steroidogenesis, and Ovulation Within Ovaries Exposed in Vitro to Hormone Level Which Mimic Those of Rat Estrous Cycle. *Biol Reprod* 29(5): 1265-1275
- Gruenwald, J., Brendler, T., Jaenicke, C. 2007. *PDR for Herbal Medicine*. 4th ed. Medical Economic Company, Montvale, New Jersey.
- Gsell, S., Eschenhagen, T., Kaspareit, G. Nose, M., Scholz, H., behrens, O., and Wieland, T. 2000. Apparent Up-regulation of Stimulatory G-protein a Subunits in the Pregnant Human Myometrium is Mimicked by Elevated Smoothelin Expression. *FASEB J Off Publ Fed Am Soc Exp Biol* 14(1): 17-26.
- Gupta, S.C., Prasad, S., Kim, J.H., Patchva, S., Webb, L.J., Priyadarsini, I.K., Aggarwal, B.B. 2011. Multitargeting by Curcumin as Revealed by Molecular Interaction Studies. *Nat Prod Rep* 28(12): 1937–1955.
- Gyles, S.L., Burns, C.J., Whitehouse, B.J., Sugden, D., Marsh, P.J., Persaud, S.J., and Jones, P.M. 2001. ERKs Regulates cyclic AMP-induced Steroid Synthesis through Transcription of the Steroidogenic Acute regulatory (StAR) Gene. *J Biol Chem* 276(37): 34888-34895.
- Hadi, R.S. 2009. Mekanisme Aktivitas Kurkumin dan Pentagamavunon-0 terhadap Steroidogenesis dan Apoptosis pada Kultur Sel Luteal. *Disertasi*. Program Doktor Ilmu Kedokteran dan Kesehatan. FK UGM. Yogyakarta.
- Hadi, R.S. and Soejono, S.K. 2007. Effect of Different Concentrations of Curcumin and Pentagamavunon-0 on Progesteron Productions by Cultured Rat Luteal Cells. Curcumin Pharmacology. *Proceedings of The International Symposium on Recent Progress in Curcumin Research*. Fakultas Farmasi Universitas Gadjah Mada. 205-214.

- Hagelüken. A., Nürnberg, B., Harhammer, R., Grünbaum, L., Schunack, W., and Seifert, R. 1995. The class III Antiarrhythmic Drug Amiodarone Directly Activates Pertussis Toxin-Sensitive G Proteins. *Mol Pharmacol* 47(2): 234-240.
- Hamm, H.E. 1998. The Many Faces of G protein Signaling. *J Biol Chem* 273(2): 669-672.
- Harris, S.M., Aschenbach, L.C., Skinner, S.M., Dozier, B.L., and Duffy, D.M. 2011. Prostaglandin E2 Receptors Are Differentially Expressed in Subpopulations of Granulosa Cells from Primate Perioovulatory Follicles. *Biol Repro* 85(5): 916-923
- Hatcher, H., Planalp, R., Cho, J., Torti, F.M., and Torti, S.V., 2008. Review Curcumin: from Ancient Medicine to Current Clinical Trials. *Cell Mol Life Sci CMLS*. 65(11):1631 – 1652
- Himesh, S., Shaan, P.S., Mishra, K. Govind, N., Singhai, A.K. 2011. Qualitative and Quantitative of Curcumin from Ethanolic extract of Curcuma longa. *IRJP* 2(4):180-184.
- Hiremath, S.P., Badami, S., Hunasagatta, S.K., Patil, S.B. 2000. Antifertility and Hormonal Properties of Flavones of *Striga orobanchioides*. *Eur J Pharmacol* 391(1-2): 193–197.
- Holler, C., Freissmuth, M., and Nanoff, C. 1999. Review G Protein as Drug target. *Cell Mol Life Sci CMLS* 55(2): 257-270
- Huang, R.R., Dehaven, R.N., Cheung, A.H., Diehl, R.E., Dixon, R.A., and Strader, C.D. 1990. Identification of Allosteric Antagonist of Receptor-Guanine Nucleotide-Binding Protein Interaction. *Mol Pharmacol* 37(2): 304-310.
- Hylka, V.W and diZerega, G.S., 1990. Granulosa Cells from Pig Follicles of Different Sizes Demonstrate Maturation Differences in Their Steroidogenic Responses to FSH, Calcium Ionophore A23187, and Phorbol Diester. *J Reprod Fertil* 89(1): 181–191.
- Ikeda, S., Nakamura, K., Kogure, K., Omori, Y., Yamashita, S., Kubota, K., Mizutani, T., Miyamoto, K., and Minegishi, T. 2008. Effect of Estrogen on the Expression of Luteinizing Hormone-Human Chorionic Gonadotropin Receptor Messenger Ribonucleic Acid in Cultured Rat Granulosa Cells. *Endocrinology* 149(4):1524–1533

- Jana, N.R., Dikshit, P., Goswami, A., and Nukina, N. 2004. Inhibition of Proteasomal Function by Curcumin Induces Apoptosis through Mitochondrial Pathway. *J Biol Chem* 279(12): 11680–11685.
- Jansen, H.K., West, C., Lehman, M.N., and Padmanabhan, V. 2001. Ovarian Estrogen Receptor- β (ER β) Regulation: I. Changes in ER β Messenger RNA Expression Prior to Ovulation in the Ewe. *Biol Reprod* 65(3): 866–872
- Jeppensen, J.V., Kristensen, S.G., Nielsen, M.E., Humaidan, P., Dal Canto, M., Fadini, R., Schmidt, K.T., Ernst E, E., and Yding Andersen, C. 2012. LH-Receptor Gene Expression in Human Granulosa and Cumulus Cells from Antral and Preovulatory Follicles. *J Clin Endocrinol Metab* 97(8): E1524-1531.
- Kahlenborn, C., Modugno, F., Potter, D.M., Severs, W.B., 2006. Oral Contraceptive Use as a Risk Factor for Premenopausal Breast Cancer: a Meta-analysis. *Mayo Clin. Proc* 81(10): 1290–1302.
- Karolczak-Bayatti, M., Abu-Amara, T.M.M., and Europe-Finner, G.N. 2012. Expression of the GTP-binding Protein G s in Human Myometrial Cells is Regulated by Ubiquitination and Protein Degradation: Involvement of Proteasomal Inhibition by Trichostatin A. *Rreprod Sci* 19(12): 1323-1331.
- Karolczak-Bayatti, M., Loughney, A.D., Robson, S.C., and Europe-Finner, G.N.2011. Epigenetic Modulation of the Protein Kinase A RII (PRKAR2A) Gene by Histon Deacetylases 1 and 2 in Human Smooth Muscle Cells. *J Cell Mol Med* 15(1): 94-108.
- Katzenellenbogen, B.S. 1996. Estrogen Receptors: Bioactivities and Interactions with cell Signaling Pathways. *Biol Reprod* 54(2): 287-293. Kahlenborn, C., Modugno, F., Potter, D.M., and Severs, W.B. 2006. Oral Contraceptive Use as a Risk Factor for Premenopausal Breast Cancer: A Meta-analysis. *Mayo Clin Proc* 81(10):1290-1302
- Kawate, N. 2004. Studies on the Regulation of Expression of Luteinizing Hormone Receptor in the Ovary and the Mechanism of Follicular Cyst Formation in Ruminants. *J Reprod Dev* 50 (1): 1-8.
- Kohli, K., Ali, J., Ansari, M.J., and Raheman, Z. 2005. Curcumin : A Natural Antiinflammatory Agent. *Indian J Pharmacol* 37(3): 141-147.

- Kojima, A.Y., Kobayashi, S., Acosta, T.J., Kudo, M., Miyamoto, A., Takagi, M., Miyazawa, K., and Sato, K. 2001. Effects of LH and PGF2alpha in Equine Dominant Follicles Observed by MDS. *J Vet Med Sci Jpn Soc Vet Sci* 64(2): 119-122.
- Lecker, S.H., Goldberg, A.L., and Mitch, W.E. 2006. Protein Degradation by the Ubiquitin-Proteasome Pathway in Normal and Disease States. *J Am Soc Nephrol* 17: 1807-1819
- Li, X.M., Juorio, A.V., and Murphy, B.D. 1993. Prostaglandins Alter the Abundance of Messenger Ribonucleic Acid for Steroidogenic Enzymes in Cultured Porcine Granulosa Cells. *Biol Reprod* 48(6): 1360-1366.
- Lindeberg, M., Carlstrom, K., Ritvos, O., and Hovatta, O. 2007. Gonadotropin Stimulation of Non-Luteinized Granulosa Cells Increases Steroid Production and The Expression of Enzymes Involved in Estrogen and Progesterone Synthesis. *Human Reproduction* 22(2): 401-406
- López Bernal, A., Bellinger, J., Marshall, J.M., Phaneuf, S., Europe-Finner, G.N., Asbóth, G., and Barlow, D.H. 1995. G Protein Expression and Second Messenger Formation in Human Granulosa Cells. *J Reprod Fertil* 104(1): 77-83.
- Lunney, J.K. 2007. Advances in Swine Biomedical Model Genomics. *Int J Biol Sci* 3(3): 179-184.
- Lupulescu, A.P. 1977. Cytologic and Metabolic Effects of Prostaglandins on Rat Skin. *J Invest Dermatol* 68(3): 138-145.
- Maheswaran, A., Brindha, P., Mullaicharam, A.L., Ravichandiran, V. 2014. Physicochemical and Phytochemical Investigation of *Curcuma Longa* Linn. Rhizome. *Am J PharmTech Res* 4(1).
- Mamluk, R., Chen, D., Greber, Y., Davis, J.S., and Meidan, R. 1998. Characterization of Messenger Ribonucleic Acid Expression for Prostaglandin F2 Alpha and Luteinizing Hormone Receptors in Various Bovine Luteal Cell Types. *Biol Reprod* 58(3): 849-856.
- Martin, C.J.H., Watson, R.R., and Preedy, V.R. 2013. *Nutrition and Diet in Menopause*. Humana Press, Springer New York Heidelberg Dordrecht London.p 168.

- Mehlhorn, H. 2011. *Nature Helps: How Plants and Other Organism Contribute to Solve Health Problems*. Springer-Verlag, Berlin Heidelberg.
- Milacic, V., Banerjee, S., Landis-Piwowar, K.R., Sarkar, F.H., Majumdar, A.P.N., and Dou, Q.P. 2008. Curcumin Inhibits the Proteasome Activity in Human Colon Cancer Cells in Vitro and in Vivo. *Cancer Res.* 68(18): 7283–7292.
- Milligan, G and Kostenis, E. 2006. Heterotrimeric G-proteins: A Short History. *Br J Pharmacol* 147 Suppl: S46-55.
- Minegishi, T., Nakamura, K., Yamashita, S., Ikeda, S., and Kogure, K. 2008. Regulation of Human Luteinizing Hormone Receptor in the Ovary. *Reprod Med Biol* 7(1): 11-16
- Murphy, B.D., 2000. Models of Luteinization. *Biol Reprod* 63(1): 2–11.
- Nair, A.K., Young, M.A., Menon, K.M.J. 2008. Regulation of Luteinizing Hormone Receptor mRNA Expression by Mevalonate kinase-Role of the Catalytic Center in mRNA Recognition. *FEBS J* 275(13): 3397-3407.
- Nurchahyo, H. 2003. Steroidogenesis, Proliferasi, dan Apoptosis pada Kultur Sel Granulosa Berbagai Ukuran Folikel Ovarium Babi setelah pemberian Kurkumin atau Pentagamavunon-0 dengan Rangsangan FSH, LH, dan/atau PGF2 . *Disertasi*. Universitas Gadjah Mada Yogyakarta
- Nurchahyo, H and Soejono, S.K. 2006. The Effects of Curcumin and Pentagamavunon-0 (PGV-0) on the Steroidogenesis, Proliferative activity, and Apoptosis in Cultured Porcine Granulosa Cells at Varying Stages of Follicular Growth in *Recent Development in Curcumin Pharmacochimistry Proceedings of The International Symposium on Recent Progress in Curcumin Research*. Fakultas Farmasi Universitas Gadjah Mada Yogyakarta.227- 241
- Nynca, A and Ciereszko, RE. 2006. Effect of Genistein on Steroidogenic Response of Granulosa cell Populations from Porcine Preovulatory Follicles. *Reprod Biol* (6(1): 31-50
- Nynca, A., Jablonska, O., Slomczynska, M., Petroff, B.K, and Ciereszko, R.E. 2009. Effects of Phytoestrogen Daidzein and Estradiol on Steroidogenesis and Expression of Estrogen Receptors in Porcine Luteinized Granulosa Cells From Large Follicles. *J Physiol Pharmacol: Off J Pol Physiol Soc* 60(2): 95-105

- Nynca, A., Nynca, J., W sowska, B., Kolesarova, A., Kołomycka, A., and Ciereszko, R.E, 2013a. Effects of the Phytoestrogen, Genistein, and Protein Tyrosine Kinase Inhibitor-Dependent Mechanisms on Steroidogenesis and Estrogen Receptor Expression in Porcine Granulosa Cells of Medium Follicles. *Domest Anim Endocrinol* 44(1): 10–18.
- Nynca, A., Swigonska, S., Piasecka, J., Kolomycka, A., Kaminska, B., Radziejewicz-Pigiel, M., Gut-Nagel, M., Ciereszko, R.E. 2013b. Biochanin A Affects Steroidogenesis and Estrogen Receptor- Expression in Porcine Granulosa Cells. *Theriogenology* 80(7): 821–828.
- Oldham, W.M and Hamm, H.E. 2008. Heterotrimetric G Protein Activation by G-Protein-Coupled Receptors. *Nat Rev Mol Cell Biol* 9(1): 60-71.
- Orun, O. 2006. A Structural approach to G-protein Signaling Mechanism: β -subunits. *Marmara Medical Journal* 19(1): 41-45.
- Osteen, K.G., Anderson, L.D., Reichert, L.E., and Channing, C.P. 1985. Follicular Fluid Modulation of Functional LH Receptor induction in Pig Granulose Cells. *J Reprod Fertil* 74(2): 407-418.
- Otte, A.P., McGrew, L.L., Olate, J., Nathanson, N.M., and Moon, R.T. 1992. Expression and potential functions of G-protein subunits in embryos of *Xenopus laevis*. *Dev Camb Engl* 116(1): 141-146
- Pari, L., Tewas, D., and Eckel J. 2008. Role of Curcumin in Health and Disease. *Arch Physiol Biochem* 114(2): 127 – 149
- Pavlik, R., Wypior, G., Hecht, S., Papadopoulos, P., Kupka, M., Thaler, C., Wiest, L., pestka, A., Friese, K., and Jeschke, U. 2011. Induction of G Protein-Coupled Estrgen Receptor (GPER) and Nuclear Steroid Hormone Receptors by Gonadotropins in Human Granulose Cells. *Histochem Cell Biol* 136(3): 289-299
- Pelletier, G and El-Alfy, M. 2000. Immunocytochemical Localization of Estrogen Receptor and in the Human Reproductive Organs. *J Clin Endocrinol Metab* 85(12): 4835-4840.
- Picton, H.M., Campbell, B.K., Hunter, M.G. 1999. Maintenance of Oestradiol Production and expression of Cytochrome P450 Aromatase Enzyme mRNA in

Long-term Serum-free Cultures of Pig Granulosa Cells. *J Reprod Fertil* 115(1): 67–77.

Pinzone, J. J., Stevenson, H., Strobl, J.S., and Berg, P. E. 2004. Molecular and Cellular Determinants of Estrogen Receptor Expression. *Mol Cell Biol* 24(11): 4605–4612

Priyadarsini, K.I. Maity, D.K., Naik, G.H., Kumar, M.S., Unnikrishnan, M.K., Satav, J.G., Mohan, H. 2003. Role of Phenolic O-H and Methylen Hydrogen on the Free Radical Reactions and Antioxidant Activity of Curcumin. *Free Radic Biol Med* 35(5): 474-484

Purwaningsih, E. 2009. Sasaran Aksi Kurkumin dan Pentagamavunon-0 pada Steroidogenesis: Kajian Kadar cAMP, Fosforilasi *Extracellular Signal Regulated Kinase* (ERK) dan Ekspresi Sitokrom P450scc pada Kultur Sel Luteal. *Disertasi*. Program Doktor Ilmu Kedokteran dan Kesehatan, Fakultas Kedokteran Universitas Gadjah Mada Yogyakarta

Purwaningsih, E., Meiyanto, E., Dasuki, D., dan Soejono, S.K. 2007. Efek Kurkumin Sintesis dan Pentagamavunon-0 terhadap Produksi Progesteron Kultur Sel Luteal dengan Pemberian Forskolin. *Jurnal Kedokteran Yarsi*. 15(3):171-177.

Puspita, D. 2011. Ekspresi Siklooksigenase-2 (COX-2) di Sel Granulosa Folikel Ovarium Akibat Pemberian Kurkumin Dengan dan Tanpa Penambahan Teofilin Setelah Stimulasi LH (Kajian *In Vivo* untuk Menentukan Letak kerja Kurkumin pada *rattus norvegicus strain Sprague Dawley* dalam Jalur Transduksi Signal Ekspresi COX-2 pada Jalur cAMP). *Tesis*. program Studi Ilmu Kedokteran Dasar dan Biomedis. Minat Utama Biomedis dan Reproduksi Manusia. Program Pascasarjana Fakultas Kedokteran Universitas Gadjah Mada Yogyakarta.

Putra, H. 2009. 2050 Dunia Akan Meledak. *Gemari* Ed.99, Tahun X.

Rajuddin. 2015. Kurkumin pada Proses Steroidogenesis dan Folikulogenesis pada wanita Subur: Kajian terhadap kadar LH, Estradiol, progesterone, dan ekspresi COX-2, VEGF, Ketebalan endometrium, dan Ukuran Folikel Ovarium. *Disertasi*. Fakultas Kedokteran Universitas Gadjah Mada, Yogyakarta.

Rapiejko, P.J., Watkins, D.C., Ros, M., Malbon, C.C. 1989. Thyroid Hormone Regulate G-Protein beta-subunit mRNA Expression In Vivo. *J Biol Chem* 264(27): 16183-16189.

- Rithaporn, T., Monga, M., Rajasekaran, M. 2003. Curcumin: A Potential Vaginal Contraceptive. *Contraception* 68(3): 219-223.
- Rodgers., B.D., Bernier, M., and Levine, M.A. 2001. Endocrine regulation of G-protein subunit production in an animal model of type 2 diabetes mellitus. *J Endocrinol* 168(3): 509–515
- Seger, R., Hanoch, T., Rosenberg, R., Dantes, A., Merz, W.E., Strauss, J.F., and Amsterdam, A. 2001. The ERK Signaling Cascade Inhibits Gonadotropin-Stimulated Steroidogenesis. *J Biol Chem* 276(17): 13957-13964
- Seifert, R., Hagelüken, A., Höer, A., Höer, D., Grünbaum, L., Offermanns, S., Schwaner, I., Zingel, V., Schunack, W., and Schultz, G. 1994. The H1 receptor agonist 2-(3-chlorophenyl)histamine Activates Gi Proteins in HL-60 Cells through A Mechanism that is Independent of Known Histamine receptor Subtypes. *Mol Pharmacol* 45(4): 578-586.
- Shah, G.M., Khan, M.A., Ahmad, M., Zafar, M., and Khan, A.A., 2009. Observations on Antifertility and Abortifacient Herbal Drugs. *African J of Biotechnol* 8 (9): 1959-1964
- Shanmugam, M., Pandita, S., and Palta, P. 2010. Effects of FSH and LH on Steroid Production by Buffalo (*Bubalus bubalis*) Granulosa Cells Cultured in Vitro under Serum-Free Conditions. *Reprod Domest Anim* 45(5): 922–926.
- Sharma, R.A., Gescher, A.J., and Steward, W.P. 2005. Curcumin: The story so far. *Eur J Cancer* 41(13): 1955–1968
- Sharma, S.C., Clemens, J.W., Pisarska, M.D., and Richards, J.S. 1999. Expression and Function of Estrogen Receptor Subtypes in Granulosa Cells: Regulation by Estradiol and Forskolin. *Endocrinology* 140 (9): 4320-4334
- Shea-Eaton, W., Sandhoff, T.W., Lopez, D., Hales, D.B., and McLean, M.P. 2002. Transcriptional Repression of the Rat Steroidogenic Acute Regulatory (StAR) Protein Gene by the AP-1 Family Member c-Fos. *Mol Cell Endocrinol* 188(1-2): 161-170.
- Shemesh, M., Mizrachi, D., Gurevich, M., Shore, L.S., Reed, J., Chang, S.M., Thatcher, W.W., and Fields, M.J. 2001. Expression of Functional Luteinizing Hormone (LH) Receptor and Its Messenger Ribonucleic Acid in Bovine Endometrium: LH Augmentation of cAMP and Inositol Phosphate In Vitro and

Human Chorionic Gonadotropin (hCG) Augmentation of Peripheral Prostaglandin In Vivo. *Reprod Biol* 1(2): 13-23.

Shenouda, N.S., Zhou, C., Browning, J.D., Ansell, P.J., Sakla, M.S., Lubahn, D.B., and Macdonald, R.S. 2004. Phytoestrogens in Common Herbs Regulates Prostate Cancer Cell growth In Vitro. *Nutr Cancer* 49(2): 200-2008.

Shi, H and Segaloff, D.L. 1995. A Role for Increased Lutropin/Choriogonadotropin Receptor (LHR) Gene Transcription in the Follitropin-Stimulated Induction of the LHR in Granulosa Cells. *Mol Endocrinol* 9(6): 734-744.

Silva, J.M and Price, C.A. 2000. Effect of Follicle-Stimulating Hormone on Steroid Secretion and Messenger Ribonucleic Acids Encoding Cytochromes P450 Aromatase and Cholesterol Side-Chain Cleavage in Bovine Granulosa Cells in Vitro. *Biol Reprod* 62(1): 186-191.

Simoni, M., Gromol, J., and Nieschlag, E. 1997. The Follicle-Stimulating Hormone Receptor: Biochemistry, Molecular Biology, Physiology, and Pathophysiology. *Endocr Rev* 18(6): 739-773.

Sirotkin, A.V., Makarevich, A.V., Kotwica, J., Marnet, P.G., Kwon, H.B., Hetenyi, L. 1998. Isolated Porcine Ovarian Follicles as a Model for the Study of Hormone and Growth Factor Action on Ovarian Secretory Activity. *J Endocrinol* 159(2): 313-321.

Singh, P and Krishna, A. 2010. Effects of GnRH Agonist Treatment on Steroidogenesis and Folliculogenesis in the Ovary of Cyclic Mice. *J Ovarian Res* 3:26

Sirait, A.M., Oemiati, R, dan Indrawati L. 2009. Hubungan Kontrasepsi Pil dengan Tumor/Kanker Payudara di Indonesia. *Maj Kedokt Indon* 59(8): 348-356.

Smith, C.P., 2000. *Information Resources on Swine in Biomedical Research*. <http://awic.nal.usda.gov/contact-us>. Cited 4 Mei 2015.

Soejono, S.K., Amin, S.M., Nurcahyo, H., dan Hadi, R.S. 2001. Peran Kurkumin Sintesis dan Analognya (Pentagamavunon-0) pada Produksi Progesteron oleh Kultur Sel Luteal Tikus (Sprague Dawley). *Mediagama* 3 (3): 42-29.

Spicer, L.J., Alpizar, E., and Echtenkamp, S.E. 1993. Effects f Insulin, Insulin-Like Growth Factor I, and Gonadotropins on Bovine Granulosa Cell Proliferation,

Progesterone Production, Estradiol Production, and(or) Insulin-Like Growth Factor I Production in Vitro. *J Anim Sci* 71(5): 1232–1241.

Stocco, D.M., Wang, X., Jo, Y., and Manna, P.R. 2005. Multiple Signaling Pathways Regulating Steroidogenesis and Steroidogenic Acute Regulatory Protein Expression: More Complicated than We Thought. *Mol Endocrinol* 19(11): 2647-2659.

Strauss III, J.F 2009. The Synthesis and Metabolism of Steroid Hormones. Chapter 4. *Yen and Jaffe's Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management*. 6th Edition. Editor: Stefanie Jewell-Thomas, P: 85

Strauss III, J.F and Williams, C.J. 2009. The Ovarian Life Cycle in *Yen and Jaffe's Reproductive Endocrinology: Physiology, Pathophysiology, and Clinical Management*. 6th Edition. Editor: Stefanie Jewell-Thomas, P:156

Strauss, J.F., Kallen, C.B., Christenson, L.K., Watari, H., Devoto, L., Arakene, F., Kiriakidou, M., and Sugawra, T. 1999. The Steroidogenic Acute Regulatory Protein (StAR): A Window into the Complexities of Intracellular Cholesterol Trafficking. *Recent Prog Horm Res* 54: 369-394.

Swindle, M.M., Makin, A., Herron, A.J., Clubb, F.J., Frazier, K.S. 2012. Swine as Models in Biomedical Research and Toxicology Testing. *Vet Pathol* 49(2): 344–356.

Syarif, R.A and Soejono, S.K. 2011. Mekanisme Kerja Kurkumin sebagai Antifertilitas: Kajian Aktivitas 3 Hydroxisteroid Dehydrogenase oleh Kultur sel Luteal Tikus secara Sitokimia dalam *Abstrak dan Program PITNAS I Pefardi "Implementasi Ilmu farmasi Kedokteran dalam Praktek Kedokteran dan Aplikasi Klinik Hasil Pengembangan Obat Herbal"*. Fakultas Kedokteran Universitas Maranatha, Bandung, Jawa Barat, Indonesia.

Syarif, R.A., Sunaryo, R.B., Haposan, J.H., Wahyuningsih, M.S.H., and Soejono, S.K. 2014. Pengaruh Kurkumin dan Ekstrak Etanol Kunyit (*Curcuma longa* L) terhadap Viabilitas Kultur Sel Granulosa Ovarium Babi dalam *Prosiding Peluang dan Tantangan Obat Tradisional dalam pelayanan Kesehatan Formal*. Bagian Farmakologi dan Terapi Fakultas Kedokteran Universitas Gadjah Mada, Yogyakarta.

- Tai, C.J., Kang, T., Choi, K.C., Tzeng, C.R., and Leung, P.C. 2001. Role of Mitogen-Activated Protein Kinase in Prostaglandine F(2alpha) Action in Human Granulosa-Luteal Cells. *J Clin Endocrinol Metab* 86(1): 375-380.
- Tajima, K., Dantes, A., Yao, Z., Sorokina, K., Kotsuji, F., Seger, R., and Amsterdam, A. 2003. Down-regulation of Steroidogenic Response to Gonadotropins in Human and Rat Preovulatory Granulosa Cells Involves Mitogen-Activated Protein Kinase Activation and Modulation of DAX-1 and Steroidogenic Factor-1. *J Clin Endocrinol Metab* 88(5): 2288–2299.
- Tamura, K., Kawaguchi, T, and Kogo, H. 2001. Interleukin-6 Inhibits the Expression of Luteinizing Hormone Receptor mRNA during the Maturation of Cultured Rat Granulosa Cells. *J Endocrinol* 170(1): 121-127.
- Terranova, P.F. 2003. The Female Reproductive System in *Medical Physiology*. . 2nd ed. Rhoades, RA and Tanner, GA. Lippincott William & Wilkins.667-683.
- Tesmer, J.J.G. 2010. The Quest to Understand Heterotrimeric G Protein Signaling. *Nat Struct Mol Biol* 17(6): 650-652
- Thakur, S., Bawara, B., Dubey, A, Nandini, D, Chauhan, N.S., and Saraf, D.K. 2009. Effect of *Carum carvi* and *Curcuma longa* on Hormonal and Reproductive Parameter of Female Rats. *Int J Phytomedicine* 1(1): 31-38
- Thill, M., Becker, S., Fischer, D., Cordes, T., Hornemann, A., Diedrich, K., Salehin, D., and Friedrich, M. 2009. Expression of Prostaglandin Metabolising Enzymes COX-2 and 15-PGDH and VDR in Human Granulosa Cells. *Anticancer Res* 29(9): 3611-3618
- Tsai, S-J and Wiltbak, M.C. 2001. Differential Effects of Prostaglandin F2 on in vitro Luteinized Bovine Granulosa Cells. *Reproduction* 122:245–253
- Turner, J.V., Agatonovic-Kustrin, S., and Glass, B.D. 2007. Molecular Aspects of Phytoestrogen Selective Binding at Estrogen Receptors. *J Pharm Sci*. 96(8):1879-85.
- Valentine, S.P., Le Nedelec, M.J., Menzies, A.R., Scandlyn, M.J., Goodin, M.G., and Rosengren, R.J. 2006. Curcumin Modulates Drug Metabolizing Enzymes in the Female Swiss Webster Mouse. *Life Sci*. 78(20):2391-2398.
- Vazeille, E., Slimani, L., Claustre, A., Magne, H., Labas, R., Béchet, D., Taillandier, D., Dardevet, D., Astruc, T., Attaix, D., and Combaret, L. 2012. Curcumin Treatment Prevents Increased Proteasome and Apoptosome Activities in Rat

Skeletal Muscle during Reloading and Improves Subsequent Recovery. *J Nutr Biochem* 23(3): 245–251.

Vezzosi, D and Bertherat, J. 2011. Phosphodiesterases in endocrine Physiology and Disease. *Euer J Endocrinol* 165(2): 177-188.

Vladusic, E.A., Hornby, A.E., Guerra-Vladusic, F.K., Lakins, J., and Lupu, S. 2000. Expression and Regulation of Estrogen Receptor beta in Human Breast Tumors and Cell Lines. *Oncol Rep* 7 (1): 157-224

Walker, W.H and Cheng, J. 2005. FSH and Testosterone Signaling in Sertoli Cells. *Reprod* 130(1): 15-28

Wang, L., Nair, A.K., and Menon, K.M.J. 2007. Ribonucleic Acid Binding Protein-mediated regulation of Luteinizing Hormone receptor Expression in Granulosa Cells Rat: Relationship to Sterol Metabolism. *Mol Endocrinol* 21(9): 2233-2241.

Willard, F.S and Crouch, M.F. 2000. Nuclear and Cytoskeletal Translocation and Localization of Heterotrimeric G-Proteins. *Immunol and Cell Biol* 78(4): 387-394.

Wood, J.R. and Strauss III, J.F. 2002. Multiple Signal Transduction Pathways Regulate Ovarian Steroidogenesis. *Rev Endocr Metab Disord* 3(1): 33-46

Worzfeld, T., Wettschureck, N., and Offermanns, S. 2008, G(12)/G(13)-mediated Signalling in Mammalian Physiology and Disease. *Trends Pharmacol Sci* 29(11): 582-589

Xia, Y., Jin, L., Zhang, B., Xue, H., Li, Q., and Xu, Y. 2007. The Potentiation of Curcumin on Insulin-Like Growth Factor-1 Action in MCF-7 Human Breast Carcinoma Cells. *Life Sci* 80(23): 2161–2169.

Yamazaki, J., Katoh, H., Yamaguchi, Y., and Negishi, M. 2005. Two G12 Family G Proteins, G alpha12 and G alpha13, Show Different Subcellular Localization. *Biochem Biophys Res Commun* 332(3): 782-786

Yang, P. 2002. Expression of ER- and ER- in the Hamster Ovary: Differential Regulation by Gonadotropins and Ovarian Steroid Hormones. *Endocrinology* 143, 2385–2398.

- Yu, F.-Q., Han, C.-S., Yang, W., Jin, X., Hu, Z.-Y., and Liu, Y.-X. 2005. Activation of the p38 MAPK Pathway by Follicle-Stimulating Hormone Regulates Steroidogenesis in Granulosa Cells Differentially. *J Endocrinol* 186(1): 85–96.
- Yung, Y., Aviel-Ronen, S., Maman, E., Rubinstein, N., Avivi, C., Orvieto, R., and Hourvitz, A. 2014. Localization of Luteinizing Hormone receptor protein in the Human ovary. *Mol Hum Reprod* 20(9): 844-849.
- Zhang, D and Trudeau, V.L. 2010. Chapter 15 Estrogen Signaling Mechanism in *Signal Transductions: Pathways, Mechanisms, and Diseases*. Editor: Sitaramaya, A. Springer-Verlag Berlin Heidelberg. P: 273-288.
- Zhang, Y and Duffau, M.L. 2002. Silencing of Transcription of the Human Luteinizing Hormone Receptor Gene by Histone Deacetylase-mSin3A Complex. *J Biol Chem* 277(36): 33431-33438.
- Zhao, C., Dahlman-Wright, K., and Gustafsson, J.-A. 2008. Estrogen receptor beta: An Overview and Update. *Nucl Recept Signal* 6: e003.
- Zhao, C., Dahlman-Wright, K., Gustafsson, J.Å. 2010. Estrogen Signaling via Estrogen Receptor . *J Biol Chem* 285(51): 39575–39579.
- Zhao, E and Mu, Q. 2011. Phytoestrogen Biological Actions on Mammalian Reproductive System and Cancer Growth. *Sci Pharm* 79(1): 1–20.