

DAFTAR PUSTAKA

- Abbara, A., Dhillon, W.S., 2021. Targeting Elevated GnRH Pulsatility to Treat Polycystic Ovary Syndrome. *J. Clin. Endocrinol. Metab.* 106, e4275–e4277. <https://doi.org/10.1210/clinem/dgab422>
- Abed, F., Fallah-Karkan, M., Majidi Zolbin, M., Naghizadeh, P., Aliakbari, F., Yazdekhashti, H., 2020. Effects of vascular endothelial growth factor supplementation and alginate embedding on human oocyte maturation in vitro. *Asian Pacific Journal of Reproduction* 9, 129. <https://doi.org/10.4103/2305-0500.284270>
- Abeydeera, L.R., 2002. In vitro production of embryos in swine. *Theriogenology* 57, 257–273. [https://doi.org/10.1016/S0093-691X\(01\)00670-7](https://doi.org/10.1016/S0093-691X(01)00670-7)
- Adeoye, O., Olawumi, J., Opeyemi, A., Christiania, O., 2017. Review on the role of glutathione on oxidative stress and infertility. *JBRA Assist. Reprod.* <https://doi.org/10.5935/1518-0557.20180003>
- Agarwal, A., Gupta, S., Sharma, R.K., 2005. Role of oxidative stress in female reproduction. *Reproductive Biology and Endocrinology* 3, 28. <https://doi.org/10.1186/1477-7827-3-28>
- Ahmadi, F., Gharaei, R., Shirali, E., Adabi, K., Alishahi, V., Tajaldini, M., 2025. The impact of platelet-rich plasma (PRP) on ovarian function and oocyte quality: A comprehensive review. *J. Reprod. Immunol.* 172, 104649. <https://doi.org/10.1016/j.jri.2025.104649>
- Al-Gubory, K.H., Fowler, P.A., Garrel, C., 2010. The roles of cellular reactive oxygen species, oxidative stress and antioxidants in pregnancy outcomes. *Int. J. Biochem. Cell Biol.* 42, 1634–1650. <https://doi.org/10.1016/j.biocel.2010.06.001>
- Ali, A.A., Bilodeau, J.F., Sirard, M.A., 2003. Antioxidant requirements for bovine oocytes varies during in vitro maturation, fertilization and development. *Theriogenology* 59, 939–949. [https://doi.org/10.1016/S0093-691X\(02\)01125-1](https://doi.org/10.1016/S0093-691X(02)01125-1)
- Alves, R., Grimalt, R., 2018. A Review of Platelet-Rich Plasma: History, Biology, Mechanism of Action, and Classification. *Skin Appendage Disord.* 4, 18–24. <https://doi.org/10.1159/000477353>
- Amable, P.R., Carias, R.B.V., Teixeira, M.V.T., da Cruz Pacheco, Í., Corrêa do Amaral, R.J.F., Granjeiro, J.M., Borojevic, R., 2013. Platelet-rich plasma preparation for regenerative medicine: optimization and quantification of cytokines and growth factors. *Stem Cell Res. Ther.* 4, 67. <https://doi.org/10.1186/scrt218>
- Anzani, B.P., 2020. Literature Review: Perbandingan Efektivitas Platelet Rich Plasma (PRP) dengan Asam Hialuronat (HA) sebagai Terapi Osteoarthritis. *Jurnal Kesehatan* 11, 158–166. <https://doi.org/10.26630/jk.v11i1.1608>
- Ashourzadeh, S., Khalili, M.A., Omid, M., Nottola, S.A., Faramarzi, A., 2021. Supplementation of IVM culture media with GDF-9 can potentially enhance oocyte quality, fertilization and embryo development in ICSI procedure. *Central Asian Journal of Medical and Pharmaceutical Sciences Innovation* 2,

- 44–54. <https://doi.org/10.22034/CAJMPSI.2021.02.01>
- Atakul, N., Şermin Kılıç, B., 2021. The Correlation of Calculated Testosterone Indices with Metabolic Markers in Polycystic Ovarian Syndrome. *Cyprus Journal of Medical Sciences* 6, 63–68. <https://doi.org/10.4274/cjms.2021.2021-199>
- Azziz, R., Carmina, E., Chen, Z., Dunaif, A., Laven, J.S.E., Legro, R.S., Lizneva, D., Natterson-Horowitz, B., Teede, H.J., Yildiz, B.O., 2016. Polycystic ovary syndrome. *Nat. Rev. Dis. Primers* 2, 16057. <https://doi.org/10.1038/nrdp.2016.57>
- Bahadur, A., Afreen, T., Heda, A., Mundhra, R., Naithani, M., Verma, R., Ratala, M.L., Jakhar, P., Vishwakarma, A., Khan, N., 2025. Prevalence of Polycystic Ovary Syndrome Phenotypes and Their Association With Vitamin D Levels, Insulin Resistance, and Homeostasis Model Assessment of Insulin Resistance in Women With Polycystic Ovary Syndrome: A Cross-Sectional Analysis. *Cureus*. <https://doi.org/10.7759/cureus.95156>
- Bakacak, M., Bostanci, M.S., İnanc, F., Yaylali, A., Serin, S., Attar, R., Yildirim, G., Yildirim, O.K., 2016. Protective Effect of Platelet Rich Plasma on Experimental Ischemia/Reperfusion Injury in Rat Ovary. *Gynecol. Obstet. Invest.* 81, 225–231. <https://doi.org/10.1159/000440617>
- Barad, D.H., Albertini, D.F., Molinari, E., Gleicher, N., 2022. Preliminary report of intraovarian injections of autologous platelet-rich plasma (PRP) in extremely poor prognosis patients with only oocyte donation as alternative: a prospective cohort study. *Hum. Reprod. Open* 2022. <https://doi.org/10.1093/hropen/hoac027>
- Barrera, S.S., Naranjo-Gomez, J.S., Rondón-Barragán, I.S., 2023. Thermoprotective molecules: Effect of insulin-like growth factor type I (IGF-1) in cattle oocytes exposed to high temperatures. *Heliyon* 9, e14375. <https://doi.org/10.1016/j.heliyon.2023.e14375>
- Belli, M., Shimasaki, S., 2018. Molecular Aspects and Clinical Relevance of GDF9 and BMP15 in Ovarian Function. pp. 317–348. <https://doi.org/10.1016/bs.vh.2017.12.003>
- Bhattacharya, K., Saha, I., Sen, D., Bose, C., Chaudhuri, G.R., Dutta, S., Sengupta, P., Bhattacharya, S., Barman, S.S., Syamal, A.K., 2022. Role of anti-Müllerian hormone in polycystic ovary syndrome. *Middle East Fertil. Soc. J.* <https://doi.org/10.1186/s43043-022-00123-5>
- Borrione, P., Gianfrancesco, A. Di, Pereira, M.T., Pigozzi, F., 2010. Platelet-Rich Plasma in Muscle Healing. *Am. J. Phys. Med. Rehabil.* 89, 854–861. <https://doi.org/10.1097/PHM.0b013e3181f1c1c7>
- Borup, R., Thuesen, L.L., Andersen, C.Y., Nyboe-Andersen, A., Ziebe, S., Winther, O., Grøndahl, M.L., 2016. Competence Classification of Cumulus and Granulosa Cell Transcriptome in Embryos Matched by Morphology and Female Age. *PLoS One* 11, e0153562. <https://doi.org/10.1371/journal.pone.0153562>
- Bos-Mikich, A., Ferreira, M.O., de Oliveira, R., Frantz, N., 2019. Platelet-rich plasma or blood-derived products to improve endometrial receptivity? *J. Assist. Reprod. Genet.* 36, 613–620. <https://doi.org/10.1007/s10815-018->

1386-z

- Bulsara, J., Patel, P., Soni, A., Acharya, S., 2021. A review: Brief insight into Polycystic Ovarian syndrome. *Endocrine and Metabolic Science* 3, 100085. <https://doi.org/10.1016/j.endmts.2021.100085>
- Buratini, J., Dellaqua, T.T., de Lima, P.F., Renzini, M.M., Canto, M.D., Price, C.A., 2023. Oocyte secreted factors control genes regulating FSH signaling and the maturation cascade in cumulus cells: the oocyte is not in a hurry. *J. Assist. Reprod. Genet.* 40, 1961–1971. <https://doi.org/10.1007/s10815-023-02822-y>
- Butt, M.S., Saleem, J., Aiman, S., Zakar, R., Sadique, I., Fischer, F., 2022. Serum anti-Müllerian hormone as a predictor of polycystic ovarian syndrome among women of reproductive age. *BMC Womens Health* 22, 199. <https://doi.org/10.1186/s12905-022-01782-2>
- Büyükyılmaz, G., Koca, S.B., Toksoy Adıgüzel, K., Boyraz, M., Gurbuz, F., 2024. The Role of the AMH, SHBG, Free Androgen Index and LH/FSH Ratio in the Diagnosis of Polycystic Ovary Syndrome in Adolescent. *Turkish Journal of Pediatric Disease* 18, 34–40. <https://doi.org/10.12956/tchd.1347807>
- Cadenas, J., Pors, S.E., Kumar, A., Kalra, B., Kristensen, S.G., Andersen, C.Y., Mamsen, L.S., 2022. Concentrations of oocyte secreted GDF9 and BMP15 decrease with MII transition during human IVM. *Reproductive Biology and Endocrinology* 20, 126. <https://doi.org/10.1186/s12958-022-01000-6>
- Çakıroğlu, Y., Vural, F., Vural, B., 2016. The inflammatory markers in polycystic ovary syndrome: association with obesity and IVF outcomes. *J. Endocrinol. Invest.* 39, 899–907. <https://doi.org/10.1007/s40618-016-0446-4>
- Cakmak, H., Franciosi, F., Zamah, A.M., Cedars, M.I., Conti, M., 2016. Dynamic secretion during meiotic reentry integrates the function of the oocyte and cumulus cells. *Proceedings of the National Academy of Sciences* 113, 2424–2429. <https://doi.org/10.1073/pnas.1519990113>
- Callejo, J., Salvador, C., González-Núñez, S., Almeida, L., Rodriguez, L., Marqués, L., Valls, A., Lailla, J.M., 2013. Live birth in a woman without ovaries after autograft of frozen-thawed ovarian tissue combined with growth factors. *J. Ovarian Res.* 6, 33. <https://doi.org/10.1186/1757-2215-6-33>
- Cao, B., Qin, J., Pan, B., Qazi, I.H., Ye, J., Fang, Y., Zhou, G., 2022. Oxidative Stress and Oocyte Cryopreservation: Recent Advances in Mitigation Strategies Involving Antioxidants. *Cells* 11, 3573. <https://doi.org/10.3390/cells11223573>
- Carmina, E., Bucchieri, S., Esposito, A., Del Puente, A., Mansueto, P., Orio, F., Di Fede, G., Rini, G., 2007. Abdominal Fat Quantity and Distribution in Women with Polycystic Ovary Syndrome and Extent of Its Relation to Insulin Resistance. *J. Clin. Endocrinol. Metab.* 92, 2500–2505. <https://doi.org/10.1210/jc.2006-2725>
- Cavallo, C., Roffi, A., Grigolo, B., Mariani, E., Pratelli, L., Merli, G., Kon, E., Marcacci, M., Filardo, G., 2016. Platelet-Rich Plasma: The Choice of Activation Method Affects the Release of Bioactive Molecules. *Biomed Res. Int.* 2016, 1–7. <https://doi.org/10.1155/2016/6591717>
- Celik, O., Celik, N., Ugur, K., Hatirnaz, S., Celik, S., Muderris, I.I., Yavuzkir, S., Sahin, İbrahim, Yardim, M., Aydin, S., 2019. Nppc/Npr2/cGMP signaling

- cascade maintains oocyte developmental capacity. *Cell. Mol. Biol.* 65, 83–89. <https://doi.org/10.14715/cmb/2019.65.4.14>
- Chang, E.M., Han, J.E., Seok, H.H., Lee, D.R., Yoon, T.K., Lee, W.S., 2013. Insulin resistance does not affect early embryo development but lowers implantation rate in *in vitro* maturation– *in vitro* fertilization–embryo transfer cycle. *Clin. Endocrinol. (Oxf)*. 79, 93–99. <https://doi.org/10.1111/cen.12099>
- Chen, W., Pang, Y., 2021. Metabolic Syndrome and PCOS: Pathogenesis and the Role of Metabolites. *Metabolites* 11, 869. <https://doi.org/10.3390/metabo11120869>
- Cheng, Y., Yata, A., Klein, C., Cho, J.-H., Deguchi, M., Hsueh, A.J.W., 2011. Oocyte-Expressed Interleukin 7 Suppresses Granulosa Cell Apoptosis and Promotes Oocyte Maturation in Rats. *Biol. Reprod.* 84, 707–714. <https://doi.org/10.1095/biolreprod.110.086504>
- Chohan, K.R., Hunter, A.G., 2003. Meiotic competence of bovine fetal oocytes following *in vitro* maturation. *Anim. Reprod. Sci.* 76, 43–51. [https://doi.org/10.1016/S0378-4320\(02\)00235-X](https://doi.org/10.1016/S0378-4320(02)00235-X)
- Chun, Y., Xiaoqiang, L., Yundong, M., Feiyang, D., Yugui, C., Jiayin, L., 2016. Polycystic ovary syndrome patients with high BMI tend to have functional disorders of androgen excess: a prospective study. *The Journal of Biomedical Research* 30, 197. <https://doi.org/10.7555/JBR.30.20140111>
- Clark, N.M., Podolski, A.J., Brooks, E.D., Chizen, D.R., Pierson, R.A., Lehotay, D.C., Lujan, M.E., 2014. Prevalence of Polycystic Ovary Syndrome Phenotypes Using Updated Criteria for Polycystic Ovarian Morphology: An Assessment of Over 100 Consecutive Women Self-reporting Features of Polycystic Ovary Syndrome. *Reproductive Sciences* 21, 1034–1043. <https://doi.org/10.1177/1933719114522525>
- Coticchio, G., Sciajno, R., Hutt, K., Bromfield, J., Borini, A., Albertini, D.F., 2010. Comparative analysis of the metaphase II spindle of human oocytes through polarized light and high-performance confocal microscopy. *Fertil. Steril.* 93, 2056–2064. <https://doi.org/10.1016/j.fertnstert.2008.12.011>
- Crespo, R.P., Bachega, T.A.S.S., Mendonça, B.B., Gomes, L.G., 2018. An update of genetic basis of PCOS pathogenesis. *Arch. Endocrinol. Metab.* 62, 352–361. <https://doi.org/10.20945/2359-3997000000049>
- Cross, P.C., Brinster, R.L., 1970. *In Vitro* Development of Mouse Oocytes I. *Biol. Reprod.* 3, 298–307. <https://doi.org/10.1093/biolreprod/3.3.298>
- Cunha, A., Póvoa, A.M., 2021. Infertility management in women with polycystic ovary syndrome: a review. *Porto Biomed. J.* 6, e116. <https://doi.org/10.1097/j.pbj.0000000000000116>
- da Silva, L.F.I., Da Broi, M.G., da Luz, C.M., da Silva, L.E.C.M., Ferriani, R.A., Meola, J., Navarro, P.A., 2021. miR-532-3p: a possible altered miRNA in cumulus cells of infertile women with advanced endometriosis. *Reprod. Biomed. Online* 42, 579–588. <https://doi.org/10.1016/j.rbmo.2020.10.010>
- Dahiya, P., Dahiya, K., Dhankhar, R., Hooda, N., Nayar, K., 2011. The Role of the Anti-Müllerian Hormone in Female Fertility: A Review.
- Das, D., Arur, S., 2022. Regulation of oocyte maturation: Role of conserved ERK signaling. *Mol. Reprod. Dev.* 89, 353–374. <https://doi.org/10.1002/mrd.23637>

- De Frene, V., Verhofstadt, L., Loeys, T., Stuyver, I., Buysse, A., De Sutter, P., 2015. Sexual and relational satisfaction in couples where the woman has polycystic ovary syndrome: a dyadic analysis. *Human Reproduction* 30, 625–631. <https://doi.org/10.1093/humrep/deu342>
- Desai, N., Ludgin, J., Sharma, R., Anirudh, R.K., Agarwal, A., 2013. Female and Male Gametogenesis, in: *Clinical Reproductive Medicine and Surgery*. Springer New York, New York, NY, pp. 43–62. https://doi.org/10.1007/978-1-4614-6837-0_3
- Dewailly, D., Andersen, C.Y., Balen, A., Broekmans, F., Dilaver, N., Fanchin, R., Griesinger, G., Kelsey, T.W., La marca, A., Lambalk, C., Mason, H., Nelson, S.M., Visser, J.A., Wallace, W.H., Anderson, R.A., 2014. The physiology and clinical utility of anti-Müllerian hormone in women. *Hum. Reprod. Update* 20, 370–385. <https://doi.org/10.1093/humupd/dmt062>
- Dhurat, R., Sukesh, M., 2014. Principles and methods of preparation of platelet-rich plasma: A review and author's perspective. *J. Cutan. Aesthet. Surg.* 7, 189. <https://doi.org/10.4103/0974-2077.150734>
- Diamanti-Kandarakis, E., 2008. Polycystic ovarian syndrome: pathophysiology, molecular aspects and clinical implications. *Expert Rev. Mol. Med.* 10, e3. <https://doi.org/10.1017/S1462399408000598>
- Diamanti-Kandarakis, E., Dunaif, A., 2012. Insulin Resistance and the Polycystic Ovary Syndrome Revisited: An Update on Mechanisms and Implications. *Endocr. Rev.* 33, 981–1030. <https://doi.org/10.1210/er.2011-1034>
- Ducibella, T., Huneau, D., Angelichio, E., Xu, Z., Schultz, R.M., Kopf, G.S., Fissore, R., Madoux, S., Ozil, J.-P., 2002. Egg-to-Embryo Transition Is Driven by Differential Responses to Ca²⁺ Oscillation Number. *Dev. Biol.* 250, 280–291. <https://doi.org/10.1006/dbio.2002.0788>
- Dumesic, D., Abbott, D., 2008. Implications of Polycystic Ovary Syndrome on Oocyte Development. *Semin. Reprod. Med.* 26, 053–061. <https://doi.org/10.1055/s-2007-992925>
- Dumesic, D.A., Oberfield, S.E., Stener-Victorin, E., Marshall, J.C., Laven, J.S., Legro, R.S., 2015. Scientific Statement on the Diagnostic Criteria, Epidemiology, Pathophysiology, and Molecular Genetics of Polycystic Ovary Syndrome. *Endocr. Rev.* 36, 487–525. <https://doi.org/10.1210/er.2015-1018>
- Dumollard, R., Ward, Z., Carroll, J., Duchon, M.R., 2007. Regulation of redox metabolism in the mouse oocyte and embryo. *Development* 134, 455–465. <https://doi.org/10.1242/dev.02744>
- Dumont, A., Robin, G., Dewailly, D., 2018. Anti-müllerian hormone in the pathophysiology and diagnosis of polycystic ovarian syndrome. *Curr. Opin. Endocrinol. Diabetes Obes.* 25, 377–384. <https://doi.org/10.1097/MED.0000000000000445>
- Eftekhari, M., Mirhashemi, E.S., Tabibnejad, N., 2019. Assisted reproductive outcomes in women with different polycystic ovary syndrome phenotypes. *International Journal of Gynecology & Obstetrics* 144, 147–152. <https://doi.org/10.1002/ijgo.12707>
- Ekart, J., McNatty, K., Hutton, J., Pitman, J., 2013. Ranking and selection of MII oocytes in human ICSI cycles using gene expression levels from associated

- cumulus cells. *Human Reproduction* 28, 2930–2942. <https://doi.org/10.1093/humrep/det357>
- Emori, C., Sugiura, K., 2014. Role of oocyte- derived paracrine factors in follicular development. *Animal Science Journal* 85, 627–633. <https://doi.org/10.1111/asj.12200>
- Eppig, J., 1996. Coordination of nuclear and cytoplasmic oocyte maturation in eutherian mammals. *Reprod. Fertil. Dev.* 8, 485–489. <https://doi.org/10.1071/RD9960485>
- Espinosa, M.E., Sánchez, R., Otzen, T., Bautista-Valarezo, E., Aguiar, S., Corrales-Gutierrez, I., Leon-Larios, F., Manterola, C., 2024. Phenotypic Characterization of Patients with Polycystic Ovary Syndrome in a Population from the Ecuadorian Andes: A Cross-Sectional Study. *J. Clin. Med.* 13. <https://doi.org/10.3390/jcm13082376>
- Farimani, M., Heshmati, S., Poorolajal, J., Bahmanzadeh, M., 2019. A report on three live births in women with poor ovarian response following intra-ovarian injection of platelet-rich plasma (PRP). *Mol. Biol. Rep.* 46, 1611–1616. <https://doi.org/10.1007/s11033-019-04609-w>
- Fausser, B.C., Devroey, P., Macklon, N.S., 2005. Multiple birth resulting from ovarian stimulation for subfertility treatment. *The Lancet* 365, 1807–1816. [https://doi.org/10.1016/S0140-6736\(05\)66478-1](https://doi.org/10.1016/S0140-6736(05)66478-1)
- Ferreira, S.R., Motta, A.B., 2018. Uterine Function: From Normal to Polycystic Ovarian Syndrome Alterations. *Curr. Med. Chem.* 25, 1792–1804. <https://doi.org/10.2174/0929867325666171205144119>
- Ferrer-Roda, M., Paramio, M.-T., Vila-Beltrán, J., Izquierdo, D., 2025. Effect of BMP15 and GDF9 in the IVM medium on subsequent oocyte competence and embryo development of prepubertal goats. *Theriogenology* 234, 164–173. <https://doi.org/10.1016/j.theriogenology.2024.12.015>
- Field, S.L., Dasgupta, T., Cummings, M., Orsi, N.M., 2014. Cytokines in ovarian folliculogenesis, oocyte maturation and luteinisation. *Mol. Reprod. Dev.* 81, 284–314. <https://doi.org/10.1002/mrd.22285>
- Filali, M., Frydman, N., Belot, M., Hesters, L., Gaudin, F., Tachdjian, G., Emilie, D., Frydman, R., Machelon, V., 2009. Oocyte in-vitro maturation: BCL2 mRNA content in cumulus cells reflects oocyte competency. *Reprod. Biomed. Online* 19, 71–84. [https://doi.org/10.1016/S1472-6483\(10\)61071-1](https://doi.org/10.1016/S1472-6483(10)61071-1)
- Firas Faisal, G., M. R. Al-Kawaz, U., Amer Al-Anbari, L., A. R. Hussaini, H., 2020. Evaluation of the Level of Stem Cell Factor in Follicular Fluid and its Effect on Oocyte Maturity, Embryo Quality and Pregnancy Rate. *Iraqi Journal Of Embryos and Infertility Researches* 9. <https://doi.org/10.28969/IJEIR.v9.i2.r5>
- Fountas, S., Petinaki, E., Bolaris, S., Kargakou, M., Dafopoulos, S., Zikopoulos, A., Moustakli, E., Sotiriou, S., Dafopoulos, K., 2024. The Roles of GDF-9, BMP-15, BMP-4 and EMMPRIN in Folliculogenesis and In Vitro Fertilization. *J. Clin. Med.* 13, 3775. <https://doi.org/10.3390/jcm13133775>
- Frost, E.R., Ford, E.A., Peters, A.E., Reed, N.L., McLaughlin, E.A., Baker, M.A., Lovell-Badge, R., Sutherland, J.M., 2020. Signal transducer and activator of transcription (STAT) 1 and STAT3 are expressed in the human ovary and have Janus kinase 1-independent functions in the COV434 human granulosa cell

- line. *Reprod. Fertil. Dev.* 32, 1027–1039. <https://doi.org/10.1071/RD20098>
- Gebhardt, K.M., Feil, D.K., Dunning, K.R., Lane, M., Russell, D.L., 2011. Human cumulus cell gene expression as a biomarker of pregnancy outcome after single embryo transfer. *Fertil. Steril.* 96, 47–52.e2. <https://doi.org/10.1016/j.fertnstert.2011.04.033>
- Gentile, P., Garcovich, S., 2020. Systematic Review—The Potential Implications of Different Platelet-Rich Plasma (PRP) Concentrations in Regenerative Medicine for Tissue Repair. *Int. J. Mol. Sci.* 21, 5702. <https://doi.org/10.3390/ijms21165702>
- Ghevaria, H., SenGupta, S., Naja, R., Odia, R., Exeter, H., Serhal, P., Gonzalez, X.V., Sun, X., Delhanty, J., 2022. Next Generation Sequencing Detects Premeiotic Errors in Human Oocytes. *Int. J. Mol. Sci.* 23, 665. <https://doi.org/10.3390/ijms23020665>
- Gilchrist, R.B., Lane, M., Thompson, J.G., 2008. Oocyte-secreted factors: regulators of cumulus cell function and oocyte quality. *Hum. Reprod. Update* 14, 159–177. <https://doi.org/10.1093/humupd/dmm040>
- González-Ortega, C., Piña-Aguilar, R.E., Cancino-Villarreal, P., Pérez-Peña, E., Gutiérrez-Gutiérrez, A.M., 2019. Natural-cycle in vitro fertilization (IVF) combined with in vitro maturation in infertile patients with polycystic ovarian syndrome (PCOS) requiring IVF. *Taiwan. J. Obstet. Gynecol.* 58, 192–195. <https://doi.org/10.1016/j.tjog.2019.01.004>
- Gordon, I., 2003. Recovering the bovine oocyte., in: *Laboratory Production of Cattle Embryos*. CABI Publishing, UK, pp. 79–111. <https://doi.org/10.1079/9780851996660.0079>
- Graziani, F., Ivanovski, S., Cei, S., Ducci, F., Tonetti, M., Gabriele, M., 2006. The *in vitro* effect of different PRP concentrations on osteoblasts and fibroblasts. *Clin. Oral Implants Res.* 17, 212–219. <https://doi.org/10.1111/j.1600-0501.2005.01203.x>
- Gruhn, J.R., Kristensen, S.G., Andersen, C.Y., Hoffmann, E.R., 2018. In Vitro Maturation and Culture of Human Oocytes. pp. 23–30. https://doi.org/10.1007/978-1-4939-8603-3_3
- Guo, S.-C., Tao, S.-C., Yin, W.-J., Qi, X., Yuan, T., Zhang, C.-Q., 2017. Exosomes derived from platelet-rich plasma promote the re-epithelization of chronic cutaneous wounds via activation of YAP in a diabetic rat model. *Theranostics* 7, 81–96. <https://doi.org/10.7150/thno.16803>
- Guo, Z., Kawamura, K., 2025. Ovarian Function Restoration Using Autologous Platelet-Rich Plasma. *Reprod. Med. Biol.* 24. <https://doi.org/10.1002/rmb2.12666>
- Guzman, L., Adriaenssens, T., Ortega-Hrepich, C., Albuz, F.K., Mateizel, I., Devroey, P., De Vos, M., Smits, J., 2013. Human antral follicles <6 mm: a comparison between in vivo maturation and in vitro maturation in non-hCG primed cycles using cumulus cell gene expression. *Mol. Hum. Reprod.* 19, 7–16. <https://doi.org/10.1093/molehr/gas038>
- Hardy, M.L.M., Day, M.L., Morris, M.B., 2021. Redox Regulation and Oxidative Stress in Mammalian Oocytes and Embryos Developed In Vivo and In Vitro. *Int. J. Environ. Res. Public Health* 18, 11374.

<https://doi.org/10.3390/ijerph182111374>

- Harvey, M.B., Leco, K.J., Arcellana-Panlilio, M.Y., Zhang, X., Edwards, D.R., Schurtz, G.A., 1995. Roles of growth factors during peri-implantation development. *Mol. Hum. Reprod.* 1, 14–20. <https://doi.org/10.1093/molehr/1.1.14>
- Haryadi, D., Sadewa, A.H., Mubarika, S., Dasuki, D., 2019. The potential application of conditioned media-mesenchymal stem cells on human oocyte maturation in assisted reproductive technology: a quasi-experimental based-study at Dr. Sardjito General Hospital, Yogyakarta, Indonesia. *Bali Medical Journal* 8, 741–748. <https://doi.org/10.15562/bmj.v8i3.1504>
- Hassani, F., Oryan, S., Eftekhari-Yazdi, P., Bazrgar, M., Moini, A., Nasiri, N., Ghaheri, A., 2019. Association between The Number of Retrieved Mature Oocytes and Insulin Resistance or Sensitivity in Infertile Women with Polycystic Ovary Syndrome. *Int. J. Fertil. Steril.* 12, 310–315. <https://doi.org/10.22074/ijfs.2019.5422>
- Hatirnaz, Ş., Ata, B., Saynur Hatirnaz, E., Dahan, M.H., Tannus, S., Tan, J., Tan, S.L., 2018. Oocyte in vitro maturation: A sytematic review. *Journal of Turkish Society of Obstetric and Gynecology* 15, 112–125. <https://doi.org/10.4274/tjod.23911>
- He, M., Guo, X., Li, T., Jiang, X., Chen, Y., Yuan, Y., Chen, B., Yang, G., Fan, Y., Liang, Z., Armstrong, D.G., Deng, W., 2020. Comparison of Allogeneic Platelet-rich Plasma With Autologous Platelet-rich Plasma for the Treatment of Diabetic Lower Extremity Ulcers. *Cell Transplant.* 29, 096368972093142. <https://doi.org/10.1177/0963689720931428>
- Heins, D.C., Baker, J.A., 1993. Clutch production in the darter *Etheostoma lynceum* and its implications for life- history study. *J. Fish Biol.* 42, 819–829. <https://doi.org/10.1111/j.1095-8649.1993.tb00392.x>
- Hestiantoro, A., Negoro, Y.S., Afrita, Y., Wiweko, B., Sumapradja, K., Natadisastra, M., 2016. Anti-Müllerian hormone as a predictor of polycystic ovary syndrome treated with clomiphene citrate. *Clin. Exp. Reprod. Med.* 43, 207. <https://doi.org/10.5653/cerm.2016.43.4.207>
- Hong, C., Luckey, M.A., Park, J.-H., 2012. Intrathymic IL-7: The where, when, and why of IL-7 signaling during T cell development. *Semin. Immunol.* 24, 151–158. <https://doi.org/10.1016/j.smim.2012.02.002>
- Hosseini, L., Shirazi, A., Naderi, M.M., Shams-Esfandabadi, N., Borjian Boroujeni, S., Sarvari, A., Sadeghnia, S., Behzadi, B., Akhondi, M.M., 2017. Platelet-rich plasma promotes the development of isolated human primordial and primary follicles to the preantral stage. *Reprod. Biomed. Online* 35, 343–350. <https://doi.org/10.1016/j.rbmo.2017.04.007>
- Hu, L., Zhang, Y., Chen, L., Zhou, W., Wang, Y., Wen, J., 2017. *MAPK* and *ERK* polymorphisms are associated with PCOS risk in Chinese women. *Oncotarget* 8, 100261–100268. <https://doi.org/10.18632/oncotarget.22153>
- Hu, M., Zheng, S., Yin, H., Zhu, X., Lu, F., Tong, X.-H., Liu, Y.-S., Zhang, Y., Xu, B., 2020. Identification of microRNAs that Regulate the MAPK Pathway in Human Cumulus Cells from PCOS Women with Insulin Resistance. *Reproductive Sciences* 27, 833–844. <https://doi.org/10.1007/s43032-019->

00086-5

- Huang, S.J., Purevsuren, L., Jin, F., Zhang, Y.P., Liang, C.Y., Zhu, M.Q., Wang, F., Jia, C.L., Wei, Z.H., 2021. Effect of anti-müllerian hormone on the development and selection of ovarian follicle in hens. *Poult. Sci.* 100, 100959. <https://doi.org/10.1016/j.psj.2020.12.056>
- Huang, X., Hao, C., Shen, X., Liu, X., Shan, Y., Zhang, Y., Chen, L., 2013. Differences in the transcriptional profiles of human cumulus cells isolated from MI and MII oocytes of patients with polycystic ovary syndrome. *Reproduction* 145, 597–608. <https://doi.org/10.1530/REP-13-0005>
- Ibáñez, L., Oberfield, S.E., Witchel, S., Auchus, R.J., Chang, R.J., Codner, E., Dabadghao, P., Darendeliler, F., Elbarbary, N.S., Gambineri, A., Garcia Rudaz, C., Hoeger, K.M., López-Bermejo, A., Ong, K., Peña, A.S., Reinehr, T., Santoro, N., Tena-Sempere, M., Tao, R., Yildiz, B.O., Alkhayyat, H., Deeb, A., Joel, D., Horikawa, R., de Zegher, F., Lee, P.A., 2017. An International Consortium Update: Pathophysiology, Diagnosis, and Treatment of Polycystic Ovarian Syndrome in Adolescence. *Horm. Res. Paediatr.* 88, 371–395. <https://doi.org/10.1159/000479371>
- Inagaki, K., Shimasaki, S., 2010. Impaired production of BMP-15 and GDF-9 mature proteins derived from proproteins WITH mutations in the proregion. *Mol. Cell. Endocrinol.* 328, 1–7. <https://doi.org/10.1016/j.mce.2010.05.017>
- Irez, T., Ocal, P., Guralp, O., Cetin, M., Aydogan, B., Sahmay, S., 2011. Different serum anti-Müllerian hormone concentrations are associated with oocyte quality, embryo development parameters and IVF-ICSI outcomes. *Arch. Gynecol. Obstet.* 284, 1295–1301. <https://doi.org/10.1007/s00404-011-1979-6>
- Ishizuka, Y., Nishimura, M., Matsumoto, K., Miyashita, M., Takeo, T., Nakagata, N., Hosoi, Y., Anzai, M., 2013. The influence of reduced glutathione in fertilization medium on the fertility of in vitro-matured C57BL/6 mouse oocytes. *Theriogenology* 80, 421–426. <https://doi.org/10.1016/j.theriogenology.2013.07.002>
- Iwahata, H., Hashimoto, S., Inoue, M., Inoue, T., Ito, K., Nakaoka, Y., Suzuki, N., Morimoto, Y., 2015. Neonatal outcomes after the implantation of human embryos vitrified using a closed-system device. *J. Assist. Reprod. Genet.* 32, 521–526. <https://doi.org/10.1007/s10815-015-0431-4>
- Jain, T., Negris, O., Brown, D., Galic, I., Salimgaraev, R., Zhaunova, L., 2021. Characterization of polycystic ovary syndrome among Flo app users around the world. *Reproductive Biology and Endocrinology* 19, 36. <https://doi.org/10.1186/s12958-021-00719-y>
- Jankowska-Ziemak, H., Kulus, M., Partynska, A., Kulus, J., Data, K.P., Domagala, D., Niebora, J., Gorska, A., Podralska, M., Podhorska-Okolow, M., Chmielewski, P., Antosik, P., Bukowska, D., Kaminski, A., Piotrowska-Kempisty, H., Zabel, M., Mozdziak, P., Dziegiel, P., Kempisty, B., 2025. The Role of Growth Factors and Signaling Pathways in Ovarian Angiogenesis. *Cells* 14, 1555. <https://doi.org/10.3390/cells14191555>
- Javvaji, P.K., Dhali, A., Francis, J.R., Kolte, A.P., Mech, A., Sathish, L., Roy, S.C., 2019. Interleukin-7 improves in vitro maturation of ovine cumulus-oocyte

- complexes in a dose dependent manner. *Cytokine* 113, 296–304. <https://doi.org/10.1016/j.cyto.2018.07.025>
- Jiang, L., Huang, J., Chen, Y., Yang, Y., Li, R., Li, Y., Chen, X., Yang, D., 2016. Identification of several circulating microRNAs from a genome-wide circulating microRNA expression profile as potential biomarkers for impaired glucose metabolism in polycystic ovarian syndrome. *Endocrine* 53, 280–290. <https://doi.org/10.1007/s12020-016-0878-9>
- JO, C.H., SHIN, J.S., LEE, S.Y., SHIN, S., 2017. ALLOGENEIC PLATELET-RICH PLASMA FOR ROTATOR CUFF REPAIR. *Acta Ortop. Bras.* 25, 38–43. <https://doi.org/10.1590/1413-785220172501163417>
- Kalem, Z., Kalem, M.N., Seval, M., Bakirarar, B., Simsir, C., Yilmaz, C., Atabekoglu, C., Gurgan, T., 2018. Serum and follicular fluid concentration of stem cell factor in PCOS. *Int. J. Reprod. Contracept. Obstet. Gynecol.* 7, 3467. <https://doi.org/10.18203/2320-1770.ijrcog20183754>
- Kalita, K., Deka, B.C., Biswas, R.K., Barua, P.M., Borah, P., Dutta, D.J., 2019. Effect of Different Types of In Vitro Maturation Medium (IVM) on Cumulus Cell Expansion and Nuclear Maturation Rate of Non-vitrified and Post-vitrified Thawed Porcine Follicular Oocytes. *J Fertil In vitro IVF Worldw Reprod Med Genet Stem Cell Biol* 7, 211.
- Kalous, J., Aleshkina, D., Anger, M., 2023. A Role of PI3K/Akt Signaling in Oocyte Maturation and Early Embryo Development. *Cells* 12, 1830. <https://doi.org/10.3390/cells12141830>
- Karagül, M.İ., Aktaş, S., Coşkun Yılmaz, B., Yılmaz, M., Örekiçi Temel, G., 2018. GDF9 and BMP15 Expressions and Fine Structure Changes During Folliculogenesis in Polycystic Ovary Syndrome. *Balkan Med. J.* 35, 43–54. <https://doi.org/10.4274/balkanmedj.2016.1110>
- Karam, H.M., Galal, S.M., Lotfy, D.M., 2023. Nrf2 and <sc>NF- κB</sc> interplay in tamoxifen- induced hepatic toxicity: A promising therapeutic approach of sildenafil and low- dose γ radiation. *Environ. Toxicol.* 38, 990–996. <https://doi.org/10.1002/tox.23742>
- Karavani, G., Wasserzug-Pash, P., Mordechai-Daniel, T., Bauman, D., Klutstein, M., Imbar, T., 2021. Age-Dependent in vitro Maturation Efficacy of Human Oocytes – Is There an Optimal Age? *Front. Cell Dev. Biol.* 9. <https://doi.org/10.3389/fcell.2021.667682>
- Karimzadeh, M.A., Javedani, M., 2010. An assessment of lifestyle modification versus medical treatment with clomiphene citrate, metformin, and clomiphene citrate–metformin in patients with polycystic ovary syndrome. *Fertil. Steril.* 94, 216–220. <https://doi.org/10.1016/j.fertnstert.2009.02.078>
- Keane, J.A., Ealy, A.D., 2024. An Overview of Reactive Oxygen Species Damage Occurring during In Vitro Bovine Oocyte and Embryo Development and the Efficacy of Antioxidant Use to Limit These Adverse Effects. *Animals* 14, 330. <https://doi.org/10.3390/ani14020330>
- Khan, M.J., Ullah, A., Basit, S., 2019. <p>Genetic Basis of Polycystic Ovary Syndrome (PCOS): Current Perspectives</p>. *Appl. Clin. Genet.* Volume 12, 249–260. <https://doi.org/10.2147/TACG.S200341>
- Khatun, M., Lundin, K., Naillat, F., Loog, L., Saarela, U., Tuuri, T., Salumets, A.,

- Piltonen, T.T., Tapanainen, J.S., 2024. Induced Pluripotent Stem Cells as a Possible Approach for Exploring the Pathophysiology of Polycystic Ovary Syndrome (PCOS). *Stem Cell Rev. Rep.* 20, 67–87. <https://doi.org/10.1007/s12015-023-10627-w>
- Kheirollahi, A., Hamidi, H., Vatannejad, A., 2025. Distribution of polycystic ovary syndrome (PCOS) phenotypes in Iranian women: a cross-sectional study. *BMC Res. Notes* 18. <https://doi.org/10.1186/s13104-025-07202-6>
- Kim, E., Seok, H.H., Lee, S.Y., Lee, D.R., Moon, J., Yoon, T.K., Lee, W.S., Lee, K.A., 2014. Correlation between expression of glucose transporters in granulosa cells and oocyte quality in women with polycystic ovary syndrome. *Endocrinology and Metabolism* 29, 40–47. <https://doi.org/10.3803/EnM.2014.29.1.40>
- King, S.M., Modi, D.A., Eddie, S.L., Burdette, J.E., 2013. Insulin and insulin-like growth factor signaling increases proliferation and hyperplasia of the ovarian surface epithelium and decreases follicular integrity through upregulation of the PI3-kinase pathway. *J. Ovarian Res.* 6, 12. <https://doi.org/10.1186/1757-2215-6-12>
- Knight, P.G., Glister, C., 2006. TGF- β superfamily members and ovarian follicle development. *Reproduction* 132, 191–206. <https://doi.org/10.1530/rep.1.01074>
- Kovacs, Gabor., Norman, Robert., 2007. Polycystic ovary syndrome. Cambridge University Press.
- Krisher, R.L., Brad, A.M., Herrick, J.R., Sparman, M.L., Swain, J.E., 2007. A comparative analysis of metabolism and viability in porcine oocytes during in vitro maturation. *Anim. Reprod. Sci.* 98, 72–96. <https://doi.org/10.1016/j.anireprosci.2006.10.006>
- Kristensen, S.G., Kumar, A., Mamsen, L.S., Kalra, B., Pors, S.E., Bøtkjær, J.A., Macklon, K.T., Fedder, J., Ernst, E., Hardy, K., Franks, S., Andersen, C.Y., 2022. Intrafollicular Concentrations of the Oocyte-secreted Factors GDF9 and BMP15 Vary Inversely in Polycystic Ovaries. *J. Clin. Endocrinol. Metab.* 107, e3374–e3383. <https://doi.org/10.1210/clinem/dgac272>
- Kusumaningtyas, T., Hanoum, I.F., Prijayanti, R.V.N., Suryaningtyas, D.A., Rahmani, N.N., Islahi, A.N., Puteri, N.R., Sawarno, A., Kusumaningtyas, I., Kusuma, B., Paramita, D.K., Dasuki, D., 2026. Effect of 5% Allogeneic Platelet-Rich Plasma Supplementation on GDF-9 and BMP-15 Secretion During the IVM of GV Oocytes From Women With PCOS: A Pilot Quasi-Experimental Study. *International Journal of Women's Health and Reproduction Sciences* 14, 71–77. <https://doi.org/10.15296/ijwhr.2026.9166>
- Lainas, G.T., Lainas, T.G., Sfontouris, I.A., Venetis, C.A., Bosdou, J.K., Chatzimeletiou, A., Grimbizis, G.F., Tarlatzis, B.C., Kolibianakis, E.M., 2020. Association between body mass index and oocyte maturation in patients triggered with GnRH agonist who are at high risk for severe ovarian hyperstimulation syndrome: an observational cohort study. *Reprod. Biomed. Online* 40, 168–175. <https://doi.org/10.1016/j.rbmo.2019.10.006>
- Laufer, N., Tarlatzis, B.C., DeCherney, A.H., Masters, J.T., Haseltine, F.P., MacLusky, N., Naftolin, F., 1984. Asynchrony between human cumulus-

- corona cell complex and oocyte maturation after human menopausal gonadotropin treatment for in vitro fertilization. *Fertil. Steril.* 42, 366–372. [https://doi.org/10.1016/S0015-0282\(16\)48074-X](https://doi.org/10.1016/S0015-0282(16)48074-X)
- Lentscher, J.A., Slocum, B., Torrealday, S., 2021. Polycystic Ovarian Syndrome and Fertility. *Clin. Obstet. Gynecol.* 64, 65–75. <https://doi.org/10.1097/GRF.0000000000000595>
- Lestari, S.W., 2023. Atlas of Human Oocyte: A Review in the Daily In Vitro Fertilization (IVF) Practices. *Bioscientia Medicina: Journal of Biomedicine and Translational Research* 7, 3289–3293. <https://doi.org/10.37275/bsm.v7i5.817>
- Li, L., Zheng, P., Dean, J., 2010. Maternal control of early mouse development. *Development* 137, 859–870. <https://doi.org/10.1242/dev.039487>
- Li, Q., Guo, J., Liu, J., Li, J., Zou, L., Fang, C., Liang, X., 2025. Comparative efficacy of single vs. double autologous platelet-rich plasma ovarian injections for improving ovarian response in poor ovarian responders. *Sci. Rep.* 15, 18292. <https://doi.org/10.1038/s41598-025-02689-2>
- Li, T., Mo, H., Chen, W., Li, L., Xiao, Y., Zhang, J., Li, X., Lu, Y., 2017. Role of the PI3K-Akt Signaling Pathway in the Pathogenesis of Polycystic Ovary Syndrome. *Reproductive Sciences* 24, 646–655. <https://doi.org/10.1177/1933719116667606>
- Liang, J., Gao, Y., Feng, Z., Zhang, B., Na, Z., Li, D., 2023. Reactive oxygen species and ovarian diseases: Antioxidant strategies. *Redox Biol.* 62, 102659. <https://doi.org/10.1016/j.redox.2023.102659>
- Lim, S.S., Davies, M.J., Norman, R.J., Moran, L.J., 2012. Overweight, obesity and central obesity in women with polycystic ovary syndrome: a systematic review and meta-analysis. *Hum. Reprod. Update* 18, 618–637. <https://doi.org/10.1093/humupd/dms030>
- Lin, Q., Zhang, H., Zhao, J., Wang, Z., 2020. Expression and Contribution of Insulin Signaling Pathway to the Development of Polycystic Ovary Syndrome, in: *Polycystic Ovarian Syndrome*. IntechOpen. <https://doi.org/10.5772/intechopen.89246>
- Liu, J., Wu, Q., Hao, Y., Jiao, M., Wang, X., Jiang, S., Han, L., 2021. Measuring the global disease burden of polycystic ovary syndrome in 194 countries: Global Burden of Disease Study 2017. *Human Reproduction* 36, 1108–1119. <https://doi.org/10.1093/humrep/deaa371>
- Liu, S., Zhang, X., Shi, C., Lin, J., Chen, G., Wu, B., Wu, L., Shi, H., Yuan, Y., Zhou, W., Sun, Z., Dong, X., Wang, J., 2015. Altered microRNAs expression profiling in cumulus cells from patients with polycystic ovary syndrome. *J. Transl. Med.* 13, 238. <https://doi.org/10.1186/s12967-015-0605-y>
- Liu, X., Wang, L., Ma, C., Wang, G., Zhang, Y., Sun, S., 2019. Exosomes derived from platelet-rich plasma present a novel potential in alleviating knee osteoarthritis by promoting proliferation and inhibiting apoptosis of chondrocyte via Wnt/ β -catenin signaling pathway. *J. Orthop. Surg. Res.* 14, 470. <https://doi.org/10.1186/s13018-019-1529-7>
- Lizneva, D., Suturina, L., Walker, W., Brakta, S., Gavrilova-Jordan, L., Azziz, R., 2016. Criteria, prevalence, and phenotypes of polycystic ovary syndrome.

- Fertil. Steril. 106, 6–15. <https://doi.org/10.1016/j.fertnstert.2016.05.003>
- Lu, S.C., 2013. Glutathione synthesis. *Biochimica et Biophysica Acta (BBA) - General Subjects* 1830, 3143–3153. <https://doi.org/10.1016/j.bbagen.2012.09.008>
- Mackens, S., Pareyn, S., Drakopoulos, P., Deckers, T., Mostinckx, L., Blockeel, C., Segers, I., Verheyen, G., Santos-Ribeiro, S., Tournaye, H., De Vos, M., 2020. Outcome of in-vitro oocyte maturation in patients with PCOS: does phenotype have an impact? *Human Reproduction* 35, 2272–2279. <https://doi.org/10.1093/humrep/deaa190>
- Maidarti, M., Garinasih, P.D., Siregar, A.A., Pratama, G., Harzif, A.K., Sumapraja, K., Wiweko, B., 2021. Anti-Müllerian Hormone Levels as Predictor of In Vitro Fertilization Outcomes. *eJournal Kedokteran Indonesia* 9, 87. <https://doi.org/10.23886/ejki.9.43.87>
- Maldonado, M., Huang, T., Chen, J., Zhong, Y., 2018. Differentiation Potential of Human Wharton's Jelly-Derived Mesenchymal Stem Cells and Paracrine Signaling Interaction Contribute to Improve the In Vitro Maturation of Mouse Cumulus Oocyte Complexes. *Stem Cells Int.* 2018, 1–8. <https://doi.org/10.1155/2018/7609284>
- Maleki-Hajiagha, A., Razavi, M., Rouholamin, S., Rezaeinejad, M., Maroufizadeh, S., Sepidarkish, M., 2020. Intrauterine infusion of autologous platelet-rich plasma in women undergoing assisted reproduction: A systematic review and meta-analysis. *J. Reprod. Immunol.* 137, 103078. <https://doi.org/10.1016/j.jri.2019.103078>
- Malin, S.K., Kirwan, J.P., Sia, C.L., González, F., 2014. Glucose-Stimulated Oxidative Stress in Mononuclear Cells Is Related to Pancreatic β -Cell Dysfunction in Polycystic Ovary Syndrome. *J. Clin. Endocrinol. Metab.* 99, 322–329. <https://doi.org/10.1210/jc.2013-3177>
- Mareta, R., Amran, R., Larasati, V., 2018. View of Hubungan Polycystic Ovary Syndrome(PCOS)dengan Infertilitas di Praktik Swasta Dokter Obstetri Ginekologi Palembang. *Majalah Kedokteran Sriwijaya*.
- Matsuo, M., Sumitomo, K., Ogino, C., Gunji, Y., Nishimura, R., Hishinuma, M., 2017. Three-step in vitro maturation culture of bovine oocytes imitating temporal changes of estradiol-17 α and β and progesterone concentrations in preovulatory follicular fluid. *Arch. Anim. Breed.* 60, 385–390. <https://doi.org/10.5194/aab-60-385-2017>
- MAYNARD, D.M., HEIJNEN, H.F.G., HORNE, M.K., WHITE, J.G., GAHL, W.A., 2007. Proteomic analysis of platelet α - granules using mass spectrometry. *Journal of Thrombosis and Haemostasis* 5, 1945–1955. <https://doi.org/10.1111/j.1538-7836.2007.02690.x>
- Mazloomi, S., Tayebinia, H., Farimani, M.S., Ghorbani, M., 2025. A Retrospective Cohort Study Investigating the Effect of Intraovarian Platelet-Rich Plasma Therapy on the Oxidative State of Follicular Fluid in Women with Diminished Ovarian Reserve. *Chonnam Med. J.* 61, 46. <https://doi.org/10.4068/cmj.2025.61.1.46>
- Md Muslim, M.Z., Mohammed Jelani, A., Shafii, N., Yaacob, N.M., Che Soh, N.A.A., Ibrahim, H.A., 2024. Correlation between anti-mullerian hormone

- with insulin resistance in polycystic ovarian syndrome: a systematic review and meta-analysis. *J. Ovarian Res.* 17, 106. <https://doi.org/10.1186/s13048-024-01436-x>
- Menezo, Y.J.R., Silvestris, E., Dale, B., Elder, K., 2016. Oxidative stress and alterations in DNA methylation: two sides of the same coin in reproduction. *Reprod. Biomed. Online* 33, 668–683. <https://doi.org/10.1016/j.rbmo.2016.09.006>
- Miot, H.A., 2011. Tamanho da amostra em estudos clínicos e experimentais. *J. Vasc. Bras.* 10, 275–278. <https://doi.org/10.1590/S1677-54492011000400001>
- Mitkova Orbetzova, M., 2020. Clinical Impact of Insulin Resistance in Women with Polycystic Ovary Syndrome, in: *Polycystic Ovarian Syndrome*. IntechOpen. <https://doi.org/10.5772/intechopen.90749>
- MIYANO, T., 2005. <i>In Vitro</i> Growth of Mammalian Oocytes. *Journal of Reproduction and Development* 51, 169–176. <https://doi.org/10.1262/jrd.16014>
- Moawad, A.R., Tan, S.L., Taketo, T., 2017. Beneficial effects of glutathione supplementation during vitrification of mouse oocytes at the germinal vesicle stage on their preimplantation development following maturation and fertilization *in vitro*. *Cryobiology* 76, 98–103. <https://doi.org/10.1016/j.cryobiol.2017.04.002>
- Mohapatra, I., Samantaray, S.R., 2024. BMI and Polycystic Ovary Syndrome: Demographic Trends in Weight and Health. *Cureus*. <https://doi.org/10.7759/cureus.55439>
- Molka, B., Gwladys, B., Dorian, B., Lucie, M., Mustapha, B., Rosalie, C., Brigitte, G., Hafida, K.-C., Moncef, B., 2022. Follicular Fluid Growth Factors and Interleukin Profiling as Potential Predictors of IVF Outcomes. *Front. Physiol.* 13. <https://doi.org/10.3389/fphys.2022.859790>
- Monte, A.P.O., Santos, J.M., Menezes, V.G., Gouveia, B.B., Lins, T.L.B.G., Barberino, R.S., Oliveira, J.L., Donfack, N.J., Matos, M.H.T., 2019. Growth differentiation factor- 9 improves development, mitochondrial activity and meiotic resumption of sheep oocytes after *in vitro* culture of secondary follicles. *Reproduction in Domestic Animals* 54, 1169–1176. <https://doi.org/10.1111/rda.13485>
- Mottershead, D.G., Sugimura, S., Al-Musawi, S.L., Li, J.-J., Richani, D., White, M.A., Martin, G.A., Trotta, A.P., Ritter, L.J., Shi, J., Mueller, T.D., Harrison, C.A., Gilchrist, R.B., 2015. Cumulin, an Oocyte-secreted Heterodimer of the Transforming Growth Factor- β Family, Is a Potent Activator of Granulosa Cells and Improves Oocyte Quality. *Journal of Biological Chemistry* 290, 24007–24020. <https://doi.org/10.1074/jbc.M115.671487>
- Moulavi, F., Akram, R.T., Khorshid Sokhangouy, S., Hosseini, S.M., 2020. Platelet rich plasma efficiently substitutes the beneficial effects of serum during *in vitro* oocyte maturation and helps maintain the mitochondrial activity of maturing oocytes. *Growth Factors* 38, 152–166. <https://doi.org/10.1080/08977194.2021.1900168>
- Mumusoglu, S., Yildiz, B.O., 2020. Polycystic ovary syndrome phenotypes and prevalence: Differential impact of diagnostic criteria and clinical versus

- unselected population. *Curr. Opin. Endocr. Metab. Res.* 12, 66–71. <https://doi.org/10.1016/j.coemr.2020.03.004>
- Murata, E., Fujii, J., 2025. Ischemia/reperfusion-associated oxidative stress is an aggravating factor for pressure ulcers. *J. Clin. Biochem. Nutr.* 76, 25–28. <https://doi.org/10.3164/jcbrn.25-28>
- Muthu, S., Bapat, A., Jain, R., Jeyaraman, N., Jeyaraman, M., 2021. Exosomal therapy—a new frontier in regenerative medicine. *Stem Cell Investig.* 8, 7–7. <https://doi.org/10.21037/sci-2020-037>
- Muthuprabakaran, K., Pai, V.V., Ahmad, S., Shukla, P., 2021. A cross-sectional analysis of the effects of various centrifugation speeds and inclusion of the buffy coat in platelet-rich plasma preparation. *Indian J. Dermatol. Venereol. Leprol.* 87, 792. https://doi.org/10.25259/IJDVL_1050_20
- Mykhalchenko, K., Lizneva, D., Trofimova, T., Walker, W., Suturina, L., Diamond, M.P., Azziz, R., 2017. Genetics of polycystic ovary syndrome. *Expert Rev. Mol. Diagn.* 17, 723–733. <https://doi.org/10.1080/14737159.2017.1340833>
- Nagyová, E., Němcová, L., Camaioni, A., 2021. Cumulus Extracellular Matrix Is an Important Part of Oocyte Microenvironment in Ovarian Follicles: Its Remodeling and Proteolytic Degradation. *Int. J. Mol. Sci.* 23, 54. <https://doi.org/10.3390/ijms23010054>
- Nazari, S., Khalili, M.A., Esmailzadeh, F., Mohsenzadeh, M., 2011. Maturation capacity, morphology and morphometric assessment of human immature oocytes after vitrification and in-vitro maturation. *Iran. J. Reprod. Med.* 9, 209–16.
- Nikbakht, R., Mohammadjafari, R., Rajabalipour, M., Moghadam, M.T., 2021. Evaluation of oocyte quality in Polycystic ovary syndrome patients undergoing ART cycles. *Fertil. Res. Pract.* 7, 2. <https://doi.org/10.1186/s40738-020-00094-z>
- Oh, D., Choi, H., Kim, M., Jawad, A., Lee, J., Oh, B.C., Hyun, S.-H., 2025. Interleukin-7 promotes porcine early embryogenesis in vitro and inner cell mass development through PI3K/AKT pathway after parthenogenetic activation. *Sci. Rep.* 15, 13850. <https://doi.org/10.1038/s41598-025-98574-z>
- Oh, D., Lee, J., Kim, E., Hwang, S.-U., Yoon, J.-D., Cai, L., Kim, M., Kim, G., Choi, H., Hyun, S.-H., 2021. Effect of Interleukin-7 on In Vitro Maturation of Porcine Cumulus-Oocyte Complexes and Subsequent Developmental Potential after Parthenogenetic Activation. *Animals* 11, 741. <https://doi.org/10.3390/ani11030741>
- Oktay, K., Newton, H., Mullan, J., Gosden, R.G., 1998. Development of human primordial follicles to antral stages in SCID/hpg mice stimulated with follicle stimulating hormone. *Human Reproduction* 13, 1133–1138. <https://doi.org/10.1093/humrep/13.5.1133>
- Olanian, O.T., Bamidele, O., Uche, S., Femi, A., Ayobami, D., Ayoola, O., Builders, M., Mali, P.C., 2019. Ovarian Metabolic activity in Dehydroepiandrosterone-Induced Polycystic Ovary in Wistar rats Treated with Aspirin. *JBRA Assist. Reprod.* <https://doi.org/10.5935/1518-0557.20190059>
- Özer, E., Taş, D., Çakır Gündoğan, S., Boyraz, M., Gürbüz, F., 2025. Clinical utility

- of FAI and SHBG in differentiating PCOS from anovulatory cycles in adolescent girls. *Front. Pediatr.* 13, 1581060. <https://doi.org/10.3389/fped.2025.1581060>
- Palomba, S., de Wilde, M.A., Falbo, A., Koster, M.P.H., La Sala, G.B., Fauser, B.C.J.M., 2015. Pregnancy complications in women with polycystic ovary syndrome. *Hum. Reprod. Update* 21, 575–592. <https://doi.org/10.1093/humupd/dmv029>
- Pandian, Z., Gibreel, A., Bhattacharya, S., 2015. In vitro fertilisation for unexplained subfertility. *Cochrane Database of Systematic Reviews*. <https://doi.org/10.1002/14651858.CD003357.pub4>
- Pang, X., Cheng, J., Wu, T., Sun, L., 2023. SIRT3 ameliorates polycystic ovary syndrome through FOXO1/PGC-1 α signaling pathway. *Endocrine* 80, 201–211. <https://doi.org/10.1007/s12020-022-03262-x>
- Pannala, V.R., Bazil, J.N., Camara, A.K.S., Dash, R.K., 2013. A biophysically based mathematical model for the catalytic mechanism of glutathione reductase. *Free Radic. Biol. Med.* 65, 1385–1397. <https://doi.org/10.1016/j.freeradbiomed.2013.10.001>
- Pantos, K., Nitsos, N., Kokkali, G., Vaxevanoglou, T., Markomichali, C., Pantou, A., Grammatidis, M., Lazaros, L., Sfakianoudis, K., 2016. Ovarian rejuvenation and folliculogenesis reactivation in peri-menopausal women after autologous platelet-rich plasma treatment.
- Papalou, O., M. Victor, V., Diamanti-Kandarakis, E., 2016. Oxidative Stress in Polycystic Ovary Syndrome. *Curr. Pharm. Des.* 22, 2709–2722. <https://doi.org/10.2174/1381612822666160216151852>
- Parvanov, D., Ganeva, R., Vidolova, N., Nikolova, K., Vasileva, M., Totev, T., Stamenov, G., 2022. Autologous ovarian platelet rich plasma treatment improves oocyte and embryo quality: a before-after prospective study. *Biotechnology & Biotechnological Equipment* 36, 425–432. <https://doi.org/10.1080/13102818.2022.2090280>
- Patel, H., Pundkar, A., Shrivastava, S., Chandanwale, R., Jaiswal, A.M., 2023. A Comprehensive Review on Platelet-Rich Plasma Activation: A Key Player in Accelerating Skin Wound Healing. *Cureus*. <https://doi.org/10.7759/cureus.48943>
- Pavlovic, V., Ciric, M., Jovanovic, V., Stojanovic, P., 2016. Platelet Rich Plasma: a short overview of certain bioactive components. *Open Medicine* 11, 242–247. <https://doi.org/10.1515/med-2016-0048>
- Pawshe, C.H., Totev, S.M., Jain, S.K., 1994. A comparison of three methods of recovery of goat oocytes for in vitro maturation and fertilization. *Theriogenology* 42, 117–125. [https://doi.org/10.1016/0093-691X\(94\)90668-9](https://doi.org/10.1016/0093-691X(94)90668-9)
- Pellicer, A., Miró, F., Sampaio, M., Gómez, E., Bonilla-Musoles, F.M., 1991. In vitro fertilization as a diagnostic and therapeutic tool in a patient with partial 17,20-desmolase deficiency. *Fertil. Steril.* 55, 970–975. [https://doi.org/10.1016/S0015-0282\(16\)54308-8](https://doi.org/10.1016/S0015-0282(16)54308-8)
- Peng, J., Li, Q., Wigglesworth, K., Rangarajan, A., Kattamuri, C., Peterson, R.T., Eppig, J.J., Thompson, T.B., Matzuk, M.M., 2013. Growth differentiation factor 9: bone morphogenetic protein 15 heterodimers are potent regulators of

- ovarian functions. *Proceedings of the National Academy of Sciences* 110. <https://doi.org/10.1073/pnas.1218020110>
- Petrogiannis, N., Chatzovoulou, K., Filippa, M., Petrogiannis, S., Chatzimeletiou, K., 2024. Successful Pregnancy Following Platelet-Rich Plasma Intraovarian Injection and In Vitro Maturation of Oocytes in a 47-Year-Old Woman: A Case Report. *Cureus*. <https://doi.org/10.7759/cureus.65281>
- Picton, H.M., Harris, S.E., Muruvi, W., Chambers, E.L., 2008. The *in vitro* growth and maturation of follicles. *Reproduction* 136, 703–715. <https://doi.org/10.1530/REP-08-0290>
- Pietrzak, W.S., Eppley, B.L., 2005. Platelet Rich Plasma: Biology and New Technology. *Journal of Craniofacial Surgery* 16, 1043–1054. <https://doi.org/10.1097/01.scs.0000186454.07097.bf>
- Pincus, G., Enzmann, E. V., 1935. THE COMPARATIVE BEHAVIOR OF MAMMALIAN EGGS IN VIVO AND IN VITRO. *Journal of Experimental Medicine* 62, 665–675. <https://doi.org/10.1084/jem.62.5.665>
- Pizzino, G., Irrera, N., Cucinotta, M., Pallio, G., Mannino, F., Arcoraci, V., Squadrito, F., Altavilla, D., Bitto, A., 2017. Oxidative Stress: Harms and Benefits for Human Health. *Oxid. Med. Cell. Longev.* 2017. <https://doi.org/10.1155/2017/8416763>
- Pompella, A., Visvikis, A., Paolicchi, A., Tata, V. De, Casini, A.F., 2003. The changing faces of glutathione, a cellular protagonist. *Biochem. Pharmacol.* 66, 1499–1503. [https://doi.org/10.1016/S0006-2952\(03\)00504-5](https://doi.org/10.1016/S0006-2952(03)00504-5)
- Potiris, A., Stavros, S., Voros, C., Christopoulos, P., Pouliakis, A., Savvidis, M., Papapanagiotou, A., Karampitsakos, T., Topis, S., Vrantza, T., Salvara, M., Gereade, A., Anysiadou, S., Daskalakis, G., Drakakis, P., Domali, E., 2024. Intraovarian Platelet-Rich Plasma Administration for Anovulatory Infertility: Preliminary Findings of a Prospective Cohort Study. *J. Clin. Med.* 13, 5292. <https://doi.org/10.3390/jcm13175292>
- Price, J.C., Sheldon, I.M., 2013. Granulosa Cells from Emerged Antral Follicles of the Bovine Ovary Initiate Inflammation in Response to Bacterial Pathogen-Associated Molecular Patterns via Toll-Like Receptor Pathways¹. *Biol. Reprod.* 89. <https://doi.org/10.1095/biolreprod.113.110965>
- Purwar, A., Nagpure, S., 2022. Insulin Resistance in Polycystic Ovarian Syndrome. *Cureus*. <https://doi.org/10.7759/cureus.30351>
- Pyoos, G.M., Maqhashu, A.M., Scholtz, M.M., Nedambale, T.L., 2019. The comparison of three media on the <i>in vitro</i> maturation rate of pig oocytes. *S. Afr. J. Anim. Sci.* 48. <https://doi.org/10.4314/sajas.v48i6.4>
- Qian, Y., Ting, F., Chen, J., Cai, L.B., Liu, J.Y., Mao, Y.D., Ding, W., Sha, J.H., 2005. Pregnancies and births resulting from in vitro matured oocytes fertilized with testicular spermatozoa. *J. Assist. Reprod. Genet.* 22, 133–136. <https://doi.org/10.1007/s10815-005-4884-8>
- Rahman, A.N.M.A., Abdullah, R.B., Wan-Khadij, W.E., 2008. In vitro Maturation of Oocytes with Special Reference to Goat: A Review. *Biotechnology(Faisalabad)* 7, 599–611. <https://doi.org/10.3923/biotech.2008.599.611>
- Rahmatnezhad, L., Moghaddam-Banaem, L., Behrooz-Lak, T., Shiva, A., Rasouli,

- J., 2023. Association of insulin resistance with polycystic ovary syndrome phenotypes and patients' characteristics: a cross-sectional study in Iran. *Reproductive Biology and Endocrinology* 21, 113. <https://doi.org/10.1186/s12958-023-01160-z>
- Ramezanali, F., Ashrafi, M., Hemat, M., Arabipoor, A., Jalali, S., Moini, A., 2016. Assisted reproductive outcomes in women with different polycystic ovary syndrome phenotypes: the predictive value of anti-Müllerian hormone. *Reprod. Biomed. Online* 32, 503–512. <https://doi.org/10.1016/j.rbmo.2016.01.010>
- Ran, Y., Yi, Q., Li, C., 2021. The Relationship of Anti-Mullerian Hormone in Polycystic Ovary Syndrome Patients with Different Subgroups. *Diabetes Metab. Syndr. Obes. Volume* 14, 1419–1424. <https://doi.org/10.2147/DMSO.S299558>
- Ren, J., Hao, Y., Liu, Z., Li, S., Wang, C., Wang, B., Liu, Y., Liu, G., Dai, Y., 2021. Effect of exogenous glutathione supplementation on the in vitro developmental competence of ovine oocytes. *Theriogenology* 173, 144–155. <https://doi.org/10.1016/j.theriogenology.2021.07.025>
- Rezaie, M.J., Allahveisie, A., Nikkhoo, B., Rezaie, M., Seyedoshohadaei, F., Nouri, B., Abdi, M., 2025. Application of Autologous Platelet-Rich Plasma-Supplemented Medium Promotes In Vitro Maturation of Human Germinal Vesicle Oocytes. *Int. J. Fertil. Steril.* 19, 429–434. <https://doi.org/10.22074/ijfs.2025.2037467.1744>
- Rhee, Y.J., Park, J.K., Ahn, S.-Y., Bang, S., Kim, J.H., Kim, M.K., Lee, W.S., 2025a. The use of autologous platelet-rich plasma in embryo culture to obtain high-quality embryos. *Sci. Rep.* 15, 26025. <https://doi.org/10.1038/s41598-025-07688-x>
- Rhee, Y.J., Park, J.K., Ahn, S.Y., Bang, S., Kim, J.H., Kim, M.K., Lee, W.S., 2025b. The use of autologous platelet-rich plasma in embryo culture to obtain high-quality embryos. *Sci. Rep.* 15. <https://doi.org/10.1038/s41598-025-07688-x>
- Riepsamen, A.H., Chan, K., Lien, S., Sweeten, P., Donoghoe, M.W., Walker, G., Fraison, E.H.J., Stocker, W.A., Walton, K.L., Harrison, C.A., Ledger, W.L., Robertson, D.M., Gilchrist, R.B., 2019. Serum Concentrations of Oocyte-Secreted Factors BMP15 and GDF9 During IVF and in Women With Reproductive Pathologies. *Endocrinology* 160, 2298–2313. <https://doi.org/10.1210/en.2019-00264>
- Rosenfield, R.L., Ehrmann, D.A., 2016. The Pathogenesis of Polycystic Ovary Syndrome (PCOS): The Hypothesis of PCOS as Functional Ovarian Hyperandrogenism Revisited. *Endocr. Rev.* 37, 467–520. <https://doi.org/10.1210/er.2015-1104>
- Sachdeva, G., Gainer, S., Suri, V., Sachdeva, N., Chopra, S., 2019. Comparison of the Different PCOS Phenotypes Based on Clinical Metabolic, and Hormonal Profile, and their Response to Clomiphene. *Indian J. Endocrinol. Metab.* 23, 326–331. https://doi.org/10.4103/ijem.IJEM_30_19
- Sadeghpour, S., Maleki, F., Hajizadeh-Sharafabad, F., Ghasemnejad- Berenji, H., 2025. Evaluation of intraovarian injection of platelet-rich plasma for enhanced

- ovarian function and reproductive success in women with POI and POR: a systematic review and meta-analysis. *Eur. J. Med. Res.* 30, 610. <https://doi.org/10.1186/s40001-025-02854-3>
- Sánchez, F., Lolicato, F., Romero, S., De Vos, M., Van Ranst, H., Verheyen, G., Anckaert, E., Smitz, J.E.J., 2017. An improved IVM method for cumulus-oocyte complexes from small follicles in polycystic ovary syndrome patients enhances oocyte competence and embryo yield. *Human Reproduction* 32, 2056–2068. <https://doi.org/10.1093/humrep/dex262>
- Sanoulis, V., Nikolettos, N., Vlahos, N., 2019. The use of Platelet-Rich Plasma in the Gynaecological Clinical Setting. A review, *HJOG An Obstetrics and Gynecology International Journal*.
- Sasaki, H., Hamatani, T., Kamijo, S., Iwai, M., Kobanawa, M., Ogawa, S., Miyado, K., Tanaka, M., 2019. Impact of Oxidative Stress on Age-Associated Decline in Oocyte Developmental Competence. *Front. Endocrinol. (Lausanne)*. 10. <https://doi.org/10.3389/fendo.2019.00811>
- Schafer, F.Q., Buettner, G.R., 2001. Redox environment of the cell as viewed through the redox state of the glutathione disulfide/glutathione couple. *Free Radic. Biol. Med.* 30, 1191–1212. [https://doi.org/10.1016/S0891-5849\(01\)00480-4](https://doi.org/10.1016/S0891-5849(01)00480-4)
- Schieber, M., Chandel, N.S., 2014. ROS Function in Redox Signaling and Oxidative Stress. *Current Biology* 24, R453–R462. <https://doi.org/10.1016/j.cub.2014.03.034>
- Shamsuddin, M., Niwa, K., Larsson, B., Rodriguez- Martinez, H., 1996. *In vitro* Maturation and Fertilization of Bovine Oocytes. *Reproduction in Domestic Animals* 31, 613–622. <https://doi.org/10.1111/j.1439-0531.1996.tb00041.x>
- Shkolnik, K., Tadmor, A., Ben-Dor, S., Nevo, N., Galiani, D., Dekel, N., 2011. Reactive oxygen species are indispensable in ovulation. *Proceedings of the National Academy of Sciences* 108, 1462–1467. <https://doi.org/10.1073/pnas.1017213108>
- Shmorgun, D., Claman, P., 2017. No-268-The Diagnosis and Management of Ovarian Hyperstimulation Syndrome. *Journal of Obstetrics and Gynaecology Canada* 39, e479–e486. <https://doi.org/10.1016/j.jogc.2017.09.003>
- Sills, E.S., Wood, S.H., 2022. Growth factors, gene activation, and cell recruitment: From intraovarian condensed platelet cytokines to de novo oocyte development. *J. Clin. Transl. Res.* 8, 49–53.
- Silvia, R., 2015. In Vitro Maturation (IVM) of Human Oocytes: Promising Potential, Challenges and Chances for Improvement. *Jurnal Kesehatan Andalas* 4. <https://doi.org/10.25077/jka.v4i2.305>
- Siristatidis, C., Sergentanis, T.N., Vogiati, P., Kanavidis, P., Chrelas, C., Papantoniou, N., Psaltopoulou, T., 2015. In Vitro Maturation in Women with vs. without Polycystic Ovarian Syndrome: A Systematic Review and Meta-Analysis. *PLoS One* 10, e0134696. <https://doi.org/10.1371/journal.pone.0134696>
- Sobti, S., Dewan, R., Ranga, S., 2017. Metabolic syndrome and insulin resistance in PCOS phenotypes. *Int. J. Reprod. Contracept. Obstet. Gynecol.* 6, 5067. <https://doi.org/10.18203/2320-1770.ijrcog20175027>

- Soebijanto, S. 2019. Konsensus Penanganan Infertilitas.
- Song, J., Xiao, L., Zhang, Z., Wang, Y., Kouis, P., Rasmussen, L.J., Dai, F., 2024. Effects of reactive oxygen species and mitochondrial dysfunction on reproductive aging. *Front. Cell Dev. Biol.* 12. <https://doi.org/10.3389/fcell.2024.1347286>
- Su, Y.-Q., Sugiura, K., Eppig, J., 2009. Mouse Oocyte Control of Granulosa Cell Development and Function: Paracrine Regulation of Cumulus Cell Metabolism. *Semin. Reprod. Med.* 27, 032–042. <https://doi.org/10.1055/s-0028-1108008>
- Sudiman, J., Sutton-McDowall, M.L., Ritter, L.J., White, M.A., Mottershead, D.G., Thompson, J.G., Gilchrist, R.B., 2014. Bone Morphogenetic Protein 15 in the Pro-Mature Complex Form Enhances Bovine Oocyte Developmental Competence. *PLoS One* 9, e103563. <https://doi.org/10.1371/journal.pone.0103563>
- Sun, B., Pan, Z., Kuang, H., Feng, X., Hou, L., Xu, F., Song, F., Sun, M., 2022. TLR4/NF- κ B Signaling Contributes to the Inflammation in Ovary and Inguinal Fats of Polycystic Ovary Syndrome. <https://doi.org/10.1101/2022.07.14.500077>
- Sun, B., Yeh, J., 2021. Identifying fertilization-ready metaphase II stage oocytes beyond the microscope: a proposed molecular path forward. *F. S. Rev.* 2, 302–316. <https://doi.org/10.1016/j.xfnr.2021.09.001>
- Tan, J., Zou, Y., Wu, X.-W., Tian, L.-F., Su, Q., He, J.-X., Huang, Z.-H., Zhao, Y., Wu, L.-P., Wu, Q.-F., 2017. Increased SCF in Follicular Fluid and Granulosa Cells Positively Correlates With Oocyte Maturation, Fertilization, and Embryo Quality in Humans. *Reproductive Sciences* 24, 1544–1550. <https://doi.org/10.1177/1933719117697125>
- Tannus, S., Hatirnaz, S., Tan, J., Ata, B., Tan, S.-L., Hatirnaz, E., Kenat-Pektas, M., Dahan, M.-H., 2018. Predictive factors for live birth after in vitro maturation of oocytes in women with polycystic ovary syndrome. *Arch. Gynecol. Obstet.* 297, 199–204. <https://doi.org/10.1007/s00404-017-4561-z>
- Teede, H.J., Khomami, M.B., Morman, R., Laven, J.S.E., Joham, A.E., Costello, M.F., Patil, M., Rees, D.A., Berry, L., Cree, M.G., Zhao, H., Norman, R.J., Dokras, A., Piltonen, T., 2026. Polyendocrine metabolic ovarian syndrome, the new name for polycystic ovary syndrome: a multistep global consensus process. *The Lancet* 407, 2329–2339. [https://doi.org/10.1016/S0140-6736\(26\)00717-8](https://doi.org/10.1016/S0140-6736(26)00717-8)
- Torreggiani, E., Perut, F., Roncuzzi, L., Zini, N., Baglio, S., Baldini, N., 2014. Exosomes: novel effectors of human platelet lysate activity. *Eur. Cell. Mater.* 28, 137–151. <https://doi.org/10.22203/eCM.v028a11>
- Toyoda, T., Isobe, K., Tsujino, T., Koyata, Y., Ohyagi, F., Watanabe, T., Nakamura, M., Kitamura, Y., Okudera, H., Nakata, K., Kawase, T., 2018. Direct activation of platelets by addition of CaCl₂ leads coagulation of platelet-rich plasma. *Int. J. Implant Dent.* 4, 23. <https://doi.org/10.1186/s40729-018-0134-6>
- Trounson, A., Anderiesz, C., Jones, G., 2001. Maturation of human oocytes in vitro and their developmental competence. *Reproduction* 121, 51–75.

<https://doi.org/10.1530/rep.0.1210051>

- Trounson, A., Wood, C., Kausche, A., 1994. In vitro maturation and the fertilization and developmental competence of oocytes recovered from untreated polycystic ovarian patients. *Fertil. Steril.* 62, 353–362. [https://doi.org/10.1016/S0015-0282\(16\)56891-5](https://doi.org/10.1016/S0015-0282(16)56891-5)
- Tsai-Turton, M., Luderer, U., 2006. Opposing Effects of Glutathione Depletion and Follicle-Stimulating Hormone on Reactive Oxygen Species and Apoptosis in Cultured Preovulatory Rat Follicles. *Endocrinology* 147, 1224–1236. <https://doi.org/10.1210/en.2005-1281>
- Ufer, 2011. The roles of glutathione peroxidases during embryo development. *Front. Mol. Neurosci.* <https://doi.org/10.3389/fnmol.2011.00012>
- Vaggopoulos, V., Trakakis, E., Chrelias, C., Panagopoulos, P., Basios, G., Makridima, S., Sioulas, V.D., Simeonides, G., Labos, G., Boutati, E., Kassanos, D., 2013. Comparing classic and newer phenotypes in Greek PCOS women: the prevalence of metabolic syndrome and their association with insulin resistance. *J. Endocrinol. Invest.* 36, 478–84. <https://doi.org/10.3275/8771>
- Van Blerkom, J., Henry, G., 1992. Oocyte dysmorphism and aneuploidy in meiotically mature human oocytes after ovarian stimulation. *Human Reproduction* 7, 379–390. <https://doi.org/10.1093/oxfordjournals.humrep.a137655>
- van der Gaast, M., Eijkemans, M., van der Net, J., de Boer, E., Burger, C., van Leeuwen, F., Fauser, B., Macklon, N., 2006. Optimum number of oocytes for a successful first IVF treatment cycle. *Reprod. Biomed. Online* 13, 476–480. [https://doi.org/10.1016/S1472-6483\(10\)60633-5](https://doi.org/10.1016/S1472-6483(10)60633-5)
- Velez, L.M., Seldin, M., Motta, A.B., 2021. Inflammation and reproductive function in women with polycystic ovary syndrome. *Biol. Reprod.* 104, 1205–1217. <https://doi.org/10.1093/biolre/ioab050>
- Verlhac, M.-H., Terret, M.-E., 2016. Oocyte Maturation and Development. *F1000Res.* 5, 309. <https://doi.org/10.12688/f1000research.7892.1>
- Vidya Bharathi, R., Swetha, S., Neerajaa, J., Varsha Madhavica, J., Janani, D.M., Rekha, S.N., S., R., B., U., 2017. An epidemiological survey: Effect of predisposing factors for PCOS in Indian urban and rural population. *Middle East Fertil. Soc. J.* 22, 313–316. <https://doi.org/10.1016/j.mefs.2017.05.007>
- Virant-Klun, I., Knez, K., Tomazevic, T., Skutella, T., 2013. Gene Expression Profiling of Human Oocytes Developed and Matured *In Vivo* or *In Vitro*. *Biomed Res. Int.* 2013, 1–20. <https://doi.org/10.1155/2013/879489>
- Wang, H., Zhang, Y., Fang, X., Kwak-Kim, J., Wu, L., 2021. Insulin Resistance Adversely Affect IVF Outcomes in Lean Women Without PCOS. *Front. Endocrinol. (Lausanne)*. 12. <https://doi.org/10.3389/fendo.2021.734638>
- Wang, K., Li, Y., 2023. Signaling pathways and targeted therapeutic strategies for polycystic ovary syndrome. *Front. Endocrinol. (Lausanne)*. 14. <https://doi.org/10.3389/fendo.2023.1191759>
- Wang, R., Kim, B. V, van Wely, M., Johnson, N.P., Costello, M.F., Zhang, H., Ng, E.H.Y., Legro, R.S., Bhattacharya, S., Norman, R.J., Mol, B.W.J., 2017. Treatment strategies for women with WHO group II anovulation: systematic

- review and network meta-analysis. *BMJ* j138. <https://doi.org/10.1136/bmj.j138>
- Wathlet, S., Adriaenssens, T., Segers, I., Verheyen, G., Van Landuyt, L., Coucke, W., Devroey, P., Smits, J., 2013. Pregnancy Prediction in Single Embryo Transfer Cycles after ICSI Using QPCR: Validation in Oocytes from the Same Cohort. *PLoS One* 8, e54226. <https://doi.org/10.1371/journal.pone.0054226>
- Wei, L.-N., Huang, R., Li, L.-L., Fang, C., Li, Y., Liang, X.-Y., 2014. Reduced and delayed expression of GDF9 and BMP15 in ovarian tissues from women with polycystic ovary syndrome. *J. Assist. Reprod. Genet.* 31, 1483–1490. <https://doi.org/10.1007/s10815-014-0319-8>
- Werner, H., 2023. The IGF1 Signaling Pathway: From Basic Concepts to Therapeutic Opportunities. *Int. J. Mol. Sci.* 24, 14882. <https://doi.org/10.3390/ijms241914882>
- Williamson, K., Gunn, A.J., Johnson, N., Milsom, S.R., 2001. The impact of ethnicity on the presentation of polycystic ovarian syndrome. *Australian and New Zealand Journal of Obstetrics and Gynaecology* 41, 202–206. <https://doi.org/10.1111/j.1479-828X.2001.tb01210.x>
- Wiweko, B., Hestiantoro, A., Sumapraja, K., Natadisastra, M., Febia, E., Andriyana, H., Pradipta, B., Susanto, C.A., 2010. Anti Mullerian Hormone Serum Level Indicates Ovarian Response in Controlled Ovarian Hyperstimulation of IVF Cycles Kadar Anti Mullerian Hormon sebagai Parameter Respons Ovarium Pasien yang Menjalani Hiperstimulasi Ovarium Terkendali Program FIV.
- Wood, T.C., Wildt, D.E., 1997. Effect of the quality of the cumulus–oocyte complex in the domestic cat on the ability of oocytes to mature, fertilize and develop into blastocysts *in vitro*. *Reproduction* 110, 355–360. <https://doi.org/10.1530/jrf.0.1100355>
- Wu, J., Piao, Y., Liu, Q., Yang, X., 2021. Platelet- rich plasma- derived extracellular vesicles: A superior alternative in regenerative medicine? *Cell Prolif.* 54. <https://doi.org/10.1111/cpr.13123>
- Wu, W.-S., Chen, L.-R., Chen, K.-H., 2025. Platelet-Rich Plasma (PRP): Molecular Mechanisms, Actions and Clinical Applications in Human Body. *Int. J. Mol. Sci.* 26, 10804. <https://doi.org/10.3390/ijms262110804>
- Xu, B., Zhang, Y.-W., Tong, X.-H., Liu, Y.-S., 2015. Characterization of microRNA profile in human cumulus granulosa cells: Identification of microRNAs that regulate Notch signaling and are associated with PCOS. *Mol. Cell. Endocrinol.* 404, 26–36. <https://doi.org/10.1016/j.mce.2015.01.030>
- Xu, X., Li, J., Lin, H., Lin, Z., Ji, G., 2025. The role of TGF- β superfamily in endometriosis: a systematic review. *Front. Immunol.* 16. <https://doi.org/10.3389/fimmu.2025.1638604>
- Xu, Y., Qiao, J., 2022. Comparison of in vitro maturation and in vitro fertilization for polycystic ovary syndrome patients—reply letter. *Ann. Transl. Med.* 10, 531–531. <https://doi.org/10.21037/atm-2022-7>
- Yan, F., Yang, W., Li, X., Lin, T., Lun, Y., Lin, F., Lv, S., Yan, G., Liu, J., Shen, J., Mu, Y., Luo, G., 2008. A trifunctional enzyme with glutathione S-transferase, glutathione peroxidase and superoxide dismutase activity.

- Biochimica et Biophysica Acta (BBA) - General Subjects 1780, 869–872. <https://doi.org/10.1016/j.bbagen.2008.03.003>
- Yan, H., Wang, L., Zhang, G., Li, N., Zhao, Y., Liu, J., Jiang, M., Du, X., Zeng, Q., Xiong, D., He, L., Zhou, Z., Luo, M., Liu, W., 2024. Oxidative stress and energy metabolism abnormalities in polycystic ovary syndrome: from mechanisms to therapeutic strategies. *Reproductive Biology and Endocrinology* 22, 159. <https://doi.org/10.1186/s12958-024-01337-0>
- Yang, H., Kolben, T., Meister, S., Paul, C., van Dorp, J., Eren, S., Kuhn, C., Rahmeh, M., Mahner, S., Jeschke, U., von Schönfeldt, V., 2021. Factors Influencing the In Vitro Maturation (IVM) of Human Oocyte. *Biomedicines* 9, 1904. <https://doi.org/10.3390/biomedicines9121904>
- Yang, S., Yang, Y., Hao, H., Du, W., Pang, Y., Zhao, S., Zou, H., Zhu, H., Zhang, P., Zhao, X., 2022. Supplementation of EGF, IGF-1, and Connexin 37 in IVM Medium Significantly Improved the Maturation of Bovine Oocytes and Vitriification of Their IVF Blastocysts. *Genes (Basel)*. 13, 805. <https://doi.org/10.3390/genes13050805>
- Yin, H., Duan, L., Wang, Z., Liu, L., Shen, J., 2025. Fibroblast growth factor 8: Multifaceted role in development and developmental disorder. *Genes Dis.* 12, 101524. <https://doi.org/10.1016/j.gendis.2025.101524>
- Yu, W., Wang, J., Yin, J., 2011. Platelet-Rich Plasma: A Promising Product for Treatment of Peripheral Nerve Regeneration After Nerve Injury. *International Journal of Neuroscience* 121, 176–180. <https://doi.org/10.3109/00207454.2010.544432>
- Zhang, Haolin, Qiu, W., Zhou, P., Shi, L., Chen, Z., Yang, Y., Lu, Y., Zhou, L., Zhang, Hua, Cheng, M., Ye, Y., Li, R., 2024. Obesity is associated with SHBG levels rather than blood lipid profiles in PCOS patients with insulin resistance. *BMC Endocr. Disord.* 24, 254. <https://doi.org/10.1186/s12902-024-01789-w>
- Zhang, J., Bao, Y., Zhou, X., Zheng, L., 2019. Polycystic ovary syndrome and mitochondrial dysfunction. *Reproductive Biology and Endocrinology* 17, 67. <https://doi.org/10.1186/s12958-019-0509-4>
- Zhang, J.-H., Zhan, L., Zhao, M.-Y., Wang, J.-J., Xie, F.-F., Xu, Z.-Y., Xu, Q., Cao, Y.-X., Liu, Q.-W., 2022. Role of EGFR expressed on the granulosa cells in the pathogenesis of polycystic ovarian syndrome. *Front. Endocrinol. (Lausanne)*. 13. <https://doi.org/10.3389/fendo.2022.971564>
- Zhang, L., Cai, H., Li, W., Tian, L., Shi, J., 2022. Duration of infertility and assisted reproductive outcomes in non-male factor infertility: can use of ICSI turn the tide? *BMC Womens Health* 22. <https://doi.org/10.1186/s12905-022-02062-9>
- Zhang, Q., Ren, J., Wang, F., Pan, M., Cui, L., Li, M., Qu, F., 2022. Mitochondrial and glucose metabolic dysfunctions in granulosa cells induce impaired oocytes of polycystic ovary syndrome through Sirtuin 3. *Free Radic. Biol. Med.* 187, 1–16. <https://doi.org/10.1016/j.freeradbiomed.2022.05.010>
- Zhang, R., Wang, X., Mo, M., Liu, Z., Liu, S., 2025. Insulin resistance as a determinant of fertilization efficiency in polycystic ovary syndrome patients undergoing IVF/ICSI: a retrospective cohort study. *Reproductive Biology and Endocrinology* 23. <https://doi.org/10.1186/s12958-025-01453-5>
- Zheng, X., Guo, W., Zeng, L., Zheng, D., Yang, S., Wang, L., Wang, R., Mol, B.W.,

- Li, R., Qiao, J., 2020. Live birth after in vitro maturation versus standard in vitro fertilisation for women with polycystic ovary syndrome: protocol for a non-inferiority randomised clinical trial. *BMJ Open* 10, e035334. <https://doi.org/10.1136/bmjopen-2019-035334>
- Zhou, Y., Zhang, Q., Ding, R., Fan, X., Li, Q., Li, Z., 2025. Effects of high levels of androgens on oocyte maturation and potential regulatory role of retinoic acid. *Life Sci.* 365, 123463. <https://doi.org/10.1016/j.lfs.2025.123463>
- Ziegler, C.G., Van Sloun, R., Gonzalez, S., Whitney, K.E., DePhillipo, N.N., Kennedy, M.I., Dornan, G.J., Evans, T.A., Huard, J., LaPrade, R.F., 2019. Characterization of Growth Factors, Cytokines, and Chemokines in Bone Marrow Concentrate and Platelet-Rich Plasma: A Prospective Analysis. *Am. J. Sports Med.* 47, 2174–2187. <https://doi.org/10.1177/0363546519832003>