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Female reproductive ageing

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References

1. United Nations. Populations and women. Report number ST/ESA/SER.R/130. New York, USA: United Nations, 1996.
2. Leridon H. Demographic effects of the introduction of steroid contraception in developed countries. *Hum Reprod Update* 2006;12:603-16.
3. Billari F, Liefbroer AC, Philipov D. The postponement of childbearing in Europe: driving forces and implications. In: *Vienna Yearbook of Population Research 2006*. Vienna, Austria: Vienna Institute of Demography, 2006, 1-17.
4. Bryant J. Theories of fertility decline and the evidence from development indicators. *Population and Development Review* 2007;33:101.
5. Dutch National Institute for Statistics. Website: statline.cbs.nl.
6. Van Agtmaal-Wobma E, Van Huis M. De relatie tussen vruchtbaarheid en opleidingsniveau van de vrouw. *Bevolkingstrends* 2008;2:32-41.
7. Baird DT, Collins J, Egozcue J, Evers LH, Gianaroli L, Leridon H, et al. Fertility and ageing. *Hum Reprod Update* 2005;11:261-76.
8. Te Velde ER, Pearson PL. The variability of female reproductive ageing. *Hum Reprod Update* 2002;8:141-54.
9. Lutz W, O'Neill BC, Scherbov S. Demographics. Europe's population at a turning point. *Science* 2003;299:1991-2.
10. Wilson C. Fertility below replacement level. *Science* 2004;304:207-8.
11. Berkowitz GS, Skovron ML, Lapinski RH, Berkowitz RL. Delayed childbearing and the outcome of pregnancy. *New Engl J Med* 1990;322:659-64.
12. Cleary-Goldman J, Malone FD, Vidaver M, Ball RH, Nyberg DA, Comstock CH, et al. Impact of maternal age on obstetric outcome. *Obstet Gynecol* 2005;105:983-90.
13. Joseph KS, Allen AC, Dodds L, Turner LA, Scott H, Liston R. The perinatal effects of delayed childbearing. *Obstet Gynecol* 2005;105:1410-8.
14. Kuhnert B, Nieschlag E. Reproductive functions of the ageing male. *Hum Reprod Update* 2004;10:327-39.
15. Block E. Quantitative morphological investigations of the follicular system in women; variations at different ages. *Acta Anat (Basel)* 1952;14:108-23.
16. Peters H. Migration of gonocytes into mammalian gonad and their Differentiation. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences* 1970;259:91.
17. Johnson J, Canning J, Kaneko T, Pru JK, Tilly JL. Germline stem cells and follicular renewal in the postnatal mammalian ovary. *Nature* 2004;430:1062.
18. Baker TG. A quantitative and cytological study of germ cells in human ovaries. *Proc R Soc Lond B Biol Sci* 1963;158:417-33.
19. Gougeon A, Ecochard R, Thalabard JC. Age-related changes of the population of human ovarian follicles: increase in the disappearance rate of non-growing and early-growing follicles in aging women. *Biol Reprod* 1994;50:653-63.
20. Markstrom E, Svensson EC, Shao R, Svanberg B, Billig H. Survival factors regulating ovarian apoptosis - dependence on follicle differentiation. *Reproduction* 2002;123:23-30.
21. Faddy MJ, Gosden RG, Gougeon A, Richardson SJ, Nelson JF. Accelerated disappearance of ovarian follicles in mid-life: implications for forecasting menopause. *Hum Reprod* 1992;7:1342-6.
22. Hansen KR, Knowlton NS, Thyer AC, Charleston JS, Soules MR, Klein NA. A new model of reproductive aging: the decline in ovarian non-growing follicle number from birth to menopause. *Hum Reprod* 2008;23:699-708.
23. Faddy MJ, Gosden RG. A model conforming the decline in follicle numbers to the age of menopause in women. *Hum Reprod* 1996;11:1484-6.

24. Richardson SJ, Senikas V, Nelson JF. Follicular depletion during the menopausal transition - Evidence for accelerated loss and ultimate exhaustion. *J Clin Endocr Metab* 1987;65:1231-7.
25. Bengtsson C, Lindquist O, Redvall L. Menstrual status and menopausal age of middle-aged Swedish women - A population study of women in Göteborg 1968-69 and 1974-75. *Acta Obstet Gynecol Scand* 1981;60:269-75.
26. Hagstad A, Johansson S, Wilhelmsson C, Janson PO. Gynaecology of middle-aged women--menstrual and reproductive histories. *Maturitas* 1985;7:99-113.
27. Riboli E, Hunt KJ, Slimani N, Ferrari P, Norat T, Fahey M, et al. European prospective investigation into cancer and nutrition (EPIC): study populations and data collection. *Public Health Nutrition* 2002;5:1113-24.
28. Van Noord PAH, Dubas JS, Dorland M, Boersma H, Te Velde E. Age at natural menopause in a population-based screening cohort: The role of menarche, fecundity, and lifestyle factors. *Fertil Steril* 1997;68:95-102.
29. De Bruin JP, Bovenhuis H, Van Noord PA, Pearson PL, Van Arendonk JA, Te Velde ER, et al. The role of genetic factors in age at natural menopause. *Hum Reprod* 2001;16:2014-8.
30. Murabito JM, Yang Q, Fox C, Wilson PW, Cupples LA. Heritability of age at natural menopause in the Framingham Heart Study. *J Clin Endocrinol Metab* 2005;90:3427-30.
31. Van Asselt KM, Kok HS, Pearson PL, Dubas JS, Peeters PH, Te Velde ER, et al. Heritability of menopausal age in mothers and daughters. *Fertil Steril* 2004;82:1348-51.
32. He C, Kraft P, Chen C, Buring JE, Pare G, Hankinson SE, et al. Genome-wide association studies identify loci associated with age at menarche and age at natural menopause. *Nat Genet* 2009, epub ahead of print.
33. Kok HS, Van Asselt KM, Van der Schouw YT, Peeters PH, Wijmenga C. Genetic studies to identify genes underlying menopausal age. *Hum Reprod Update* 2005;11:483-93.
34. Murabito JM, Yang Q, Fox CS, Cupples LA. Genome-wide linkage analysis to age at natural menopause in a community-based sample: the Framingham Heart Study. *Fertil Steril* 2005;84:1674-9.
35. Stolk L, Zhai G, Van Meurs JB, Verbiest MM, Visser JA, Estrada K, et al. Loci at chromosomes 13, 19 and 20 influence age at natural menopause. *Nat Genet* 2009, epub ahead of print.
36. Cohen LE. Cancer treatment and the ovary: the effects of chemotherapy and radiation. *Ann N Y Acad Sci* 2008;1135:123-5.
37. De Bruin ML, Van Dulmen-Den Broeder E, Van den Berg MH, Lambalk CB. Fertility in female childhood cancer survivors. *Endocr Dev* 2009;15:135-58.
38. Kato I, Toniolo P, Akhmedkhanov A, Koenig KL, Shore R, Zeleniuch-Jacquotte A. Prospective study of factors influencing the onset of natural menopause. *J Clin Epidemiol* 1998;51:1271-6.
39. Kinney A, Kline J, Levin B. Alcohol, caffeine and smoking in relation to age at menopause. *Maturitas* 2006;54:27-38.
40. Bouchard G. Family Reproduction in New Rural-Areas - Outline of A North-American Model. *Canadian Historical Review* 1994;75:475-510.
41. O'Connor KA, Holman DJ, Wood JW. Declining fecundity and ovarian ageing in natural fertility populations. *Maturitas* 1998;30:127-36.
42. Abma JC, Chandra A, Mosher WD, Peterson LS, Piccinino LJ. Fertility, family planning, and women's health: new data from the 1995 National Survey of Family Growth. *Vital Health Stat* 1997;23:1-114.
43. Treloar AE, Boynton RE, Behn BG, Brown BW. Variation of the human menstrual cycle through reproductive life. *Int J Fertil* 1967;12:77-126.
44. Schwartz D, Mayaux MJ. Female fecundity as a function of age: results of artificial insemination in 2193 nulliparous women with azoospermic husbands. *Federation CECOS. N Engl J Med* 1982;306:404-6.
45. Van Noord-Zaadstra BM, Looman CW, Alsbach H, Habbema JD, Te Velde ER, Karbaat J. Delaying childbearing: effect of age on fecundity and outcome of pregnancy. *BMJ* 1991;302:1361-5.

46. Centers for Disease Control and Prevention. Assisted Reproductive Technology Success Rates: National Summary and Fertility Clinic Reports. Website: <http://apps.nccdc.cdc.gov/ART>.
47. National Institute for Health and Clinical Excellence. Fertility assessment and treatment for people with fertility problems. London, UK: NICE, 2004.
48. Nyboe Andersen A, Goossens V, Bhattacharya S, Ferraretti AP, Kupka MS, De Mouzon J, et al. Assisted reproductive technology and intrauterine inseminations in Europe, 2005: results generated from European registers by ESHRE. The European IVF Monitoring Programme (EIM), for the European Society of Human Reproduction and Embryology (ESHRE). *Hum Reprod* 2009;24:1267-87.
49. Templeton A, Morris JK, Parslow W. Factors that affect outcome of in-vitro fertilisation treatment. *Lancet* 1996;348:1402-6.
50. Hassold T, Chiu D. Maternal age-specific rates of numerical chromosome abnormalities with special reference to trisomy. *Hum Genet* 1985;70:11-7.
51. Hassold T, Hunt P. To err (meiotically) is human: the genesis of human aneuploidy. *Nat Rev Genet* 2001;2:280-91.
52. Battaglia DE, Goodwin P, Klein NA, Soules MR. Influence of maternal age on meiotic spindle assembly in oocytes from naturally cycling women. *Hum Reprod* 1996;11:2217-22.
53. Hunt PA, Hassold TJ. Human female meiosis: what makes a good egg go bad? *Trends Genet* 2008;24:86-93.
54. Kuliev A, Cieslak J, Verlinsky Y. Frequency and distribution of chromosome abnormalities in human oocytes. *Cytogenet Genome Res* 2005;111:193-8.
55. Pellestor F, Anahory T, Hamamah S. Effect of maternal age on the frequency of cytogenetic abnormalities in human oocytes. *Cytogenet Genome Res* 2005;111:206-12.
56. Delhanty JD. Mechanisms of aneuploidy induction in human oogenesis and early embryogenesis. *Cytogenet Genome Res* 2005;111:237-44.
57. Eichenlaub-Ritter U. Genetics of oocyte ageing. *Maturitas* 1998;30:143-69.
58. Allen EG, Freeman SB, Druschel C, Hobbs CA, O'Leary LA, Romitti PA, et al. Maternal age and risk for trisomy 21 assessed by the origin of chromosome nondisjunction: a report from the Atlanta and National Down Syndrome Projects. *Hum Genet* 2009;125:41-52.
59. Lamb NE, Sherman SL, Hassold TJ. Effect of meiotic recombination on the production of aneuploid gametes in humans. *Cytogenet Genome Res* 2005;111:250-5.
60. Sherman SL, Petersen MB, Freeman SB, Hersey J, Pettay D, Taft L, et al. Non-disjunction of chromosome 21 in maternal meiosis I: evidence for a maternal age-dependent mechanism involving reduced recombination. *Hum Mol Genet* 1994;3:1529-35.
61. Tarin JJ. Aetiology of age-associated aneuploidy: a mechanism based on the 'free radical theory of ageing'. *Hum Reprod* 1995;10:1563-5.
62. Volarcik K, Sheehan L, Goldfarb J, Woods L, Abdul-Karim FW, Hunt P. The meiotic competence of in-vitro matured human oocytes is influenced by donor age: evidence that folliculogenesis is compromised in the reproductively aged ovary. *Hum Reprod* 1998;13:154-60.
63. Warburton D. The effect of maternal age on the frequency of trisomy: change in meiosis or in utero selection? *Prog Clin Biol Res* 1989;311:165-81.
64. Dursun P, Gultekin M, Yuce K, Ayhan A. What is the underlying aneuploidy associated cause of with increasing maternal age? Is it associated with elevated levels of gonadotropins? *Medical Hypotheses* 2005;66:143-7.
65. McTavish KJ, Jimenez M, Walters KA, Spaliviero J, Groome NP, Themmen AP, et al. Rising follicle-stimulating hormone levels with age accelerate female reproductive failure. *Endocrinology* 2007;148:4432-9.

66. Roberts R, Iatropoulou A, Ciantar D, Stark J, Becker DL, Franks S, et al. Follicle-stimulating hormone affects metaphase I chromosome alignment and increases aneuploidy in mouse oocytes matured in vitro. *Biol Reprod* 2005;72:107-18.
67. Gauden ME. Maternal age effect: the enigma of Down syndrome and other trisomic conditions. *Mutat Res* 1992;296:69-88.
68. Van Blerkom J, Antczak M, Schrader R. The developmental potential of the human oocyte is related to the dissolved oxygen content of follicular fluid: association with vascular endothelial growth factor levels and perifollicular blood flow characteristics. *Hum Reprod* 1997;12:1047-55.
69. Henderson SA, Edwards RG. Chiasma frequency and maternal age in mammals. *Nature* 1968;218:22-8.
70. Soules MR, Sherman S, Parrott E, Rebar R, Santoro N, Utian W, et al. Executive summary: Stages of Reproductive Aging Workshop (STRAW). *Fertil Steril* 2001;76:874-8.
71. Den Tonkelaar I, Te Velde ER, Looman CW. Menstrual cycle length preceding menopause in relation to age at menopause. *Maturitas* 1998;29:115-23.
72. Broekmans FJ, Kwee J, Hendriks DJ, Mol BW, Lambalk CB. A systematic review of tests predicting ovarian reserve and IVF outcome. *Hum Reprod Update* 2006;12:685-718.
73. Bukman A, Heineman MJ. Ovarian reserve testing and the use of prognostic models in patients with subfertility. *Hum Reprod Update* 2001;7:581-90.
74. De Koning CH, McDonnell J, Themmen AP, De Jong FH, Homburg R, Lambalk CB. The endocrine and follicular growth dynamics throughout the menstrual cycle in women with consistently or variably elevated early follicular phase FSH compared with controls. *Hum Reprod* 2008;23:1416-23.
75. Scott RT Jr, Hofmann GE, Oehninger S, Muasher SJ. Intercycle variability of day 3 follicle-stimulating hormone levels and its effect on stimulation quality in in vitro fertilization. *Fertil Steril* 1990;54:297-302.
76. De Koning CH, Popp-Snijders C, Martens F, Lambalk CB. Falsely elevated follicle-stimulating hormone levels in women with regular menstrual cycles due to interference in immunoradiometric assay. *J Assist Reprod Genet* 2000;17:457-9.
77. De Koning CH, Benjamins T, Harms P, Homburg R, Van Montfrans JM, Gromoll J, et al. The distribution of FSH receptor isoforms is related to basal FSH levels in subfertile women with normal menstrual cycles. *Hum Reprod* 2006;21:443-6.
78. Schipper I, De Jong FH, Fauser BC. Lack of correlation between maximum early follicular phase serum follicle stimulating hormone concentrations and menstrual cycle characteristics in women under the age of 35 years. *Hum Reprod* 1998;13:1442-8.
79. Van Zonneveld P, Scheffer GJ, Broekmans FJ, Te Velde ER. Hormones and reproductive aging. *Maturitas* 2001;38:83-91.
80. Burger HG, Hale GE, Robertson DM, Dennerstein L. A review of hormonal changes during the menopausal transition: focus on findings from the Melbourne Women's Midlife Health Project. *Hum Reprod Update* 2007;13:559-65.
81. Nader S, Berkowitz AS. Use of the hormonal response to clomiphene citrate as an endocrinological indicator of ovarian ageing. *Hum Reprod* 1991;6:931-3.
82. Scott RT, Leonardi MR, Hofmann GE, Illions EH, Neal GS, Navot D. A prospective evaluation of clomiphene citrate challenge test screening of the general infertility population. *Obstet Gynecol* 1993;82:539-44.
83. Hannoun A, Abu MA, Awwad J, Kaspar H, Khalil A. Clomiphene citrate challenge test: cycle to cycle variability of cycle day 10 follicle stimulating hormone level. *Clin Exp Obstet Gynecol* 1998;25:155-6.
84. Kwee J, Schats R, McDonnell J, Lambalk CB, Schoemaker J. Intercycle variability of ovarian reserve tests: results of a prospective randomized study. *Hum Reprod* 2004;19:590-5.
85. De Vet A, Laven JS, De Jong FH, Themmen AP, Fauser BC. Anti-Müllerian hormone serum levels: a putative marker for ovarian aging. *Fertil Steril* 2002;77:357-62.

86. Fanchin R, Schonauer LM, Righini C, Guibourdenche J, Frydman R, Taieb J. Serum anti-Müllerian hormone is more strongly related to ovarian follicular status than serum inhibin B, estradiol, FSH and LH on day 3. *Hum Reprod* 2003;18:323-7.
87. Durlinger AL, Gruijters MJ, Kramer P, Karels B, Kumar TR, Matzuk MM, et al. Anti-Müllerian hormone attenuates the effects of FSH on follicle development in the mouse ovary. *Endocrinology* 2001;142:4891-9.
88. Fanchin R, Louafi N, Mendez Lozano DH, Frydman N, Frydman R, Taieb J. Per-follicle measurements indicate that anti-Müllerian hormone secretion is modulated by the extent of follicular development and luteinization and may reflect qualitatively the ovarian follicular status. *Fertil Steril* 2005;84:167-73.
89. Gruijters MJ, Visser JA, Durlinger AL, Themmen AP. Anti-Müllerian hormone and its role in ovarian function. *Mol Cell Endocrinol* 2003;211:85-90.
90. Weenen C, Laven JS, Von Bergh AR, Cranfield M, Groome NP, Visser JA, et al. Anti-Müllerian hormone expression pattern in the human ovary: potential implications for initial and cyclic follicle recruitment. *Mol Hum Reprod* 2004;102:77-83.
91. La Marca A, De Leo V, Giulini S, Orvieto R, Malmusi S, Giannella L, et al. Anti-Müllerian hormone in premenopausal women and after spontaneous or surgically induced menopause. *J Soc Gynecol Investig* 2005;12:545-8.
92. Lee MM, Donahoe PK, Hasegawa T, Silverman B, Crist GB, Best S, et al. Müllerian inhibiting substance in humans: normal levels from infancy to adulthood. *J Clin Endocrinol Metab* 1996;81:571-6.
93. Van Rooij IA, Broekmans FJ, Scheffer GJ, Looman CW, Habbema JD, De Jong FH, et al. Serum anti-Müllerian hormone levels best reflect the reproductive decline with age in normal women with proven fertility: a longitudinal study. *Fertil Steril* 2005;83:979-87.
94. Van Rooij I, Den Tonkelaar I, Broekmans FJ, Looman CW, Scheffer GJ, De Jong FH, et al. Anti-Müllerian hormone is a promising predictor for the occurrence of the menopausal transition. *Menopause* 2004;11:601-6.
95. Van Disseldorp J, Faddy MJ, Themmen AP, De Jong FH, Peeters PH, Van der Schouw YT, et al. Relationship of serum anti-Müllerian hormone concentration to age at menopause. *J Clin Endocrinol Metab* 2008;93:2129-34.
96. Hehenkamp WJ, Looman CW, Themmen AP, De Jong FH, Te Velde ER, Broekmans FJ. Anti-Müllerian hormone levels in the spontaneous menstrual cycle do not show substantial fluctuation. *J Clin Endocrinol Metab* 2006;91:4057-63.
97. La Marca A, Stabile G, Artenisio AC, Volpe A. Serum anti-Müllerian hormone throughout the human menstrual cycle. *Hum Reprod* 2006;21:3103-7.
98. Hale GE, Zhao X, Hughes CL, Burger HG, Robertson DM, Fraser IS. Endocrine features of menstrual cycles in middle and late reproductive age and the menopausal transition classified according to the Staging of Reproductive Aging Workshop (STRAW) staging system. *J Clin Endocrinol Metab* 2007;92:3060-7.
99. Hurwitz JM, Santoro N. Inhibins, activins, and follistatin in the aging female and male. *Semin Reprod Med* 2004;22:209-17.
100. Miro F, Parker SW, Aspinall LJ, Coley J, Perry PW, Ellis JE. Sequential classification of endocrine stages during reproductive aging in women: the FREEDOM study. *Menopause* 2005;12:281-90.
101. Sowers MR, Eyvazzadeh AD, McConnell D, Yosef M, Jannausch ML, Zhang D, et al. Anti-Müllerian hormone and inhibin B in the definition of ovarian aging and the menopause transition. *J Clin Endocrinol Metab* 2008;93:3478-83.
102. Gülekli B, Bulbul Y, Onvural A, Yorukoglu K, Posaci C, Demir N, et al. Accuracy of ovarian reserve tests. *Hum Reprod* 1999;14:2822-6.
103. Gougeon A, Chainy GB. Morphometric studies of small follicles in ovaries of women at different ages. *J Reprod Fertil* 1987;81:433-42.

104. Broekmans FJ, Faddy MJ, Scheffer G, Te Velde ER. Antral follicle counts are related to age at natural fertility loss and age at menopause. *Menopause* 2004;11:607-14.
105. Muttukrishna S, McGarrigle H, Wakim R, Khadum I, Ranieri DM, Serhal P. Antral follicle count, anti-müllerian hormone and inhibin B: predictors of ovarian response in assisted reproductive technology? *BJOG* 2005;112:1384-90.
106. Ruess ML, Kline J, Santos R, Levin B, Timor-Tritsch I. Age and the ovarian follicle pool assessed with transvaginal ultrasonography. *Am J Obstet Gynecol* 1996;174:624-7.
107. Gougeon A. Regulation of ovarian follicular development in primates: facts and hypotheses. *Endocr Rev* 1996;17:121-55.
108. De Boer EJ, Den Tonkelaar I, Burger CW, Looman CW, Van Leeuwen FE, Te Velde ER. The number of retrieved oocytes does not decrease during consecutive gonadotrophin-stimulated IVF cycles. *Hum Reprod* 2004;19:899-904.
109. De Boer EJ, Den Tonkelaar I, Te Velde ER, Burger CW, Van Leeuwen FE. Increased risk of early menopausal transition and natural menopause after poor response at first IVF treatment. *Hum Reprod* 2003;18:1544-52.
110. Lawson R, El-Toukhy T, Kassab A, Taylor A, Braude P, Parsons J, et al. Poor response to ovulation induction is a stronger predictor of early menopause than elevated basal FSH: a life table analysis. *Hum Reprod* 2003;18:527-33.
111. Broer SL, Mol BW, Hendriks D, Broekmans FJ. The role of anti-Müllerian hormone in prediction of outcome after IVF: comparison with the antral follicle count. *Fertil Steril* 2009;91:705-14.
112. Klinkert ER, Broekmans FJ, Looman CW, Te Velde ER. A poor response in the first in vitro fertilization cycle is not necessarily related to a poor prognosis in subsequent cycles. *Fertil Steril* 2004;81:1247-53.
113. Lass A. The fertility potential of women with a single ovary. *Human Reprod Update* 1999;5:546-50.
114. Melica F, Chiodi S, Cristoforoni PM, Ravera GB. Reductive surgery and ovarian function in the human--can reductive ovarian surgery in reproductive age negatively influence fertility and age at onset of menopause? *Int J Fertil Menopausal Stud* 1995;40:79-85.
115. El-Nemr A, Al-Shawaf T, Sabatini L, Wilson C, Lower AM, Grudzinskas JG. Effect of smoking on ovarian reserve and ovarian stimulation in in-vitro fertilization and embryo transfer. *Hum Reprod* 1998;13:2192-8.
116. Zenzes MT. Smoking and reproduction: gene damage to human gametes and embryos. *Hum Reprod Update* 2000;6:122-31.
117. Nybo Andersen AM, Wohlfahrt J, Christens P, Olsen J, Melbye M. Maternal age and fetal loss: population based register linkage study. *BMJ* 2000;320:1708-12.
118. Ferro J, Martinez MC, Lara C, Pellicer A, Remohi J, Serra V. Improved accuracy of hysteroembryoscopic biopsies for karyotyping early missed abortions. *Fertil Steril* 2003;80:1260-4.
119. Hassold T, Abruzzo M, Adkins K, Griffin D, Merrill M, Millie E, et al. Human aneuploidy: incidence, origin, and etiology. *Environ Mol Mutagen* 1996;28:167-75.
120. Ljunger E, Cnattingius S, Lundin C, Anneren G. Chromosomal anomalies in first-trimester miscarriages. *Acta Obstet Gynecol Scand* 2005;84:1103-7.
121. Philipp T, Philipp K, Reiner A, Beer F, Kalousek DK. Embryoscopic and cytogenetic analysis of 233 missed abortions: factors involved in the pathogenesis of developmental defects of early failed pregnancies. *Hum Reprod* 2003;18:1724-32.
122. Boue A, Boue J, Gropp A. Cytogenetics of Pregnancy Wastage. *Advances in Human Genetics* 1985;14:1-57.
123. Snijders RJ, Holzgreve W, Cuckle H, Nicolaides KH. Maternal age-specific risks for trisomies at 9-14 weeks' gestation. *Prenat Diagn* 1994;14:543-52.
124. Snijders RJ, Sebire NJ, Nicolaides KH. Maternal age and gestational age-specific risk for chromosomal defects. *Fetal Diagn Ther* 1995;10:356-67.

125. Sherman SL, Allen EG, Bean LH, Freeman SB. Epidemiology of Down syndrome. *Ment Retard Dev Disabil Res Rev* 2007;13:221-7.
126. Freeman SB, Allen EG, Oxford-Wright CL, Tinker SW, Druschel C, Hobbs CA, et al. The National Down Syndrome Project: design and implementation. *Public Health Rep* 2007;122:62-72.
127. Braude P, Bolton V, Moore S. Human gene expression first occurs between the four- and eight-cell stages of preimplantation development. *Nature* 1988;332:459-61.
128. Puissant F, Van Rysselberge M, Barlow P, Deweze J, Leroy F. Embryo scoring as a prognostic tool in IVF treatment. *Hum Reprod* 1987;2:705-8.
129. Gianaroli L, Magli MC, Ferraretti AP, Fortini D, Tabanelli C, Gergolet M. Gonadal activity and chromosomal constitution of in vitro generated embryos. *Mol Cell Endocrinol* 2000;161:111-6.
130. Munne S, Lee A, Rosenwaks Z, Grifo J, Cohen J. Diagnosis of major chromosome aneuploidies in human preimplantation embryos. *Hum Reprod* 1993;8:2185-91.
131. Baart EB, Martini E, Van den Berg I, Macklon NS, Galjaard RJ, Fauser BC, et al. Preimplantation genetic screening reveals a high incidence of aneuploidy and mosaicism in embryos from young women undergoing IVF. *Hum Reprod* 2006;21:223-33.
132. Coonen E, Derhaag JG, Dumoulin JC, Van Wissen LC, Bras M, Janssen M, et al. Anaphase lagging mainly explains chromosomal mosaicism in human preimplantation embryos. *Hum Reprod* 2004;19:316-24.
133. Kok HS, Van Asselt KM, Van der Schouw YT, Grobbee DE, Te Velde ER, Pearson PL, et al. Subfertility reflects accelerated ovarian ageing. *Hum Reprod* 2003;18:644-8.
134. Maheshwari A, Fowler P, Bhattacharya S. Assessment of ovarian reserve-should we perform tests of ovarian reserve routinely? *Hum Reprod* 2006;21:2729-35.
135. Scott RT, Opsahl MS, Leonardi MR, Neall GS, Illions EH, Navot D. Life table analysis of pregnancy rates in a general infertility population relative to ovarian reserve and patient age. *Hum Reprod* 1995;10:1706-10.
136. Van der Steeg JW, Steures P, Eijkemans MJ, Habbema JD, Hompes PG, Broekmans FJ, et al. Predictive value and clinical impact of basal follicle-stimulating hormone in subfertile, ovulatory women. *J Clin Endocrinol Metab* 2007;92:2163-8.
137. Van Montfrans JM, Hoek A, Van Hooff MH, De Koning CH, Tonch N, Lambalk CB. Predictive value of basal follicle-stimulating hormone concentrations in a general subfertility population. *Fertil Steril* 2000;74:97-103.
138. Van Rooij I, Broekmans FJ, Hunault CC, Scheffer GJ, Eijkemans MJ, De Jong FH, et al. Use of ovarian reserve tests for the prediction of ongoing pregnancy in couples with unexplained or mild male infertility. *Reprod Biomed Online* 2006;12:182-90.
139. Hendriks DJ, Te Velde ER, Looman CW, Bancsi LF, Broekmans FJ. Expected poor ovarian response in predicting cumulative pregnancy rates: a powerful tool. *Reprod Biomed Online* 2008;17:727-36.
140. Saldeen P, Kallen K, Sundstrom P. The probability of successful IVF outcome after poor ovarian response. *Acta Obstet Gynecol Scand* 2007;86:457-61.
141. Augood C, Duckitt K, Templeton AA. Smoking and female infertility: a systematic review and meta-analysis. *Hum Reprod* 1998;13:1532-9.
142. Hassan MAM, Killick SR. Negative lifestyle is associated with a significant reduction in fecundity. *Fertil Steril* 2004;81:384-92.
143. Homan GF, Davies M, Norman RJ. The impact of lifestyle factors on reproductive performance in the general population and those undergoing infertility treatment: a review. *Hum Reprod Update* 2007;13:209-23.
144. Lintsen AM, Pasker-De Jong PC, De Boer EJ, Burger CW, Jansen CA, Braat DD, et al. Effects of subfertility cause, smoking and body weight on the success rate of IVF. *Hum Reprod* 2005;20:1867-75.
145. Waylen AL, Metwally M, Jones GL, Wilkinson AJ, Ledger WL. Effects of cigarette smoking upon clinical outcomes of assisted reproduction: a meta-analysis. *Hum Reprod Update* 2009;15:31-44.

146. Abdalla H, Thum MY. An elevated basal FSH reflects a quantitative rather than qualitative decline of the ovarian reserve. *Hum Reprod* 2004;19:893-8.
147. Elter K, Kavak ZN, Gokaslan H, Pekin T. Antral follicle assessment after down-regulation may be a useful tool for predicting pregnancy loss in in vitro fertilization pregnancies. *Gynecol Endocrinol* 2005;21:33-7.
148. Lekamge DN, Barry M, Kolo M, Lane M, Gilchrist RB, Tremellen KP. Anti-Müllerian hormone as a predictor of IVF outcome. *Reprod Biomed Online* 2007;14:602-10.
149. Levi AJ, Raynault MF, Bergh PA, Drews MR, Miller BT, Scott RT Jr. Reproductive outcome in patients with diminished ovarian reserve. *Fertil Steril* 2001;76:666-9.
150. Luna M, Grunfeld L, Mukherjee T, Sandler B, Copperman AB. Moderately elevated levels of basal follicle-stimulating hormone in young patients predict low ovarian response, but should not be used to disqualify patients from attempting in vitro fertilization. *Fertil Steril* 2007;87:782-7.
151. Van Montfrans JM, Van Hooff MH, Huirne JA, Tanahatooe SJ, Sadrezadeh S, Martens F, et al. Basal FSH concentrations as a marker of ovarian ageing are not related to pregnancy outcome in a general population of women over 30 years. *Hum Reprod* 2004;19:430-4.
152. De Sutter P, Dhont M. Poor response after hormonal stimulation for in vitro fertilization is not related to ovarian aging. *Fertil Steril* 2003;79:1294-8.
153. Kumbak B, Ulug U, Erzik B, Akbas H, Bahceci M. Early clinical pregnancy loss rate in poor responder patients does not change compared to age-matched normoresponders. *Fertil Steril* 2009;91:106-9.
154. Winter E, Wang J, Davies MJ, Norman R. Early pregnancy loss following assisted reproductive technology treatment. *Hum Reprod* 2002;17:3220-3.
155. Kline J, Kinney A, Levin B, Warburton D. Trisomic pregnancy and earlier age at menopause. *Am J Hum Genet* 2000;67:395-404.
156. Bartmann AK, Araujo FM, Iannetta O, Paneto JC, Martelli L, Ramos ES. Down syndrome and precocious menopause. *J Assist Reprod Genet* 2005;22:129-31.
157. Van Montfrans JM, Dorland M, Oosterhuis GJ, Van Vugt JM, Rekers-Mombarg LT, Lambalk CB. Increased concentrations of follicle-stimulating hormone in mothers of children with Down's syndrome. *Lancet* 1999;353:1853-4.
158. Van Montfrans JM, Van Hooff MH, Martens F, Lambalk CB. Basal FSH, estradiol and inhibin B concentrations in women with a previous Down's syndrome affected pregnancy. *Hum Reprod* 2002;17:44-7.
159. Kline J, Kinney A, Reuss ML, Kelly A, Levin B, Ferin M, et al. Trisomic pregnancy and the oocyte pool. *Hum Reprod* 2004;19:1633-43.
160. Seifer DB, MacLaughlin DT, Cuckle HS. Serum müllerian-inhibiting substance in Down's syndrome pregnancies. *Hum Reprod* 2007;22:1017-20.
161. Nasser A, Mukherjee T, Grifo JA, Noyes N, Krey L, Copperman AB. Elevated day 3 serum follicle stimulating hormone and/or estradiol may predict fetal aneuploidy. *Fertil Steril* 1999;71:715-8.
162. Havryliuk Y, Dragisic KG, Rosenwaks Z, Spandorfer S. Baseline serum FSH levels in poor prognostic IVF patients: do abnormal levels predict fetal aneuploidy? *Fertil Steril* 2006;86:S21.
163. Massie JA, Burney RO, Milki AA, Westphal LM, Lathi RB. Basal follicle-stimulating hormone as a predictor of fetal aneuploidy. *Fertil Steril* 2008;90:2351-5.
164. Freeman SB, Yang Q, Allran K, Taft LF, Sherman SL. Women with a reduced ovarian complement may have an increased risk for a child with Down syndrome. *Am J Hum Genet* 2000;66:1680-3.
165. Brook JD, Gosden RG, Chandley AC. Maternal ageing and aneuploid embryos-evidence from the mouse that biological and not chronological age is the important influence. *Hum Genet* 1984;66:41-5.
166. Ebner T, Sommergruber M, Moser M, Shebl O, Schreier-Lechner E, Tews G. Basal level of anti-Müllerian hormone is associated with oocyte quality in stimulated cycles. *Hum Reprod* 2006;21:2022-6.

167. Lie Fong S, Baart EB, Martini E, Schipper I, Visser JA, Themmen AP, et al. Anti-Müllerian hormone: a marker for oocyte quantity, oocyte quality and embryo quality? *Reprod Biomed Online* 2008;16:664-70.
168. Smeenk JM, Sweep FC, Zielhuis GA, Kremer JA, Thomas CM, Braat DD. Anti-Müllerian hormone predicts ovarian responsiveness, but not embryo quality or pregnancy, after in vitro fertilization or intracytoplasmic sperm injection. *Fertil Steril* 2007;87:223-6.
169. Silberstein T, MacLaughlin DT, Shai I, Trimarchi JR, Lambert-Messerlian G, Seifer DB, et al. Müllerian inhibiting substance levels at the time of HCG administration in IVF cycles predict both ovarian reserve and embryo morphology. *Hum Reprod* 2006;21:159-63.
170. Devreker F, Pogonici E, De Martelaer V, Revelard P, Van den Bergh M, Englert Y. Selection of good embryos for transfer depends on embryo cohort size: implications for the 'mild ovarian stimulation' debate. *Hum Reprod* 1999;14:3002-8.
171. Gruber I, Just A, Birner M, Losch A. Effect of a woman's smoking status on oocyte, zygote, and day 3 pre-embryo quality in in vitro fertilization and embryo transfer program. *Fertil Steril* 2008;90:1249-52.
172. Neal MS, Hughes EG, Holloway AC, Foster WG. Sidestream smoking is equally as damaging as mainstream smoking on IVF outcomes. *Hum Reprod* 2005;20:2531-5.
173. Wright KP, Trimarchi JR, Allsworth J, Keefe D. The effect of female tobacco smoking on IVF outcomes. *Hum Reprod* 2006;21:2930-4.
174. Gosden RG, Faddy MJ. Ovarian aging, follicular depletion, and steroidogenesis. *Exp Gerontol* 1994;29:265-74.
175. Scott RT Jr., Hofmann GE. Prognostic assessment of ovarian reserve. *Fertil Steril* 1995;63:1-11.
176. Te Velde ER, Scheffer GJ, Dorland M, Broekmans FJ, Van Kooij RJ. Age-dependent changes in serum FSH levels. In: Fauser BCJM, Coelingh Bennink HJT, Evers JLH, editors. *FSH Action and Intraovarian Regulation*. London, UK: Parthenon, 1997:145-155.
177. Evers JL, Slaats P, Land JA, Dumoulin JC, Dunselman GA. Elevated levels of basal estradiol-17 β predict poor response in patients with normal basal levels of follicle-stimulating hormone undergoing in vitro fertilization. *Fertil Steril* 1998;69:1010-4.
178. Licciardi FL, Liu HC, Rosenwaks Z. Day 3 estradiol serum concentrations as prognosticators of ovarian stimulation response and pregnancy outcome in patients undergoing in vitro fertilization. *Fertil Steril* 1995;64:991-4.
179. Soules MR, Battaglia DE, Klein NA. Inhibin and reproductive aging in women. *Maturitas* 1998;30:193-204.
180. Welt CK, McNicholl DJ, Taylor AE, Hall JE. Female reproductive aging is marked by decreased secretion of dimeric inhibin. *J Clin Endocrinol Metab* 1999;84:105-11.
181. Fanchin R, De Ziegler D, Olivennes F, Taieb J, Dzik A, Frydman R. Exogenous follicle stimulating hormone ovarian reserve test (EFORT): a simple and reliable screening test for detecting 'poor responders' in in-vitro fertilization. *Hum Reprod* 1994;9:1607-11.
182. Ranieri DM, Quinn F, Makhoulouf A, Khadum I, Ghutmi W, McGarrigle H, et al. Simultaneous evaluation of basal follicle-stimulating hormone and 17 β -estradiol response to gonadotropin-releasing hormone analogue stimulation: an improved predictor of ovarian reserve. *Fertil Steril* 1998;70:227-33.
183. Winslow KL, Toner JP, Brzyski RG, Oehninger SC, Acosta AA, Muasher SJ. The gonadotropin-releasing hormone agonist stimulation test-a sensitive predictor of performance in the flare-up in vitro fertilization cycle. *Fertil Steril* 1991;56:711-7.
184. Ng EH, Yeung WS, Fong DY, Ho PC. Effects of age on hormonal and ultrasound markers of ovarian reserve in Chinese women with proven fertility. *Hum Reprod* 2003;18:2169-74.
185. Scheffer GJ, Broekmans FJ, Looman CW, Blankenstein M, Fauser BC, De Jong FH, et al. The number of antral follicles in normal women with proven fertility is the best reflection of reproductive age. *Hum Reprod* 2003;18:700-6.

186. Syrop CH, Willhoite A, Van Voorhis BJ. Ovarian volume: a novel outcome predictor for assisted reproduction. *Fertil Steril* 1995;64:1167-71.
187. Wallace WH, Kelsey TW. Ovarian reserve and reproductive age may be determined from measurement of ovarian volume by transvaginal sonography. *Hum Reprod* 2004;19:1612-7.
188. Chang MY, Chiang CH, Hsieh TT, Soong YK, Hsu KH. Use of the antral follicle count to predict the outcome of assisted reproductive technologies. *Fertil Steril* 1998;69:505-10.
189. Scheffer GJ, Broekmans FJ, Dorland M, Habbema JD, Looman CW, Te Velde ER. Antral follicle counts by transvaginal ultrasonography are related to age in women with proven natural fertility. *Fertil Steril* 1999;72:845-51.
190. Magoffin DA, Jakimiuk AJ, Inhibin A, inhibin B and activin A in the follicular fluid of regularly cycling women. *Hum Reprod* 1997;12:1714-9.
191. Jayaprakasan K, Walker KF, Clewes JS, Johnson IR, Raine-Fenning NJ. The interobserver reliability of off-line antral follicle counts made from stored three-dimensional ultrasound data: a comparative study of different measurement techniques. *Ultrasound Obstet Gynecol* 2007;29:335-41.
192. Pache TD, Wladimiroff JW, De Jong FH, Hop WC, Fauser BC. Growth patterns of nondominant ovarian follicles during the normal menstrual cycle. *Fertil Steril* 1990;54:638-42.
193. Scheffer GJ, Broekmans FJ, Bancsi LF, Habbema JD, Looman CW, Te Velde ER. Quantitative transvaginal two- and three-dimensional sonography of the ovaries: reproducibility of antral follicle counts. *Ultrasound Obstet Gynecol* 2002;20:270-5.
194. Groome NP, Illingworth PJ, O'Brien M, Pai R, Rodger FE, Mather JP, et al. Measurement of dimeric inhibin B throughout the human menstrual cycle. *J Clin Endocrinol Metab* 1996;81:1401-5.
195. Krohn PL. Factors influencing the number of oocytes in the ovary. *Arch Anat Microsc Morphol Exp* 1967;56:151-9.
196. Krarup T, Pedersen T, Faber M. Regulation of oocyte growth in the mouse ovary. *Nature* 1969;224:187-8.
197. Leidy LE, Godfrey LR, Sutherland MR. Is follicular atresia biphasic? *Fertil Steril* 1998;70:851-9.
198. Tufan E, Elter K, Durmusoglu F. Assessment of reproductive ageing patterns by hormonal and ultrasonographic ovarian reserve tests. *Hum Reprod* 2004;19:2484-9.
199. Kline J, Kinney A, Kelly A, Reuss ML, Levin B. Predictors of antral follicle count during the reproductive years. *Hum Reprod* 2005;20:2179-89.
200. Welt CK, Schneyer AL. Differential regulation of inhibin B and inhibin A by follicle-stimulating hormone and local growth factors in human granulosa cells from small antral follicles. *J Clin Endocrinol Metab* 2001;86:330-6.
201. Gougeon A, Lefevre B. Evolution of the diameters of the largest healthy and atretic follicles during the human menstrual cycle. *J Reprod Fertil* 1983;69:497-502.
202. Navot D, Rosenwaks Z, Margalioth EJ. Prognostic assessment of female fecundity. *Lancet* 1987;2:645-7.
203. Ng EH, Chan CC, Tang OS, Ho PC. Antral follicle count and FSH concentration after clomiphene citrate challenge test in the prediction of ovarian response during IVF treatment. *Hum Reprod* 2005;20:1647-54.
204. Tanbo T, Dale PO, Lunde O, Norman N, Abyholm T. Prediction of response to controlled ovarian hyperstimulation: a comparison of basal and clomiphene citrate-stimulated follicle-stimulating hormone levels. *Fertil Steril* 1992;57:819-24.
205. Hendriks DJ, Broekmans FJ, Bancsi LF, De Jong FH, Looman CW, Te Velde ER. Repeated clomiphene citrate challenge testing in the prediction of outcome in IVF: a comparison with basal markers for ovarian reserve. *Hum Reprod* 2005;20:163-9.
206. Jain T, Soules MR, Collins JA. Comparison of basal follicle-stimulating hormone versus the clomiphene citrate challenge test for ovarian reserve screening. *Fertil Steril* 2004;82:180-5.

207. Kwee J, Elting MW, Schats R, Bezemer PD, Lambalk CB, Schoemaker J. Comparison of endocrine tests with respect to their predictive value on the outcome of ovarian hyperstimulation in IVF treatment: results of a prospective randomized study. *Hum Reprod* 2003;18:1422-7.
208. Van der Stege JG, Van der Linden PJ. Useful predictors of ovarian stimulation response in women undergoing in vitro fertilization. *Gynecol Obstet Invest* 2001;52:43-6.
209. Collins JA, Burrows EA, Wilan AR. The prognosis for live birth among untreated infertile couples. *Fertil Steril* 1995;64:22-8.
210. Eimers JM, Te Velde ER, Gerritse R, Vogelzang ET, Looman CW, Habbema JD. The prediction of the chance to conceive in subfertile couples. *Fertil Steril* 1994;61:44-52.
211. Hunault CC, Habbema JD, Eijkemans MJ, Collins JA, Evers JL, Te Velde ER. Two new prediction rules for spontaneous pregnancy leading to live birth among subfertile couples, based on the synthesis of three previous models. *Hum Reprod* 2004;19:2019-26.
212. Hunault CC, Laven JS, Van Rooij IA, Eijkemans MJ, Te Velde ER, Habbema JD. Prospective validation of two models predicting pregnancy leading to live birth among untreated subfertile couples. *Hum Reprod* 2005;20:1636-41.
213. Van der Steeg JW, Steures P, Eijkemans MJ, Habbema JD, Hompes PG, Broekmans FJ, et al. Pregnancy is predictable: a large-scale prospective external validation of the prediction of spontaneous pregnancy in subfertile couples. *Hum Reprod* 2007;22:536-42.
214. Hofmann GE, Danforth DR, Seifer DB. Inhibin B: the physiologic basis of the clomiphene citrate challenge test for ovarian reserve screening. *Fertil Steril* 1998;69:474-7.
215. Haadsma ML, Bukman A, Groen H, Roeloffzen EM, Groenewoud ER, Heineman MJ, et al. The number of small antral follicles (2-6 mm) determines the outcome of endocrine ovarian reserve tests in a subfertile population. *Hum Reprod* 2007;22:1925-31.
216. Harrell FE Jr., Lee KL, Mark DB. Multivariable prognostic models: issues in developing models, evaluating assumptions and adequacy, and measuring and reducing errors. *Stat Med* 1996;15:361-87.
217. Thernau TM, Grambsch PM. Modelling survival data. New York, USA: Springer, 2000.
218. Steures P, Van der Steeg JW, Hompes PG, Habbema JD, Eijkemans MJ, Broekmans FJ, et al. Intrauterine insemination with controlled ovarian hyperstimulation versus expectant management for couples with unexplained subfertility and an intermediate prognosis: a randomised clinical trial. *Lancet* 2006;368:216-21.
219. Rai R, Regan L. Recurrent miscarriage. *Lancet* 2006;368:601-11.
220. Gurbuz B, Yalti S, Ozden S, Ficioglu C. High basal estradiol level and FSH/LH ratio in unexplained recurrent pregnancy loss. *Arch Gynecol Obstet* 2004;270:37-9.
221. Trout SW, Seifer DB. Do women with unexplained recurrent pregnancy loss have higher day 3 serum FSH and estradiol values? *Fertil Steril* 2000;74:335-7.
222. Hofmann GE, Khoury J, Thie J. Recurrent pregnancy loss and diminished ovarian reserve. *Fertil Steril* 2000;74:1192-5.
223. Haadsma ML, Groen H, Fidler V, Bukman A, Roeloffzen EM, Groenewoud ER, et al. The predictive value of ovarian reserve tests for spontaneous pregnancy in subfertile ovulatory women. *Hum Reprod* 2008;23:1800-7.
224. Harrel FE. Regression modeling strategies. New York, USA: Springer, 2001.
225. Hanoch J, Lavy Y, Holzer H, Hurwitz A, Simon A, Revel A, et al. Young low responders protected from untoward effects of reduced ovarian response. *Fertil Steril* 1998;69:1001-4.
226. Lambalk CB, De Koning CH. Interpretation of elevated FSH in the regular menstrual cycle. *Maturitas* 1998;30:215-20.

227. Metwally M, Ong KJ, Ledger WL, Li TC. Does high body mass index increase the risk of miscarriage after spontaneous and assisted conception? A meta-analysis of the evidence. *Fertil Steril* 2008;90:714-26.
228. Wang JX, Norman RJ, Wilcox AJ. Incidence of spontaneous abortion among pregnancies produced by assisted reproductive technology. *Hum Reprod* 2004;19:272-7.
229. Visser JA, De Jong FH, Laven JS, Themmen AP. Anti-Müllerian hormone: a new marker for ovarian function. *Reproduction* 2006;131:1-9.
230. Te Velde ER, Dorland M, Broekmans FJ. Age at menopause as a marker of reproductive ageing. *Maturitas* 1998;30:119-25.
231. Nikolaou D, Templeton A. Early ovarian ageing. *Eur J Obstet Gynecol Reprod Biol* 2004;113:126-33.
232. Warburton D. Biological aging and the etiology of aneuploidy. *Cytogenet Genome Res* 2005;111:266-72.
233. Haadsma ML, Groen H, Fidler V, Seinen LH, Broekmans FJ, Heineman MJ, et al. The predictive value of ovarian reserve tests for miscarriage in a population of subfertile ovulatory women. *Hum Reprod* 2009;24:546-52.
234. Zhen XM, Qiao J, Li R, Wang LN, Liu P. The clinical analysis of poor ovarian response in in-vitro-fertilization embryo-transfer among Chinese couples. *J Assist Reprod Genet* 2008;25:17-22.
235. Klip H, Van Leeuwen FE, Schats R, Burger CW. Risk of benign gynaecological diseases and hormonal disorders according to responsiveness to ovarian stimulation in IVF: a follow-up study of 8714 women. *Hum Reprod* 2003;18:1951-8.
236. Tarlatzis BC, Zepiridis L, Grimbizis G, Bontis J. Clinical management of low ovarian response to stimulation for IVF: a systematic review. *Hum Reprod Update* 2003;9:61-76.
237. Bancsi LF, Broekmans FJ, Looman CW, Habbema JD, Te Velde ER. Impact of repeated antral follicle counts on the prediction of poor ovarian response in women undergoing in vitro fertilization. *Fertil Steril* 2004;81:35-41.
238. Rothman KJ, Greenland S. Introduction to stratified analysis. In: Rothman KJ, Greenland S, editors. *Modern Epidemiology*. Philadelphia, USA: Lippincott-Raven, 1998, 256-8.
239. Brigham SA, Conlon C, Farquharson RG. A longitudinal study of pregnancy outcome following idiopathic recurrent miscarriage. *Hum Reprod* 1999;14:2868-71.
240. Shanbhag S, Aucott L, Bhattacharya S, Hamilton MA, McTavish AR. Interventions for 'poor responders' to controlled ovarian hyperstimulation (COH) in in-vitro fertilisation (IVF). *Cochrane Database Syst Rev* 2007: CD004379.
241. Moreno C, Ruiz A, Simon C, Pellicer A, Remohi J. Intracytoplasmic sperm injection as a routine indication in low responder patients. *Hum Reprod* 1998;13:2126-9.
242. Quenby S, Vince G, Farquharson R, Aplin J. Recurrent miscarriage: a defect in nature's quality control? *Hum Reprod* 2002;17:1959-63.
243. Tummers P, De Sutter P, Dhont M. Risk of spontaneous abortion in singleton and twin pregnancies after IVF/ICSI. *Hum Reprod* 2003;18:1720-3.
244. Lambers MJ, Mager E, Goutbeek J, McDonnell J, Homburg R, Schats R, et al. Factors determining early pregnancy loss in singleton and multiple implantations. *Hum Reprod* 2007;22:275-9.
245. Sabatini L, Zosmer A, Hennessy EM, Tozer A, Al Shawaf T. Relevance of basal serum FSH to IVF outcome varies with patient age. *Reprod Biomed Online* 2008;17:10-9.
246. Zheng CJ, Byers B. Oocyte selection: a new model for the maternal-age dependence of Down syndrome. *Hum Genet* 1992;90:1-6.
247. Broekmans FJ, Scheffer GJ, Bancsi LF, Dorland M, Blankenstein MA, Te Velde ER. Ovarian reserve tests in infertility practice and normal fertile women. *Maturitas* 1998;30:205-14.
248. De Boer EJ, Den Tonkelaar I, Te Velde ER, Burger CW, Klip H, Van Leeuwen FE. A low number of retrieved oocytes at in vitro fertilization treatment is predictive of early menopause. *Fertil Steril* 2002;77:978-85.

249. De Jong-Van den Berg LT, Faber A, Van den Berg PB. HRT use in 2001 and 2004 in The Netherlands—a world of difference. *Maturitas* 2006;54:193-7.
250. Rookus MA, Van Leeuwen FE. Oral contraceptives and risk of breast cancer in women aged 20-54 years. Netherlands Oral Contraceptives and Breast Cancer Study Group. *Lancet* 1994;344:844-51.
251. Loutradis D, Drakakis P, Milingos S, Stefanidis K, Michalas S. Alternative approaches in the management of poor response in controlled ovarian hyperstimulation (COH). *Ann NY Acad Sci* 2003;997:112-9.
252. Ubaldi FM, Rienzi L, Ferrero S, Baroni E, Sapienza F, Cobellis L, et al. Management of poor responders in IVF. *Reprod Biomed Online* 2005;10:235-46.
253. Mastenbroek S, Twisk M, Echten-Arends J, Sikkema-Raddatz B, Korevaar JC, Verhoeve HR, et al. In vitro fertilization with preimplantation genetic screening. *N Engl J Med* 2007;357:9-17.
254. Kevenaar ME, Meerasahib MF, Kramer P, Van de Lang-Born BM, De Jong FH, Groome NP, et al. Serum anti-müllerian hormone levels reflect the size of the primordial follicle pool in mice. *Endocrinology* 2006;147:3228-34.
255. Steer CV, Mills CL, Tan SL, Campbell S, Edwards RG. The cumulative embryo score: a predictive embryo scoring technique to select the optimal number of embryos to transfer in an in-vitro fertilization and embryo transfer programme. *Hum Reprod* 1992;7:117-9.
256. Cook CL, Siow Y, Taylor S, Fallat ME. Serum müllerian-inhibiting substance levels during normal menstrual cycles. *Fertil Steril* 2000;73:859-61.
257. Staessen C, Platteau P, Van Assche E, Michiels A, Tournaye H, Camus M, et al. Comparison of blastocyst transfer with or without preimplantation genetic diagnosis for aneuploidy screening in couples with advanced maternal age: a prospective randomized controlled trial. *Hum Reprod* 2004;19:2849-58.
258. Ulug U, Ben Shlomo I, Turan E, Erden HF, Akman MA, Bahceci M. Conception rates following assisted reproduction in poor responder patients: a retrospective study in 300 consecutive cycles. *Reprod Biomed Online* 2003;6:439-43.
259. Tanbo T, Abyholm T, Bjoro T, Dale PO. Ovarian stimulation in previous failures from in-vitro fertilization: distinction of two groups of poor responders. *Hum Reprod* 1990;5:811-5.
260. Raad voor de Volksgezondheid en Zorg. *Uitstel van ouderschap: medisch of maatschappelijk probleem?* Den Haag, The Netherlands: Raad voor de Volksgezondheid en Zorg, 2007.
261. Myrskylä M, Kohler H, Billari FC. Advances in development reverse fertility declines. *Nature* 2009;460:741-3.

