**Validation of a mathematical model of the bovine estrous cycle for cows with different estrous cycle characteristics**

H. M. T. Boer, S.T. Butler, C. Stötzel, M.F.W. te Pas, R. F. Veerkamp, H. Woelders

**Supplementary** **Table S3**

List of parameters and initial parameter values1 (resulting in a 3-wave cycle).

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| No. | Parameter | Value | Dimension | Description |
| 1 |  | 2.75 |  | Rate constant for the synthesis of GnRH in the hypothalamus |
| 2 |  | 16.00 |  | Maximum concentration of GnRH in the hypothalamus |
| 3 |  | 2.05 | 1/[t] | Maximum rate constant for (P4&E2)-dependent GnRH release. |
| 4 |  | 0.10 | [E2] | Threshold for E2 to suppress GnRH release |
| 5 |  | 0.35 | [P4] | Threshold for P4 to enable E2 to suppress GnRH release |
| 6 |  | 1.91 | 1/[t] | Maximum rate constant for P4-dependent GnRH release |
| 7 |  | 0.25 | [P4] | Threshold for P4 to inhibit GnRH release directly |
| 8 |  | 0.99 |  | Maximum ability of the pituitary to sense GnRH |
| 9 |  | 0.65 | [E2] | Threshold for E2 to increase the ability of the pituitary to sense GnRH |
| 10 |  | 1.63 | 1/[t] | Rate constant for the clearance of GnRH from the pituitary |
| 11 |  | 4.21 | [FSH]/[t] | Maximum FSH synthesis rate in the pituitary |
| 12 |  | 0.12 | [Inh] | Threshold for Inhibin to inhibit FSH synthesis |
| 13 |  | 0.29 | 1/[t] | Maximum rate constant for P4-stimulated FSH release |
| 14 |  | 0.15 | [P4] | Threshold for P4 to stimulate FSH release |
| 15 |  | 0.40 | 1/[t] | Maximum rate constant for E2-inhibited FSH release |
| 16 |  | 0.31 | [E2] | Threshold for E2 to inhibit FSH release |
| 17 |  | 1.23 | 1/[t] | Maximum rate constant for GnRH-stimulated FSH release |
| 18 |  | 0.07 |  | Threshold for GnRH to stimulate FSH release |
| 19 |  | 2.73 | 1/[t] | Rate constant for the clearance of FSH from peripheral blood |
| 20 |  | 0.95 | 1/[t] | Rate constant for basal FSH release from the pituitary |
| 21 |  | 0.38 | [LH]/[t] | Maximum rate of E2-stimulated LH synthesis |
| 22 |  | 0.24 | [E2] | Threshold for E2 to stimulate LH synthesis |
| 23 |  | 2.71 | [LH]/[t] | Maximum rate of P4-inhibited LH synthesis |
| 24 |  | 0.03 | [P4] | Threshold for P4 to inhibit LH synthesis |
| 25 |  | 2.22 | 1/[t] | Maximum rate constant for GnRH-stimulated LH release |
| 26 |  | 0.69 |  | Threshold for GnRH to stimulate LH release |
| 27 |  | 0.01 | 1/[t] | Rate constant for basal LH release from the pituitary |
| 28 |  | 12.0 | 1/[t] | Rate constant for the clearance of LH from peripheral blood |
| 29 |  | 0.56 | [Foll]/[t] | Maximum rate of the FSH-dependent increase of Follicle size |
| 30 |  | 0.57 | [FSH] | Maximum threshold for FSH to stimulate increase of Follicle size. |
| 31 |  | 0.22 | [Foll] | Threshold for Follicle size to reduce the FSH threshold |
| 32 |  | 1.10 | 1/[t] | Maximum rate constant for the P4-dependent decrease of Follicle size |
| 33 |  | 0.13 | [P4] | Threshold for P4 to stimulate decrease of follicle size. |
| 34 |  | 3.49 | 1/[t] | Maximum rate constant for the LH-dependent change of Follicle size |
| 35 |  | 0.17 | [LH] | Threshold for LH to stimulate decrease of follicle size |
| 36 |  | 53.91 | [PGF2α]/[t] | Maximum rate of PGF2α secretion |
| 37 |  | 1.43 | [OTR] | Threshold for OTR to allow OT to stimulate PGF2α secretion |
| 38 |  | 1.09 | [OT] | Threshold for OT to stimulate PGF2α secretion |
| 39 |  | 1.23 | 1/[t] | PGF2α clearance rate constant |
| 40 |  | 0.20 | [CL]/[t] | Scaling factor for LH-induced rise of CL |
| 41 |  | 0.04 | [CL]/[t] | Maximum rate of increase of CL stimulated by itself |
| 42 |  | 0.10 | [CL] | Threshold volume of CL to stimulate self-growth |
| 43 |  | 41.39 | 1/[t] | Maximum rate of decrease of CL stimulated by IOF |
| 44 |  | 1.32 | [IOF] | Threshold for IOF to stimulate CL regression |
| 45 |  | 2.25 |  | Proportionality constant for P4 secretion by the CL |
| 46 |  | 1.41 | 1/[t] | Rate constant for P4 clearance in peripheral blood |
| 47 |  | 2.19 |  | Proportionality constant for E2 secretion by the follicles |
| 48 |  | 1.23 | 1/[t] | Rate constant for E2 clearance in peripheral blood |
| 49 |  | 1.41 |  | Proportionality constant for Inh secretion by the follicles |
| 50 |  | 0.48 | 1/[t] | Rate constant for Inh clearance in peripheral blood |
| 51 |  | 3.58 | [OTR]/[t] | Maximum rate of P4-dependent OTR synthesis in the endometrium |
| 52 |  | 0.77 | [P4] | Threshold for P4 to stimulate OTR synthesis in the endometrium |
| 53 |  | 2.98 | 1/[t] | Rate constant for OTR clearance in the endometrium |
| 54 |  | 1.59 |  | Maximum proportionality factor for OT secretion by the CL. |
| 55 |  | 0.14 | [E2] | Threshold for E2 to stimulate OT secretion by the CL |
| 56 |  | 0.64 | 1/[t] | Rate constant for OT clearance |
| 57 |  | 39.68 | [IOF]/[t] | Maximum rate of synthesis of ‘intra-ovarian factor’ (IOF) |
| 58 |  | 1.22 | [PGF2α] | Threshold for PGF2α to stimulate synthesis of ‘intra-ovarian factor’ (IOF) |
| 59 |  | 0.60 | [CL] | Threshold CL volume to stimulate synthesis of ‘intra-ovarian factor’ (IOF) |
| 60 |  | 0.30 | 1/[t] | Rate constant for clearance of ‘intra-ovarian factor’ (IOF) |

1 E2 = estradiol, P4 = progesterone, GnRH = gonadotropin releasing hormone, Inh = inhibin, OT = oxytocin, OTR = oxytocin receptor, FSH = follicle stimulating hormone, LH = luteinizing hormone, IOF = intra-ovarian factors, PGF2α = prostaglandin2α, CL = corpus luteum size. Foll = follicle size, Ovul. Foll. = ovulated follicle,  *Pit* =pituitary, *Hypo* = hypothalamus, *c* = rate constant, *t* = time, *T* = threshold for change of behaviorof the Hill functions, *m* = maximum value of the switched parameter.