# An endocrine hypothesis to explain obesity-related lactation insufficiency in breastfeeding mothers

Christopher H Knight

## SUPPLEMENTARY FILE

## Supplementary references

Evidence that obesity compromises breastfeeding:

- **Donath SM and Amir LH** (2000) Does maternal obesity adversely affect breastfeeding initiation and duration? *Journal of Paediatrics and Child Health* **36**, 482-486.
- Li R, Jewell S and Grummer-Strawn L (2003) Maternal obesity and breast-feeding practices. American Journal of Clinical Nutrition 77, 931-936.
- Rasmussen KM, Hilson JA and Kjolhede CL (2001) Obesity may impair lactogenesis II. *Journal of Nutrition* 131, 3009S-3011S.

## *Evidence that oestrogens compromise milk synthesis and secretion:*

- Athie F, Bachman KC, Head HH, Hayen MJ and Wilcox CJ (1996) Estrogen administered at final milk removal accelerates involution of bovine mammary gland. *Journal of Dairy Science* **79**, 220-226.
- Delbecchi L, Miller N, Prud'homme C, Petitclerc D, Wagner GF and Lacasse P (2005) 17b-estradiol reduces milk synthesis and increases stanniocalcin gene expression in the mammary gland of lactating cows. *Livestock Production Science* **98**, 57-66.
- Harrison RF and Bonnar J (1980) Clinical uses of estrogens. Pharmacology and Therapeutics. 11, 451-467.

#### Evidence of aromatase activity in the mammary fat pad:

- Brodie A, Sabnis G and Jelovac D (2006) Aromatase and breast cancer. Journal of Steroid Biochemistry and Molecular Biology 102, 97-102.
- Janowski T, Zdunczyk S, Malecki-Tepicht J, Baranski W and Ras A (2002) Mammary secretion of oestrogens in the cow. *Domestic Animal Endocrinology* 23, 125-137.
- Marinelli L, Gabai G, Wolfswinkel J and Mol JA (2004) Mammary steroid metabolizing enzymes in relation to hyperplasia and tumorigenesis in the dog. *Journal of Steroid Biochemistry and Molecular Biology* 92, 167-173.
- Nakamura J, Lu Q, Aberdeen G, Albrecht E and Brodie A (1999) The effect of estrogen on aromatase and vascular endothelial griowth factor messenger ribonucleic acid in the normal nonhuman primate mammary gland. *Journal of Clinical Endocrinology and Metabolism* **84**, 1432-1437.
- Song D, Liu G, Luu-The V, Zhao D, Wang L, Zhang H, Xueling G, Li S, Desy L, Labrie F and Pelletier G (2006) Expression of aromatase and 17beta-hydroxysteroid dehydrogenase types 1, 7 and 12 in breast cancer. An immunohistochemical study. *Journal of Steroid Biochemistry and Molecular Biology* 101, 136-144.

#### Evidence regarding the efficacy of counseling for obese mothers wishing to breastfeed:

Chapman DJ, Morel K, Bermúdez-Millán A, Young S, Damio G and PérezEscamilla R (2013) Breastfeeding education and support trial for overweight and obese women: a randomized trial. *Pediatrics* 131 e162–70.

Rasmussen KM, Dieterich CM, Zelek ST, Altabet JD and Kjolhede CL (2011)

Interventions to increase the duration of breastfeeding in obese mothers:

the Bassett Improving Breastfeeding Study. Breastfeeding Medicine 6 69-75.

Methodology, blood sampling protocols for endocrine analysis:

- Johansson B, Uvnas-Moberg K, Knight CH & Svennersten-Sjauna K (1999) Effect of feeding before, during and after milking on milk production and the hormones oxytocin, prolactin, gastrin and somatostatin. J. Dairy Res. **66**, 151-163.
- Knight CH, Calvert DT & Flint DJ (1986) Inhibitory effect of bromocriptine on mammary development and function in lactating mice. *J. Endocr.* **110**, 263-270.

#### Methodology, endocrine and adipose manipulations:

- Luthra R, Kirma N, Jones J & Tekmal RR (2003) Use of letrazole as a chemopreventative agent in aromatase overexpressing transgenic mice. *Journal of Steroid Biochemistry and Molecular Biology* **86**, 461-467.
- Mauer MM, Harris RB and Bartness TJ (2001) The regulation of total body fat: lessons learned from lipectomy studies. *Neuroscience and Biobehavioural Reviews* **25**, 15-28.