

Mothers, Mother Nature and the Divine Plan

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Mammals, universally, are primed to nourish their off-spring after birth with a substance that is designed in a species-specific way to complete the cycle of growth and development that was initially governed by the placenta. This is how female mammals play a unique and unequivocal role in providing for the next generation. It appears, from anthropological evidence, that Mother Nature's model of optimal reproduction among humans has a period of in-utero gestation of nine months followed by an ex-utero period of continued nourishment at the breast that, for primates specifically, is supposed to be six times the gestation rate. That means that babies should have access to their mother's milk until they are at least four.¹ WHO advises at least two years!

Such a model still prevails today among primitive societies where living hand to mouth and being beset by the vagaries of climate, governs food availability. The bottom line is – if babies are denied the breast they die! Harsh as this may seem, it is a definitive statement regarding the crucial role that human milk plays in sustaining an infant. When there is no way a mother can reach for a tin of formula, her options are limited. In fact, UNICEF tells us that over a million babies die each year due to lack of breastmilk.² In situations where mothers think that they are choosing the sophisticated or "scientific" option, the realities of lack of clean water, poor sanitation and insufficient funds to buy formula and pay for heating, soon hit home and babies die of malnutrition or infection.

Furthermore, the planet is also sustained, as breastmilk is an ecologically sound product that contributes but little to any environmental disturbance of Earth's ecosystems. Our atmosphere, soil, flora, fauna and waterways are less affected during human milk production when compared to the production of breastmilk substitutes. It is a totally renewable resource; and, as such, breastfeeding is essentially a carbon-neutral activity.

Consequently there are real and tangible benefits afforded the economy when babies get breast milk for an extended period. Apart from the lack of waste associated with the production and distribution of human milk, breastfeeding helps to promote population control, as it is a good form of contraception in situations where babies have unlimited access to the breast and mothers are only adequately nourished. In primitive societies babies tend to be conceived many years apart as those women tend to return to oestrus only when they wean. Lactating women worldwide produce (on average) half a litre of milk daily. As billions of litres are, therefore, produced annually throughout the world, its contribution to the gross national product (GNP) and balance of payments of all nations is considerable.^{3;4;5} The health budgets of nations particularly benefit!

UNIQUENESS OF SPECIES-SPECIFIC MILK

Perusal of the chart below shows us at a glance that each mammal's milk is unique unto itself within the broader confines of being a substance that contains water; amino acids (protein); carbohydrate (lactose); fat and minerals (ash). And it is this situation of species-specificity that is Mother Nature's way of ensuring that each mammal is initially nourished with a substance that uniquely gives it an optimum start in Life.

CONSTITUENTS OF THE MILK (g/100 g) OF VARIOUS MAMMALS

Mammal	total solids	fat	total protein	lactose	ash
Antelope	13.5	1.3	6.9	4	1.3
Ass	11.1	1.2	1.7	6.9	1.3
Baboon	14.2	5.0	1.6	7.3	0.3
Bison	13.2	1.7	4.8	5.7	0.96
Black bear	41.2	24.5	14.5	0.4	1.8
Black rhino	8.1	0.0	1.4	6.1	0.3
Camel	14.4	4.9	3.7	5.1	0.7
Cat	25.4	10.9	11.1	3.4	
Cow (Jersey)	15.0	5.5	3.9	4.9	0.7
Deer	34.1	19.7	10.4	2.6	1.4
Dog/Wolf	25.1	12.9	7.9	3.1	1.2
Dolphin	30.4	14.1	10.4	5.9	
Elephant	24.1	15.1	4.9	3.4	0.76
Goat	12.0	3.5	3.1	4.6	0.79
Guinea pig	15.8	3.9	8.1	3.0	0.82
Horse	11.0	1.6	2.7	6.1	0.51
Human	13.6	5.5	1.0	7.0	0.1
Kangaroo	9.5	2.1	6.2	trace	1.2
Lion	24.8	13.7	8.5	2.6	
Llama	14.0	5.6	4.3	3.3	0.8
Mink	22.6	8.0	7.0	6.9	0.7
Monkey	14.5	3.9	2.1	5.9	2.6
Orangutan	11.2	3.5	1.5	6.0	0.2
Opossum	20.1	6.1	9.2	3.2	1.6
Polar bear	42.9	31.0	10.2	0.5	1.2
Pig	19.5	8.2	5.8	4.8	0.63
Rabbit	26.4	12.2	10.4	1.8	2.0
Rat	30.5	14.8	11.3	2.9	1.5
Reindeer	36.1	22.5	10.3	2.6	0.7
Sea lion	50.9	36.5	13.8	0.0	0.6
Seal (grey)	67.7	53.2	11.2	2.6	0.7
Sheep	16.3	5.3	5.5	4.6	0.9
Whale	51.8	34.8	13.6	1.8	1.6

Sources various; primary source: Jenness R; Sloan RE Composition of milk in Larson BL. Smith VR editors *Lactation vol3 Nutrition and Biochemistry of Milk Maintenance* New York 1974 Academic Press

For instance seal's milk is very high in protein and fat. This is to ensure that the calf grows quickly and is able to put down fat to protect it against its hostile environment as well as to be able to sustain itself for days at a time while the mother goes off to feed herself. Kangaroo milk is low in solids and has a very high water content which is consistent with the harsh dry conditions of its habitat. Human milk, on the other hand is low in protein (we grow slowly) and high in lactose as lactose is a prime promoter of brain growth.

And, although it is the milk of the ass which has closest correspondence to human milk, there is, naturally, good correspondence between the profiles of the human, baboon, monkey and orangutan milks as all are primates. A distinguishing feature of primate milk is the high lactose as it is this component of milk that optimises brain growth and promotes higher order cognitive functioning. Breastfed babies tend to be intelligent as a consequence and many studies over several decades have been published and can attest to this fact.

Unique attributes notwithstanding, there is much that all milks have in common; and, as a substance it is something that we tend to take for granted. It is a food staple enjoyed in both savoury as well as sweet forms; and humans are the only mammals who continue to enjoy what it has to offer after weaning when we drink the milk of another mammal. Why is that so? Apart from the fact that babies in the developed world would die without some sort of breastmilk substitute, dairy foods constitute a nutritious and convenient food choice. However it is, no doubt, due to the fact that we are denied the breast for as long as Mother Nature deemed it to be appropriate, that we then go through Life playing catch-up; craving what we lacked as an infant as milk provides inner nourishment on both a physical and psychological level.

IMMUNE BENEFITS OF HUMAN MILK

It is beyond the scope of this article to discuss the unique, complex and dynamic biochemistry of human milk. However suffice to say that it establishes an optimal microbiome and breastfeeding promotes a healthy immune system in both mother and baby with research indicating protection against a raft of conditions extending well into adulthood. These include protection in the long term against:

- Obesity (artificially fed infants consume 30,000 more calories than breastfed babies in the first eight months)
- Crohn's disease
- Ulcerative colitis
- Coeliac disease
- Cardiovascular disease (in both mother and baby)
- Type 2 diabetes (in both mother and baby)

And, in the short term against:

- NEC (Necrotising Entero-colitis) and late onset sepsis if you're a preterm infant
- Bacterial meningitis (in the NICU [Neonatal Intensive Care Unit])
- Botulism
- Diarrhoea
- Upper respiratory tract infections and otitis media
- Urinary tract infections

Added to that is a lowered risk of type 1 diabetes because the majority of breastmilk substitutes are based on cow's milk and research has long established a link between cow's milk consumption and type 1 diabetes in children.

PSYCHOLOGICAL BENEFITS OF HUMAN MILK

The other aspect of this discussion must, however, concern itself with the psychological benefits that also occur when babies enjoy such an extended time with their mothers. It was Niles Newton in the 1970s who was the first to suggest (in lactation literature) that breastfeeding imparted a psychological benefit to the neonate. It was noted that such children developed into more "mature, secure and assertive" individuals.⁶ This is consistent with the observations also made by Erik Erickson [figure 1] who, as a psychologist, identified two distinct stages in a child's development.⁷

Figure 1

ERIK ERIKSON'S EIGHT EPIGENETIC STAGES OF MAN

VIII Maturity/Old Age: (WISDOM)	Ego Integrity vs Despair, Disgust
VII Middle Adulthood: (CARE)	Generativity vs Stagnation
VI Young Adulthood: (LOVE)	Intimacy vs Isolation
V Puberty and Adolescence: (FIDELITY)	Ego Identity vs Role Confusion
IV School Age: Latency (COMPETENCY)	Industry vs Inferiority
III Play Age: Locomotor/Genital (PURPOSE)	Initiative vs Guilt
II Early Childhood: Muscular/Anal (WILL POWER)	Autonomy vs Shame, Doubt
I Infancy: Oral/Sensory (HOPE)	Basic Trust vs Mistrust

Source: Adapted from diagram in *Childhood and Society* by Erik H. Erikson, 1963, reproduced in *Personality Theories*, L. A. Hjelle and D. J. Ziegler (editors), McGraw Hill Inc., Sydney, 1985, 2nd edition

Stage 1 lasts from birth to 18 months and is labelled: **Trust vs Mistrust**. During this developmental stage the infant who has his needs met and feels physically safe grows in confidence and comes to trust his environment. As he begins to become ambulatory, he then comes and goes from his mother with confidence and a sense of being in charge, which helps to minimise separation anxiety. Those toddlers who come to trust their environment in this way then move easily into the next stage identified by Erickson. He described this stage as lasting from 18 months to 3 years and labelled it: **Autonomy vs Shame**.

During this second stage the breastfed toddler further grows in re-assurance and confidence as he begins to move away from his mother and explore his exciting new world with his newly acquired motor and verbal skills. Breastfeeding during this stage is as much for emotional as well as nutritional needs, as the toddler's process of individuation gradually unfolds and he grows in the realisation that he is a separate individual who has control over his environment. These stages, during which the toddler grows into the mental capability to recognise that objects have permanency when out of sight (and therefore to accept the notion of separateness), have also been defined by Piaget and labelled: Object Constancy.⁸

To my mind, Erik Erikson has elegantly defined Man's journey with these eight stages each governed by the need to resolve a crisis which sets the foundation for what follows. So, a normal, drug-free physiologic birth after which an infant is given the space to search for the nipple himself offers the newborn a valuable first lesson.....If I struggle; I will survive. Then, if he has access to his mother's breastmilk throughout the next four years, he has the best chance, early on in his development, of becoming an autonomous and trusting individual and this sets the pattern for Life and holds out the reward of self-actualisation.

Other pertinent observations regarding the psychological importance of the mother/baby dyad have, more recently, been made by a group of Swedish researchers⁹ and followed up on by Nils Bergman, who has described this unit as a "single bio-sociological organism".¹⁰ As a researcher, Bergman has done much to promote the concept of the kangaroo-mother-care phenomenon whereby he asserts that maternal-infant skin to skin contact is the natural "habitat" for all newborn babies; and is the one that best initiates both psychological and physiological development. Bergman argues that removal from this habitat, which promotes easy access to the breast, results in a protest-despair response first so-named by Alberts¹¹ but originally identified by Bowlby¹² in orphans after World War II and subsequently studied in monkeys by Harlow,^{13;14} who introduced the term "skin hunger" which was given another perspective as "touch hunger" by Montague.¹⁵

If any of the monkeys in Harlow's research who were deprived of the closeness of the mother inadvertently reproduced, they did not care for their offspring and even behaved brutally and aggressively towards them.¹⁶ This epigenetic consequence of maternal deprivation was further given perspective in a series of studies in Canada with rats who, when denied maternal grooming in the first week of life, were less nurturing towards their own offspring, and it is understood that this behaviour was due to differences in maternal oxytocin receptor levels.^{17;18}

IMPORTANCE OF OXYTOCIN

So what, exactly, is oxytocin and what is its importance? It was discovered in 1909 by Sir Henry Dale when he noted that an extract from the pituitary dorsal lobe caused contractions of the uterus in pregnant cats. A few years later he discovered that it, similarly, caused the alveoli in the breast to contract, thereby triggering the milk ejection reflex. We now know that it is mainly formed in two large groups of nerve cells in the brain, called the supraoptic and paraventricular nuclei - both located in the hypothalamus. It can travel in the blood, where it acts as a hormone or, via the nerves, where it acts as a neurotransmitter. It is also known to affect other nerve cells by diffusion, so has a paracrine effect¹⁹.

All mammals require oxytocin for all aspects of sexual maturation, courtship, pair-bonding, pregnancy, birth and breastfeeding, and research^{20;21} shows that oxytocin induces not only the aforementioned maternal behaviours such as breastfeeding and bonding; but also trust, cognition, social behaviour and positive emotions. Additionally, and more importantly, it also regulates the immune system and autonomic nervous system [ANS],^{22;23} which controls the internal organs and other key involuntary body functions. It does this by increasing activity in the parasympathetic nervous system [PNS] branch of the ANS, which slows the heart, reduces blood pressure and energy expenditure, and promotes rest, digestion, and affiliation, resulting in a "calm and connection" effect.

That is, it governs homeostasis; "restores physiological balance" as its release during times of excessive stress reduces activity in the flight-or-flight (sympathetic nervous system branch of the ANS), by reducing levels of the stress hormones epinephrine (adrenaline) and norepinephrine (noradrenaline). As well, it reduces activity in the hypothalamic-pituitary-adrenal pathway (HPA system), reducing medium-term stress response hormones, including corticotrophin releasing hormone (CRH), adrenocorticotrophic hormone (ACTH), beta-endorphins, and cortisol.

For oxytocin to be able to do its job of keeping the body on track it needs receptors and these receptors are laid down during the primal period. This is the time that extends from conception to weaning (five years). Conception occurs as a consequence of male and female conjugation underpinned by oxytocin which precipitates the orgasm. Normal physiologic birth is also oxytocin-driven, as it is oxytocin which gives rise to the contractions of the uterus during the birthing process.

During labour, a good foetal head position initiates what is known as the Ferguson Reflex as the specialised nerves that detect stretch in the lower vagina and cervix are stimulated. These nerves send a signal to the labouring woman's brain, triggering an outpouring of oxytocin, which further increases contractions; and foetal descent further stimulates these nerves, thereby making birth a relatively efficient process. On the other hand synthetic oxytocin, which is used in a medicalised birth, crosses the blood brain barrier in the infant; and, due to continuous streaming via an IV-line, is known to lead to receptor desensitisation.²⁴

This positive feedback cycle, is also understood to have a neuro-protective role for the foetal brain during labour as it reduces hypoxia, and elevates oxytocin levels in both the mother and baby into the early postpartum period. Specifically, the oxytocin, which builds in the mother during labour, makes her more maternal and allows her to bond with her baby. It also opens up the peripheral blood vessels on her chest so that the baby is kept warm during skin-to-skin time while he searches for the nipple. The added benefit of this getting-to-know-you time as the baby wriggles around on the mother's abdomen is the minimising of the risk of post-partum haemorrhage due to the continued oxytocin spikes that occur as a result of the close contact, and the further colonisation of the baby's oral mucosa with maternal bacteria, (a process initiated during foetal descent through the birth canal) thereby paving the way for an optimal microbiome.

Therefore it is a normal physiologic birth which initiates optimal oxytocin receptor formulation. This is prevented in labours that are artificially stimulated with synthetic oxytocin and in elective caesarean sections (an emergency caesarean is not such a problem in this regard as the baby is exposed to lots of oxytocin during the dilation phase of the labour). It is not surprising therefore, that recent media reports sharing research undertaken by way of a questionnaire claim that "most mums (specifically 60%) do not feel an instant bond with their newborns",²⁵ as artificial initiation, or augmentation of labour, or delivery via elective caesarean section, is on the rise.

So, while the initial priming (or not, in the case of a medicalised birth) of oxytocin receptors occurs during labour, it is reassuring to know that extended breastfeeding up-regulates oxytocin as it's the oestrogens in the milk that induce the transcription of both oxytocin and its receptors, and these play a pivotal role in transforming the epigenetic experiences associated with the primal period into permanent changes in the anatomy and physiology of the developing brain and central nervous system.^{26;27} These benefits are known to be immediately beneficial as there's emerging research linking the lack of oxytocin receptors to the autism spectrum phenomenon;²⁸ however, that the effect is trans-generational, gives further pause for thought!

So it would appear that it is not so easy to take the biological mother out of the equation when it comes to human reproduction. As a society we need to have a conversation regarding the pivotal role that she plays in ensuring optimum functioning in the individual she conceives and gives birth to. Mothering is a real job and a vital aspect of the evolutionary process and we need to acknowledge this fact and give real support to mothers or risk individual or collective peril.

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