Undisturbed Birth: Nature's Blueprint for Ease and Ecstasy

Author: Buckley, Sarah J, MB, ChB, Dip, Obst

Publication info: Journal of Prenatal & Perinatal Psychology & Health 17. 4 (Summer 2003): 261-288.
ProQuest document link

Abstract: None available.

Full Text: Headnote ABSTRACT: When a woman labors and gives birth without disturbance, her body produces peak levels of birthing hormones. These include oxytocin, the hormone of love; beta-endorphin, hormone of pleasure and the body's natural analgesic; adrenaline and noradrenaline (epinephrine/norepinephrine) hormones of excitement; and prolactin, the mothering and breastfeeding hormone. This paper outlines current knowledge of the functions, and interconnections of these hormones, and the hormonal interferences caused by medical interventions, in particular, induction and augmentation (acceleration), opiate and epidural pain relief, cesarean surgery, and early separation of mother and baby. The author argues that an undisturbed birth creates maximum ease and safety for mother and baby, as well as making birth a potentially ecstatic experience. KEY WORDS: Oxytocin; beta-endorphin; adrenaline; noradrenaline; epinephrine; norepinephrine prolactin; induction; pitocin; syntocinon; augmentation; acceleration; opiate analgesia; epidural; mother-infant attachment; bonding, labor; birth; undisturbed birth; ecstatic birth. INTRODUCTION The term undisturbed birth came to have great meaning for me when I gave birth to my fourth baby, unassisted (and unexpectedly breech) at home. It describes well this beautiful experience which awakened me anew to the ecstasy of birth, and I realized that the process of birth can be very simple, if we avoid disturbing it. Comparing this birth to my three previous midwife-assisted home births, and to home and hospital births that I had attended, I saw also how ingrained is our habit of disturbance, and that our need to "do something" so often becomes self-fulfilling in the birth room. I realized that birth is also very complex, and that the process is exquisitely sensitive to outside influences. The parallels between making love and giving birth became very clear to me, not only in terms of passion and love, but also because we need essentially the same conditions for both experiences; to feel private, safe, and unobserved. Yet the conditions that we provide for birthing women are almost diametrically opposed to these; no wonder giving birth is so difficult for most women today. WHAT DISTURBS BIRTH? As I imply, anything that disturbs a laboring woman's sense of safety and privacy will disrupt the birth process. This definition covers most of modern obstetrics, which has created an entire industry around the observation and monitoring of pregnant and birthing women. Some of the techniques used are painful or uncomfortable, most involve some transgression of bodily and/or social boundaries, and almost all are performed by people who are essentially strangers to the woman herself. All of these factors are disruptive to pregnant and birthing women. Underlying these procedures, is a deep distrust of women's bodies, and of the natural processes of gestation and birth, and this attitude in itself has a strong nocebo, or noxious effect. On top of this, is another obstetric layer devoted to correcting the "dysfunctional labor" that such disruption is likely to produce. The resulting distortion of the process of birth, what we might call "disturbed birth," has come to be what women expect when they have a baby and perhaps, in a strange circularity, it works. Under this model, women are almost certain to "need" the interventions that the medical model promotes, and to come away grateful to be "saved," no matter how difficult or traumatic their experience. These disturbances are counterproductive for midwives also. When a midwife's time and focus is taken up with monitoring and recording, she is less able to be "with women," as the guardian of natural birth. When her intuitive skills and simple ways of knowing have been buried in service to the system, more and more invasive procedures will be needed to get information that, in other times, a midwife's heart and hands would have illuminated. And when a woman misses out on the joy and ecstasy of birth, so does her midwife, which will influence her expectations of birth, as well as her job satisfaction. UNDISTURBED BIRTH However, our women's bodies have their own wisdom and our innate system of birth,

refined over 100,000 generations, is not so easily overpowered. This system, which I am calling undisturbed birth, has the evolutionary stamp of approval, not only because it is safe and efficient for the vast majority of mothers and babies, but also because it incorporates our hormonal blueprint for ecstasy in birth. When birth is undisturbed, our birthing hormones can take us into ecstasy, outside (ec) our usual state (stasis), so that we enter motherhood awakened and transformed. This is not just a good feeling; the post-birth hormones that suffuse the brains of a new mother and her baby also catalyze profound neurological, or brain, changes. These changes give the new mother personal empowerment, physical strength and an intuitive sense of her baby's needs (Pearce, 1995), and prepare both partners for the pleasurable mutual dependency that will ensure a mother's care and protection, and her baby's survival. Undisturbed birth, then, represents the smoothest hormonal orchestration of the birth process, and, therefore, the easiest transition possible; physiologically, hormonally, psychologically, and emotionally, from pregnancy and birth to new motherhood and lactation, for each woman. When a mother's hormonal orchestration is undisturbed, her baby's safety is also enhanced, not only during labor and delivery, but also in the critical transition from intra- to extra-uterine life. Furthermore, the optimal expression of a woman's "motherhood hormones" will ensure that her growing child is well nurtured, adding another layer of evolutionary "fitness" to the process of undisturbed birth. Undisturbed birth does not mean unsupported birth. Some anthropologists believe that human females have sought assistance in birth since we began to walk on two legs. The change in our pelvic shape that accompanied our upright stance added uniquely complex twists and turns to our babies' journeys during birth, making assistance more necessary than for other mammals (Rosenberg &Trevathan, 2001). It does mean having supporters who we have specifically chosen as our familiar and loving companions; who are confident in our abilities, and who will intervene as little and as gently as possible. Undisturbed birth does not mean painless birth. Giving birth is a huge event, physically and psychologically, and makes demands on the body which are hormonally equivalent to endurance athletics (Goland, Wardlaw, Blum, Tropper &Stark, 1988) but, when a woman feels confident in her body, well supported, and able to express herself without inhibition, any painful feelings can become just one part of the process. She can then respond instinctively from her own resources using, for example, breath, sound, and movement. Undisturbed birth does not guarantee an easy birth. There are many layers, both individual and cultural, that can impede us at birth. But, when we approach birth with the intention of minimum disturbance, we are optimizing the functioning of our birth hormones. This, coupled with our unparalleled levels of hygiene and nutrition, gives us a better chance of an easy and safe birth than almost any of our foremothers, from whom we have also inherited, through natural selection, the female anatomy and physiology that births most easily and efficiently. THE HORMONES OF BIRTH The hormonal orchestration of birth, to which I refer here, is exceedingly complex. Despite a great amount of research over the last 50 years, on both humans and other mammals, many fundamental processes are still not understood. In this paper, I will be primarily discussing oxytocin; beta endorphin; the catecholamines, adrenalin and noradrenaline (epinephrine and norepinephrine) and prolactin. As the hormones of love, transcendence, excitement, and mothering, respectively, these hormones are the major components of an ecstatic cocktail of hormones that nature prescribes to aid birthing mothers of all mammalian species. All of these are produced primarily in the middle or mammalian brain, also called the limbic system. Their levels build during an undisturbed labor, peaking around the time of birth for both mother and baby, and subsiding or reorganizing over the subsequent hours or days. For birth to proceed optimally, this more "primitive" part of the brain needs to take precedence over our neocortex, our "new brain," which is the seat of our rational mind. This shift is aided by, and also aids, the release of birthing hormones such as beta-endorphin, and is inhibited by disturbances such as bright lighting, conversation, and expectations of rationality. If we were to consider giving birth as the deepest meditation possible, and accord birthing women the commensurate respect, support, and lack of disturbance that is needed, we would provide the best physiological conditions for birth. This optimal hormonal orchestration provides ease, ecstasy, and safety for mother and baby. Conversely, interference with this process will also

disrupt this hormonal orchestration. Mother Nature's pragmatic and efficient principles dictate that these hormones should also help the baby at birth, and this is increasingly being ratified by scientific research. This hormonal interdependence contradicts the oft-repeated obstetric response to natural birth as the mother prizing her experience over her baby's safety, and underlines the mutual dependency of mother and baby, even as they begin their physical separation. Oestrogen and Progesterone In our current understanding, the prime movers-the hormones which are involved in setting the scene-which includes activating, inhibiting, and reorganizing other hormone systems, are the sex steroids progesterone and oestrogen (of which there are three distinct types). In pregnancy, progesterone production by the placenta increases 10 to 18 times, while placental production of oestriol, the dominant type of pregnancy estrogen, rises more than 1000 times. (Russell, Douglas, &Ingram, 2001). These hormones are thought to play a critical but complex role in the initiation of labor, most likely through changes in their levels and/ or ratios (Weiss, 2000). Oestrogen also increases the number of uterine oxytocin receptors (Jackson &Dudley, 1998) and gap junctions (Petrocelli &Lye, 1993) in late pregnancy, effectively "wiring up" the uterus for coordinated contractions in labor. Oestrogen and progesterone together also activate opiate pain-killing pathways in the brain and spinal cord in preparation for labor (Russell, et al., 2001). Oxytocin Oxytocin has been called the hormone of love because of its connection with sexual activity, orgasm, birth, and breastfeeding. In addition, oxytocin is produced in social situations such as sharing a meal (Verbalis, McCann, McHale &Stricker, 1986) making it a hormone of altruism, or, as Michel Odent (1994) suggests, of "forgetting oneself." Oxytocin is made in the hypothalamus, the nervous system's primary communicator with the endocrine system. It is then stored, and released in pulses from the posterior pituitary, the master gland of the endocrine system, into the bloodstream. Levels are difficult to measure in the human because of its pulsatile pattern of release and its half-life of only 3 minutes (Fuchs &Fuchs, 1984). The number of oxytocin receptors in a woman's uterus increases substantially late in pregnancy, increasing her sensitivity to oxytocin. Circulating levels do not actually rise until late in labor, as below (Steer, 1990). Oxytocin is thought to be the prime initiator of the rhythmic uterine contractions of labor, although it is not the only hormonal system involved-mice who have had their oxytocin gene inactivated are still able to deliver-but not breastfeed-their young (Young, Shepard, Amico, Hennighausen, Wagner, Ala Marka, McKinnel &Ginn, 1996). It has been hypothesized that prostaglandins-especially prostaglandin F2alpha-take over this "uterotonic" role later in labor (Fuchs &Fuchs, 1984). Oxytocin has also been shown to have a pain-killing effect in pregnant rats and mice (Lundeberg, Uvnas-Moberg, Agren &Brezelius, 1994). The baby also releases large amounts of oxytocin from the pituitary during labor, as part of the activation of the endocrine and nervous systems, which occurs naturally for the baby during labor and birth. There is evidence that this oxytocin is transported back through the placenta into the mother's circulation (Fuchs &Fuchs, 1984). Oxytocin is also produced by the placenta and fetal membranes, as well as being present in amniotic fluid (Fuchs &Fuchs, 1984). Some researchers have therefore suggested that fetal oxytocin may directly stimulate the uterine muscle and that this may be important in the process of labor (Chard, 1989). Oxytocin catalyses the final powerful uterine contractions at the end of an undisturbed birth-sometimes called the fetal ejection reflex (Odent 1994)-that birth the baby quickly and easily. At this time the baby's descending head stimulates "stretch receptors" in a woman's lower vagina, giving positive feedback to pituitary oxytocin neurons and releasing oxytocin in large quantities (Dawood, Raghavan, Pociask &Fuchs, 1978). This is also called the Ferguson reflex. After the birth, ongoing high levels of oxytocin, augmented by more pulses released as the baby touches, licks, and nuzzles the breast (Matthiesen, Ransjo-Arvidson, Nissen, &Uvnas-Moberg, 2001), help to keep the new mother's uterus contracted and so protect her against post-partum hemorrhage. Skin-to-skin and eye-to-eye contact between mother and baby are also thought to optimize oxytocin release. Oxytocin levels peak with the delivery of the placenta and subside over about 60 minutes (Nissen, Lilja, Widstrom &Uvnas-Moberg, 1995). Newborn oxytocin levels peak at around 30 minutes after birth (Leake, Weitzman, &Fisher, 1981) so that during the first hour after birth, both mother and baby are bathed in an ecstatic cocktail of hormones, including oxytocin, the hormone of love. Newborn babies

have elevated levels of oxytocin for at least 4 days after birth (Leake et al., 1981). Oxytocin is also involved with the olfactory system, which is known to play an important role in mammalian birth. In labor, the olfactory sense (smell) augments oxytocin release, and after the birth, this is thought to be important in the establishment of mothering behavior (Russell et al., 2001). For example, one study found that monkeys delivered by caesarean rejected their offspring unless the babies were swabbed with secretions from the mother's vagina (Lundblad &Hodgen, 1980). The large number of human genes which are involved with smell-1-2% of the total (Axel, 1995)-suggests that smell is of evolutionary importance in mother-infant bonding in our species also. As well as reaching peak levels after birth, oxytocin is secreted in large amounts in pregnancy, when it acts to enhance nutrient absorption, and conserve energy by making pregnant women more sleepy (Uvnas-Moberg, 1998). The well-documented suppression of the Hypothalamic-Pituitary-Adrenal (HPA) stress axis during pregnancy and lactation, which makes pregnant and breastfeeding mothers more relaxed, more resistant to stress and experience more positive mood states, may be due, at least in part, to oxytocin (Russell et al., 2001). During breastfeeding, oxytocin mediates the milk-ejection, or "let down" reflex and is released in pulses as the baby suckles. During the months and years of lactation, oxytocin continues to act to keep the mother relaxed and well nourished. One researcher calls it "a very efficient anti-stress situation which prevents a lot of disease later on."(Uvnas Moberg, 1998, p. 38). From her research, mothers who breastfed for more than seven weeks were calmer when their babies were six months old than mothers who did not breastfeed at all. The oxytocin system has also been implicated in aggressive-defensive behavior in lactating females (Giovenardi, Padoin, Cadore &Lucion, 1998), although opiate mechanisms are also known to be involved (Kinsley &Bridges, 1986). Other studies indicate that oxytocin is also involved in cognition, tolerance and adaptation, and researchers have recently found that oxytocin also acts as a cardiovascular hormone, with effects such as slowing the heart rate and reducing blood pressure (Gutkowska, Jankowski, Makaddam-Daher, &McCann, 2000). Another researcher has ascribed a "relaxation and growth response" to oxytocin release, contrasting this physiologically with the body's fight-or-flight stress response (Uvnas-Moberg, 1997). Other research suggests that the female response to stress is marked by a "tend and befriend" pattern, which may be mediated by oxytocin (Taylor, Klein, Lewis, Grunewald, Gurung &Updegraff, 2000). Malfunctions of the oxytocin system have been implicated in conditions such as schizophrenia (Feifal &Raza, 1999), autism (Insel, 1999), cardiovascular disease (Knox &Uvnas-Moberg, 1998), and drug dependency (Sarnyai &Kovacs, 1994), and it has been suggested that oxytocin may mediate the antidepressant effect of drugs such as Prozac (Uvnas-Moberg, Bjokstrand, Hillegart &Ahlenius, 1999). Beta-Endorphin Beta-endorphin is one of a group of naturally occurring opiates, with properties similar to meperidine (pethidine, demerol), morphine, and heroin, and has been shown to work on the same receptors of the brain. It is secreted from the pituitary gland under conditions of pain and stress, and high levels are present in pregnancy, birth, and lactation. Beta-endorphin acts as a natural pain-killer, and causes an increasing tolerance to pain in pregnant rats (Laaitikainen, 1991). Beta-endorphin also suppresses that immune system, which may be important in preventing a pregnant mother's immune system from acting against her baby, whose genetic material is foreign to hers. Like the addictive opiates, beta-endorphin induces feelings of pleasure, euphoria, and dependency or, with a partner, mutual dependency. Beta-endorphin levels increase throughout labor, (Brinsmead, Smith, Singh, Lewin &Owens, 1985) when levels of beta-endorphin and CRH (another stress hormone) reach those found in male endurance athletes during maximal exercise on a treadmill (Goland et al., 1988). Levels peak at the time of birth and subside slowly, reaching normal levels one to three days after birth. (Bacigalupo, Riese, Rosendahl &Saling, 1990). Such high levels help a laboring woman to transmute pain and enter the altered state of consciousness that characterizes an undisturbed birth. The baby also secretes beta-endorphin during labor from the fetal pituitary (Facchinetti, Lanzani, &Genazzani, 1989) as well as directly from placental tissue and membranes (Facchinetti, Garuti, Petraglia, Mercantini, &Genazzani, 1990) and levels in the placenta at birth are even higher than those in maternal blood (Jevremovich, Terzic, Kartaljevic, Filpovic, Filipovic &Rostic 1991). Kimball (1979) speculated that early cord cutting may "... deprive mothers and infants of

placental opiod molecules designed to induce interdependency of mothers and infants." (p. 128) Beta-endorphin has complex and incompletely understood relationships with other hormonal systems (Laatikainen, 1991). For example, high levels of beta-endorphin inhibit oxytocin release. It makes sense that when pain or stress levels are very high, contractions will slow, thus "rationing labor according to both physiological and psychological stress." (Jowitt, 1993). Beta-endorphin may also be involved in inhibiting the action of oxytocin before labor begins (Douglas, Bicknell, &Russell, 1995). Beta-endorphin also facilitates the release of prolactin during labor (Rivier, Vale, Ling, Brown &Guillemin, 1976), which prepares the mother's breasts for lactation and also aids in lung maturation for the baby (Parker, MacDonald, Guzick, Porter, Rosenfeld &Hauth, 1989). Beta-endorphin is also important in breastfeeding. Levels peak in the mother at 20 minutes (Franceschini, Venturini, Cataldi, Barreca, Bagni &Rolandi, 1989) and beta-endorphin is also present in breast-milk, (Zanardo, Nicolussi, Carlo, Marzi, Favaro &Plebani, 2001) inducing a pleasurable mutual dependency for both mother and baby in their ongoing relationship. Catecholamines The fight-or-flight hormones adrenaline and noradrenaline (epinephrine and norepinephrine), are, along with dopamine, known as the catecholamines, and are produced by the body in response to stresses such as hunger, fear and cold. Together they stimulate the sympathetic nervous system for fight or flight. Catecholamine levels rise during an undisturbed labor; research suggests that adrenaline levels are more responsive to psychological stresses such as pain and anxiety, with noradrenaline increasing in response to the physiological work of labor (Costa, deFilippis, Vodlino, Giraudi, Massobrio, Benedetto, Marzio, Gallo, Molina &Fabris, 1988). Very high adrenaline levels in the first stage of labor will inhibit oxytocin release, therefore slowing or even stopping labor. Adrenaline also acts to reduce blood flow to the uterus and placenta and, therefore, to the baby. This makes sense for mammals birthing in the wild, where the presence of danger would activate this fight or flight response, inhibiting labor and diverting blood to the major muscle groups so that the mother can flee to safety. In humans, high levels of adrenaline have been associated with longer labor and adverse fetal heart rate patterns (Lederman, Lederman, Work &McCann, 1985). After an undisturbed labor, however, when the moment of birth is imminent, these hormones act in a different way. There is a sudden increase in CA levels, especially noradrenaline, which activates the fetal ejection reflex. The mother experiences a sudden rush of energy; she will be upright and alert, with a dry mouth and shallow breathing and perhaps the urge to grasp something. She may express fear, anger, or excitement, and the CA rush will produce, in concert with oxytocin, several very strong contractions, which will birth the baby quickly and easily (Odent, 1994). Some birth attendants have made good use of this reflex when a woman is having difficulties in the second stage of labor. For example, one anthropologist working with an indigenous Canadian tribe recorded that when a woman was having difficulty in birth, the young people of the village would gather together to help. They would suddenly and unexpectedly shout out close to her, with the shock triggering her fetal ejection reflex and a quick birth (Odent, 1994). After the birth, the new mother's CA levels drop steeply, and she may feel shaky or cold as a consequence. If she is not helped to warm up, the cold stress will keep her CA levels high, which will inhibit her oxytocin production and, therefore, increase her risk of postpartum hemorrhage (Saito, Sano &Satohisa, 1991). Noradrenaline, as part of the ecstatic cocktail, is also implicated in instinctive mothering behavior. Mice bred to be deficient in noradrenaline will not care for their young after birth unless noradrenaline is injected back into their system (Thomas, Fletcher &Hill, 1997). For the baby also, labor is an exciting and stressful event, reflected in increasing CA levels. In labor these hormones have a very beneficial effect, and protect the baby from the effects of hypoxia (lack of oxygen) and subsequent acidosis by redistributing cardiac output (Philippe, 1983) and by increasing the capacity for anaerobic glycolysis, i.e., metabolism of glucose at low oxygen levels (Irestedt, Lagercrantz &Belfrage, 1984). The baby also experiences a marked CA surge, especially of noradrenaline, at the time of birth, probably triggered by pressure on the baby's head (Eliot, Lam, Leake, Hobel &Fisher, 1980; Langercrantz, 1986) This plays a very important role in the newborn's adaptation of extra-uterine life. It aids newborn metabolism by increasing levels of glucose and free fatty acids (Hagnevik, Faxelius, Irestedt, Lagercrantz, Lundell &Persson 1984), which protect the brain from the low blood sugar that

naturally occurs in the early newborn period (Colson, 2002). In addition, catecholamines enhance respiratory adaptation to extra-utero life by increasing the absorption of amniotic fluid from the lungs and stimulating surfactant release (Irestedt et al., 1984). They also assist with the necessary newborn shift to non-shivering thermogenesis (heat production) (Lowe &Reiss, 1996), increase cardiac contractility, stimulate breathing and enhance responsiveness and tone in the newborn (Irestedt et al., 1984). High CA levels at birth also ensure that the baby is wide-eyed and alert at first contact with the mother. The baby's CA levels also drop steeply after an undisturbed birth, being soothed by contact with the mother, but remain significantly elevated for the first 12 hours (Eliot et al., 1980). Prolactin Prolactin is named for its well known "prolactation" effects, preparing a woman's breasts for lactation in pregnancy and, postnatally, acting as the major hormone of milk synthesis and breastfeeding. Prolactin is also known as the mothering hormone and a recent review concluded that prolactin may be "a key player in the organization and coordination of the neuroendocrine and behavioral ' adaptations of the maternal brain" (Grattan, 2001, p. 153). Prolactin levels rise progressively during pregnancy, but its actions on the breast are inhibited, until delivery of the placenta, by high levels of progesterone. All mammalian species also produce a placental hormone with lactogenic effects-in the human this is human placental lactogen (hPL), which is produced by the placenta. Human placental lactogen parallels prolactin in its increase throughout pregnancy, illustrating the baby's active role, via placental hormones, in organising the mother's brain for maternity (Grattan, 2001). Prolactin levels rise in labor, peaking at birth, and then subsiding. During lactation, prolactin levels are directly related to the suckling intensity, duration, and frequency (Grattan, 2001). Known effects of prolactin on the mammalian brain include; induction of maternal behavior, increase in appetite and food intake, suppression of fertility, stimulation of motor and grooming activity, reduction of the stress response, stimulation of oxytocin secretion and opioid activity, alteration of the sleep-wake cycle and increase in REM sleep, reduction in body temperature, and stimulation of natural analgesia (Grattan, 2001). Prolactin is also a hormone of submission or surrender (in primate troupes, the dominant male has the lowest prolactin level) and also produces some anxiety. In the breastfeeding relationship, these effects activate a mother's vigilance and help her to put her baby's needs first (Odent, 1994). The baby produces prolactin in utero and prolactin is also present in breastmilk, with a significant amount being transferred intact into the newborn circulation, at least in the rat (Grosvenor, 1983). According to one researcher, ". . . there is evidence that prolactin plays an important role in the development and maturation of the neonatal neuroendocrine [brain/hormone] system." (Grattan 2001, p. 165). As noted above, prolactin also plays a role in lung maturation in utero (Parker et al., 1989). IMPACT OF OBSTETRIC PROCEDURES Induction and Augmentation with Synthetic Oxytocin Here in Australia, more than 25% of women have their labor induced and another 20% have an augmentation of labor (also called stimulation or acceleration) with synthetic oxytocin, e.g. Syntocinon, Pitocin (AIHW, 2001). In the US, figures are lower, 19.8% and 17.9% respectively (NCHS, 2002). This still results in large numbers of laboring women, and their babies, being exposed to unnaturally high levels of this hormone around the time of birth. Synthetic oxytocin administered intravenously in labor acts very differently to a laboring woman's intrinsic oxytocin. Firstly, the uterine contractions produced by IV Syntocinon are different to natural contractions, possibly because Syntocinon is administered continuously rather than in a pulsatile manner, and can cause detrimental effects to the baby in utero. When synthetic oxytocin is administered, a woman's uterine contractions can occur too close together, leaving insufficient time for the baby to recover from the loss of blood and oxygen that occurs when the placenta is compressed. Syntocinon also causes the resting tone of the uterus to increase (Friedman &Sachtleben, 1978). Such effects can produce abnormal fetal heart rate (FHR) patterns, fetal distress (leading to caesarean section), and even uterine rupture (Stubbs, 2000). Oxytocin augmentation stimulates uterine contraction, but has minimal effects on cervical dilatation, compared to a natural labor (Bidgood &Steer, 1987); this creates the possibility of "failed induction" where the cervix fails to dilate, and a caesarean becomes necessary. Secondly, oxytocin, whether synthetic or not, cannot cross from the body back to the brain through the "blood-brain barrier." This means that when it is administered in any way, except

directly into the brain, it can cause effects on the body, but it cannot act as the hormone of love. It does, however, generate "negative feedback." That is, receptors in the laboring woman's body detect high levels of oxytocin and signal her brain to reduce production. We know that women who labor with an oxytocin infusion are at increased risk of post-partum hemorrhage (Gilbert, Porter, &Brown, 1987) because their own oxytocin production has been shut down. What we do not know, however, are the psychological, or psychoneuroendocrine, effects of giving birth without the peak levels of oxytocin that nature prescribes for all mammalian species. In one study, women who had synthetic oxytocin augmentation did not experience an increase in beta endorphin levels in labor (Genazzani, Petraglia, Fachinetti, Galli &Volpe, 1985), indicating the complexities that may result from interference with any of the hormonal systems in labor. Other research has suggested that exogenous oxytocin may pass through the placenta unchanged (Dawood, 1993), which implies that the fetal oxytocin system may also be disrupted by administration of synthetic oxytocin in labor. Michel Odent notes, "Many experts believe that through participating in the initiation of his own birth, the fetus may be training himself to secrete his own love hormone . . ." (1994, p. 108). Odent speaks passionately about our society's deficits in our capacity to love self and others, and he traces these problems back to the time around birth, and especially to interference with the oxytocin system. Opiate Pain-killers Pethidine (demerol, meperidine) is the usual opiate administered in Australian labor wards. Here in Queensland, Australia, in 1998, around a third of laboring women used this drug (Queensland Health, 2001). In the US, other narcotics such as nalbuphine (Nubain), butorphanol (Stadol), alphaprodine (Nisentil), hydromorphone (Dilaudid), and fentanyl citrate (Sublimaze) have been traditional mainstays of labor analgesia. Opiate painkillers are reportedly still used by up to 50% of women laboring in some US hospitals (Hawkins, Beatty &Gibbs, 1999), despite the increasing popularity of epidural analgesia, which may also contain opiates, as discussed below. All opiates used in labor can cause side effects, such as maternal nausea, vomiting, sedation, pruritus (itching), hypotension (low blood pressure), and respiratory depression. For the baby, these drugs can cause fetal heart rate (FHR) abnormalities, respiratory depression, impaired early breastfeeding and altered neonatal neurobehaviour (ACOG 1996). As with oxytocin, use of these drugs will reduce a woman's own opioid hormone production (Thomas, Fletcher &Hill, 1982), which may be helpful if excessive levels are inhibiting labor. However, the use of pethidine has been shown to slow labor, in a dose-response way (Thomson, 1994). In one randomised trial, morphine (but not naloxone), administered in labor directly reduced oxytocin release (Lindow, van der Spuy, Hendricks, Rosselli, Lombard &Leng, 1992). Again, we must ask, "What may be the effects for mother and baby of laboring and birthing without peak levels of these hormones of pleasure and transcendence?" Some researchers have nominated our endogenous opiates as the reward system for reproductive acts. That is, the endorphin fix keeps us making babies, having babies, and breastfeeding (Kimball, 1979; Odent, 1999). Anecdotally, I notice that women who reap pleasure from these activities, e.g., home-birthers and la leche mothers, tend to have larger families. On a global scale, also, countries that have embraced the obstetric model of care, which prizes drugs and interventions above birthing pleasure and empowerment, have experienced steeply declining birth rates in recent years. More serious are the implications of Swedish research into the use of opiates at birth (Jacobsen, Nybewg, Gronblah, Eklund, Bygedeman &Rydberg, 1990), and recently replicated with a prospective US population (Nyberg, Buka &Lipsitt, 2000). In the first study, researchers looked at the birth records of 200 opiate addicts born between 1945 and 1966, and compared them to their non-addicted siblings. Offspring whose mothers used analgesia in labor (opiates, barbiturates, and nitrous oxide gas) were more likely to become addicted to drugs (opiates, amphetamines) as adults, especially when multiple doses were administered. For example, when a mother had received three doses of any of these drugs in her labor, her child was 4.7 times more likely to become addicted to opiate drugs in adulthood. This figure was replicated almost exactly in the Nyberg study. Animal studies suggest a mechanism for such an effect. It seems that drugs administered chronically in late pregnancy can cause effects in brain structure and function, e.g., chemical and hormonal imbalance, in offspring which may not be obvious

until young adulthood (Myerson, 1985; Kellogg, Primus &Bitran, 1991; Liverzey, Rayburn &Smith, 1992; Mirmiran &Swaab, 1992). Whether such effects apply to human babies who are exposed for shorter periods around the time of birth is not known but, as one researcher warns "During this prenatal period of neuronal (brain cell) multiplication, migration and interconnection, the brain is most vulnerable to irreversible damage." (Liverzey et al., 1992). Epidural Drugs Epidural analgesia uses several types of drugs, administered into the epidural space around the spinal cord. Traditionally epidurals have used local anaesthetics, all cocaine derivatives (e.g. bupivicaine/marcaine, ropivicaine, lidocaine) which numb the motor as well as sensory nerves, making lower-limb movement impossible. More recently these have been used in lower doses and/or combined with low-dose opiates, as a "walking epidural." An epidural may also include catecholamines, such as adrenaline. Spinal pain relief involves a single dose of the same drugs injected through the coverings of the spinal cord, and is usually short acting, unless given as a combined spinal-epidural (CSE). Epidural pain relief has major effects on all of the above-mentioned hormones of labor. Epidurals inhibit beta-endorphin production (Bacigalupo et al., 1990) and, therefore, also inhibit the shift in consciousness that is part of a normal labor. Their popularity may partly reflect the difficulty that we have allowing laboring women to enter an altered state of consciousness, and our lack of training and facilities to accommodate this most basic requirement for birth. When an epidural is in place, the oxytocin peak that occurs at birth is also inhibited because the stretch receptors of a birthing woman's lower vagina, which trigger this peak, are numbed. This effect probably persists even when the epidural has worn off and sensation has returned, because the nerve fibres involved are smaller than the sensory nerves and therefore more sensitive to drug effects (Goodfellow, Hull, Swaab, Dogterom &Buijs, 1983). A woman laboring with an epidural therefore misses out on the fetal ejection reflex, and must use her own effort, often against gravity, to compensate this loss. This explains the increased length of the second stage of labor and the extra need for forceps when an epidural is used (Lieberman &O'Donoghue, 2002). The use of epidurals also inhibits catecholamine release for both mother and baby (Jones, McCullouch, Butters, Hamilton, Rubin &Reid, 1985). This may be advantageous for the mother in the first stage of labor; close to the time of birth, however, a reduction in CA levels will inhibit the fetal ejection reflex and prolong the second stage. The health of the newborn may be affected, to some extent, by the lack of catecholamines under epidural. For vulnerable babies, the loss of this protection could compromise cardiac, respiratory, metabolic and thermal adaptations at birth. Release of the important uterine stimulating hormone prostaglandin F2 alpha is also adversely affected by epidurals. Levels of this hormone naturally rise during an undisturbed labor, consistent with its presumed role as the major mediator of uterine contractions later in labor. However, in one study, women with epidurals experienced a decrease in PGF2 alpha, and a prolongation of labor (Behrens, Goeschen, Luck &Fuchs, 1993). In this study, average labor times were increased from 4.7 to 7.8 hours. Drugs administered by epidural enter the mother's bloodstream immediately and go straight to the baby at equal, and sometimes effectively greater, levels than in the mother (Fernando &Bonello, 1995; Brinsmead, 1987). Some drugs will be preferentially taken up into the baby's brain (Hale, 1998), and almost all will take longer to be eliminated from the baby's immature system after the cord is cut. For example, the half-life of bupivicaine (i.e., time for blood levels to fall by half) is 2.7 hours in the adult, but around 8 hours in the neonate (Hale, 1997). Studies using the Brazelton Neonatal Assessment Scale (NBAS) have found deficits in newborn abilities consistent with toxicity from these drugs (Lieberman &O'Donoghue, 2001). Epidural anaesthesia used for caesareans has also been associated with more acidaemia (acid blood levels) in healthy newborn babies than general anaesthetic, an indication that epidurals can compromise fetal blood and oxygen supply (Mueller, Bruhwiler, Schupter &Luscher, 1997; Roberts, Leveno, Sidawi, Lucas &Kelly, 1995). This is possibly the result of a vasodilating effect, which causes a drop in the mother's blood pressure. Another indication that epidurals may have unintended side-effects for mothers and babies comes from French researchers who gave epidurals to laboring sheep (Krehbiel, Poindron, Levy &Prud'homme, 1987). The ewes failed to display their normal mothering behavior; this effect was especially marked for the ewes in their first lambing that were given

epidurals early in labor. Seven out of eight of these mothers showed no interest in their offspring for at least 30 minutes. Some studies indicate that this disturbance may also apply to humans. Mothers given epidurals in one study spent less time with their babies in hospital, in inverse proportion to the dose of drugs they received and the length of the second stage of labor (Sepkoski, Lester, Ostheimer &Brazelton, 1992). In another study, mothers who had epidurals described their babies as more difficult to care for one month later (Murray, Dolby, Nation &Thomas, 1981). Such subtle shifts in relationship and reciprocity may reflect hormonal dysfunctions, and/or drug toxicity, and/or the less-than-optimal circumstances that often accompany epidural births, e.g., long labors, forceps, and Caesareans. Incredibly, there have been no good studies of the long-term effects of epidurals on breastfeeding (Walker, 1997). There is evidence that babies born after epidural have a diminished suckling reflexes and capacity (Riordan, Gross, Matthiesen, Lilja, Brown &Guillemin, 2001), consistent with drug-related neurobehavioral deficits as above. A recent study showed that, for healthy full-term babies born vaginally, being exposed to an epidural reduced their chance of being fully and successfully breastfed before hospital discharge (Baumgarten, Muehl, Fischer &Pribbenow, 2003). Caesarean Surgery In the western world we are experiencing an epidemic of caesareans, and we have somehow come to believe that this is a safe, and perhaps even safer, way of delivering our babies. There is no evidence to support this assertion. Caesarean section involves major abdominal surgery and increases the risk of maternal death by about four times (Enkin, Keirse, Neilson, Crowther, Duley, Hodnett &Hoffmeyr, 2000). Mother's and baby's health may also be compromised, and risk of death increased, in all subsequent pregnancies because of an increased risk of placental abnormalities such as placenta previa and placenta accreta, as well as increased risk of ectopic pregnancy (Hemminki &Merilainen, 1996). Caesarean rates are currently 21.9 percent in Australia (AIHW, 2001) and 24.4 percent, the highest level on record, in the U.S., in 2001 (NCHS, 2002). With a caesarean, there is an absent or curtailed labor, and the maternal hormonal peaks of oxytocin, endorphins, catecholamines, and prolactin are absent or reduced. Studies also show significantly lower levels of oxytocin (Marchini, Lagercrantz, Winberg, &Uvnas-Moberg, 1988), beta-endorphins (Facchinetti, Garuti, Petraglia, Mercantini, &Genazzani, 1990), catecholamines (Jones, McCulloch, Butters, Rubin &Reid, 1985), and prolactin (Heasman, Spencer, &Symonds, 1997) in babies delivered by elective caesarean. Some of the well-documented risks of caesareans can be ascribed to these hormonal deficits, particularly, for the baby, to absence of the catecholamine surge. This means that babies born after caesareans, are at increased risk of respiratory compromise (Faxelius, Hagnevik, Lagercrantz, Lundell &Irestedt, 1983) as well as low blood sugar (Hagnevik et al., 1984), and poor temperature regulation (Christensson, Sues, Cabera, Belaustequi, de la Fuente &Lagercrantz 1993). Other effects may be more subtle, especially if brain and hormone systems are involved. After a caesarean, mothers and babies are usually separated for some hours, so the first breastfeed is usually delayed. Both will also be affected to some extent by the drugs used in the procedure (epidural, spinal, or general anaesthetic) and for post-operative pain relief. The consequences of such radical departures from our maternal blueprint are suggested in the work of Australian researchers who interviewed 242 women in late pregnancy and again after birth. The 50 percent of women who had given spontaneous vaginal birth experienced, in general, a marked improvement in mood and an elevation of self-esteem after delivery. In comparison, the 17 percent who had caesarean surgery were more likely to experience a decline in mood and self-esteem. The remaining women had forceps or vacuum assistance, and their mood and self-esteem were, on average, unaltered (Fisher, Astbury &Smith, 1997). Another study looked at the breastfeeding hormones prolactin and oxytocin on day two, comparing women who had given birth vaginally with women who had undergone emergency caesarean surgery. In the caesarean group, prolactin levels did not rise as expected with breastfeeding, and the oxytocin pulses were reduced or absent. In this study, first suckling had been at 240 minutes average for caesarean babies, and 75 minutes average for babies vaginally born. The authors of this study conclude; "These data indicate that early breastfeeding and physical closeness may be associated not only with more interaction between mother and child, but also with endocrine [hormonal] changes in the mother." (Nissen, Uvnas-Moberg,

Svensson, Stock, Widstrom &Winberg, 1996, p. 116). Other research has shown that early and frequent suckling positively influences milk production and the duration of breastfeeding (Salariya, Easton &Cater, 1978; De Chateau &Wiberg, 1977). Most studies have shown significantly reduced breastfeeding rates after caesarean surgery (DiMatteo, Morton, Lepper, Damush, Carney, Pearson &Kahn, 1996). These studies not only indicate important links between birth, hormones, and breastfeeding, but also show how an optimal birth experience is designed to enhance the long-term health of mother and baby. For example, successful and long-term breastfeeding confers advantages such as reduced risk of breast cancer and osteoporosis for the mother and increased intelligence, reduced risk of diabetes, and less obesity long-term for the child. A comprehensive and referenced list of the benefits of breastfeeding can be found online at http:// www.promom.org/101/. The connections between events at birth and long-term health certainly deserve more study. (See Michel Odent's Primal Health Database, www.birthworks.org/primalhealth, for a comprehensive listing of current research.) But, we cannot afford to wait for years for researchers to "prove" the benefits of an undisturbed birth. Perhaps the best we can do is trust our instincts and vote with our birthing bodies, choosing (and supporting) models of care that increase the chances of undisturbed birthing. Early Separation There are many animal studies that show that removing newborns from their mothers has deleterious effects on maternal-infant care and on the growing offspring. For some species, there is an inviolable need to lick and smell the offspring, without this attachment will not occur. There seems also to be a critical period for mammals, the first hour or so after birth, when this process is most easily disrupted. Human studies also support the importance of not disturbing this early contact. Swedish researchers noted that if an infant's lips touched the mother's nipple in the first hour of life, the mother, in hospital, kept her infant with her for an extra 100 minutes every day compared to mothers who did not experience suckling until later (Widstrom, Wahlburg &Matthiesen, 1990). Early breastfeeding also confers a lifelong benefit to the baby's gut system. Uvnas-Moberg has found that when the infant suckles from the breast, there is an outpouring of 19 different gastrointestinal hormones in both the mother and the infant, including insulin cholesystokinin, and gastrin. Five of these hormones stimulate the growth of intestinal villi in the mother and the infant. As a result, with each feeding, there is an increased intestinal surface area for nutrient absorption. The hormonal release is stimulated by the touch of the mother's nipple by her infant's lips. This increases oxytocin in both the mother's brain and the infant's brain, which stimulates the vagus nerve, then causes the increase in the output of gastrointestinal hormones. Before the development of modern agriculture and grain storage 10 000 years ago, these responses in the infant and mother were essential for survival when famine was common. (Uvnas-Moberg 1989; quoted in Klaus, 1998, p. 1245) Undisturbed early contact, especially skin-to-skin, also fulfills the newborn's physical needs, giving efficient temperature regulation, easy access to the mother's breast, and less crying than babies wrapped and placed in cots (Christensson, Sues &Moreno, 1992). Researchers have also identified a separation distress call in the human neonate, equivalent to that in other mammalian species. This cry, which is almost certainly genetically encoded, signals the newborn's need for close body contact with the mother after birth, and ceases at reunion. The authors note "These findings are compatible with the opinion that the most appropriate position of the healthy full-term newborn baby after birth is in close body contact with the mother." (Christensson, Cabera, Christensson, Uvnas-Moberg &Winberg, 1995, p. 468) Beyond the early hours, there is a 'vulnerable period' of several days when attachment is still developing; separation at this time also has negative long-term consequences for mammalian species. For example, Biagini, Pich, Carani, Marrama &Agnati (1998) found that infant rats removed for 5 hours a day in the first week of life had increased responsiveness to stress in adulthood associated with alterations in HPA axis regulation. In humans, extra contact "allowed" in hospital decreases the risks of abandonment, abuse, neglect and failure to thrive in childhood (Klaus, 1998). In one study, mothers who had experienced extra early contact with their babies spoke differently to their children at 2 years of age, using more questions, adjectives, and words per proposition, along with fewer commands and content words (Ringler, Kennell, Jarvella, Navojosky &Klaus, 1975). Michel Odent notes that almost every currently existing culture has

rituals or practices that disturb the time immediately after birth, and believes that these disruptions to the mother-infant bond have predominated because they instil aggressive, and therefore more adaptive, traits in the offspring (Odent, 1999). In western obstetrics, we also have a lot of unnecessary activity at this time, e.g. "active management of the third stage," (Buckley, 2000). Even in gentle birth settings, it is unusual for the baby to remain in the mother's arms for the first one to two hours. The wisdom of undisturbed mother-baby contact after birth is well described by Joseph Chilton Pearce in his book Evolution's End: Reclaiming the Potential of Our Intelligence (Pearce, 1995). According to Pearce, when the newborn baby is in skin-to-skin contact, at the mother's left breast, which is where new mothers in all cultures instinctively cradle their babies, and in contact with her heart rhythm, "a cascade of supportive, confirmative information activates every sense, instinct, and intelligence needed for the radical change of environment... Thus intelligent learning begins at birth." (p. 114-115) For the mother also, "A major block of dormant intelligences is activated ... the mother then knows exactly what to do and can communicate with her baby on an intuitive level." (Pearce, 1995, p. 115. Such intuitive capacities, which are almost certainly derived from hormonal reorganization of the mother's brain, are sorely needed in our human culture, where we rely on outside advice from books and "experts" to tell us how to care for our babies. According to Pearce, when these activations do not occur within about 45 minutes of birth, "... cut off from his mother's nurturing and with none of the encoded expectancies met, the newborn's adrenals continue to release steroids in the face of maximum fear and abandonment. The infant screams for a short time and then silence falls." (1995, p. [122]) The damage caused by separation, Pearce writes, is "massive" and "probably past the point of repair." [p 125] Like Odent, he believes that our current birth practices are psychologically crippling to babies, mothers, and society as a whole, and the evidence in his book is compelling. UNDISTURBING BIRTH How can we avoid disturbing the process of birth, and align our practices with our evolutionary blueprint? This can seem difficult in a culture where birth has been disturbed, one way or another, for many generations. Yet it is really very simple. If we were to provide conditions of privacy, and a sense of safety for birth, which, as Jeannine Parvati Baker reminds us, "is orgasmic in its essence," (Baker 2001. p 90) most women would experience a spontaneous, ecstatic, and relatively easy birth. Suggestions for Undisturbing Birth: * Take responsibility for your health, healing, and wholeness throughout the child-bearing years * Choose a model of care that enhances the chance of a natural and undisturbed birth (eg home birth, birth center, one-on-one midwifery care). * Arrange support according to individual needs; trust, a loving relationship, and continuity of care with support people are important. * Consider having an advocate at a hospital birth, e.g. private midwife or doula. * Ensure an atmosphere where the laboring woman feels safe, unobserved, and free to follow her own instincts. * Reduce neocortical stimulation by keeping lighting and noises soft and reducing words to a minimum. * Cover the clock and any other technical equipment. * Avoid procedures (including obvious observations) unless absolutely necessary. * Avoid giving 'advice' unless absolutely necessary. * Avoid drugs unless absolutely necessary. * Avoid caesarean surgery unless absolutely necessary. * Don't separate mother and baby for any reason, including resuscitation, which will be more effective with the cord still attached (Buckley, 2000). * Breastfeed soon after birth, continue long-term, and enjoy it! Dutch professor of obstetrics, G. Kloosterman, offers a succinct summary, which would be well placed on the door of every birth room: Spontaneous labor in a normal woman is an event marked by a number of processes so complicated and so perfectly attuned to each other that any interference will only detract from the optimal character. The only thing required from the bystanders is that they show respect for this awe-inspiring process by complying with the first rule of medicine-nil nocere [Do no harm]." (1982, p 40) References REFERENCES ACOG-American College of Obstetricians and Gynecologists. (1996). Obstetric Analgesia and Anesthesia Technical Bulletin number 225, July. AIHW-Australian Institute of Health and Welfare (2001). National Perinatal Statistics Unit Australia's Mothers and Babies,1999. www.aihw.gov.au/npsu Retrieved March 2003. Axel, R. (1995). The molecular logic of smell. Scientific American, 273(4): 154-159. Bacigalupo, G., Riese, S., Rosendahl, H., Baling, E. (1990). Quantitative relationships between pain intensities during labor and beta-endorphin and cortisol concentrations

in plasma. Decline of the hormone concentrations in the early postpartum period. Journal of Perinatal Medicine, 18(4):289-296. Baker, J.P. (2001). Prenatal Yoga and Natural Childbirth, Silver Anniversary 3rd edition. Berkley: North Atlantic Books. Baumgarten, D. J., Muehl, P., Fischer, M., Pribbenow, B. (2003). Effect of labor epidural anesthesia on breastfeeding of healthy full-term newborns delivered vaginally. Journal of the American Board of Family Practice, 16(1): 7-13. Behrens, O., Goeschen, K., Luck, H.J., Fuchs, A.R. (1993). Effects of lumbar epidural analgesia on prostaglandin F2 alpha release and oxytocin secretion during labor. Prostaglandins, 45(3): 285-296. Biagini, G., Pich, E.M., Carani, C., Marrama, P., Agnati, L.F. (1998). Postnatal maternal separation during the stress hyporesponsive period enhances the adrenocortical response to novelty in adult rats by affecting feedback regulation in the CA1 hippocampal field. International Journal of Developmental Neuroscience, 16(3-4): 187-197. Bidgood, K.A., Steer, P.J. (1987). A randomized control study of oxytocin augmentation of labor. 2. Uterine activity. British Journal of Obstetrics and Gynaecology, 94(6): 518-522. Brinsmead, M., Smith, R., Singh, B., Lewin, T., Owens, P. (1985). Peripartum Concentrations of Beta Endorphin and Cortisol and Maternal Mood States. Australia New Zealand Journal of Obstetrics and Gynaecology, 25:194-197. Brinsmead, M. (1987). Fetal and neonatal effects of drugs administered in labor. Medical Journal of Australia, 146:481-486. Buckley, S. (1998). Epidurals-real risks for mothers and babies. First published in Australia's Parents as "All about epidurals," Australia's Parents Aug//Sept. Also www.birthlove.com/free/sarah.html Buckley, S. (2000). Leaving Well Alone-A Natural Approach to the Third Stage. IN Lotus Birth, Shivam Rachana, (Ed.) Melbourne: Greenwood Press. Also published in Midwifery Today, 2001, 59: 33-38, www.cordclamping.com/Buckley.htm Chard, T. (1989). Fetal and maternal oxytocin in human parturition. American Journal of Perinatal Medicine, 6: 145-152. Christensson, K., Sues, C., Moreno, L. (1992). Temperature, metabolic adaptation and crying in healthy newborns cared for skin-to-skin, or in cot. Acta Paediatrica Scandinavica 8:488-503. Christiansson, K., Sues, C., Cabera, T., Belaustequi, A., de la Fuente, P., Lagercrantz, H. (1993). Lower body temperatures in infants delivered by caesarean section than in vaginally delivered infants. Acta Paediatrica, 82(2):128-131. Christensson, K., Cabera, T., Christensson, E., Uvnas-Moberg, U., Winberg, J. (1995). Separation distress call in the human neonate. Acta Paediatrica, 84(5):468-73. Colson, S. (2002). Womb to World: a metabolic perspective. Midwifery Today 61:12-17. Costa, A., deFilippis, V., Voglino, M., Giraudi, G., Massobrio, M., Benedetto, C., Marzio, L., Gallo, M., Molina, G., Fabris, C. (1988). Adrenocorticotrophic hormone and catecholamines in maternal, umbilical and neonatal plasma in relation to vaginal delivery. Journal of Endocrinological Investigation, 11: 703-709. Dawood, M.Y., Raghavan, K.S., Pociask, C., Fuchs, F. (1978). Oxytocin in human pregnancy and parturition. Obstetrics and Gynecology 51: 138-143. Dawood, M. (1993). Neurohypophyseal hormones. In Endocrinology of Pregnancy 3rd ed., Fuchs, F. and Koppler, A. (Eds.), pp. 204-228. Philadelphia: Harper and Row. De Chateau, P., Wiberg, B. (1977). Long term effect of mother-infant behavior of extra contact during the first hour post partum II, A follow up at three months. Acta Paediatrica Scandinavica, 66:145-151. DiMatteo, M.R., Morton, S., Lepper, H.S., Damush, T.M., Carney, M.F., Pearson, M., Kahn, K.L. (1996). Cesarean childbirth and psychosocial outcomes: a meta-analysis. Health Psychology, 15(4): 303-314. Douglas, A.J., Bicknell, R. J., Russell, J.A. (1995). Pathways to parturition. Advances in Experimental Medicine and Biology, 395:381-394. Eliot, R.J., Lam, R., Leake, R.D., Hobel, C.J., Fisher, D.A. (1980). Plasma catecholamine concentrations in infants at birth and during the first 48 hours of life. Journal of Pediatrics, 96(2): 311-315. Enkin, M., Keirse, M.J.N.K., Neilson, J., Crowther, C., Duley, L., Hodnett, E., Hoffmeyr, G.J. (2000) A Guide to Effective Care in Pregnancy and Childbirth. Third edition. Chapter 42, pp 404-^08. Oxford: Oxford University Press. Facchinetti, F., Lanzani, A., Genazzani, A.R. (1989). Fetal intermediate lobe is stimulated by parturition. American Journal of Obstetrics and Gynecology, 161(5): 1267-1270. Facchinetti, F., Garuti, G., Petraglia, F., Mercantini, F., Genazzani, A.R. (1990). Changes in beta-endorphin in fetal membranes and placenta in normal and pathological pregnancies. Acta Obstetrica Gynecologica Scandinavica, 69(7-8): 603-607. Falconer, A.D., Powles, A.B. (1982). Plasma noradrenaline levels during labor. Influence of elective lumbar epidural blockade. Anaesthesia, 37: 416-420 Faxelius, G.,

Hagnevik, K., Lagercrantz, H., Lundell, B., Irestedt, I. (1983). Catecholamine surge and lung function after delivery. Archives of Disease in Childhood, 58(4): 262-266. Feifal, P., Raza, T. (1999). Oxytocin modulates psychomimetic-induced deficits in sensorimotor gating. Psychopharmacology, 141(1): 93-98. Fernando, R., Bonello, E. (1995). Placental and maternal plasma concentrations of fentanyl and bupivicaine after ambulatory combined spinal epidural (CSE) analgesia during labor. International Journal of Obstetric Anesthesia, 4:178-179. Fisher, J., Astbury, J., Smith, A. (1997). Adverse psychological impact of operative obstetric interventions: A prospective longitudinal study. Australia New Zealand Journal of Psychiatry, 31:728-738. Franceschini, R., Venturini, P.L., Cataldi, A., Barreca, T., Bagni, N., Rolandi, E. (1989). Plasma beta-endorphin concentrations during suckling in lactating women. British Journal of Obstetrics and Gynaecology, 96(6): 711-713. Freidman, E.A., Sachtleben, M.R. (1978). Effect of oxytocin and oral prostaglandin E2 on uterine contractility and fetal heart rate patterns. American Journal of Obstetrics and Gynecology, 130(4): 403-407. Fuchs, A., Fuchs, F. (1984). Endocrinology of human parturition: a review. British Journal of Obstetrics and Gynaecology, 91:948-967. Genazzani, A.R., Petraglia, F., Facchinetti, F., Galli, P.A., Volpe, A. (1985). Lack of betaendorphin plasma level rise in oxytocin-induced labor. Gynecologic and Obstetric Investigation, 19(3): 130-134. Gilbert, L., Porter, W., Brown, V. (1987). Postpartum haemorrhage: a continuing problem. British Journal of Obstetrics and Gynaecologyl, 94: 67-71. Giovenardi, M., Padoin, M.J., Cadore, L.P., Lucion, A.B. (1998). Hypothalamic paraventricular nucleus modulates maternal aggression in rats: effects of ibotenic acid lesion and oxytocin antisense. Physiology and Behavior, 63: 351-359. Goland, R., Wardlaw, S., Blum, M., Tropper, P.J., Stark, R.I. (1988). Biologically active corticotrophin releasing hormone in maternal and fetal plasma during pregnancy. American Journal of Obstetrics and Gynecology, 159: 884-890. Goodfellow, C.F., Hull, M.G.R., Swaab, D.F., Dogterom, J., Buijs, R.M. (1983). Oxytocin deficiency at delivery with epidural analgesia. British Journal of Obstetrics and Gynaecology, 90:214-219. Grattan, D.R. (2001). The actions of prolactin in the brain during pregnancy and lactation. Progress in Brain Research, 135:153-171. Gutkowska, J., Jankowski, M., Mukaddam-Daher, S., McCann, S.M. (2000). Oxytocin is a cardiovascular hormone. Brazilian Journal of Medical and Biological Research, 33(6): 625-633. Hagnevik, K., Faxelius, G., Irestedt, L, Lagercrantz, H., Lundell, B., Persson, B. (1984). Catecholamine surge and metabolic adaptation in the newborn after vaginal delivery and caesarean section. Acta Paediatrica Scandinavica, 73(5): 602-609. Hale, T. (1997). Medications and Mother's Milk. 6th ed. Texas: Pharmasoft Medical Publishing. Hale, T. (1998). The effects on breastfeeding women of anaesthetic medications used during labor. Paper presented at Passage to Motherhood Conference, Brisbane. Hawkins, J.L., Beaty, B.R., Gibbs, C.P. (1999). Update on obstetric anesthesia practices in the US (abstract) Anesthesiology, 91 A1060. Heasman, L., Spencer, J.A., Symonds, M.E. (1997). Plasma prolactin concentrations after caesarean section or vaginal delivery. Archives of Disease in Childhood. Fetal and Neonatal Ed., 77(3):F237-8. Hemminki, E, Merilainen J. (1996). Long-term effects of caesarean sections: ectopic pregnancies and placental problems. American Journal of Obstetrics and Gynecology, 174(5) 1569-1574. Insel, T.R. (1999). Oxytocin, vasopressin and autism- is there a connection? Biological Psychiatry, 45(2): 145-147. Irestedt, L., Lagercrantz, H., Belfrage, P. (1984). Causes and consequences of maternal and fetal sympathoadrenal activation during parturition. Acta Obstetrica et Gynecologica Scandinavica, Supplement 1,18:111-115. Jackson, M., Dudley, D. (1998). Endocrine Assays to predict preterm delivery. Clinics in Perinatology, 4:837-857. Jacobsen, B., Nyberg, K., Gronbladh, L., Eklund, G., Bygdeman, M., Rydberg, U. (1990). Opiate addiction in adult offspring through possible imprinting after obstetric treatment. British Medical Journal, 301:1067-1070. Jevremovic, M., Terzic, M., Kartaljevic, G., Filipovic, B., Filipovic, S., Rostic B. (1991). The opioid peptide, beta-endorphin, in spontaneous vaginal delivery and cesarean section. [Article in Serbo-Croatian (Cyrillic), abstract in English] Srp Arh Celok Lek, 119(9-10):271-274. Jones, C.M., Greiss, F.C. (1982). The effect of labor on maternal and fetal circulating catecholamines. American Journal of Obstetrics and Gynecology, 144(2): 149-153. Jones, C.R., McCullouch, J., Butters, L., Hamilton, C.A., Rubin, P.C., Reid, J.L. (1985). Plasma catecholamines and modes of delivery: the relation between catecholamine levels and in-vitro

platelet aggregation and adrenoreceptor radioligand binding characteristics. British Journal of Obstetrics and Gynaecology, 92(6):593-599. Jowitt, M. (1993), Beta-endorphin and Stress in Pregnancy and Labor. Midwifery Matters, 56:3-4. Kellogg, C.K., Primus, R.J., Bitran, D. (1991). Sexually Dimorphic Influence of Prenatal Exposure to Diazepam on Behavioral Responses to Environmental Challenge and on Gamma Aminobutyric Acid (GABA)-Stimulated Chloride Uptake in the Brain. Journal of Pharmacology and Experimental Theraputics, 256(1): 259-265. Kimball, C.D. (1979). Do endorphin residues of beta lipotrophin in hormone reinforce reproductive functions? American Journal of Obstetrics and Gynecology, 134(2): 127-132. Kinsley, C.H., Bridges, R.S. (1986). Opiate involvement in postpartum aggression in rats. Pharmacology, Biochemistry and Behavior, 25(5):1007-1011. Klaus, M. (1998). Mother and infant: early emotional ties. Pediatrics, 102(5) Supplement 1244-1246. Kloosterman, G.J. (1982). The universal aspects of childbirth: Human birth as a sociopsychosomatic paradigm. Journal of Psychosomatic Obstetrics and Gynecology, 1(1): 35-41. Knox, S., Uvnas-Moberg, K. (1998). Social isolation and cardiovascular disease: an atherosclerotic pathway. Psychoneuroendocrinology, 23(8): 877-890. Krehbiel, D., Poindron, P., Levy F., Prud'homme M.J. (1987). Peridural anesthesia disturbs maternal behavior in primiparous and multiparous parturient ewes. Physiology and Behavior, 40:463-472. Laatikainen, T. (1991). Corticotrophin releasing hormone and opioid peptides in reproduction and stress. Annals of Medicine, 23(5):489-496. Lagercrantz, H., (1986). The stress of being born. Scientific American, 254(4): 100-107 Leake, R.D., Weitzman, R.E., Fisher, D.A. (1981). Oxytocin concentrations during the neonatal period. Biology of the Neonate, 39(3-4): 127-131. Lederman, R., Lederman, E., Work, B., McCann, D.S. (1985). Anxiety and epinephrine in multiparous women in labor: relationship to duration of labor and fetal heart rate patterns. American Journal of Obstetrics and Gynecology, 153(8): 70-77. Lieberman, E., O'Donoghue, C. (2002). Unintended side effects of epidural analgesia during labor: a systematic review. American Journal of Obstetrics and Gynecology, 186: S31-68. Lindow, S.W., van der Spuy, Z.M., Hendricks, M.S., Rosselli, A.P., Lombard, C., Leng, G. (1992). The effect of morphine and naloxone administration on plasma oxytocin concentrations in the first stage of labor. Clinical Endocrinology, 37(4): 349-353. Liverzey, G.T., Rayburn, W.F., Smith, C.V. (1992). Prenatal exposure to phenobarbital and quantifiable alterations in the electroencephalogram of adult rat offspring, American Journal of Obstetrics and Gynecology, 167(6): 1611-1615. Lowe, N., Reiss, R. (1996). Parturition and fetal adaptation. Journal of Obstetric, Gynaecologic and Neonatal Nursing, 25(4): 339-349. Lundblad, E.G., Hodgen, G.D. (1980). Induction of maternal-infant bonding in rhesus and cynomolgus monkeys after cesarean delivery. Laboratory Animal Science, 30(5): 913. Lundeberg, T., Uvnas-Moberg, K, Agren, G., Bruzelius, G. (1994). Anti-nocioceptive effects of oxytocin in rats and mice. Neuroscience Letters, 170(1): 153-157. Marchini, G., Lagercrantz, H., Winberg, J., Uvnas-Moberg, K. (1988). Fetal and maternal plasma levels of gastrin, somatostatin and oxytocin after vaginal delivery and elective cesarean section. Early Human Development, 18(1): 73-79. Matthiesen, A.S., Ransjo-Arvidson, A.B., Nissen, E., Uvnas-Moberg, K. (2001). Post-partum maternal oxytocin release by newborns: effects of infant hand massage and sucking. Birth, 28(1): 13-19. Mirmiran, M., Swaab, D.F. (1992). Effects of Perinatal medication on the developing brain. Fetal Behavior, Nijhuis JG (Ed), Oxford: Oxford University Press. Mueller, M.D., Bruhwiler, H., Schupter, G.F., Luscher, K.P. (1997). Higher rate of fetal acidemia after regional anesthesia for elective cesarean delivery. Obstetrics and Gynecology, 90(1): 131-134. Murray, A.D., Dolby, R.M., Nation, R.L., Thomas, D.L. (1981). Effects of epidural anesthesia on newborns and their mothers. Child Development, 52: 71-82. Myerson, B.J. (1985). Influence of early B-endorphin treatment on the behavior and reaction to B-endorphin in the adult male rat. Psychoneuroendocrinology, 10:135-147. NCHS (National Center for Health Statistics) (2002). Birth-final data for 2000. Also, Births-preliminary date for 2001. www.cdc.gov/nchs retrieved March, 2003. Nissen, E., Lilja, G., Widstrom, A.M., Uvnas-Moberg, K. (1995). Elevation of oxytocin levels early post-partum in women. Acta Obstetrica Gynecologica Scandinavica, 74(7): 530-533. Nissen, E., Uvnas-Moberg, K., Svensson, K., Stock, S., Widstrom, A.M., Winberg, J. (1996). Different patterns of oxytocin, prolactin but not cortisol release during breastfeeding in women delivered by Caesarean section or by the vaginal route. Early

Human Development, 45:103-118. Nyberg, K., Buka, S.L., Lipsitt, L.P. (2000). Perinatal Medication as a Potential Risk Factor for Adult Drug Abuse in a North American Cohort. Epidemiology, 11(6): 715-716. Odent, M. (1994). The Fetus Ejection Reflex. In: The Nature of Birth and Breastfeeding. CT: Bergin and Garvey. Odent, M. (1998). Don't manage the third stage of labor! The Practising Midwife, 1(9): 31-33. Odent, M. (1999). The Scientification of Love. London: Free Association Books. Parker, C.R., MacDonald, P.C., Guzick, O.S., Porter, J.C., Rosenfield, C.R., Hauth, J.C. (1989). Prolactin levels in umbilical cord blood of human infants: relation to gestational age, maternal complications, and neonatal lung function. American Journal of Obstetrics and Gynecology, 161(3): 795-802. Pearce, J.C. (1995). Evolution's End: Reclaiming the Potential of Our Intelligence. N.Y.: Harper San Francisco. Petrocelli, T., Lye, S. (1993). Regulation of transcripts encoding the myometrial gap junction protein, connexin-43, by estrogen and progesterone. Endocrinology, 133:284-290. Phillippe, M. (1983). Fetal catecholamines. American Journal of Obstetrics and Gynecology, 146(7):840-855. Primal Health Database www.birthworks.org/primalhealth Promom.org. http://www. promom.org/101. Queensland Health. Perinatal Statistics 2001. www.health.qld.gov.au/hic/1999peri/ home.htm Retrieved Nov., 2001. Ransjo-Arvidson, A.B., Matthiesen, A.S., Lilja, G., Nissen, E., Widstrom, A.M., Uvnas-Moberg, K. (2001). Maternal analgesia during labor disturbs newborn behavior: effects on breastfeeding, temperature, and crying. Birth, 28(1):20-21. Ringler, N.M., Kennell, J.H., Jarvella, R., Navojosky, B.J., Klaus, M.H. (1975). Mother-to-child speech at 2 years-effects of early postnatal contact. Journal of Pediatrics, 86(1): 141-144. Riordan J, Gross AS, Angeron J, Krumwiede B, Melin J. (2000). The effect of labor pain relief medication on neonatal suckling and breastfeeding duration. Journal of Human Lactation 16(1):7-12. Rivier, C., Vale, W., Ling, N., Brown, M., Guillemin, R. (1976). Stimulation of in vivo of the secretion of prolactin and growth hormone by beta-endorphin. Endocrinology, 100: 238-241. Roberts, S.W., Levino, K.J., Lucas, M.J., Kelly, M.A. (1995). Fetal acidemia associated with regional anesthesia for elective cesarean delivery. Obstetrics and Gynecology, 85(1):79-83. Rosenberg, K.R., Trevathan, W.R. (2001). The Evolution of Human Birth. Scientific American, 285(5): 72-77. Russell, J.A., Douglas, A.J., Ingram, C.D. (2001). Brain preparations for maternity: adaptive changes in behavioral and neuroendocrine systems during pregnancy and lactation: an overview. Progress in Brain Research, 133:1-38. Saito, M., Sano, T., Satohisa, E. (1991). Plasma catecholamines and microvibration as labor progresses. Shinshin-Thaku, 31: 381-389 (Abstract in English) (Also presented at the Ninth International Congress of Psychosomatic Obstetrics and Gynecology, Amsterdam 28-31 May 1989, Free communication no 502) Salariya, E.M., Easton, P.M., Cater, I. (1978). Duration of breastfeeding after early initiation and frequent feeding. Lancet, 2(8100): 1141-1143. Sarnyai, Z., Kovacs, G.L. (1994). Role of oxytocin in the neuroadaptation to drugs of abuse. Psychoneuroendocrinology, 19(1): 85-117. Sepkoski, C.B., Lester, G., Ostheimer, G.W., Brazelton, B. (1992). The effects of maternal epidural anesthesia on neonatal behavior during the first month. Developmental Medicine and Child Neurology, 34:1072-1080. Steer, P. (1990). The endocrinology of parturition in the human. Balliere's Clinical Endocrinology and Metabolism, 4(2): 333-349. Stubbs, T.M. (2000). Oxytocin for labor induction. Clinical Obstetrics and Gynecology, 43(3): 489-494. Taylor, S.T., Klein, L.D., Lewis, B.P., Grunewald, T.L., Gurung, R.A., Updegraff, J.A. (2000). Biobehavioral responses to stress in females: Tend and befriend, not fight or flight. Psychology Review, 107(3):411-429. Thomas, T.A., Fletcher, J.E., Hill, R.G. (1997). Influence of medication, pain and progress in labor on plasma beta-endorphin like immunoreactivity. British Journal of Anaesthesia, 54:401-408. Thomas, S.A., Palminter, R.D. (1997). Impaired maternal behavior in mice lacking norepinephrine and epinephrine. Cell, 91(5): 583-592. Thomson, A.M. (1994). A re-evaluation of the effect of pethidine on the length of labor. Journal of Advanced Nursing, 19(3): 448-456. Uvnäs-Moberg, K. (1989). The gastrointestinal tract in growth and reproduction. Scientific American, 261(1): 78-83. Uvnas-Moberg, K. (1997). Oxytocin linked antistress effects-the relaxation and growth response. Acta Physiologica Scandinavica, Suppl 640:38-42. Uvnas-Moberg, K. (1998). Quoted in Oxytocin has big role in maternal behavior, report of Australian Lactation Consultant's Conference, Gold Coast, Australia Australian Doctor 7/8/98, p 38. Uvnas-Moberg, K., Bjokstrand, E., Hillegart, V., Ahlenius, S. (1999). Oxytocin as a possible

mediator of SSRI-induced antidepressant effect. Psychopharmacology, 142(1): 95-101. Verbalis, J.G., McCann, M., McHale, C.M., Stricker, E.M. (1986). Oxytocin secretion in response to cholecystokinin and food: differentiation of nausea from satiety. Science, 232: 1417-1419. Walker, M. (1997). Do labor medications affect breastfeeding? Journal of Human Lactation, 13(2):131-137. Weiss, G. (2000). Endocrinology of parturition. Journal of Clinical Endocrinology and Metabolism, 85(12): 4421-4425. Widstrom, A.M., Wahlburg, W., Matthiesen, A.S. (1990). Short-term effects of early suckling and touch of the nipple on maternal behavior. Early Human Development, 21: 153-163. Young, W.S. 3rd, Shepard, E., Amico, J., Hennighausen, L., Wagner, K.U., Ala Marca, M.E., MacKinnel, C., Ginns, E.I. (1996). Deficiency in mouse oxytocin prevents milk ejection but not fertility or parturition. Journal of Neuroendocrinology, 8: 847-853. Zanardo, V., Nicolussi, S., Carlo, G., Marzi, F., Favaro, F., Palebani, M. (2001). Beta endorphin concentrations in human milk. Journal of Pediatric Gastroenterology and Nutrition, 33(2): 160-164. AuthorAffiliation Sarah J. Buckley, M.B., Ch.B.: Dip. Obst. AuthorAffiliation Sarah J. Buckley, M.B., an Australian General Practitioner, is currently a full-time mother who writes about pregnancy, birth, and parenting. You can reach her at: sarahjbuckley@uqconnect.net

Publication title: Journal of Prenatal&Perinatal Psychology&Health

Volume: 17

Issue: 4

Pages: 261-288

Number of pages: 28

Publication year: 2003

Publication date: Summer 2003

Year: 2003

Publisher: Association for Pre&Perinatal Psychology and Health

Place of publication: Forestville

Country of publication: United States

Journal subject: Medical Sciences--Obstetrics And Gynecology, Psychology, Birth Control

ISSN: 10978003

Source type: Scholarly Journals

Language of publication: English

Document type: General Information

ProQuest document ID: 198724973

Document URL: http://search.proquest.com/docview/198724973?accountid=36557

Last updated: 2010-06-06

Database: ProQuest Public Health