

The Long Term Consequences of How We Are Born

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Full Text: Headnote ABSTRACT: This article is an updated review of the literature on the long term consequences of birth. Current literature reviewed includes the topics of autism, juvenile criminality, drug addiction, anorexia nervosa, asthma, exposure of antibiotics during pregnancy, the behavioural effects of hormones, and caesarean sections and is offered from a primal health perspective. The article closes with recommendations the profound changes that need to be made if this vision of childbirth is to be brought to a broader audience. KEY WORDS: Birth, perinatal, asthma, autism, anorexia nervosa, drug addiction, criminality, suicide, oxytocin, ethnology. INTRODUCTION Seven years and twenty-eight newsletters have passed since I first wrote an essay with this title. I now find it necessary to re-examine available data regarding the long-term consequences of how we are born. The recent publication of a great number of relevant studies is not the only reason to re-introduce this topic. The main reason is that in changing scientific, technical, and cultural contexts, it is becoming easier to understand the many implications of an emerging field of research. Since the last decades of the twentieth century, midwifery and obstetrics practice have been objectively evaluated according to well-established criteria. The method of evaluation of the newborn infant proposed by Virginia Apgar (Apgar, 1953) became widely used in the 1970s. At the same time, precise definitions of perinatal mortality and perinatal morbidity rates appeared in the mainstream medical literature. Then the concepts of maternal morbidity and mortality were clarified and routinely included among what we might call the twentieth century evaluation criteria. Cost effectiveness occasionally has been taken into account. Today, the development of primal health research encourages us to transcend these conventional criteria. The need for new criteria is even better understood if we also refer to two other contemporary phenomena that are developing side by side. These are the 'scientification of love' and the increased safety of caesareans. THE NEED TO THINK LONG-TERM For those who are not yet familiar with Primal Health Research, it is a developing branch of epidemiology that explores correlations between what happened during the " primal period" and what may happen later in life in terms of health, behaviour, and personality traits. (The primal period comprises fetal life, the period surrounding birth, and the year following birth [Odent, 1986]). It is difficult to find such studies because they do not fit into current classifications. This is the main reason for the primal health research database (www.birthworks.org/primalhealth), which compiles articles published in authoritative medical or scientific journals. How to Use the Database An overview of this database reveals that, in all fields of medicine and health sciences, there have been studies detecting correlations between health in adulthood, adolescence or childhood, and events during gestation. It is even possible to conclude, through this subgroup of studies, that our health is to a great extent shaped in the womb. (www.wombecology.com) Many studies have detected risk factors in the perinatal period for a great number of pathological conditions. To link relevant data, the database can be explored prospectively (for example via keywords such as 'birth complications', 'birth optimality', 'caesarean', 'labour induction', 'breech presentation', 'cephalhaematoma', 'forceps', 'ventouse', 'hypoxia', 'neonatal pulmonary hypertension', etc.), or retrospectively (for example via key words such as 'asthma', 'juvenile criminality', 'suicide', 'drug addiction', 'anorexia nervosa', 'autism', etc.). Impaired Capacity to Love Others and to Love Oneself It is noticeable when researchers explore behaviour, a personality trait, or a disease that can be interpreted as an 'impaired capacity to love', they always detect risks factors in the perinatal period. The term 'impaired capacity to love' is convenient because it can encompass self-destructive behaviours which are essentially an 'impaired capacity to love oneself'. Autism may be considered a pathological deviation from

the usual gregarious human tendency. Various research studies in the database suggest that the timing of gene-environment interactions, for example, is different for autism than for schizophrenia. Several authoritative studies emphasize the paramount importance of the perinatal period in the genesis of the various autistic spectrum disorders. The case of autism is also a good example of how the long-term consequences of perinatal events can be dissociated from the long-term consequences of prenatal events. Niko Tinbergen - one of the founders of ethology, who shared the Nobel Prize with Konrad Lorenz and Karl Von Frisch in 1973 preceded modern epidemiologists in his study of autism from a primal health research perspective. As an ethologist familiar with observing animal behaviour, he researched the non-verbal behaviour of autistic children. As a "field ethologist" he studied the children in their home environment. Not only did he offer detailed descriptions of his observations, but he concluded that there were risk factors in the perinatal period, such as labour induction and "deep forceps" delivery (Tinbergen, 1983). We must also save from oblivion a report by Ryoko Hattori, a psychiatrist from Kumamoto, Japan (Hattori, 1991). She evaluated the risks of becoming autistic according to the place of birth. Children born in a certain hospital were significantly more at risk. In that particular hospital, the routine was to induce labour a week before the expected date of birth, and to administer a complex mixture of sedatives, anaesthetic agents and analgesics during labour. Among the three recent large and authoritative studies of autism from a primal health research perspective, the Australian one will convince anyone that risk factors in the perinatal period should be seriously considered (Glasson, 2004). The 465 subjects born in Western Australia between 1980 and 1995 diagnosed with an autism spectrum disorder by 1999 were compared with the birth records of 481 siblings of the cases, and with the records of 1313 controls. There were no difference in gestational age at birth (including the proportion of premature infants), weight for gestational age, head circumference, or body length between cases and control subjects. Pre-eclampsia did not appear as a risk factor. These negative findings lend more credence to perinatal factors. Compared with their siblings, autism cases were more likely to have been induced, to have experienced fetal distress, and to have been born with a low Apgar score. Compared with control subjects, they were more likely to have been born after induction and to have been born by elective or an emergency caesarean. Similar conclusions can be drawn from a study involving all Swedish children born from 1974 to 1993. No association was found between autism and head circumference, maternal diabetes, being a twin, or season of birth; however caesarean birth appeared to be a risk factor (Hultman, 2002). This study could not consider labour induction as a possible risk factor, since this term did not appear in the Swedish birth registers until 1991. A recent report from Israel also found no prenatal differences between autistic children and controls, but the rates of birth complications were higher among the autistic population (Stein, 2006). In addition, we must consider data suggesting that anesthesia during labour is a risk factor for the development of dyskinesia among autistic children (Armenteros, 1995). It is interesting to use the database to contrast autism and schizophrenia in terms of early risk factors. Many research studies suggest the importance of the ante partum environment in the genesis of schizophrenia (given the data about head circumference at birth, birth weight, frequency of association with minor physical anomalies, prenatal exposure to famine, bleeding in pregnancy, maternal diseases in pregnancy such as influenza, toxoplasmosis and pre-eclampsia, pharmaceutical drugs in pregnancy, stressful prenatal events, etc). When researchers detect intrapartum complications as risk factors for schizophrenia, the inclusion of multiple variables usually suggests that these complications may be partly secondary to earlier events. The timing is apparently different concerning the genesis of autism: the focus is more often than not on the perinatal period. Juvenile criminality can also be viewed as a deviation from the usual human gregarious tendency. Raine and colleagues found that the main risk factor for being a violent criminal at age 18 was the association of birth complications, together with early separation from or rejection by the mother. Early separation-rejection by itself was not a risk factor (Raine, 1994). All sorts of self-destructive behavior - such as suicide, drug abuse and anorexia nervosa - can be interpreted as an "impaired capacity to love oneself". Teenage suicide, almost unknown fifty years ago, is a pressing challenge specific to our time. Salk et al. found risk factors in the perinatal period for adolescent

suicide victims who died before their 20th birthday (Salk, 1985). One very significant factor was resuscitation at birth. Jacobson also focused on how people commit suicide. He found that suicides involving asphyxiation were closely associated with asphyxiation at birth; suicides by violent mechanical means were associated with mechanical birth trauma. In his last study, Jacobson confirmed that men (but not women) who had traumatic births are five times more at risk of committing suicide by violent means (Jacobson, 1998). Jacobson also compared the background of 242 adults who committed suicide by using a firearm, or by jumping from a height, or by jumping in front of a train, or by hanging, or by laceration, etc. with 403 siblings born during the same period and at the same group of hospitals. Many possible confounding factors were considered. The differences between men and women disappeared if their mothers had used analgesic drugs of the opiate family when in labor. Jacobson and Nyberg found that if a mother had been given analgesic or sedative medication during labor (opiates, barbiturates or nitrous oxide), her child was statistically at increased risk of becoming drug-addicted in adolescence (Jacobson, 1990). According to Nyberg, Buka, and Lipsitt (Nyberg et al., 2000) adolescents who have been exposed to 3 doses (or more) of opiates or barbiturates during the perinatal period had a risk of becoming drug addicted multiplied by 4.7 (95% CI = 1.00-44.1). The largest study of anorexia nervosa included in our data bank detected correlations with the birth itself (Cnattingius, 1999). A team of researchers had access to the birth records of all girls born in Sweden from 1973 to 1984. They also had access to the files of the 781 girls who had stayed in a Swedish hospital due to having anorexia nervosa between age 10 and age 21. For each anorexic girl there were five controls (non-anorexic girls born in the same hospital during the same year). Apart from being born before 32 weeks gestation, the most significant risk factor for anorexia nervosa was a cephalhematoma at birth. Forceps and ventouse deliveries were also risk factors. An Italian retrospective study of subjects with eating disorders found that the risk of developing anorexia nervosa increased with the total number of obstetric complications. In addition, an increasing number of complications significantly predicted the age at onset of anorexia nervosa (Favaro, 2006). Impaired Breathing Function and Allergies Since to be born is associated with the sudden need to breathe, the results of a study of adaptability to oxygen deprivation could be anticipated. An ingenious Swiss study clearly demonstrated that the mean increase in pulmonary artery pressure at high altitude is significantly greater in participants who had experienced pulmonary hypertension during the week following their birth (Sartori, 1999). These findings suggest that a transient insult to the pulmonary circulation leaves a persistent imprint which, when activated in adult life, predisposes to a pathological response. The keyword asthma also leads to several studies that reveal correlations with perinatal events. Finnish researchers looked at the risks of having asthma and allergic diseases among adults aged 31 (in a population born in 1966). It appeared that risk of having asthma among those born by a caesarean was multiplied by 3.23 compared with those born vaginally, (Xu, 2001). On the other hand, the risk of having an allergic disease such as hay fever or eczema, or having an allergic reaction detected by skin tests, was not increased. The same team looked at the risks of having asthma at age seven (Xu, 2000). They found that birth complications in general, and caesarean sections in particular, were risk factors. A Finnish team linked data from their 1987 National Birth Register with data from several health registers to obtain information on asthma. This study, involving nearly 60,000 children, confirmed the increased risk of developing asthma in childhood among the caesarean-born (Kero, 2002). A Danish study also found that a caesarean birth is a risk factor for asthma, but not for allergic rhinitis (Eager, 2003), while a British study confirmed that there are no increased risks for allergies following a caesarean section. (McKeever, 2002). As we examine such convergent findings, we must consider the well-documented frequency of neonatal respiratory problems after a scheduled 'non-labour' caesarean compared with either vaginal birth or a caesarean during labour. Unfortunately none of these studies in our data bank compared 'labour caesareans' and 'non-labour caesareans'. Today we are in a position to understand that the fetus is programmed to participate in the initiation of labour. For example, the release into the amniotic fluid of substances such as 'platelet activating factor' may be a signal indicating that its lungs are mature. Furthermore, it seems that hormones released by

mother and baby during the birth process can complete lung maturation (Faxelius, 1983). It is therefore easy to predict that babies born by a non-labour caesarean are more at risk of respiratory difficulties, not only immediately after birth but also later on in life (Hook, 1997). Notably, caesarean section appears as a risk factor for asthma as a respiratory, but not as an allergic disease. While a caesarean section is not a significant risk factor for 'atopic' allergic diseases (such as hay fever, allergic rhinitis and eczema), it might increase the risk of food allergies. According to a Norwegian study, caesarean-born children of allergic mothers are at high risk of being allergic to eggs, fish, and nuts (Eggesbo, 2003). In the Age of Antibiotics Exposure to antibiotics is becoming a frequent intrapartum event. One of the most common reasons is to prevent the vertical transmission of group B Streptococcus infections. Exploring antibiotics in our database, intrapartum exposure appears a risk factor for late-onset severe bacterial infection. Furthermore, pathogens that cause such infections are more likely to be resistant to ampicillin after exposure to intrapartum antibiotics (Glasgow, 2005). We must also place great emphasis on a study using a birth cohort of 24,690 children, derived from the West Midlands General Practice Research Database. One can conclude from this study that pre- and perinatal exposure to antibiotics is associated with a dose-related, increased risk of asthma, and similar associations are present for eczema and hay fever (McKeever, 2003).

Practical Implications This new generation of epidemiological research inspires several comments. It is noticeable that the studies mentioned - those detecting correlations with intrapartum events - are related to highly topical issues. The incidence of asthma, autism, anorexia nervosa, drug addiction, suicide of adolescents and juvenile criminality has increased during the past decades, for reasons that are claimed as yet unclear. It is also noticeable that despite the publication of extensive research in authoritative medical and scientific journals, the findings are shunned by the medical community and the media. They are rarely quoted (Odent, 2003) and lie dormant within the framework of "cul-de-sac epidemiology" (Odent, 2000). However, the medical community must pay attention to this developing branch of epidemiology that leads us to think long-term and, by the same token, to expand the list of criteria commonly used to evaluate obstetrical and midwifery practices.

THE SCIENTIFICATION OF LOVE Until recently, love was the realm of poets, novelists and philosophers. Today, it is studied from a variety of scientific perspectives. It is easy to miss the importance of this phenomenon due to myriad specialised approaches to exploring the nature of love. Genuine scientific advances always lead to new questions being raised or to the reformulation of old questions. These scientific advances may provide answers to questions that have never been properly formulated. This is the case with the scientification of love, which requires us to ask simple and paradoxically, new questions, such as 'How does the capacity to love develop?' Although today scientific data emphasizes the importance of early experiences, particularly during the perinatal period (Odent, 1999), for millennia the widespread promotion of love overlooked this fundamental question.

Ethologists as Pioneers Ethologists were the first scientists to explore love. The legendary observation by Konrad Lorenz in the 1930s, symbolizes the advent of this new scientific era. This founder of modern ethology reported that one day he interposed himself between newly-hatched ducklings and their mother, and then imitated the mother duck's quacking. These ducklings became attached to Lorenz for the rest of their lives, following him when he walked in the garden, for example. Thus, the concept of a sensitive period in the process of forming attachment came to be introduced. Since that time there have been countless studies involving a great diversity of mammals, including primates. All ethologists seem to agree that attachment between mother and baby constitutes the prototypical form of love. It is interesting that pioneering ethologists such as Lorenz (who studied ducks and geese) and Harlow (who studied primates) did not hesitate to introduce the word 'love' into the scientific vocabulary. From studies among mammals as diverse as rats, hamsters, sheep, goats, and monkeys one can conclude, in spite of differences between species, that there is always, immediately after birth, a short 'sensitive' period which will never be repeated, and which is critical in mother-baby attachment and subsequent development.

Behavioural Effects of Hormones The concept of a sensitive period had to wait until the behavioural effects of hormones involved in parturition had been studied. In 1968, Terkel and Rosenblatt injected virgin rats with blood taken from mother rats within 48 hours of parturition

(Terkel, 1968). The virgin rats then displayed maternal behaviour. This historical experiment was followed in the 1970s by a great number of other experimental studies exploring the behavioral effects of fluctuating (estrogens, prolactin, progesterone) hormones in the perinatal period. A new era of research started in 1979 when Prange and Pedersen published the results of their landmark experiment. Instead of intravenous oxytocin, they injected this hormone directly into the cerebral ventricles of virgin rats (Pedersen, 1979). About half the rats developed the full spectrum of nurturing behaviour typically exhibited by rat mothers, in less than one hour. Interestingly, the rats that responded to oxytocin with maternal behaviour were in stages of the oestrus cycle associated with rising, elevated, or recently-elevated oestrogens. The authors had demonstrated that oxytocin has behavioural effects, and also that these effects are further influenced by other hormones. Until 1979 we understood only the mechanical effects of oxytocin, such as its role in causing contractions during parturition, and also causing myoepithelial cells of the breast to contract for the milk ejection reflex. We have also known for a long time that oxytocin released during an orgasm can induce uterine contractions to facilitate the movement of sperm toward the egg (Egli, 1961). Furthermore, its mechanical effects on the prostate and the seminal vesicles have been well-documented (Sharaf, 1992). It was also in 1979 that a Japanese team revealed that oestrogens affect both the release of and the response to oxytocin (Yamaguchi, 1979), while Melvyn Soloff and his team at the University of Texas showed that the response of an organ to oxytocin depends much more on the density of the targeted receptors than on the blood concentrations of the hormone (Soloff, 1979). After 1979 an explosion of studies into oxytocin's effects in "Maternal, Sexual and Social Behaviors" led to the simple conclusion that oxytocin is the primary "hormone of love" (Pedersen, 1992). In the 1980s accumulated data confirmed that oxytocin receptors in mammals' brains resemble those found in the uterine and mammary glands. (Brinton, 1984; De Kloet, 1985; Freund-Mercier, 1987; Insel, 1986; Van Leeuwen, 1985). Among rats during birth there is an increased number of such receptors in the "bed nucleus of the stria terminalis". Because experimental destruction of this zone inhibits maternal behaviour - without disturbing the birth - it appears that the oxytocin receptors in that zone play an important role in maternal behaviour (Pedersen, 1992). Since the early 1980s, research into oxytocin has gradually increased and clarified its release and effects in a great variety of situations. Researchers from the Karolinska Institute in Sweden have increased our understanding of the physiological processes during the perinatal period. Thanks to them we can claim that the highest peak of oxytocin a woman reaches in her entire life occurs just after birth, and that oxytocin returns to its pre-labour levels about an hour later (Nissen, 1995). This team also studied the patterns of oxytocin release as lactation commenced. Two days after birth, when the baby is at the breast, women who gave birth vaginally release oxytocin rhythmically, in a pulsatile manner and thus more effectively, while women who had a caesarean during labour release their oxytocin in a less pulsatile, and less effective way (Nissen, 1996). Oxytocin release has been studied in so many diverse situations that here we can mention only some. It has also been studied during sexual arousal and orgasm (Carmichael, 1987; McNeilly, 1972). The system of oxytocin (and vasopressin) has been studied comparatively among polygamie and monogamie mammals (Sapiro, 1992). For example sharing a meal with companions has been found to increase one's blood level of oxytocin (Verbalis, 1986). According to the results of highly original studies originally presented by Paul Zak to the Society for Neuroscience, oxytocin levels rise when people perceive a message of trust (Zak, 2003). These experiments were based on the physiological response to different situations of money transfer. The stronger the signal of trust is, the greater the increase in oxytocin (and the more trustworthy a person). We are probably still in a preliminary phase of our knowledge of the posterior pituitary gland's hormones. However, our current understanding of oxytocin as the hormone of love, and the observations of those who have studied the effects of other sexual hormones, in particular estrogens and progesterone, seem to agree. Today, it is well-understood that estrogens activate oxytocin and prolactin receptors. This is an example of hormonal balance: immediately after birth, oxytocin - an altruistic hormone - and prolactin - a mothering hormone - complement each other. In the near future, we must address the complexity of the oxytocin system since it has become clear that oxytocin

can take several forms in the brain. There is the nonapeptide oxytocin (OT) and the 'C-terminal extended peptides', which are described together as OT-X. The OT-X represent intermediate stages of oxytocin that accumulate in the case of an incomplete synthesis. It has already been found that there was a decrease in blood OT, an increase in OT-X and an increase in the ratio of OT-X/OT among autistic prepubertal children (Green, 2001). It was also in 1979 that the maternal release of beta-endorphins during labour and delivery was demonstrated. In the early 1980s, we learnt that the fetus releases its own endorphins during birth and today there is no doubt that, for a certain time following birth, both mother and neonate are saturated with opiates. The ability of opiates to induce states of dependency is well-known, so it is easy to expect maternal-infant attachment as a development of "dependency". Although the behavioural effects of the mothering hormone prolactin (levels of which tend to increase during birth) have been understood for a long time, Swedish studies using the 'Karolinska Scales of Personality* test are important. They remind us that, under the effects of prolactin, human beings are more prone to abide by the laws of nature (Uvnas-Moberg, 1989). Catecholamines also play a role in the interaction between mother and neonate. During the final contractions before birth, maternal levels peak: as the "fetus ejection reflex" commences, women tend to be upright, full of energy, with a sudden need to grasp something or someone. They often need to drink water, just as a speaker may in front of an audience. This release of catecholamines ensures that the mother is alert when her baby is born. It is also well-known that the fetus has its own survival mechanisms during the, final strong expulsive contractions, and releases its own catecholamines. The visible effect of this release of noradrenaline is seen in the alert newborn, with eyes wide-open and pupils dilated. Human mothers are fascinated and delighted by this gaze. It is as if the baby is giving a signal, and it certainly seems that the intense eye-to-eye contact at this time is an important feature of the beginning of their relationship. The highly-complex role of catecholamines in the interaction between mother and baby has not been studied for long. A small number of animal experiments indicate that further research is needed. Mice that lack a gene responsible for the production of noradrenaline leave their pups scattered, unclean and unfed - unless they are injected with a noradrenaline-producing drug when giving birth (Thomas 1997). Our current knowledge about the behavioural effects of different hormones involved in the birth process helps us to understand the ethologists' concept of a sensitive period. Not all the different hormones released by the mother and fetus during birth are eliminated immediately. It is also clear that all have a specific role to play in the interactions between mother and baby such as the effect of endogenous opiates on the beginning of a mutual attachment. The significance of genuine scientific advances is usually ignored by those who live at that time. This is the case with our new knowledge about the behavioural effects of hormones involved in parturition, lactation, and sexual intercourse. Few people have realized how crucial it is to know that oxytocin, the hormone necessary for effective uterine contractions during parturition, is also the main hormone of love. The media's interest in the behavioural effects of oxytocin was stirred in 2005, after publication in Nature of the study of the biological basis of trust (Kosfeld, 2005). Today we can simply summarize, that in order to give birth, mammals have been programmed to release a complex cocktail of love hormones.

Ethnology as a Science We can also include ethnology among the disciplines exploring the scientification of love, since its data on pregnancy, childbirth and the first days following birth is easily accessible. In different ways, all cultures disturb physiological processes in the perinatal period. One can also conclude that the greater the societal expression of aggression and destruction, the greater the need to diminish the capacity to love by intrusive perinatal rituals and beliefs. This can be illustrated by some extreme attitudes, such as the population of Spartan warriors in ancient Greece. When a baby boy was born, he was thrown on the floor. If he survived, he was supposed to become a good warrior. Unfortunately, only a very small number of pre-agricultural peoples were studied before they became extinct. Their strategy was to live in perfect harmony with the ecosystem; in such societies it was therefore an advantage to develop the form of love that fosters a respect for Mother-Earth. It was a priority in these societies to avoid aggression. The Efe Pygmies, for example, living in Zaire's Ituri Forest, had a deeply-rooted ecological instinct, and in particular, an enormous regard for trees. Rituals or beliefs

which disturbed the birth process were apparently absent (Hallet, 1973). We also know about the "solitary and unaided births" among the African hunters and gatherers! Kung San (Eaton, 1988). Since many studies in the Primal Health Research Database are related to antisocial behaviours (e.g. impaired capacity to love others) and to self-destructive behaviours (e.g. impaired capacity for self-love), it is clear that primal health research also contributes to the scientific study of love. Practical Implications The scientification of love is another contemporary phenomenon that demands that we think long-term. Furthermore, we must examine both culture and civilisation (Odent, 2002) because human beings, like most other primates, need to live in groups. Since we have the capacity for sophisticated communication, particularly language, we create milieus and civilizations. Therefore, the effects of widespread interference in physiological processes, especially during the perinatal period, must be examined in terms of civilization. In our species, it is difficult to detect the effects of new lifestyles at an individual level. In this regard, humans are special compared with other mammals. When a woman knows that she is pregnant, she can choose to display some maternal behaviour, while pregnant non-human mammals must wait until the day when they will release the flow of hormones associated with parturition. Sufficient animal experiments and observations by veterinarians and primate research will convince anyone that the maternal behaviour of non-human mammals is dramatically altered by any interference with the process of parturition. Anaesthesia will disturb maternal behavior. Almost a century ago, in South Africa, Eugene Marais confirmed his intuition as a poet that a connection exists between the pain of birth and maternal love (Marais, 1937). He studied a group of sixty Kaffir Bucks, knowing that no buck mother in the herd had rejected her young in the previous fifteen years. He gave the birthing females a few whiffs of chloroform and ether, and noticed that the mothers refused to accept their newborn lambs afterwards. In the 1980s, Krehbiel and Poindron studied the effects of epidural anaesthesia among ewes giving birth (Krehbiel, 1987). The results of this study are easily summarized: when ewes give birth with epidural anaesthesia, they neglect their lambs. Today, caesarean sections are common in veterinary medicine, particularly among dogs. However, human beings must compensate for frequently inadequate maternal behaviour, and assist the process of nursing providing, if necessary, commercial canine milk. The effects of a caesarean on the maternal behaviour of primates are also well documented, because several species of monkeys are routinely used as laboratory animals. The 'crab-eating macaques' and the rhesus monkeys do not take care of their baby after a caesarean; laboratory personnel must intervene, such as by spreading vaginal secretions on the baby's body, to encourage a mother's interest in her newborn. (Lundbland, 1980). The immediate and spectacular responses of animals to interferences with the process of parturition indicate the questions we should raise where our species is concerned. We just need to include in the questions terms such as 'civilisation' or 'culture'(Odent, 2004). For example, if non-human primates do not take care of their babies after being delivered by c-section, the appropriate question is: "What is the future of a civilisation born by caesarean?" SAFER AND SAFER CAESAREANS Spectacular technical and organisational advances have created a recent milestone where the safety of the caesarean, in developed countries, can be compared with the safety of vaginal birth. While modern anaesthesiology has made a caesarean section safer and thus more acceptable, operative technique itself is still evolving. In the 1990s, Michael Stark and the team at the Misgav Ladach Hospital, in Jerusalem, introduced a method based on the 'Joel-Cohen incision', which was originally used for hysterectomy (Joel-Cohen, 1972). This method restricts the use of sharp instruments, preferring manual manipulation instead. One objective is to remove every unnecessary step. For example, after the delivery of the baby and of the placenta, only the fascia and the skin are sutured since the peritoneum heals rapidly and more completely when not stitched (Tulandi, 2003). An accumulation of data confirms that this Michael Stark technique can reduce blood loss and operating time, therefore increasing the safety of the operation. Furthermore, the risk of adhesions is significantly reduced. This new phase in the history of childbirth requires that we reconsider traditional strategies in obstetrics. Since the caesarean has become a simple, fast, and safe operation in well-organised maternity units, we must first question what should be stringently avoided. When considering common reasons for transfer to an intensive

care unit, and also reviewing the data provided by the "Primal Health Research Data Bank", it seems clear a future priority should be the avoidance of instrumental deliveries after long hours of augmentation with synthetic oxytocin. Similar conclusions can be drawn from the abundant literature on perineal damage resulting from childbirth, such as after a forceps delivery following a long, arduous labour. This is the conclusion of a British study of more than 8,000 vaginal births that examined tears involving the anal sphincter (Sultan et al., 1994). Likewise, an Australian study investigated the effect of childbirth on pelvic organ mobility using translabial ultrasound (Dietz & Bennett, 2003). Today, there is a commonplace concern about rising caesarean rates worldwide. In contrast, we might claim that our first concern should be stable or even increasing rates of instrumental vaginal deliveries in the age of the safe caesarean (Odent, 2004). In the USA, the rates of both forceps deliveries and vacuum extractions have increased recently (Kozak & Weeks 2002; Poma, 1999). In the United Kingdom, the rates of instrumental deliveries have remained fairly constant (between 10% and 15%), although there has been a change in preference of instruments (Thomas & Paranjothy, 2001) www.show.scot.nhs.uk/isd/sexual_health). Even among a Brazilian population of women giving birth in private institutions, the rate of forceps delivery can still be 3%, despite the fact that delivery via the abdominal route is 72% (Potter et al., 2001). There are also good reasons to avoid emergency caesareans, when the surgical team races to rescue a life-threatening situation. Such emergency caesareans should not be confused with intrapartum caesareans. A retrospective study of a population born by caesarean between 1952 and 1954, after an active labour prolonged more than 12 hours, found that the average IQ (intellectual quotient) was low, compared with a control group that included siblings and other family members (Roemer et al., 1991). Furthermore, the risks of intraoperative complications are higher in a situation of critical urgency: cervical dilation of 9 or 10 cm. at the time of operation and general anaesthesia have been identified as independent risk factors (Hager et al., 2004). Pre-labour elective caesareans, I dare to suggest, are among the situations that should be avoided, wherever possible. Although the exact mechanisms involved in the initiation of human parturition have yet to be fully understood, we are in a position to claim that the fetus participates in the initiation of labour depending on the maturation of its lungs and other vital organs. Furthermore, a prelabour caesarean prevents the surge of endogenous steroids and catecholamines that accompanies term gestation and spontaneous vaginal delivery and which is partly responsible for the clearance of fetal lung fluid (Jain, 2006; Vogl, 2006). Disrupting this process can lead to the retention of fluid in air spaces, and possible alveolar hypoventilation. Such theoretical considerations are supported by an accumulation of clinical data confirming that a pre-labour caesarean section is a risk factor for transient tachypnea of the newborn and respiratory distress syndrome. Finally, when considering all the situations we should avoid in the age of the safe caesarean, it appears that we are evolving toward a simplified strategy, which is valid for most obstetrical cases: either the birth process is straightforward and the vaginal route is considered a wise option; or it is not, and an intrapartum nonemergency caesarean is the best solution. If such futuristic strategies were adopted overnight the global caesarean rates worldwide would climb dramatically, probably passing the 50 per cent mark in most developed countries. Certain medical circles would accept and even welcome this new obstetric protocol. As early as 1998, in an editorial of *The British Journal of Obstetrics and Gynaecology*, Philip Steer anticipated that in the future, the unpredictable risks of labour would no longer be justified for most women. (Steer 1998) This point of view is implicitly shared by the many female obstetricians who choose a term caesarean for the birth of their own babies (Ai-Mufti et al., 1997, Gabbe & Holzman, 2001). Such thinking is understandable if one just evaluates obstetrics and midwifery practices by conventional criteria. However, many others will claim that the abdominal route cannot be accepted as the norm. The opposite point of view can be based simply on the intuition that this new stage in the lifestyle of human populations would be a risky, irreversible jump into a "Brave New World". This point of view will also justify the addition of new criteria, based on long-term thinking, when evaluating how babies are born.

TOWARDS A 'PARADIGM SHIFT' Thinking long-term and introducing the cultural dimension both require a profound change in the attitudes and perceptions that form our vision of childbirth. Although the rate of change

in our age is faster than ever before, such a 'paradigm shift' will take time. One practical reason is that the available data concerning long-term consequences of intrapartum events cannot provide criteria as precise and as easily measurable as, for example, perinatal mortality rates, or even perinatal morbidity rates. We cannot ignore human nature. Long term thinking has not been part of our evolutionary programming, For millions of years our tropical ancestors consumed the food they could find from day to day, either by collecting shellfish and small fish in shallow water, by gathering plants and fruits, or by scavenging and hunting. After the comparatively recent advent of agriculture and animal breeding, they had to improve their capacity to anticipate, at least in terms of seasons. Today, we have such powerful technologies at our disposal that we must suddenly learn to think in terms of decades and centuries, in particular regarding childbirth. Before the medicalization of birth, there was no reason to research life-long consequences of how we are born, since everybody was born vaginally, after the spontaneous onset of labour, and mother and baby had to rely on their own abilities to cope. Births were just more or less difficult, and more or less disturbed by the cultural environment. Today, there are many kinds of 'births from below' and many sorts of 'births from above'. Health professionals must also realize that a newborn baby has a life expectancy of about 80 years today. To train ourselves to think long-term, we need new tools. The primal health research database can play such a role At the same time we also need to think in terms of civilisation. For centuries doctors have been working within Hippocratic principles of ethics. Traditional Hippocratic medicine considers only the perspective of individual patients. There is no mention in the Hippocratic Oath of the doctor's societal responsibilities. As for the midwife, she is traditionally in intimate communication - in communion - with the labouring woman, usually sharing her priorities. Finally, doctors and midwives are not in a position to think in terms of civilization: neither are pregnant and postpartum women. They have other understandably vital and immediate priorities. When a woman is pregnant, her main preoccupation is usually the health and well-being of her own baby. After birth, her behaviour tends to be more than ever under the control of her 'selfish genes'. Learning to think in terms of civilisation would encourage comparative studies of the evolution of various cultural milieus in relation to the evolution of obstetrical practices. Of course, in the age of globalization, cultural differences are being reduced. Furthermore, the practice of obstetrics and midwifery tends toward international standardization in the age of evidence-based medicine and computerized databases. In reality, at the dawn of the twenty first century, thinking in terms of civilisation requires us to imagine the future of our "planetary village". However, there remain huge local differences when considering, in particular, the caesarean rates. It is necessary to select specific criteria to track the evolution of the cultural characteristics of countries that are distinctly different in terms of obstetrical practice. It would be possible, for example, to contrast the evolution of the Dutch culture (moderate rates of caesareans and high rates of home births) with the evolution of the Brazilian culture (high caesarean rates) and also the evolution of the Irish culture (widespread use of synthetic oxytocin). One could also compare the evolution of the characteristics of the Japanese culture (moderate rates of obstetric intervention) with the evolution of the Taiwanese and South Korean cultures (high rates of obstetric intervention). These Asian populations, which are genetically almost similar, share comparable standards of living. One major obstacle in the preparation for a genuine 'paradigm shift' is the current lack of understanding of birth physiology. This is a cultural phenomenon, shared by the natural childbirth establishment and medical circles as well (Odent, 2001). Until the re-discovery of the basic needs of labouring women and newborn babies, the caesarean rates will tend to increase... if the primary objective is to avoid difficult vaginal births. We must keep in mind that the basic survival strategy for all societies is to dominate both other human groups and nature. Until now, successful societies have been those that transmit beliefs and rituals, the effects of which effects are to develop the human potential for aggression and to modulate the development of the capacity to love. We are mired in the aftermath of countless beliefs and rituals that have been transmitted from generation to generation for thousands of years (Odent, 1992). Since all cultures tend to control the birth process, there is an advantage in disseminating the idea that a woman cannot give birth without active help or guidance by birth attendants. In most languages, the use of disempowering

words tends to focus on the role of the birth attendant rather than on the needs of labouring women. Women do not give birth: somebody delivers them. (In English the 'coach' is supposed to bring his or her expertise, while the 'support person' is supposed to bring his or her energy). In such a context it will take time to rediscover that privacy and silence are basic needs during the involuntary process of parturition. To rediscover these fundamental facts, our priority must be the physiological perspective. The concept of adrenaline-oxytocin antagonism is essential to comprehend the needs of birthing mammals in general. The concept of reduced neocortical activity is crucial to understand the specifically human vulnerability in the perinatal period and the inhibitory effect of language (Odent, 1987). Rediscovering the basic needs of labouring women requires the rediscovery of authentic midwifery. A midwife is originally a mother figure. In an ideal world our mother is the prototype of the person with whom we can feel secure, without feeling observed or judged. It will also take a long time to eradicate or even diminish the influence of age-old beliefs and rituals that disturb the earliest mother newborn interaction and the initiation of breastfeeding. Although we are now in a position to understand the vital significance of this brief period of time, new 'excuses' are constantly created to distract the mother at the very time when she needs to release a vital peak of oxytocin. Some of these excuses are rationalized by the medical institution. For example it is commonplace to rationalize cord clamping or cord cutting before the delivery of the placenta. Other excuses are rationalized by the natural childbirth circles. For example fathernewborn 'bonding' immediately after the birth of the baby ignores the vital significance of the delivery of the placenta and the initiation of lactation. We must remain committed to exploring the long-term consequences of intrapartum events if we are to interpret the current turning point in the history of childbirth.

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