

*Perspective*

## Evolution of menstruation in mammals

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**Why do placental mammals dismantle their endometrium in cyclic pattern? And why the amount of blood that is lost relative to the reabsorbed amount differs between species Some species as in humans shed notable amount of blood in association with menstruation that occurs by the end of the menstrual cycle, whereas, other species barely discharge any blood in what is known as the estrous cycle. This essay discusses such evolutionary processes by presenting previous hypotheses and presents a new hypothesis in an attempt to give more insight into the evolution of menstruation in mammals and in humans in particular.**

**Key words:** Menstruation, mammals, biochemical samples, accelerating evolution, self energy loss bait.

### PREVIOUS HYPOTHESES

Many have questioned the advantage blood shedding during menstruation (Finn, 1987, 1998; Profet, 1993; Strassmann, 1996). One hypothesis correlated this to energy saving concerns since it is cheaper to build new endometrium rather than maintaining it during the infertility duration. Whereas, others suggested that ovary menstruation cleans the uterus from sperm-borne pathogens that are flushed by blood shedding (Profet, 1993). Other researchers proposed that this process is not beneficial in itself but the fetal development of these species requires a more developed thick endometrium that makes it hard to be completely reabsorbed (Strassmann, 1996).

Logically, all above explanations are still to be hypothesis and may not likely become accepted fact since none of these present a convincing reasoning behind this evolutionary process for the reasons that are discussed below.

The first hypothesis which suggests that menstruation helps to cut the energy burden on the menstruating mammals by dismantling the placenta during the infertility duration rather than maintaining it could be disputed by two simple facts: First, it is hard to accept that the energy needed to build a new endometrium would be less than

the energy needed to maintain it during infertility since the duration of maintaining the placenta during the infertility is comparable to the duration of both dismantling the old placenta and rebuilding new one as it is evident in humans. Second, such hypothesis may be accepted for those species that go through estrous cycle in which evolution had led to total blood reabsorbing than rather losing any in order to lower the energy burden on the specie. Nevertheless, the more evolved mammals like primates violate this trend by discharging blood at the end of their menstrual cycle, hence, it makes such explanation unlikely.

Next, the hypothesis which suggests that menstruation is useful by cleaning the uterus from sperm-borne pathogens again presents unlikely explanation since it would be inefficient to clean the uterus by such costly mechanism rather than cleaning by less expensive liquids that the mammals should have developed during their evolution, as they do for cleaning their exposed sensory systems such as the eyes, ears and nose. Moreover, it would be more likely that natural selection have played its role to strengthen the kind by eliminating those host females that are vulnerable to the post mating harmful potential diseases.

The third hypothesis suggests that all mammals are supposed to reabsorb their self energy in order to lower the energy burden, nevertheless, menstruating mammals have developed during their evolutionary process a relatively thick endometrium in order to host their more developed fetus compared to those which belongs to the mammals that go into the estrous cycle. Therefore, menstruating mammals are unable to completely reabsorb their thick more developed endometrium near the end of menstrual cycle when no conception is taking place, which eventually leads to blood shedding. As a matter of fact this hypothesis does not answer the question truly for two reasons: First, such assumption carry contradictions, since it can not be that those higher primates, who discharge more notable blood during their menstrual cycle and are better evolved, are at the same time more deficient to reabsorb their self energy. Second, it would be cheaper and safer for the menstruating mammals to gain energy by total reabsorbing of the endometrium than seeking and digesting food that give the same amount of energy. Apparently, the more successful mammals like humans and some other primates discharge blood since they can afford it, and it is more likely to be a sort of balancing between the ability to afford this self loss of energy bait and how much risk menstruating mammals are taking on the one hand, and how much menstruating mammals could benefit from such energy scarify on the other hand.

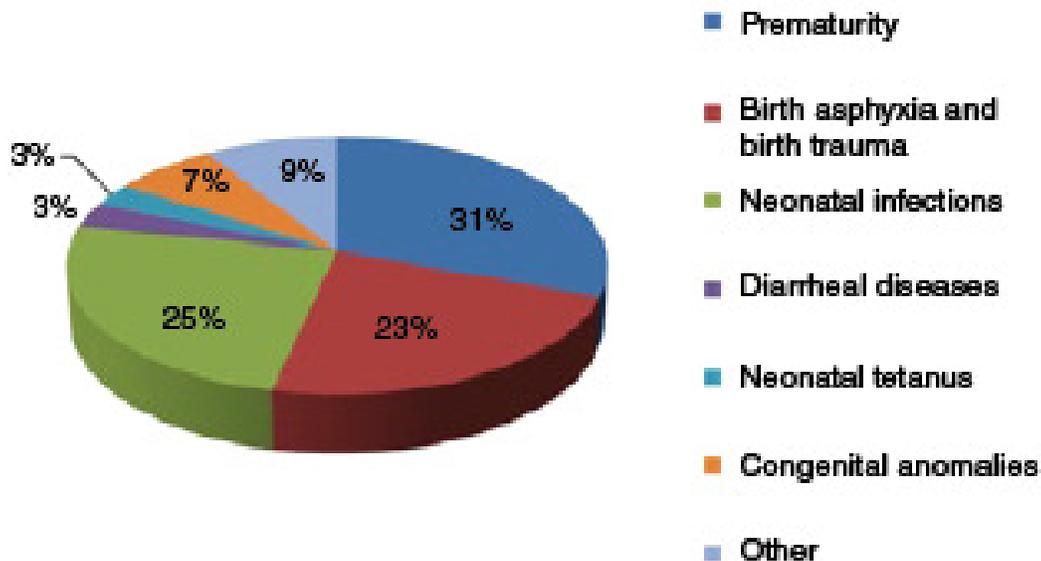
## DISCUSSION AND FACTS

Since the above hypotheses are not providing a likely prime reason behind how menstruation could adequately benefit species, there should be highly beneficial reason justify this self loss of energy, which as I believe should be related to the fundamental aspects of species, like their survivability and the continuity of the kind. The reason to conclude the last statement is that it is evident that our kind, which without doubts, is the most successful specie in securing food and energy to fuel his living and counts; nevertheless humans, in part, still to this day suffer hard times to secure adequate energy as it can be evident by the starvations that struck some groups of our kind just in the recent centuries. It is even clear to any thoughtful observer that the average human is more occupied in energy gathering than any other activity, which resulted in a backlash of heart diseases that presents the most killing causes in modern societies. Such troubling trend for gathering excess energy storage is simply the momentum of a vital instinct that has been developed millions of years during which food gathering to fuel living was really a major concern. Moreover, it is an evident fact to any zoologist and even to normal humans that the top priority and the time occupancy of most species is to search for food in order to fuel the living individuals' continuity during their life span, which indeed comes even before searching for a mate that

serves the continuity of the kind. This is a logical ordering of priorities because if the living individuals life is threaten by shortage of energy this would surly lead to reproduction frailer simply by two reasons: First, the reproduction seeds, if delivered to mating, would be with questioned quality that could not carry better evolving specie. Second, raising and providing for the offspring is even more demanding than being alone. Hence, there are two thresholds of how much energy the living individuals should secure before they can go into mating and reproduction; the first is to secure fueling their own living, whereas, the second is to secure both themselves and their offspring for a period of time till they are adequately mature to struggle the life's trials. The point to make out of all this discussion is to confirm that scarifying self energy through blood shed during menstruation is seriously a risky business that holds lots of gambling and the specie would not adopt such strategy without expecting lots of spoils like securing higher level of energy by producing more intelligence-demanding-energy and better-surrounding-fighters offspring. As a matter of fact since life started even at primitive stages the urge for better kinds has been an associating trend in order to strengthen its presence on earth. To reach this goal, species since early beginnings are in constant mode of competition and struggling to reach ahead evolutionary stage from which other species can be dictated to serve those more evolved ones and fuel more dominancy by widening the evolutionary gap. This trend is also apparent in the individuals of the same kind and what we humans are experiencing of conflicts is just obeying those very basic rules of Mother Nature. Mammals, and the more evolved primates, have employed such strategy really effectively. In order to win such active competitions against other species, adequate info about the surrounding environments, can be considered as the surrounding signatures, need to be acquired via agents of biochemical samples in order to steer properly as a first step to become a victor. The amounts and timing of this info that reflects the status of the surrounding is critical to increase the likelihood of being dominant. Moreover, in order to maintain status, the dynamic constantly changing surrounding dictates on the current victors to have regularly periodic gathering of the surrounding signatures.

## THE NEW HYPOTHESIS

Accepting above discussion with the implied facts, we could at this stage start deciphering the life's secret behind menstruation. As a matter of fact, mammals present the last stage, but maybe not final, in the current evolutionary ladder. That means they are new comers to life, therefore, they should work harder to cope and compete with the already life existing forms. Naturally, new species are usually not welcomed easily by the already established ones since this would provoke the



**Figure 1.** Worldwide causes of newborns death, age from born to one month. Adapted from World Health Organization and the United Nations Children Fund GAPP (2009).

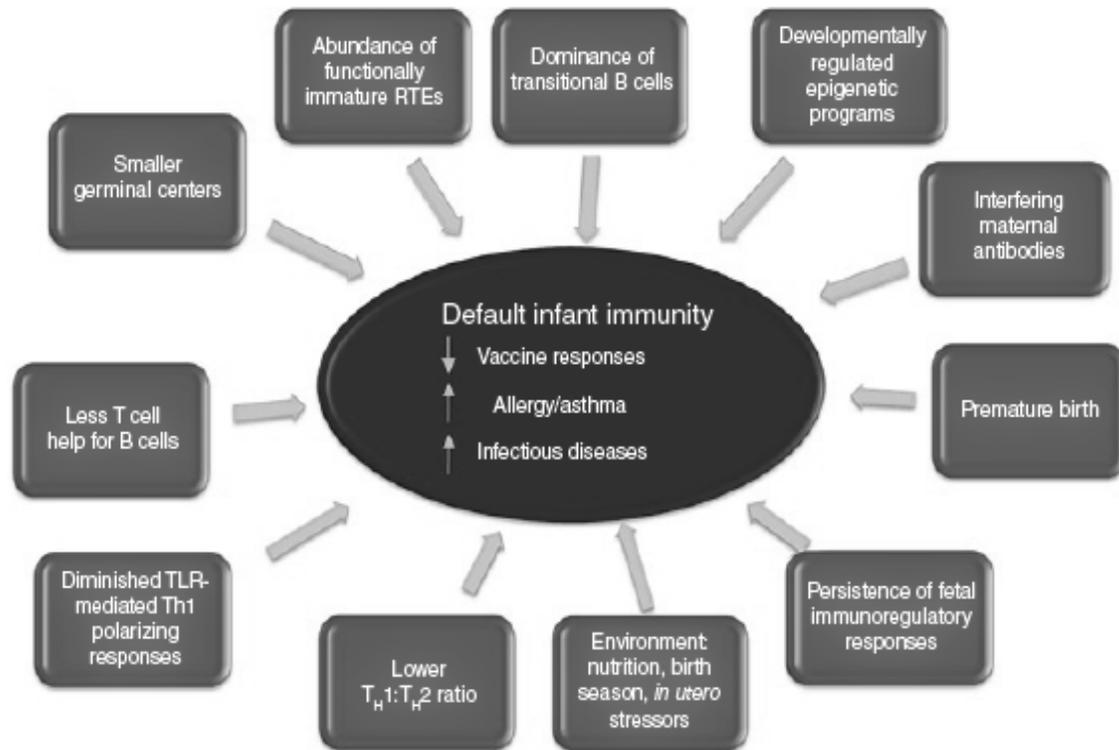
already steady ecological system and leads to more crowded earth that threaten their existence since Mother Nature afford limited resources and always send the weakest strategy species to extension. Hence, new comers to life specially those ones which deemed to dominate the globe, as the primates, should have encountered really harsh stages through their evolution; and those species would not succeed without been armed with new and effective strategies. It is more likely that for menstruating mammals to have better chances for surviving and then dominancy, they have developed such cyclic fertility process in order to provide the endometrium continuously with fresh biochemical samples from the surrounding environment that could be passed and introduced to mammalian zygote. It is well known fact that mammalian mother passes both useful and harmful materials to their fetus via the placenta, which can be at different forms and levels of order that can reach even to the viruses (Palmeira et al., 2012; Gall et al., 2011; Wright and Sibley, 2011; Simister and Story, 1997; Lenore et al., 2003; Roth et al., 1996). In fact, though passing harmful materials can be destructive to the fetus, from broader point of view, it can also benefit the mother and her kind since this would test the fitness of her anticipated offspring against the surrounding environment host at early stages before consuming her resources and consequently weaken the kind in general. Moreover, it is an accepted fact that the early stages of formation for any kind are key ones that shape things afterward (Gillespie and Turelli, 1989; Levene, 1953; Lindstron, 1999; Lummaa and Clutton-Brock, 2002). Figure 1 shows the worldwide most common causes of newborns death, age from birth to one month.

Hence, by cyclic dismantling of the endometrium lining during their infertility and bringing fresh one that carry the dynamic surrounding environment signatures, mammals' offspring are better introduced at early stages to their constantly changing and challenging environment at these vital early formation stages, therefore permit more survivability and better accelerating evolution among other species that could lead to dominancy that all species seek. Figure 2 shows the hormonal changes and endometrial histology of a human female during her menstrual cycle, and Figure 3 shows the hormonal changes of a bitch during her estrous cycle.

In contrast, if the endometrium is not equipped with such cyclic pattern it would lack the amount and variety of those key biochemical samples that are provided to the mother from the surrounding environment through her food and interactions with that surrounding. Furthermore, those more successful mammals like us that could afford relatively more loss of blood should have better amounts and varieties of the key biochemical samples to be passed to the offspring at the early formation stages. Figure 4 shows our present understanding for the different factors that affects the infant immune system (Prabhu Das et al., 2011).

Therefore, the answer of the second introductory question in this article is that it is a matter of how much that kind of specie could afford more blood loss to lower the risk taken from the self loss of energy bait on the one hand, and the necessity to compensate the more blood shed that is accompanied with better amounts and varieties of the surrounding biochemical samples, which consequently leads to more suitable mammalian offspring on the other hand. Those mammals that exhibit cyclic





**Figure 4.** Factors that contribute to infant's immunity. Adapted from Prabhu Das et al. (2011).

the menstruating mammals is more or less tangible in nature.

## CONCLUSION

Menstruation in humans and some other higher primates is simply an association of a vital goal toward surviving and dominancy. Offering an energy bait to get the big prize is an act of intelligence; it is more likely that it started by the time when those primates begin to use their minds more effectively, like employing basic tools and planning, thus securing adequate energy for the menstruation bait and the surviving of life's trials to become the masters of survival.

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