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How And Why Did Women Evolve Periods?



Quora,
CONTRIBUTOR



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Thousands of devotees from all over India gather on occasion of Ambubachi Mela, which is celebrated to mark the menstruation period of the goddess and during which occasion the sanctorum of

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*the shrine remains closed to worshippers.
The Ambubach Mela runs from June 22-
26. (Photo: BIJU BORO/AFP/Getty
Images)*

*What is the evolutionary
benefit or purpose of
having periods?
originally appeared on
Quora – the knowledge
sharing network where
compelling questions are
answered by people with
unique insights.*

**Answer by Suzanne
Sadedin, Ph.D in
evolutionary biology
from Monash
University, on Quora:**

The answer to this
question is one of the
most illuminating and
disturbing stories in
human evolutionary
biology, and almost
nobody knows about it.
And so, my friends,
gather close, and hear the
extraordinary tale of how
the woman got her
period.

Contrary to popular
belief, most mammals do
not menstruate. In fact,
it's a feature exclusive to

the higher primates and certain bats*. What's more, modern women menstruate vastly more than any other animal. And it's bloody stupid (sorry). A shameful waste of nutrients, disabling, and a dead giveaway to any nearby predators. To understand why we do it, you must first understand that you have been lied to, throughout your life, about the most intimate relationship you will ever experience: the mother-fetus bond.

Isn't pregnancy beautiful? Look at any book about it. There's the future mother, one hand resting gently on her belly. Her eyes misty with love and wonder. You sense she will do anything to nurture and protect this baby. And when you flip open the book, you read about more about this glorious symbiosis, the absolute altruism of female physiology designing a



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The advertisement features three images of dresses: a black and white lace dress, a black and white patterned dress, and a woman wearing a blue and white patterned dress. A small information icon is in the top right corner.

perfect environment for
the growth of her child.

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If you've actually *been* pregnant, you might know that the real story has some wrinkles. Those moments of sheer unadulterated altruism exist, but they're interspersed with weeks or months of overwhelming nausea, exhaustion, crippling backache, incontinence, blood pressure issues, and anxiety that you'll be among the 15% of women who experience *life-threatening* complications.

From the perspective of

most mammals, this is just crazy. Most mammals sail through pregnancy quite cheerfully, dodging predators and catching prey, even if they're delivering litters of 12. So what makes us so special? The answer lies in our bizarre placenta. In most mammals, the placenta, which is part of the fetus, just interfaces with the surface of the mother's blood vessels, allowing nutrients to cross to the little darling. Marsupials don't even let their fetuses get to the blood: they merely secrete a sort of milk through the uterine wall. Only a few mammalian groups, including primates and mice, have evolved what is known as a "hemochorial" placenta, and ours is possibly the nastiest of all.

Inside the uterus we have a thick layer of endometrial tissue, which contains only tiny blood

vessels. The endometrium seals off our main blood supply from the newly implanted embryo. The growing placenta literally burrows through this layer, rips into arterial walls and re-wires them to channel blood straight to the hungry embryo. It delves deep into the surrounding tissues, razes them, and pumps the arteries full of hormones so they expand into the space created. It paralyzes these arteries so the mother cannot even constrict them.

What this means is that the growing fetus now has direct, unrestricted access to its mother's blood supply. It can manufacture hormones and use them to manipulate her. It can, for instance, increase her blood sugar, dilate her arteries, and inflate her blood pressure to provide itself with more nutrients. And it does.

Some fetal cells find their way through the placenta and into the mother's bloodstream. They will grow in her blood and organs, and even in her brain, for the rest of her life, making her a genetic chimera**.

This might seem rather disrespectful. In fact, it's sibling rivalry at its evolutionary best. You see, mother and fetus have quite distinct evolutionary interests. The mother 'wants' to dedicate approximately equal resources to all her surviving children, including possible future children, and none to those who will die. The fetus 'wants' to survive, and take as much as it can get. (The quotes are to indicate that this isn't about what they consciously want, but about what evolution tends to optimize.)

There's also a third player here – the father, whose interests align still

less with the mother's because her other offspring may not be his. Through a process called genomic imprinting, certain fetal genes inherited from the father can activate in the placenta. These genes ruthlessly promote the welfare of the offspring at the mother's expense.

How did we come to acquire this ravenous hemochorial placenta which gives our fetuses and their fathers such unusual power? Whilst we can see some trend toward increasingly invasive placentae within primates, the full answer is lost in the mists of time. Uteri do not fossilize well.

The consequences, however, are clear. Normal mammalian pregnancy is a well-ordered affair because the mother is a despot. Her offspring live or die at her will; she controls their nutrient supply, and

she can expel or reabsorb them any time. Human pregnancy, on the other hand, is run by committee – and not just any committee, but one whose members often have very different, competing interests and share only partial information. It's a tug-of-war that not infrequently deteriorates to a tussle and, occasionally, to outright warfare. Many potentially lethal disorders, such as ectopic pregnancy, gestational diabetes, and pre-eclampsia can be traced to missteps in this intimate game.

What does all this have to do with menstruation? We're getting there.

From a female perspective, pregnancy is always a huge investment. Even more so if her species has a hemochorial placenta. Once that placenta is in place, she not only loses full control of her own

hormones, she also risks hemorrhage when it comes out. So it makes sense that females want to screen embryos very, very carefully. Going through pregnancy with a weak, non-viable or even sub-par fetus isn't worth it.

That's where the endometrium comes in. You've probably read about how the endometrium is this snugly, welcoming environment just waiting to enfold the delicate young embryo in its nurturing embrace. In fact, it's quite the reverse. Researchers, bless their curious little hearts, have tried to implant embryos all over the bodies of mice. The single most difficult place for them to grow was – the endometrium.

Far from offering a nurturing embrace, the endometrium is a lethal testing-ground that only the toughest embryos

survive. The longer the female can delay that placenta reaching her bloodstream, the longer she has to decide if she wants to dispose of this embryo without significant cost. The embryo, in contrast, wants to implant its placenta as quickly as possible, both to obtain access to its mother's rich blood, and to increase her stake in its survival. For this reason, the endometrium got thicker and tougher – and the fetal placenta got correspondingly more aggressive.

But this development posed a further problem: what to do when the embryo died or was stuck half-alive in the uterus? The blood supply to the endometrial surface must be restricted, or the embryo would simply attach the placenta there. But restricting the blood supply makes the tissue weakly responsive to

hormonal signals from the mother – and potentially more responsive to signals from nearby embryos, who naturally would like to persuade the endometrium to be more friendly. In addition, this makes it vulnerable to infection, especially when it already contains dead and dying tissues.

The solution, for higher primates, was to slough off the whole superficial endometrium – dying embryos and all – after every ovulation that *didn't* result in a healthy pregnancy. It's not exactly brilliant, but it works, and most importantly, it's easily achieved by making some alterations to a chemical pathway normally used by the fetus during pregnancy. In other words, it's just the kind of effect natural selection is renowned for: odd, hackish solutions that work to solve proximate

problems. It's not quite as bad as it seems, because in nature, women would experience periods quite rarely – probably no more than a few tens of times in their lives between lactational amenorrhea and pregnancies***.

We don't really know how our hyper-aggressive placenta is linked to the other traits that combine to make humanity unique. But these traits did emerge together somehow, and that means in some sense the ancients were perhaps right. When we metaphorically 'ate the fruit of knowledge' – when we began our journey toward science and technology that would separate us from innocent animals and also lead to our peculiar sense of sexual morality – perhaps that was the same time the unique suffering of menstruation, pregnancy

and childbirth was inflicted on women. All thanks to the evolution of the hemochorial placenta.

Links / References:

[The evolution of menstruation: A new model for genetic assimilation](#)

[Genetic conflicts in human pregnancy.](#)

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During my pregnancy I
was privileged to audit a
class at Harvard
University by the
eminent Professor David
Haig, whose insight
underlies much of this
research. Thanks also to
[Edgar A. Duenez-
Guzman](#), who reminded
me of crucial details. All
errors are mine alone.

*Dogs undergo vaginal
bleeding, but do not
menstruate. Elephant

shrews were previously thought to menstruate, but it's now believed that these events were most likely spontaneous abortions.

**** Scientists Discover Children's Cells Living in Mothers' Brains** (Thanks to [Robyn Adair](#) for the link).

***One older published estimate for hunter gatherers was around 50, but this relied on several assumptions, including 3 whole years of menstruation before reproduction (36 periods) for no obvious reason.

A study of the Dogon of Mali based on 57 women in natural-fertility cycles estimates the median number of life-time menses at 109:
<http://www.jstor.org/stable/2744446>

To get a feel for life history parameters, we can look at data from the Hadza of Tanzania, who

reach puberty around 18, bear an average of 6.2 children in their lives (plus 2-3 noticeable miscarriages) starting at 19, and go through menopause at about 43 if they survive that long (about 50% don't). Around 20% of babies die in their first year; the remainder breastfeed for about 4 years. So this is 25 years of reproductive life, of which about 20 are spent lactating, and 4.5 pregnant. That would leave only about 6 periods, but amenorrhoea would cease during the last year of lactation for each child, so this figure is too low. On the other hand, this calculation ignores the ~50% of women who died before menopause, miscarriages, months spent breastfeeding infants who would die, and periods of food scarcity, all of which would further reduce lifetime menstruation.

Stats from:

<http://www.fas.harvard.edu/%7Ehb...>

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iPhone 7 Leak Reveals Significant Feature Removed



**Gordon
Kelly,**

CONTRIBUTOR

*I write about
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FULL BIO 

Do you want an iPhone 7? In past years this would've been a rhetorical question. *Of course millions and millions of [Apple](#)*

AAPL -0.57% customers wanted the latest and greatest iPhone. But [doubts are growing](#) about what users might get in 2016...

And now according to the usually reliable [Macotakara](#), Apple's latest hardware innovation to be pulled from the iPhone 7 is the 'Smart Connector'.

Interestingly this was clearly visible in a [leaked iPhone 7 prototype](#) (identifiable by the three dots on the back of the device – below) and [Macotakara](#) says Apple decided not to carry it forward to the final design.



iPhone 7 Pro schematics. Image credit: Mac Fan

What is the Smart Connector? In short: something potentially rather exciting.

Apple introduced the Smart Connector with the [iPad Pro range](#) and it enables the Lightning port to deliver both power and data simultaneously. For example, with the iPad Pro this means third party keyboards don't require batteries or charging – they just work the moment they are plugged in.

How would this be used with iPhones? That would obviously be up to Apple and creative third parties to decide, but with accessories able to take power from an iPhone it could've led to

some seriously sleek wireless headphones, mini keyboards, ‘smart’ protective cases, etc.

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New iPhone 7
Photos Reveal
Essential Upgrade

iPhone 7 Feature Cuts Mount

Meanwhile the eagle eyed will spot this isn't the first time Apple has supposedly scaled back ambitions for the iPhone 7. Breaking from tradition, Apple is widely thought to have ditched a new design for the iPhone 7, instead sticking with the same chassis as the iPhone 6 and iPhone 6S.



iPhone 7 render based on new design information. Image credit: MacRumors

Meanwhile, despite controversially removing the headphone jack, it appears Apple has not used the internal space this saves too much obvious effect with [minimal battery life gains](#) and tentative plans for a [second speaker also pulled](#).

In fact famously accurate KGI Securities analyst Ming-Chi Kuo has claimed the iPhone 7 will not have “[many attractive selling points](#)”.

Bigger Apple Concerns

All of which has me worried.

Yes Apple suffered its first [major iPhone sales decline](#) last month, but it still made millions.

Instead my issue is with Apple's growing practice of fragmenting its hardware innovations.

Think about it for a minute. On the software side, iOS is lauded for its lack of fragmentation compared to Android but equally key is the major advantage of hardware unity as well. Features like Touch ID gain traction as Apple included it in all iOS devices ensuring developer support, while Android struggles to get anything like the same unity between manufacturers.

But right now Apple's strategy is faltering.



3D Touch on the iPhone 6S and iPhone 6S Plus is suffered as Apple has not introduced the feature more widely to other devices. Image credit: Gordon Kelly

For example, the company introduced 3D Touch on the iPhone 6S and iPhone 6S Plus, but left it out the [iPhone SE](#) and iPad Pro range making it a curiosity rather than a key differentiator to rivals. Similarly the Smart Connector now looks marooned on the iPad Pro range when it should be spread liberally across all Apple hardware to encourage user adoption.

What could be fuelling this? Is the so-called '[All glass](#)' [iPhone 8](#) the real priority? At this point it's impossible to say. I'd advise staying calm for now. After all there is still plenty of time for Apple to pull out some surprises and wow us with the iPhone 7.

But right now, it's not looking great...

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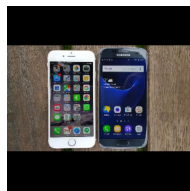
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