

## Menstruation Reading

Read the article below and answer the following questions. (Write answer in your Javah book if you have it, otherwise on a separate sheet of paper).

1. What is the traditional scientific interpretation of menstrual flow? What is Ms. Profet's alternative explanation? What evidence does she offer in support of her hypothesis?
2. What kinds of additional evidence could be gathered in the future that would
  - a. Support her hypothesis?
  - b. Refute her hypothesis?
3. Suppose a woman was experiencing abnormal uterine bleeding. What used to be the conventional interpretation and treatment for such symptoms? What new interpretation and treatment are called for, based on Ms. Profet's hypothesis?

### Radical New View of Role of Menstruation

It may serve to protect the uterus from sperm-borne microbes, biologist says.

By Natalie Angier  
New York Times, 1994

The menstruating woman has been variously vilified, feared, pitied or banished from the village to spend her bloody days in solitude. Even the standard medical explanation connotes loss. A woman bleeds every month as a way of discarding her unfertilized eggs and the uterine lining that has been optimistically fattening up in anticipation of a baby that never arrived.

Now an evolutionary biologist proposes a radical new way of viewing menstruation, one that gives the ordinary business of having a period an active and salutary spin. The scientist, Margie Profet of the University of California at Berkeley, suggests that menstruation evolved as a mechanism for protecting a female's uterus and Fallopian tubes against harmful microbes delivered by incoming sperm.

According to this scheme, the uterus is extremely vulnerable to bacteria and viruses that may be hitching a ride on the sperm, and menstruation is an aggressive means of preventing infections that could lead to infertility, illness, and even death. In menstruation, Ms. Profet suggests, the body takes a two-pronged attack against potential interlopers: it sloughs off the outer lining of the uterus, where the pathogens are likely to be lingering, and it bathes the area in blood, which carries immune cells to destroy the microbes.

"The body kills the tissue and ejects it, and it directly kills the pathogens with immune cells," said Ms. Profet. "It eliminates the pathogens and their home at the same time."

Ms. Profet presents her theory in a comprehensive report that takes up the bulk of the September issue of *The Quarterly Review of Biology*. In it, she seeks to answer the simple question of why the bodies of premenopausal women go to the trouble of shedding considerable quantities of blood and tissue each month, losing valuable nutrients, in particular iron, in the process.

Why not keep the uterine lining around until it is used, she wondered. And even if some of it must be turned over, why the messy bleeding? After all, the lining of the digestive tract is regenerated every two to four days, the skin sheds tens of thousands of cells every day, and other organs are freshened and patched up, all without the assistance of blood. "Menstruation is a

costly event to the female, and it wouldn't be there if it didn't serve a very important purpose," she said.

Ms. Profet also suggests that other types of uterine bleeding, like that which sometimes accompanies ovulation and the implantation of the embryo and postpartum bleeding, may be the body's way of intermittently cleaning house and purging pathogenic intruders.

"It's an astonishing piece of work," said Dr. Donald Symons, a professor of anthropology and an evolutionary theorist at the University of California at Santa Barbara. "It's a fitting together of many disparate elements into one coherent explanatory system, and it's wonderful. It's exactly what a scientific theory should be."

Going further, in her article Ms. Profet says that humans and other higher primates are not the only mammals to menstruate, as is commonly supposed. Through an extensive review of scientific literature dating back to the last century, she has discovered that a number of mammals widely separated in evolutionary time have been observed to menstruate, including bats, marsupial cats, tree shrews and primitive monkeys. She predicts that it will turn out that nearly all mammals menstruate, if researchers only take the time to look, although many species may bleed only trace amounts that escape easy detection. "This is a bold prediction, and she's really going out on a limb in saying it," said Dr. Symons.

Ms. Profet suggests that her hypothesis has important medical implications. If bleeding helps prevent infections, she said, then women should avoid oral contraceptives that suppress menstruation entirely. In addition, she said, inexplicable uterine bleeding should be viewed as a possible early sign of infection, a symptom that the body is struggling to thwart a disease. Often doctors regard such bleeding as the result of abnormal hormonal flux, seeing it as a reaction that in turn increases a woman's risk of contracting a pelvic infection. But this attitude, Ms. Profet says, is completely backwards.

"Saying uterine bleeding causes infections is like saying a fireman causes a fire," said Ms. Profet. If she is right, she said, the worst thing a doctor could do for an episode of unexplained uterine bleeding would be to block the bleeding with hormones. A more appropriate response, she said, might be to test for an infectious organism like chlamydia and then prescribe an immediate course of antibiotics.

The new hypothesis also may explain the puzzle of why women who use intrauterine devices have extremely heavy periods.

"The IUD causes chronic inflammation of the uterus, and in general inflammation is a sign of infection," said Ms. Profet. "My guess is the uterus thinks there's an infection there and increases blood flow."

There can be other reasons for unexplained bleeding – for example, tumors, fibroid disease or ectopic pregnancy – but Ms. Profet believes that infection should also be considered.

Other scientists familiar with the new hypothesis said it was brilliantly argued, although some suggested that aspects of it may prove incorrect. They questioned here thesis that most mammals menstruate and that abnormal bleeding is closely tied to infection.

"Hers is the first real attempt at a functional analysis of menstruation, and I'm really sure she's on the right track," said Dr. George C. Williams, a professor emeritus of ecology and evolution at the State University of New York and Stony Brook and editor of *The Quarterly Review of Biology*. "Even if some of her particular explanations of things are shown to be in error – and at this point there's no reason to assume they will be – I'm sure her approach will turn out to be extremely fruitful, stimulating people to look for evidence for or against the hypothesis."

Ms. Profet, 35, recently won a MacArthur “genius” award for a body of work and an approach to science that has been consistently piquant and unorthodox. She has never bothered to get a doctorate, viewing it as a waste of time and a potential damper on creativity. Instead, she has published theories on the evolution of commonplace phenomena that scientists and physicians had generally ignored.

For example, she has proposed that morning sickness, long thought to be an incidental aspect of pregnancy, in fact evolved to prevent women from eating vegetables and other foods that are rich in natural toxins at a time when the developing fetus is most vulnerable to ingested poisons. She has also suggested that some people suffer from allergies as a way of protecting themselves against plant-borne compounds that would damage their cells if not expelled from the body by a sneeze or cough.

“Margie has an uncanny gift for these kinds of things,” said Dr. Symons. “It makes you wonder what else is lying around there waiting to be noticed and explained.”

Ms. Profet first considered the problem of menstruation when she learned of it at age 7. “I was disgusted because it made no sense and seemed so inefficient,” she said. “Why go to all that trouble to make that elaborate lining just to get rid of it? I thought, God must really hate us.”

As she grew older, the clinical explanation of menstruation dissatisfied her. She was particularly incensed by medical descriptions that dismissed a woman’s period as the unfortunate and possibly unnecessary byproduct of hormonal cycling. The idea that menstruation evolved as a protection against disease came to her several years ago in a vivid dream of black triangles stuck in deep red tissue.

Through exhaustive research, she has come up with converging lines of evidence to support the theory. She first sought proof that menstruation was an adaptation, something that has evolved to meet a defined goal, rather than being a meaningless byproduct of oscillating hormones. Studying physiology, she learned that a distinctive type of artery known as a spiral artery opens to the uterus and orchestrates menstruation by first sharply closing and then rapidly dilating. “The spiral arteries constrict and kill off the tissue,” said Ms. Profet, “and then dilate again to force the necrotic tissue off.”

What is more, menstrual blood is notably lacking in clotting factors, which cause blood elsewhere in the body to solidify upon exposure to air. “Clearly we are supposed to bleed and bleed in a steady flow,” said Ms. Profet.

Satisfied with the evidence showing an adaptive design to menstruation, Ms. Profet pursued her theory of what bleeding is designed for. She found abundant clinical confirmation that sperm is a potent vector of disease. For example, electron micrographs of sperm invariably show the familiar teardrop cells girdled with tag-along bacteria. And though mucus around the cervix generally inhibits the passage of any organism into the upper reproductive tract, the mucus becomes quite permeable during ovulation, when sperm must be permitted unfettered access to a waiting egg.

By piggybacking on sperm, microbes originating with the male or picked up from the vaginal canal during intercourse can glide through the cervix and invade a woman’s internal organs, putting her or any embryo that may implant at risk of disease.

Other evidence points to a protective role for menstruation. The blood is exceptionally rich in macrophages, immune cells that engulf infiltrators, and it is able to sequester iron and keep it from bacteria, which require the metal to survive.

Knowing that other female mammals would be exposed to sperm-borne microbes as readily as would humans, Ms. Profet sought to find proof that menstruation and other types of

uterine bleeding are common in the mammalian kingdom. She came up with a list of many species that bleed either visibly or covertly, and she could find no persuasive evidence that any female does not menstruate. “But the truth is, we need a lot more comparative mammalian data,” she said.

Ms. Profet believes that of all mammals, humans need the heaviest periods, for they are receptive more often than any other species and thus may be at greatest risk of uterine infections from sex. Women are freed from the need for bleeding during pregnancy, when the cervix is fairly well sealed off from sperm by a thick and chemically hostile coat of mucus. During the last two months of pregnancy, however, the mucus becomes more permeable and some doctors advise their patients to have their partners use condoms during sex to protect against sperm-borne infections.

By the same token, Ms. Profet said, postmenopausal women also have thicker cervical mucus than do fertile women, presenting a barrier that at least partly offsets the loss of the body’s monthly house-cleaning. When sperm cells need no longer be permitted entry to any receptive partner, they and the microbes might as well be blocked at the cervical gate.

(Remember to answer a question!!!)