Eleven body fluids we couldn't live without

November 3 2015, by Richard Gunderman

Credit: Mariana Montrazi from Pexels

How is a human being like a fish?

Just as a fish never stops to think about the water in which it spends its entire life, so do many human beings rarely pause to consider the body fluids that make our lives possible.

Though not always fit for polite conversation, even the less pleasant among them play a crucial role in maintaining health. By learning a bit more about 11 of these body fluids, we can develop a deeper appreciation for the beauty and complexity of our own biology. What exactly are these fluids, and what often unheralded contributions do they make?

1. Bile

Bile is a brown to dark green fluid that is produced by the liver, stored in the gallbladder (a synonym for bile is gall), and released into the intestines when we eat. It is partly responsible for the color of vomitus and stool. Its most important ingredient is bile salts, which function like soap to break down dietary fats, enabling them and fat-soluble vitamins such as A, D and E to be absorbed. They also help to prevent the cholesterol-containing bile in the gallbladder from forming gallstones.

Curiously, about 15 grams of bile salts are excreted into the intestine each day, yet the human body contains only about five grams in total. How is this possible? The answer is that bile salts are recycled, being reabsorbed into the blood through the small intestine and then secreted again by the liver.

Some intestinal diseases, such as Crohn's disease, can damage the part of the small bowel where bile salts are reabsorbed, predisposing patients to gallstones.

2. Blood

Perhaps the most important body fluid of all is blood. The average adult contains about six liters of blood, which functions to transport oxygen to cells, carry metabolic waste products such as carbon dioxide away from cells and transport infection-fighting white blood cells, glucose, hormones and other essential substances throughout the body. Blood also contains cell fragments called platelets and clotting factors that help to seal leaks that may develop in blood vessels.

An adult's body contains about 25 trillion red blood cells – about one-third of all the body's cells. Red blood cells survive on average about 120 days, which means that every second of every day, an adult human produces about two million red blood cells. If lined up end to end, the tiny blood vessels in which gas is actually exchanged, the capillaries, would reach a length of about 60,000 miles, long enough to encircle the earth more than twice.

3. Menstrual fluid

The average woman menstruates every 28 days over 42 years of her life, for a total of about 520 menstrual periods. The average volume of menstrual fluid is approximately 40 milliliters, or about 2.5 tablespoons in total. The fluid itself is about one-half blood, and also contains tissue from the inner lining of the uterus, mucus and secretions from the vagina. If the amount of bleeding is abnormally high, it can result in anemia, a deficit of red blood cells.

Along with blood and semen, menstrual fluid is one of the body fluids with the strongest psychological and cultural overtones. Traditionally, the onset of menstruation is associated with the transition from childhood to adulthood, and the onset of each menstrual cycle has long provided the best evidence that a woman is not pregnant. Some societies and faith traditions have sequestered menstruating women, although menstrual fluid is no more biologically hazardous than blood.

4. Mucus

Mucus sounds unpleasant, but none of us would be here without it. A slippery, clear liquid produced by mucous glands, it lines the cells of the bronchi in the lungs, the stomach and intestines, the urinary and reproductive tracts, and the eyes and ears. Mucus contains a variety of important substances, including antiseptic enzymes, antibodies and mucins that give mucus its gel-like properties. The average adult produces about one liter of mucus per day.

Mucus keeps the lining of the respiratory system from drying out and also filters out dust and infectious agents in the air we breathe. Microscopic hair-like projections from the cells lining the lung's air passages help to propel the mucus back up toward the mouth at a speed of about one millimeter per minute, where it can be swallowed or expectorated.

Credit: AI-generated image (disclaimer)

Patients with cystic fibrosis have a genetic mutation that makes their mucus too thick, undermining this important defense against infection.

5. Pus

Pus sounds even more disagreeable but serves as a sign that the immune system is working. A white, yellow or brown viscous fluid that accumulates at sites of infection, pus usually consists of bacteria, white blood cells, and other proteins and cell debris. Pus under the skin is often found in a pimple, but deeper in the body a larger collection is known as an abscess. Pimples and abscesses represent the body's attempt to contain the spread of an infection.

For many centuries, one of the dictums of the barber-surgeon was, "Where there is pus, evacuate it," thereby purging the infection from the body. Until several decades ago, drainage required a surgical procedure. Today, however, many abscesses are drained using just a needle and catheter, with ultrasound or CT imaging for guidance. This less invasive approach reduces the need for anesthesia, recovery time and cost.

6. Semen

Semen, the fluid released by males at ejaculation, generally contains spermatozoa, the gametes that fertilize the female egg, though this is not the case for males who have undergone the most common sterilization procedure, vasectomy.

In addition to providing a medium through which sperm can "swim," semen also contains fructose, a sugar that nourishes the sperm, as well as alkaline secretions that help to neutralize the normally acidic environment of the vagina.

Females are born with all the eggs they will ever have, but males continuously produce gametes from puberty onward, and the average healthy male's ejaculate of about five milliliters contains approximately 300 million spermatozoa.

Why such large quantities are produced when only one sperm can fertilize an egg is a bit of a puzzle, but one explanation may be that the competition between sperm helps to select for the fittest.

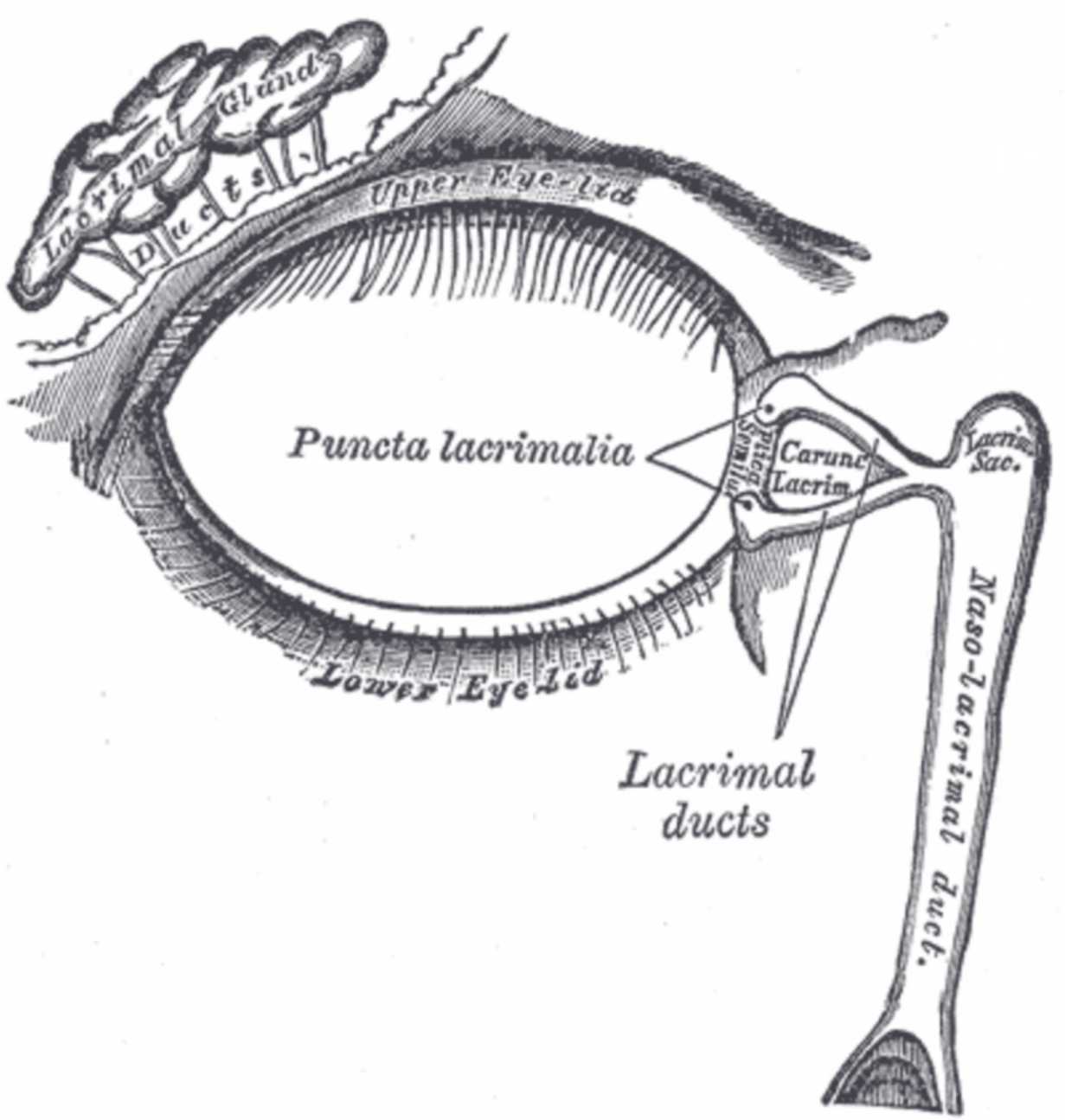
7. Saliva

Saliva is secreted by salivary glands in and around the mouth. The average adult produces about a liter of saliva per day, with peak secretion at meals. Like mucus, saliva contains antibacterial enzymes and antibodies, as well as mucus itself. Saliva helps to moisten food, which is important to lubricate chewing and swallowing. It also enhances taste, because if the chemicals in food were not in a liquid medium, they could not be detected by taste receptors.

Some of the enzymes in saliva also begin to break down substances in food, such as starches, which are broken down by amylase. Because such enzymes are generally neutralized within seconds after reaching the highly acidic secretions in the stomach, they probably function mainly to break down food particles trapped between teeth, helping to prevent cavities.

Patients who lack sufficient saliva have much higher rates of tooth decay and gum disease.

8. Sweat



Engraving of the lacrimal gland. Credit: Henry Vandyke Carter, via Wikimedia Commons

Sweat, like saliva, consists almost entirely of water, though it also contains minerals that account for its salty taste. Sweat production can vary widely between one-tenth of a liter and eight liters per day, and during intense exercise, an adult may produce two liters per hour or more. The body's three million sweat glands come in two types. Eccrine glands are found all over the body, with the highest density in palms and souls. Apocrine glands are located most prominently in the armpits.

Sweat's most important role is thermoregulation, helping to cool the body when it begins to overheat. By comparison, dogs, which lack sweat glands, must pant to dissipate heat through evaporation. The brain stimulates sweating through nerves, and the rate is increased in response not just to heat but also emotional states. In contrast to heat-based sweating, the emotional type is associated with perspiration in only the palms, soles and armpits.

9. Tears

Tears are produced by the lacrimal glands above and lateral to the eye, and are spread over the eye's surface by blinking. They are drained into the nasal cavity, which explains why people often get a runny nose when they cry. Tears serve three functions: to lubricate the eye, to remove irritants such as smoke (and a sulfuric acid-producing chemical from cut onions) and in association with emotional states such as sorrow and joy.

Dry eye syndrome, the most common eye disease, affects as many as one-third of elderly people, though it can occur at any time in life. The most common cause is decreased tear production, which in most patients occurs for no known reason, though it is associated with a variety of diseases and medications. The most common treatment involves, naturally enough, the use of eye drops.

10. Urine

The average adult produces about 1.5 liters of urine per day. Produced by the kidneys and stored by the bladder, urine contains many substances that must be removed from the body to maintain a state of health. These include the breakdown products of protein metabolism, which would become toxic if they were allowed to accumulate in the blood. Urine also serves as the principal means for removing excess salt and water from the body.

A common diagnostic procedure in medicine is urinalysis. Finding glucose in urine could indicate that a patient is suffering from diabetes mellitus, a disease that got its name in part from the fact that the urine of diabetic patients tastes sweet. Likewise, finding bacteria suggests that the patient is suffering from a urinary tract infection. Interestingly, most of the amniotic fluid that cushions a fetus in utero is made up of urine produced by the fetus' kidneys.

11. Vomitus

Vomitus differs from the other body fluids discussed here because it is not produced under everyday circumstances. Everyone vomits at some point in their life in response to one of several types of stimuli. The balance center of the inner ear can induce vomiting, as in motion sickness. Another cause is irritation of the gastrointestinal tract by infections and poisons.

In some cases, vomiting purges the body of toxins, but in other cases vomitus contains only food. In either case, the fluid is usually highly acidic, because of the acids normally secreted by the stomach. In individuals who vomit frequently, such as patients with bulimia, this acid can erode the surface of the teeth and cause dangerous changes in the pH

balance of the blood. The presence of blood in vomitus is generally a sign of bleeding from the esophagus or stomach.

This list of bodily fluids only scratches the surface. For every fluid that is regularly visible to the eye, there is another that, at least in health, we see only rarely. These include amniotic fluid, cerebrospinal fluid and the fluids that lubricate the surface of the heart and lungs, the abdominal organs and the joints, among many others. To get to know these fluids better is to gain deep insights into the biology of the human body in both health and disease.

Source: The Conversation