Sexual activity alters the microbiome, with potential psychiatric implications

Evidence is strong that sexual partners transmit microbiota (bacteria, viruses, fungi, protozoa, and archaea) to each other. While microbial flora are abundant in the gastrointestinal tract, they are also present in the vagina, penis, urethra, mouth, and skin. For better or worse, sexual contact of all types means that participants will acquire each other’s microbiota.

The 39 trillion microbiota in the body (which exceed the 30 trillion cells in the body) are commensal and influence both the larger brain in the skull and the smaller enteric brain in the gut. The microbiota and their microbiome genes (1,000 times larger than the human genome) have been linked to depression, anxiety, psychosis, and autism. They produce 90% of the body’s serotonin, as well as catecholamines (norepinephrine, epinephrine, dopamine), make hormones (eg, cortisol), and modulate the immune system. Microbiota have several important functions, including food digestion, synthesis of vitamins, autoimmunity, hypothalamic-pituitary-adrenal axis regulation, and CNS modulation.

Consequences of dysbiosis

Everyone should be concerned about maintaining a healthy diversity of microbiota in their body, with a predominance of beneficial bacteria such as Lactobacillus and Bacteroides, and avoiding acquiring pathogenic bacteria such as Gardnerella, Prevotella, and Atopobium. Sexual activity involving a partner with unhealthy microbiota may increase the risk of dysbiosis, defined as a reduction in microbiota diversity, including a loss of beneficial bacteria and a rise in harmful bacteria.

Dysbiosis is associated with multiple symptoms, including:

- brain “fog,” irritability, mood changes, and anxiety
- bloating, loss of intestinal permeability, and insufficient reclamation of nutrients
- congestion of certain organs, such as the liver, gallbladder, and pancreas
- production of antigen-antibody complexes in response to chemicals in partially digested food
- aggravation of inflammatory disorders such as migraine, arthritis, and autoimmune disorders.

Apart from intimate sexual contact, simply sharing a household with someone leads to sharing of gut microflora. Persons who live together, whether genetically related or not, have similar microbiota. Compared with people
living in separate households, cohabiting human pairs, dog pairs, and human-dog pairs share most of their microbiota (especially in the skin).

A consequence of acquiring pathogenic microbiota in the vagina is bacterial vaginosis (BV), which is not an infection but an ecologic imbalance in the composition of the vaginal microbiota. BV is caused by a significant decline in the beneficial vaginal Lactobacillus and a marked increase in the non-Lactobacillus taxa (especially Gardnerella and Atopobium). It can last for at least 1 week after sexual intercourse. BV is rare or absent among virgins. For a male partner, penile microbiota changes significantly after unprotected sex.

Pathogenic bacteria can be cultivated from the glans, the coronal sulcus, and the prepuce, as well as from the penile skin, semen, urethra, and urine. Diverse bacteria exist in human semen, regardless if the male is fertile or infertile. Anaerococcus is a biomarker for low sperm quality. Many of the semen bacteria are also found in the vagina of women with BV. Semen is a medium for the transmission of bacteria and viruses between men and women, and can contribute to sexually transmitted diseases.

There are approximately 21 million cases of BV in the United States each year, and BV can also increase the risk of HIV and poor obstetric outcomes. The microbiota in the penile skin and urethra in males who have monogamous relationships with females are very similar to the vaginal microbiota of their female partner.

Consequences of BV include:
- decrease in hydrogen peroxide-producing bacilli
- prevalence of anaerobic bacteria (Prevotella, Gardnerella, and Atopobium)
- alkalinization, fishy odor, and gray-white vaginal discharge
- increase in the rate of pelvic inflammatory disease, ectopic pregnancy, endometriosis, preterm birth, and tubal factor infertility.

Circumcision decreases the risk of BV. There is an increased rate of BV bacterial taxa in men with extramarital affairs and in women with multiple partners. Both oral and vaginal sex increase the abundance of Lactobacillus in the male oral and penile microbiota. Gingivitis has also been reported after oral sex.

A link to psychiatric disorders

Given that all forms of sexual contact (vaginal, oral, anal, or skin) can transmit microbiota bidirectionally between partners, it is vital to practice safe sex and consider a monogamous relationship rather than indiscriminate promiscuity. Unfortunately, certain psychiatric disorders, such as bipolar disorder, are associated with hypersexuality and multiple partners, which may disrupt the microbiota. This can further disrupt the diversity of an individual’s microbiome and may put them at risk for mood, anxiety, and other psychiatric disorders. Another problem is sexually transmitted infections such as gonorrhea or syphilis that require antibiotic therapy. It is well established that antibiotics kill both the bad pathogenic and the good nonpathogenic microbiota, further exacerbating dysbiosis and leading to disruptions in the microbiota-gut-brain (MGB) axis, which then results in psychiatric disorders.

The MGB axis modulates neurological processes via the vagus nerve, the major “highway” connecting the gut and brain for bidirectional traffic. The MGB axis produces microbial metabolites and immune factors that can lead to changes in brain neurotransmitters as well as neuroinflammation and psychiatric symptoms such as depression and anxiety.

Many researchers are focusing on how to exploit the microbiome to develop novel therapeutic strategies, and encouraging advances are continued on page 12
emerging. It is highly likely that dysbiosis is associated with mood and anxiety symptoms.

The bottom line: Sexual activity—whether it is heavy kissing, vaginal intercourse, oral sex, anal sex, or extensive skin contact—can lead to the exchange of microbiota. If an individual has dysbiosis, that could impact the mental health of their sexual partner(s). This raises the question of whether counseling patients about avoiding indiscriminate sex and practicing safe sex is as important for mental health as diet and exercise counseling is for physical health.

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References