



AIDS and Sexual Transmission of HIV: Vaginal Liquid with a pH of 2.8-4.2 Protects Women's Health as a Natural Antiseptic

Aleksandr L Urakov^{1*}, Natalya A Urakova², Anastasia P Stolyarenko³, Darya O Suntsova³, Ilnur I Yagudin³, Nikita M Muhutdinov³ and Varvara V Sokolova³

¹DM, Professor, Head of the Department of General and Clinical Pharmacology, Izhevsk State Medical Academy, Izhevsk, Russia

²PhD, Associate Professor of the Department of Obstetrics and Gynecology, Izhevsk State Medical Academy, Izhevsk, Russia

³Student of Izhevsk State Medical Academy, Izhevsk, Russia

***Corresponding Author:** Aleksandr L Urakov, DM, Professor, Head of the Department of General and Clinical Pharmacology, Izhevsk State Medical Academy, Izhevsk, Russia.

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HIV continues to be a serious global public health problem, with 40.1 million [33.6-48.6 million] deaths to date [1]. Yet according to the World Health Organization (WHO), there is no cure for HIV. By all accounts, sexual contact with an infected partner is the most likely cause of infection [2-4]. A woman can acquire HIV from her sexual partner through blood, semen or vaginal secretions [4,5].

It is important to stress that sexual contact with an infected partner does not result in 100% infection with HIV. This may be due, on the one hand, to the high vulnerability of HIV to some natural influences and, on the other hand, to the high physiological resistance of women to infection with HIV and micro-organisms that cause other sexually transmitted infections [6].

We believe that this fact is very important, as it can be used to adjust the HIV control strategy. The fact is that the antiviral effect on HIV of physical-chemical factors involved in the local interaction of viruses with the colloidal environment inside the vagina has not yet been fully studied. In particular, the values of certain physical-chemical factors of the natural environment inside the female vagina that can have a detrimental effect on HIV while maintaining women's health, and the reserves of the female body

in the antiviral physical-chemical opposition to HIV have not been fully specified. While this is the kind of information that can be very useful and relevant to all women on the planet, as it can improve their personal hygiene and prevent infection not only AIDS but also other sexually transmitted infections.

The following data support the validity of our assumption. On the one hand, HIV has been reported to die very rapidly outside the blood and lymphatic systems, especially when exposed to common detergents, antiseptics and disinfectants [6,7]. Moreover, antiseptics have devastating effects not only on HIV, but also on pathogens of other viral infections. In particular, antiseptic solutions of 1.25-2.5% povidone iodine have been reported to be able to inactivate coronaviruses, including SARS and MERS, in 15 seconds when injected into the nasal and/or oral cavity, without causing side effects [8]. In recent years, intrapulmonary used of an antiseptic solution of 0.3-0.5% hydrogen peroxide and 2-10% sodium bicarbonate has been suggested to control coronavirus infection [9-11]. On the other hand, it is reported that women's bodies are well protected against sexually transmitted infections, including HIV. This is supported by the fact that healthy women with healthy lifestyles, good personal hygiene and timely

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gynaecological consultations are less vulnerable to HIV infection than sick women with unhealthy lifestyles, poor personal hygiene and lack of gynaecological consultation [12-14].

Nevertheless, women still do not have a clear understanding of what exactly protects their bodies from HIV and other infectious agents and how reliable this natural protection is. This is due to the fact that professionals themselves have not yet formed a clear idea of the main natural weapon women have inherited from their ancestors, which for centuries has reliably protected women from infectious infections. Moreover, the medical community seems to be convinced that HIV (and other viral infections) are spreading rampantly among the world's population [15]. At the same time, the media echoes them in unison, which shapes public perceptions of the invincibility of HIV.

At the same time, the entire history of human development shows that people have never lived in sterile environments, but have always been surrounded by infectious agents. However, pathogens have not succeeded in destroying humanity. On the contrary, humanity has safely adapted to living in an "infectious" environment, hardening its natural defence weapon against all pathogens, without the use of special artificially created drugs!

The human body has continuously adapted to exist in an environment rich in various microorganisms throughout centuries of evolution in the natural environment of the globe. Evolution has naturally established in human body the ability to produce acids and store them in sufficient quantities in those parts of the body that are most susceptible to massive attacks of microorganisms. These areas are the female vagina and the human stomach. The fact is that microorganisms repeatedly enter the stomach through the consumption of water, food and saliva, and in the vagina through sexual intercourse, as both processes are not carried out in sterile conditions. It is no coincidence that these areas of the body are often referred to as "gateways" for infection. Today there is no doubt that the acidic colloidal fluid normally present in these cavities plays the role of a universal and reliable disinfectant, capable of immediately destroying almost any infectious agent in a single interaction and thereby maintaining human health.

Therefore, an in-depth study of the process of HIV penetration through the female genital tract remains relevant and appropriate

[12]. Moreover, we propose to take the physico-chemical properties of the vaginal fluid of healthy women of reproductive age for 100% high-quality natural "microbiocide" in order to compare all other vaginal antiseptics with this liquid, and call the comparison scale itself the normal vaginal discharge scale. The fact is that worldwide identification of HIV strains resistant to many chemotherapeutic drugs continues to increase [16,17]. Therefore, it is unlikely that new highly effective antiviral drugs from the chemotherapeutic drug group will be available in the near future. At the same time, antiseptics and disinfectants continue to readily kill many viruses, including HIV [18-20]. In particular, solutions of 0.1-0.75% povidone iodine, 0.5% hydrogen peroxide and 1% sodium hypochlorite have been reported to have virucidal activity [19,20].

The conclusion from this is that sexually transmitted pathogens are not resistant to normal vaginal fluid, antiseptics and disinfectants.

At first glance, it might seem that vaginal liquid and antiseptic solutions are completely different "drugs" and their mechanism of virucidal action is completely different. But this is not entirely true. We believe that both types of fluids (vaginal fluid and aqueous solutions of vaginal antiseptics) can reasonably be grouped into one common group, but not by their composition (in other words - not by their "formulation") and specific pharmacological activity of the main ingredients, but by aggressive physical-chemical properties that provide a non-specific sanitizing effect on pathogens inside the vagina.

Our assumption is substantiated by the following recent discovery by Russian researchers. It has been shown that the local effect of various drugs from different pharmacological groups, developing in the first seconds and minutes during local interaction with tissues at the site of application, instillation or injection and causing local irritant, inflammatory and necrotic effects, is of a universal nature, not related to the specific pharmacological activity of the main ingredients [21]. Moreover, it has been shown that one of the causes of local irritant, inflammatory and necrotic effects of dosage forms (solid, liquid and gaseous) is their excessive physical-chemical aggressiveness due to excessive hypertonic and/or hyperacidic activity by ignorance [21,22].

The fact is that blood and most tissues of the human body have alkaline activity within pH 7.4 and osmotic activity within 280-300 mosmol/L of water, so it is alkaline and isotonic activity that is normal for most microorganisms that are human pathogens. And that is why high acidic and hypertonic activity is totally abnormal and even deadly for the cells of most human organs and tissues and for pathogenic microorganisms at the same time. All this makes it very easy, in our opinion, to explain why, in healthy humans, gastric juices and vaginal fluids are highly acidic. The above presentation makes it obvious that human evolution has chosen acids to protect us from infections and has therefore placed acid solutions in the stomach and vagina.

This may explain why organic and inorganic acid solutions are officially designated as a separate group of antiseptics. It is important to emphasize that acid solutions ("acids"), as well as saline solutions ("hypertonic") belong to the antiseptics and disinfectants that have been used since ancient times as effective disinfectants for the treatment of various purulent diseases [23,24]. This may also explain why acetic acid and table salt (sodium chloride) are still the leaders in protecting various foodstuffs (including animal and fish meat) from rotting (i.e. from microbial attack).

Unfortunately, researchers have not yet been able to determine in detail all the physical-chemical properties and biological activity of the vaginal fluid in healthy women of reproductive age [25]. However, it has been established that their vagina is normally inhabited by lactic acid bacteria that constantly maintain an acidic environment through the continuous production of lactic acid [25,26]. It has also been found that over the course of each woman's life, her vaginal fluid changes its acidic activity, as the value of its acidic activity is different for each period of a woman's life. In particular, for a long period of human history, sexual intercourse was most likely to occur at night, as during the daytime men were engaged in obtaining food and were therefore absent from the home. Therefore, women with periods of increased vaginal acidity at night had a greater opportunity to maintain their health and procreation. Because of this, it is very likely that many modern women are descendants of such women and have also retained this diurnal rhythm of changing vaginal acidity. However, this remains to be investigated in the future.

Regardless, the high acidity of the vaginal fluids has the highest protective value during the female reproductive period.

It has now been established that an average up to 4 - 6 g of vaginal fluid is produced per day in women, the acidic activity of which is largely determined by the content of lactic acid bacteria and lactic acid. It has been revealed that the vaginal fluid of healthy young girls and women of reproductive age has the highest acidic activity, in the pH range of 2.8-4.2 [27]. In addition, vaginal fluid has been reported to have lower acidic activity in abnormal vaginal microbiota, as well as in earlier and older women. Specifically, in adolescent girls, vaginal acidity is pH 4.5 - 5.0, and in older postmenopausal women, pH 6.0 - 8.0 [25-30].

Therefore, an acidic vaginal fluid with a pH of 2.8-4.2 acts as a natural antiseptic in the vagina, designed to kill sexually transmitted infections, including HIV. Therefore, the presence of acid vaginal fluid with a pH of 2.8-4.2 in a woman's vagina indicates that she is less vulnerable to sexual transmission of HIV and development of AIDS than is the case with vaginal fluid with a pH greater than 4.2 (particularly at pH 6.0-8.0).

Information on the pH value of the vaginal fluids can be obtained by the woman herself by vaginal pH test (Figure 1).

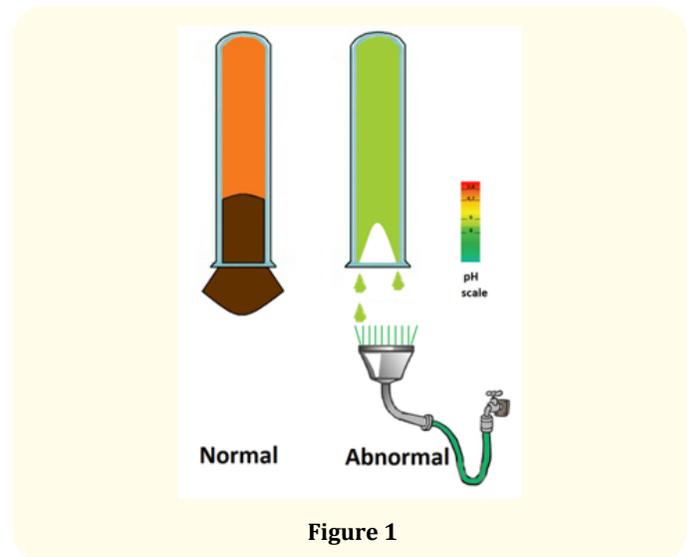


Figure 1

Bibliography

1. World Health Organization. "HIV/AIDS". (2022).
2. Kapustin DV., et al. "New aspects of the etiology and pathogenesis of HIV infection (literature review)". *Journal of Siberian Medical Sciences* 1 (2021): 92-104.
3. Wang Z., et al. "Trace the history of HIV and predict its future through genetic sequences". *Tropical Medicine and Infectious Disease* 7.8 (2022): 190.

4. Vardavas R and Blower S. "The emergence of HIV transmitted resistance in Botswana: "when will the WHO detection threshold be exceeded?". *PLoS One* 2.1 (2007): e152.
5. Peterman TA, et al. "Risk of human immunodeficiency virus transmission from heterosexual adults with transfusion-associated infections". *JAMA* 259.1 (1988): 55-58.
6. Suligoi B, et al. "The epidemic of HIV infection and AIDS, promotion of testing, and innovative strategies". *Annali dell'Istituto Superiore di Sanita* 46.1 (2010): 15-23.
7. Kawana R, et al. "Inactivation of human viruses by povidone-iodine in comparison with other antiseptics". *Dermatology (Basel, Switzerland)* 195 (1997): 29-35.
8. Frank S, et al. "Povidone-iodine use in sinonasal and oral cavities: A review of safety in the COVID-19 era". *Ear, Nose, Throat Journal* 99.9 (2020): 586-593.
9. Urakov AL and Shabanov PD. "Acute respiratory syndrome-2 (SARS-CoV-2): A solution of hydrogen peroxide and sodium bicarbonate as an expectorant for recanalization of the respiratory tract and blood oxygenation in respiratory obstruction (review)". *Reviews on Clinical Pharmacology and Drug Therapy* 19.4 (2021): 383-393.
10. Urakov AL and Urakova NA. "COVID-19: intrapulmonary injection of hydrogen peroxide solution eliminates hypoxia and normalizes respiratory biomechanics". *Russian Journal of Biomechanics* 25.4 (2021): 350-356.
11. Fisher E, et al. "COVID-19: intrapulmonary alkaline hydrogen peroxide can immediately increase blood oxygenation". *MEDICINSKI ČASOPIS* 55.4 (2021): 135-138.
12. Abdool Karim Q, et al. "Preventing HIV infection in women: a global health imperative". *Clinical Infectious Diseases: an Official Publication of the Infectious Diseases Society of America* 50 (2010): S122-S129.
13. GBD 2019 Tuberculosis Collaborators. "Global, regional, and national sex differences in the global burden of tuberculosis by HIV status, 1990-2019: results from the Global Burden of Disease Study 2019". *The Lancet Infectious Diseases* 22.2 (2022): 222-241.
14. Lan CW, et al. "Alcohol and sexual risk reduction interventions among people living in Russia: a systematic review and meta-analysis". *AIDS and Behavior* 18.10 (2014): 1835-1846.
15. Guinan ME and Leviton L. "Prevention of HIV infection in women: overcoming barriers". *Journal of the American Medical Women's Association*.1972 50.3-4 (1995): 74-77.
16. Naziri H, et al. "Antiretroviral drug resistance mutations in naïve and experienced patients in Shiraz, Iran, 2014". *Archives of Virology* 161.9 (2016): 2503-2509.
17. Liu Z, et al. "Insights into the mechanism of drug resistance: X-ray structure analysis of multi-drug resistant HIV-1 protease ritonavir complex". *Biochemical and Biophysical Research Communications* 431.2 (2013): 232-238.
18. Kampf G. "Efficacy of biocidal agents and disinfectants against the monkeypox virus and other orthopoxviruses". *The Journal of Hospital Infection* 127 (2022): 101-110.
19. Fadaei A. "Viral Inactivation with Emphasis on SARS-CoV-2 Using Physical and Chemical Disinfectants". *The Scientific World Journal* (2021): 9342748.
20. Kampf G, et al. "Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents". *The Journal of Hospital Infection* 104.3 (2020): 246-251.
21. Urakov A, et al. "Post-injection complications. Nicolau syndrome as a consequence of local irritant effects of drugs, including antiseptics, local anesthetics, NSAIDs, steroids and anticoagulants". *Journal of Pharmaceutical Research International* 34.33A (2022): 26-36.
22. Urakov AL. "Nicolau syndrome: Necrotic activity of drugs and ways to prevent post-injection abscesses (In memory of Professor László A Gömze)". *Creative Surgery and Oncology* 12.2 (2022): 159-163.
23. Katzung B and Trevor A. "Basic and Clinical Pharmacology". 15th Edition. (2020).
24. Bodduluri VP, et al. "Physico-chemical properties of antiseptics in surgery: What is not taken into account in treating long-term non-healing wounds". *Creative Surgery and Oncology* 11.3 (2021): 256-259.
25. Ravel J, et al. "Vaginal microbiome of reproductive-age women". *Proceedings of the National Academy of Sciences of the United States of America* 108.1 (2011): 4680-4687.
26. Ng K, et al. "In vivo oxygen, temperature and pH dynamics in the female reproductive tract and their importance in human conception: a systematic review". *Human Reproduction Update* 24.1 (2018): 15-34.

27. O'Hanlon DE., *et al.* "Vaginal pH and microbicidal lactic acid when lactobacilli dominate the microbiota". *PLoS One* 8.11 (2013): e80074.
28. O'Hanlon DE., *et al.* "Vaginal pH measured in vivo: lactobacilli determine pH and lactic acid concentration". *BMC Microbiology* 19.1 (2019): 13.
29. Boskey ER., *et al.* "Origins of vaginal acidity: high D/L lactate ratio is consistent with bacteria being the primary source". *Human Reproduction (Oxford, England)* 16.9 (2001): 1809-1813.
30. Lykke MR., *et al.* "Vaginal, cervical and uterine pH in women with normal and abnormal vaginal microbiota". *Pathogens (Basel, Switzerland)* 10.2 (2021): 90.