

Role of female intimate hygiene in vulvovaginal health: Global hygiene practices and product usage

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Abstract

Women use various feminine hygiene products, often as part of their daily cleansing routine; however, there is a paucity of published medical literature related to the external vulva and how personal hygiene practices can affect it. This review article provides background information on the physiological changes that occur during women's lives and reviews the relevance of transient and resident microbiota as they relate to common vaginal and vulvar disorders. It also discusses the need for female intimate hygiene, common practices of feminine hygiene from a global perspective, and the potential benefits of using suitable external, topical feminine vulvar washes to minimize the risk of vulvovaginal disorders and to improve overall intimate health in women around the world. Supported by international guidelines, daily gentle cleansing of the vulva is an important aspect of feminine hygiene and overall intimate health. Women should be encouraged to choose a carefully formulated and clinically tested external wash that provides targeted antimicrobial and other health benefits without negatively impacting on the natural vulvovaginal microbiota.

Keywords

female intimate hygiene, feminine hygiene guidelines, intimate washes/cleansing products, microbiota, vulvovaginal

Date received: 13 January 2017; revised: 21 April 2017; accepted: 14 August 2017

Introduction

Worldwide, women use a variety of intimate hygiene products as part of their daily cleansing routine. These practices are impacted by many factors, including personal preference, cultural norms, religious practices, and guidance from health care professionals. Although there is abundant literature on the vaginal environment, little is known about the vulvar area and how personal hygiene practices can affect its biological and physiological stability. More specifically, there is little published in the medical literature about intimate feminine hygiene as it relates to external topical washes and the role intimate feminine hygiene plays in managing unpleasant symptoms and supporting overall intimate health.

This article describes vulvovaginal physiology and the relevance of transient and resident microbiota as it relates to common vulvovaginal disorders. It also reviews global feminine hygiene practices and the potential benefits and risks of external feminine vulvar washes in overall feminine intimate health.

There has been a recent increase in female intimate wash products on the market, making this topic timely and relevant to a wide range of women and their health care professionals.

Physiology of the vulvovaginal area

The vulvovaginal area

The vulva is the first line of defense to protect the genital tract from infection. Contaminants often collect in the vulvar folds, and increased moisture, sweating, menses, and hormonal fluctuations influence vulvar microbial growth

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Table 1. Physiological characteristics of the vulvar and vaginal area.

	Vulva	Vagina
Tissue structure	Mons pubis, labia, clitoris, and perineum: keratinized, stratified squamous structure with sweat glands, sebaceous glands, and hair follicles Vulvar vestibule mucosa: non-keratinized	Fibromuscular canal composed mainly of smooth muscle with a lining of aglandular, non-keratinized stratified squamous epithelium
pH	3.5–4.7	Premenarche: 7.0 Reproductive age: 3.8–4.4 Menopause: 6.5–7.0 (without hormone therapy); 4.5–5.0 (with hormone replacement therapy)
Microflora	Lipophilic and non-lipophilic diphtheroids; coagulase-negative staphylococci, micrococci, and lactobacilli; streptococci; Gram-negative rods; Gram-negative bacilli; <i>Neisseria</i> ; <i>Gardnerella vaginalis</i> ; and/or yeasts	<i>Lactobacillus</i> spp., <i>Atopobium vaginae</i> , <i>Megasphaera</i> spp., <i>Leptotrichia</i> spp., <i>Gardnerella vaginalis</i> , <i>Staphylococcus aureus</i> , and/or <i>Candida albicans</i>

and species balance, potentially resulting in odor and vulvovaginal infection.

Vulvar skin differs from other skin sites in hydration, friction, permeability, and visually discernible irritation and is more susceptible to topical agents than forearm skin because of its increased hydration, occlusion, and frictional properties.^{1–5} The non-keratinized vulvar vestibule is likely to be more permeable than keratinized skin.¹ Genital skin is unique in that it is covered by a thin stratum corneum containing large hair follicles, making it easier for microbial and other substances to permeate the skin.⁶

The vagina is the fibromuscular canal extending from its external opening in the vulva to the cervix and is composed mainly of smooth muscle covered with a non-keratinized epithelial lining, which, until the menopause, is thick, with folds kept moist by fluid secreted through the vaginal wall and mucus from cervical and vestibular glands (Table 1).

Microflora

Although knowledge about the microbial composition of the external vulvar area is in its infancy, maintenance of the microbiota ratio is anticipated to play a key role in overall vulvovaginal health. Data have shown that the normal vulvar flora includes vaginal, urethral, and colonic microbes as well as microbes characteristic of intertriginous skin.^{7,8} Various studies of healthy women have shown that the microbiota of the vulva is diverse, with no single species common to all women and these may include staphylococci, micrococci, diphtheroids, lactobacilli, streptococci, Gram-negative rods, yeasts, and species of fecal origin.^{7,9–11} Vulvar flora may also affect the proliferation of exogenous pathogens that cause vaginal and urinary tract infections.⁷

The vaginal microflora composition is better understood. It was previously thought that a healthy vagina was dominated by *Lactobacillus*, which is a non-sporing,

Gram-positive bacilli that produce lactic acid, resulting in an acidic environment (pH 3–4).¹² These *Lactobacilli* prevent colonization by other bacteria in the vagina (including pathogens) via competition for epithelial cell receptors and through inhibition of growth by generation of antimicrobial compounds in collaboration with innate host defenses (e.g. periodic hormonal cycling promoting glycogen release and constant sloughing of bacteria-containing epithelial cells) to maintain a healthy vaginal ecosystem.¹³ However, the composition of healthy vaginal flora is more variable than initially thought, and in some healthy women, *Lactobacilli* are absent and replaced by other lactic acid-producing bacteria, such as *Atopobium vaginae*, *Megasphaera* spp., and/or *Leptotrichia* spp. In some cases, asymptomatic, reproductive-age women are colonized by potentially pathogenic species (e.g. *Gardnerella vaginalis*, *Staphylococcus aureus*, *Candida albicans*),¹⁴ and thus, the definition of healthy versus unhealthy vaginal microbiome is complex.¹³

The composition of the vaginal microflora fluctuates as a function of internal factors (age, hormonal shifts (e.g. during menarche, menses, and pregnancy), and infections)¹³ and various external factors (e.g. hygiene practices, sexual intercourse, the use of antibiotics, and hormone replacement therapy).¹⁵ Several studies suggest differences in normal vaginal flora based on ethnicity,¹⁶ with communities dominated by *Lactobacillus* spp. in 80.2% and 89.7% of Asian and White women, respectively, but in only 59.6% and 61.9% of Hispanic and Black women, respectively.¹⁶ However, these differences may be partially attributed to differences in hygiene practices among various ethnic groups.¹⁷ A longitudinal study assessed the vaginal microbiome throughout full-term, uncomplicated pregnancies and found low diversity (two species dominated; *Lactobacillus crispatus* and *Lactobacillus iners*) and high stability throughout pregnancy.¹⁸ An individual's skin microbiome appears to be affected by birth mode^{19,20} (cesarean vs vaginal birth),

which may impact immune development²¹ and have longer term implications for microbial diversity. Dominguez-Bello and colleagues²² demonstrated that the skin microbiome of cesarean-born infants can, at least in part (through vaginal microbial transfer), be restored to what would be expected following a vaginal birth; however, additional studies are needed to elucidate long-term health benefits.

Besides vaginal infections (discussed later), another negative effect of vaginal microbiome disturbance is that bacteria can alter the innate immune response and barrier properties of the human vaginal epithelia in a species-specific manner, requiring host epithelial cells to discriminate between commensal and pathogenic bacteria.²³ These interactions can lead to the development and progression of reproductive disease by disrupting the immune barrier.

pH

Vulvar pH could be expected to fall between values for the skin (estimated at pH 4.7)²⁴ and the vagina (average pH 3.5),²⁵ with reports ranging from 3.8 to 4.2 during the menstrual cycle.²⁶ Various factors may affect vulvar pH, including endogenous factors (e.g. humidity, sweat, vaginal discharge, menstruation, urine and fecal contamination, anatomical folding, genetics, and age) and exogenous factors (e.g. soap, detergents, cosmetic products, lubricants and spermicides, occlusion with tight clothing or sanitary pads, shaving, and depilation products). Prolonged drying of the vulvar skin has been shown to significantly reduce its pH.²⁷ Vaginal pH correlates with total lactate concentration as the vaginal mucosa is a rich source of lactic acid, a by-product of estrogen-regulated anaerobic glucose metabolism.²⁸ *Lactobacillus* bacteria and other species also metabolize extracellular glycogen into lactic acid. The vaginal pH is therefore determined by the sum total of lactic acid production by the vaginal mucosa and microbial flora, but vaginal metabolism may have more influence than microbial metabolism.²⁸ Vaginal pH seems also to vary with ethnicity. For example, a study found that the vaginal pH of healthy reproductive-age Hispanic (pH 5.0 ± 0.59) and Black (pH 4.7 ± 1.04) women was much less acidic than that of White (pH 4.2 ± 0.3) and Asian (pH 4.4 ± 0.59) women, reflecting the higher prevalence of vaginal bacterial communities not dominated by *Lactobacillus* spp. in these two ethnic groups.¹⁶

Vaginal discharge

For a year or two before puberty, until after menopause, it is normal and healthy for a woman to produce a vaginal discharge, consisting of bacteria and desquamated epithelial cells that slough from the vaginal walls together with mucus and fluid (plasma) produced by the cervix and vagina. The quantity and texture of this change during the menstrual cycle: vaginal discharge is thick, sticky, and

hostile to sperm at the beginning and end of the menstrual cycle when estrogen is low and gets progressively clearer, watery, and more stretchy as estrogen levels rise prior to ovulation.^{29,30}

Protection from infections

The normal vaginal flora, acidic vaginal pH, and vaginal discharge are all components of the innate defense mechanisms that protect against vulvovaginal infections. Resident bacteria help maintain an acidic pH and compete with exogenous pathogens to adhere to the vaginal mucosa. They also fend off pathogens by producing antimicrobial compounds, such as bacteriocin. Vaginal fluids collected from five women showed in vitro activity against non-resident bacterial species, including *Escherichia coli* and Group B *Streptococcus*.³¹ Protection against Group B *Streptococcus* is particularly important for pregnant women as it often colonizes the vagina through the gastrointestinal tract and increases the risk of preterm delivery, neonatal meningitis, and even fetal death. It may also cause asymptomatic bacteriuria and urinary tract infections, upper genital tract infections, and postpartum endometritis.

In a study of pregnant women, elevated vaginal pH without current vaginal infection was significantly associated with preterm birth,³² posing obstetrical challenges. Elevated vaginal pH has also been associated with a 30% greater risk of infection with multiple human papillomavirus (HPV) types and with low-grade squamous intraepithelial lesions (LSILs) in a large population-based study.³³

Following menopause, and as estrogen levels fall, vaginal pH increases,³⁴ and this alkaline pH is associated with increased colonization with pathogenic microbes.²⁸ Vulvar skin disorders are also more prevalent after the menopause.

The importance of vaginal lactic acid needs to be emphasized as it correlates with vaginal health, inhibits the growth of bacteria associated with bacterial vaginosis,²⁵ and possibly plays a role in the local immune defense.³⁵ Vaginal epithelial cells also produce a range of compounds with antimicrobial activity (e.g. lysozyme and lactoferrin),³¹ and rapid vaginal epithelium turnover serves as another defense mechanism.³⁶ Recent research has also highlighted the important function of various factors in the innate and adaptive immunity of the female genital tract, including Toll-like receptors, surfactant protein A, complement system, β -defensins, and nitric oxide.³⁷⁻⁴⁰

Common vulvovaginal disorders

Vulvovaginal infections

Vulvovaginal disease is often caused by multiple factors. Many factors, such as immune deficiency, hormonal changes, stress, or use of a vaginal douche or soap to clean the vagina, may upset the normal flora and cause infections.

The vulva is susceptible to dermatitis and other dermatological conditions, particularly when the barrier function of the skin is compromised by factors that constitute the normal vulvar environment, namely, moisture (urine, vaginal discharge), enzymes (stool residue), friction, and heat.^{41,42} Signs and symptoms of vulvovaginal disorders are common (e.g. pruritus, pain and discomfort, changes in skin color and texture)⁴³ and can have significant impact on quality of life. Infections are often polymicrobial, with both aerobic and anaerobic bacteria involved.

Vulvovaginal candidiasis, characterized by an odorless, white, curdy discharge and local irritation, is most common during the reproductive years.⁴⁴⁻⁴⁶ The vulvar skin has an irregular or asymmetrical pattern, mild to intense erythema, edema of the labia minora, and possible edema of the labia majora. Triggers for symptomatic infection include pregnancy, poorly controlled diabetes, and recent antibiotic use. *C. albicans*, part of the normal flora, is the most common strain of *Candida* involved.

Bacterial vaginosis is the most frequent cause of abnormal vaginal discharge among women of reproductive age and can arise and remit spontaneously.^{47,48} It is an overgrowth of predominantly anaerobic bacteria found in the normal flora, including *G. vaginalis*, *Prevotella* spp., *Mycoplasma hominis*, and *Mobiluncus* spp., with a loss of normal *Lactobacilli*. Bacterial vaginosis is characterized by a white/gray homogeneous coating of the vaginal walls and vulva, with a fishy odor and vaginal pH >4.5. Recurrence can be a problem⁴⁹ due to the bacteria's adaptive mechanism and normal vaginal flora not being re-established properly. In fact, as part of the Vaginal Human Microbiome Project, microbiome diversity was linked to the incidence of bacterial vaginosis, with African American women 2.9 times more likely to be diagnosed with bacterial vaginosis versus women of European ancestry, likely due to differences in their "normal" vaginal flora.⁵⁰ An extensive review confirmed that *Lactobacilli*-dominated molecular vaginal microbiota corresponded to a healthy vaginal microenvironment and that bacterial vaginosis should be described as a polybacterial dysbiosis (microbial imbalance)⁵¹ where *Lactobacillus* load decreases and diversity and bacterial load of other anaerobic bacteria increases. Dysbiosis has been consistently associated with increased risk of human immunodeficiency virus (HIV), HPV, herpes simplex virus–type 2 (HSV-2), and *Trichomonas vaginalis* infection.^{15,51,52}

Vulvovaginal itching and abnormal vaginal discharge

In qualitative interviews of 10 women with various vulvar skin conditions,⁵³ itching was the most common and troublesome symptom, leading to sleep disturbances and decreased quality of life. Itching can be caused by vaginal infections, such as vaginal trichomonas or vulvovaginal candidiasis, sexually transmitted diseases (e.g. HSV), and

vulvar disorders (e.g. contact dermatitis, vulvar psoriasis, lichen sclerosus). Malodorous vaginal discharge is often associated with infectious (e.g. bacterial vaginosis, vulvar ulceration (infectious ulcerations such as herpes or trichomonas or non-infectious ulcerations such as Behcet's disease or lichen planus that can become supra-infected with *Staphylococcus*), pelvic inflammatory disease, hidradenitis suppurativa) or non-infectious (e.g. excessive perspiration, urinary or fecal incontinence, poor hygiene) causes of vaginitis or vulvar disease.

Intimate feminine hygiene

Many factors contribute to feminine hygiene practices, including personal preference and cultural and societal influences. Although vaginal douching is common for many women, there are no known confirmed health benefits, and this may undermine the innate immune defenses by altering the normal vaginal flora and predisposing women to infections.^{8,54,55} Vaginal douching has also been associated with an increased risk of pelvic inflammatory disease, endometriosis, and sexually transmitted infections.⁵⁴ In contrast, routine washing of the vulva is desirable to prevent accumulation of vaginal discharge, sweat, urine, and fecal contamination to prevent offensive body odor. Although vulvar cleansing may be a useful adjunct to medical treatment, vulvar cleansing products are not designed to treat infections. There has, however, been a surge in intimate hygiene products for cleanliness and odor control, but some may upset pH in the vulvovaginal area, which will affect the composition of the normal vulvovaginal microbiota needed for protection against infection.⁵⁶

Guidelines on feminine hygiene

The topic of intimate feminine hygiene has not received enough attention in the medical literature, thus making education a priority. In 2011, the Royal College of Obstetricians and Gynaecologists (RCOG) performed extensive literature searches to develop evidence-based guidelines intended for the general gynecologist for improving initial assessment and care of vulvar skin disorders (Box 1).⁵⁷ Similarly, a committee from the Middle East and Central Asia (MECA) conducted extensive literature searches to form recommendations on female genital hygiene (Box 2).⁵⁸ Both guidelines suggest daily vulva cleansing with a gentle hypoallergenic liquid wash.

Common practices around the world

Social, culture, and religious influences. Differences in feminine hygiene practices are related to differences in cultural beliefs and religious practices. Studies have found that Afro-Caribbean immigrants are more likely to wash the vulva with bubble bath or antiseptic than Caucasian women, and this is consistent with the belief that rigorous

Box 1. RCOG guidance on care of vulvar skin.⁵⁷

- Most women with a vulvar disorder (e.g. contact dermatitis, vulvovaginitis) need advice about vulvar skin care and how to avoid contact irritants.
- Washing with water can cause dry skin and make itching worse. Use a small amount of soap substitute and water to clean the vulva.
- Shower rather than bathe and clean the vulva only once a day. Overcleaning can aggravate vulvar symptoms (e.g. symptoms of contact dermatitis). An emollient may be helpful.
- Avoid using sponges or flannels. Just use your hand. Gently pat dry with a soft towel.
- Wear loose-fitting silk or cotton underwear. Avoid close-fitting clothes. Wear loose-fitting trousers or skirts and replace tights with stockings. You may prefer to wear long skirts without underwear.
- Sleep without underwear.
- Avoid fabric conditioners and biological washing powders. Consider washing underwear separately in a non-biological laundry detergent.
- Avoid using soap, shower gel, scrubs, bubble bath, deodorant, baby wipes, or douches on the vulva.
- Some over-the-counter creams, including baby or nappy creams, herbal creams (e.g. tea tree oil, aloe vera), and “thrush” treatments, may include irritants.
- Avoid using panty liners or sanitary towels on a regular basis.
- Avoid antiseptic (as a cream or added to bath water) in the vulvar area.
- Wear white or light colored underwear. Dark textile dyes (black, navy) may cause an allergy, but if new underwear is laundered before use, it will be less likely to cause a problem.
- Avoid using colored toilet paper.
- Avoid wearing nail varnish on fingernails if you tend to scratch your skin.

RCOG: Royal College of Obstetricians and Gynaecologists.

Box 2. MECA guidelines on female genital hygiene.⁵⁸

- Women of all ages require daily intimate hygiene to keep their genital area clean.
- The vulva is susceptible to contact dermatitis. Take care to avoid contact with irritants.
- Use a hypoallergenic liquid wash with mild detergency and pH 4.2 to 5.6.
- Avoid bar soaps and bubble baths, which are abrasive and have a more alkaline pH.
- Lactic acid-based liquids with an acidic pH may augment skin homeostasis and have been shown to be helpful in vaginal infections as an adjuvant therapy but not as a treatment.
- Vaginal douching is not recommended.
- Wear loose-fitting cotton underwear and minimize wearing tight clothes.
- Change underwear frequently.
- Do not use talcum powder.
- Use any perfumes and deodorants sparingly (after allergy testing).
- Change tampons and sanitary pads frequently.
- Before and after intercourse, cleanse the vulva from front to back, especially the clitoris and vulval folds.
- Do not cleanse the vulva vigorously or irrigate the vagina.
- Use a safe method of pubic hair removal and take care to avoid sensitivity and scarring.
- Postpartum care should include frequent cleansing, drying, and using pads as necessary. Maintain dryness over any sutures. Do not use any creams.
- Wash hands prior to children's genital care. Use separate towels.

MECA: Middle East and Central Asia.

body cleansing is necessary for health and well-being.²⁶ Some Orthodox Jewish women perform ritual baths (mikveh) following their menstrual periods or after childbirth to become ritually pure, while the Muslim faith teaches a bathing ritual called full ablution (ghusl) for men and women as an act of purification after sexual intercourse or menstruation. In Mozambique and South Africa, some women internally cleanse their vaginas with lemon juice, salt water, or vinegar to eliminate vaginal discharge and “treat” sexually transmitted diseases.⁵⁹

The use of conventional panty liners (i.e. with a non-breathable back sheet) is a widespread practice but can increase the temperature, skin surface moisture, and pH of

the vulvar skin, thereby significantly changing the microclimate of the vulva.⁶⁰

Extensive pubic hair removal, which was typically only done for cultural and religious reasons, has become more common for aesthetic reasons.^{26,61,62} Hair removal may cause skin microtrauma and subsequent spread of infectious agents throughout the pubic area.⁶¹ Severe consequences may include vulvovaginal irritation and infection and spread of sexually transmitted infections (e.g. molluscum contagiosum and HSV).^{63–65} In a recent study of pubic hair removal practices, over half of women reported removing all pubic hair and the majority experienced one or more complications due to removal.⁶³ Pubic hair serves

Table 2. A summary of current feminine intimate hygiene products on the market.⁷⁰

	Vaginal products	Vulvar products
Product formats	Lubricant Moisturizer Tablet Estrogen product Self-diagnostic kits for pH or hydration Others: topical prebiotics/probiotics	Liquid wash (gel) Wipes Bar soap Spray Foam Others: talcum powder, cream, and deodorant
Key actives	Lactic acid Glycerin Vitamin Naturals: lavender, chamomile, aloe, etc	Lactic acid Glycerin Vitamin Naturals: green tea
Characteristics	Botanical/herbal Gentle pH balance Dermatologically tested Odor-neutralizing Hypoallergenic Soap-free, paraben-free, fragrance-free	Antibacterial pH neutral Hypoallergenic Odor-neutralizing Moisturizing Respect microflora Suitable for everyday use
Avoid	Douching Oil-based lubricant	Soap or harsh surfactant Disruption of pH or natural flora

as a physical barrier for the vulvovaginal area and complete removal could lead to increased susceptibility to infections, although more data are needed to establish this link.

Vulvovaginal products summary. Martin Hilber and colleagues⁶⁶ investigated vaginal practices in Indonesia, Mozambique, South Africa, and Thailand and found that women used a range of products, from traditional herbal-type preparations (more common in African sites) to commercial products such as douches, soaps, and vaginal creams (more common in Asian sites). In a cross-sectional study of personal hygiene habits/practices in postmenopausal women, approximately half of women reported using at least one and one-third reported using at least two over-the-counter vulvovaginal treatments in the previous 3 months (e.g. barrier treatments, topical anesthetics, powders, antifungals).⁶⁷ Preclinical testing of 10 vaginal lubricant products showed that seven had an acidic pH and three had a neutral pH; six of the products were hyperosmolar, two were nearly iso-osmolar, and two were hypo-osmolar.⁶⁸ In a randomized placebo-controlled study of a vaginal topical pH-balanced gel in breast cancer survivors, the vaginal pH-balanced gel decreased vaginal pH and relieved vulvovaginal symptoms significantly better than the placebo gel.⁶⁹ A search on the latest vulvovaginal products launched in the past 3 years revealed that multiple formats exist in the marketplace, including soaps, body washes, foam, premoistened wipes, powders, and deodorant sprays. Key ingredients include lactic acid, glycerin, and a variety of natural extracts. These products claim to have efficacy in odor-neutralizing, moisturizing, or antibacterial activity (Table 2).

Scientific support for a properly designed feminine wash. Although common sense dictates that good feminine hygiene is desirable and healthy, no systematic trials have evaluated the health impact of vulvar hygiene. In a study of 500 women in Iran, poor menstrual and vaginal hygiene practices were significantly correlated with bacterial vaginosis.⁷¹ Anand et al.⁷² used data from a household survey and discovered that women who used unhygienic methods during menstruation (anything other than a sanitary pad or locally prepared napkin) were 1.04 times more likely to report symptoms of reproductive tract infections and 1.3 times more likely to have an abnormal vaginal discharge, including itching, vulvar irritation, lower abdomen pain, pains during urination or defecation, and low back pain. This highlights the need for safe and hygienic practices for women worldwide. In another study, women with vulvar use of bubble bath were twice as likely to have bacterial vaginosis than women who did not use this product, and bacterial vaginosis was three times more common in women using antiseptic solutions on the vulva or in the vagina and six times more common in women using a douching agent.¹⁷ Washing with water alone or with harsh surfactants can be abrasive, may impact the local flora, and could lead to dry skin and vulvar itching, thereby increasing the risk of infection. A recent *in vitro* study suggested that some vaginal products may be harmful to *Lactobacillus* bacteria and alter the vaginal immune environment and therefore should be used with caution.⁵⁶

Since harsh soaps may irritate the vulvar skin and mucous membranes and provoke or exacerbate vulvar dermatitis, feminine wash products should be formulated and tested specifically for the vulvar area to ensure that they do

not cause skin irritation or sensitization. Bahamondes and colleagues⁷³ demonstrated that using a lactic acid plus lactoserum liquid soap (~pH 4) for vulvar cleansing may help prevent bacterial vaginosis recurrence after oral metronidazole. In a large study during which women were asked to use feminine wash products containing natural plant extracts for 4 weeks, a positive clinical effect was shown favoring reduction of vaginal pH and improvement of symptoms and quality of sexual activity compared with pretreatment.^{74,75} Another study demonstrated that a feminine intimate hygiene deodorant spray with or without antibacterial components (0.01% or 0.02% chlorhexidine) did not significantly affect perivaginal microflora¹¹; however, the study was done before molecular identification techniques such as 16s ribosomal RNA (rRNA) microbiome sequencing and shotgun metagenomics became readily available.

Taken together, these data demonstrate the importance of appropriate female intimate hygiene using properly designed and tested products with key attributes including hypoallergenic, soap-free, pH friendly, mild cleanser, no irritants, protection against dryness, and maintenance of balanced microflora. In many cases, proper intimate feminine hygiene can help prevent or relieve the troublesome symptoms of itching and abnormal vaginal discharge and improve overall well-being.

Conclusion

Women regularly use intimate hygiene products as part of their daily cleansing routine. Currently, there are many different intimate feminine hygiene products that may be used for cleanliness and/or odor control, but some can alter the normal pH level/microbiota needed for protection against infection. Although there is much published literature on the internal vaginal environment, there is relatively limited information related to the external vulva and how intimate personal hygiene practices can affect it. Thus, education about the importance of, and potential risks associated with, female intimate hygiene is an important priority for both health care professionals and women to advance overall intimate health and hygiene.

Gentle vulvar cleansing is desirable, and evidence suggests that it is an important aspect of female intimate hygiene and overall vulvovaginal health. Because of the risks associated with internal washing/douching, external feminine washes are considered more appropriate for intimate health, particularly those containing lactic acid, with an acidic pH that augments skin homeostasis and may serve as a helpful adjunct therapy in women with vaginal infections or taking antibiotics. Vulvar cleansing may be a useful adjunct for women with odorous vaginal discharge, and daily use of a feminine wash may reduce the risk of recurrence of bacterial vaginosis. In addition, clinical practice guidelines recommend women to use a pH-balanced hypoallergenic

cleansing agent for daily vulvar cleansing. These external washes need to be carefully formulated for mild, gentle cleansing without impacting the natural flora, particularly in cultures where women may use these products frequently. It is also important for intimate feminine hygiene products to be assessed clinically to ensure that they are well tolerated and provide targeted antimicrobial and other health benefits without negatively impacting the natural vulvovaginal microbiota.

Future perspective

A properly designed feminine hygiene product should have targeted antimicrobial activity, mitigating transient pathogen invasion (such as Group B *Streptococcus*) while supporting the commensal flora. In light of the recent American College of Obstetricians and Gynecologists (ACOG) guideline⁷⁶ against vaginal seeding (a practice of transferring vaginal fluids to an infant born via cesarean delivery) due to lack of established safety and benefits, what is the future direction for restoring a cesarean-born baby's skin microbiome? It will be interesting to observe whether start-up companies will find a better alternative to vaginal seeding using defined combinations of customized vaginal bacteria. Considering the increasing amount of research and data in the vulvovaginal microbiome field, should the future MECA and RCOG guidelines evolve to incorporate this very important aspect of vulvovaginal health? With the rapidly developing field of microbiome research, therapeutics, and diagnostics, we can expect to see more product offerings that will not only maintain the innate vulvovaginal microflora but also selectively boost the beneficial strains to enhance immunity against pathogenic infections.

Executive summary

- There is little published in the medical literature about intimate feminine hygiene as it relates to external topical washes and the role intimate feminine hygiene plays in managing unpleasant symptoms and supporting overall intimate health.

Physiology of the vulvovaginal area

- The vulva is the first line of defense to protect the genital tract from infection.
- Although knowledge about the microbial composition of the external vulvar area is in its infancy, maintenance of the microbiota ratio is anticipated to play a key role in overall vulvovaginal health.
- The normal vaginal flora, acidic vaginal pH, and vaginal discharge are all components of the innate defense mechanisms that protect against vulvovaginal infections.

Vulvovaginal infections

- Many factors, such as immune deficiency, hormonal changes, stress, or use of a vaginal douche or soap to clean the vagina, may upset the normal flora and cause infections.

Intimate feminine hygiene

- The topic of intimate feminine hygiene has not received enough attention in the medical literature, thus making education a priority.
- Differences in feminine hygiene practices are related to differences in cultural beliefs and religious practices.
- Although common sense dictates that good feminine hygiene is desirable and healthy, no systematic trials have evaluated the health impact of vulvar hygiene.
- Since harsh soaps may irritate the vulvar skin and mucous membranes and provoke or exacerbate vulvar dermatitis, feminine wash products should be formulated and tested specifically for the vulvar area to ensure that they do not cause skin irritation or sensitization.
- Appropriate female intimate hygiene using properly designed and tested products with key attributes including hypoallergenic, soap-free, pH friendly, mild cleanser, no irritants, protection against dryness, and maintenance of balanced microflora is important.

Acknowledgements

The authors acknowledge Sarah de Szalay and Dr David Hicks for critically reviewing this manuscript. Writing and editorial support were provided by Ashley O'Dunne, PhD, of MedErgy. Reckitt Benckiser LLC (RB) was given the opportunity to review the manuscript for medical and scientific accuracy as well as intellectual property considerations. The authors meet criteria for authorship as recommended by the International Committee of Medical Journal Editors (ICMJE). All authors contributed to the concept or design of the work, development of content, provided critical review and input, provided final approval, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Declaration of conflicting interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Y.C., E.B., and J.R. are employees of Reckitt Benckiser LLC (RB). S.E.E. has served as a consultant for RB.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: Writing and editorial support were funded by Reckitt Benckiser LLC (RB).

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