Original Article

A study of biophysical profile of inguinal skin: An implication for health and disease

Puneet Bhargava, Heena Singdia, Shivi Nijhawan, Deepak K. Mathur, Rishi K. Bhargava
Department of Dermatology, SMS Medical College, Jaipur, Rajasthan, India

Address for correspondence:
Dr. Heena Singdia, Room 404, SMS Girls Hostel, SMS Medical College and Attached Hospitals, JLN Marg, Jaipur - 302 004, Rajasthan, India.
E-mail: heenasingdia@gmail.com

Abstract

Context: Inguinal skin is prone to various infectious dermatological conditions such as erythrasma, intertrigo, hidradenitis suppurativa, folliculitis, dermatophytic infection, and various sexually transmitted diseases, as compared to the skin elsewhere. **Aim:** Our study attempts to compare the biophysical profile parameters (BPPs) of the genital skin with that of the rest of the body, while taking skin of the upper back as control. It also attempts to find out if there is a difference in BPPs of the two sites and that how the change in the BPPs, bring about change in microbiome and make inguinal skin more prone to infections. **Materials and Methods:** This was a hospital-based comparative study conducted over 976 patients (600 males and 376 females) of age group 18–60 years, where BPP parameters such as hydration, skin pH, transepidermal water loss (TEWL), and sebum content were measured over the skin of the upper back and right inguinal region, and the results were summarized and presented as proportions (%). Chi-square test was used to compare abnormal findings. $P \leq 0.05$ was taken as statistically significant. MedCalc 16.4 version software was used for all statistical calculations. **Results:** Significant difference was noted in skin pH and TEWL, where P value came out to be <0.05, which was statistically significant, whereas there was minimal difference in sebum content and skin hydration in both the areas, in males and females. **Conclusion:** Raised skin pH disturbs organization of lipid bilayers (disturbed barrier), decreases lipid processing (impaired SC cohesion), and increases serine protease activity (reduced AMP). Increased TEWL (defect in physical barrier) and decreased hydration predispose the genital skin to infections. Use of pH buffered solutions (3–4), barrier repair creams containing ceramides, and barrier protective creams with dimethicone can help prevent these inguinal dermatoses.

Key words: Biophysical profile parameters, inguinal infections, moisturizers, physiological lipid-based therapy, skin barrier

INTRODUCTION

Inguinal region is defined as an area enclosed within anterior superior iliac spine superolaterally, pubic tubercle medially, thighs inferiorly, and bounded by anterior abdominal wall anteriorly.[1]

It includes the skin of external genitalia and extragenital area.

Access this article online

Quick Response Code:

Website: www.ijstd.org

DOI: 10.4103/ijstd.IJSTD_101_19

Inguinal region presents with certain unique and perplexing complex characteristics compared to other regions of the body.

Inguinal skin has high concentration of active apocrine glands and sebaceous glands (400–900/

How to cite this article: Bhargava P, Singdia H, Nijhawan S, Mathur DK, Bhargava RK. A study of biophysical profile of inguinal skin: An implication for health and disease. Indian J Sex Transm Dis 2021;42:7-13.

Submitted: 28-Nov-2019 **Revised:** 28-Jul-2020
Accepted: 12-Oct-2020 **Published:** 03-May-2021

cm^2)[2] and also has higher resting body sweat of 0.12 mg/cm^2 /min as compared to rest of the body.[3] Downregulation of neuropeptides such as CGRP, substance P and neuronal receptors and presence of unique commensal microbiomata are also characteristic of inguinal skin.[4]

Bodily skin microbiome is divided into five types:

- Type I: *Corynebacterium* species
- Type II: *Acinetobacter* and *Moraxella* species
- Type III: *Staphylococcus epidermidis*
- Type IV: *Porphyromonas* and *Peptoniphilus* species
- Type V: *Propionibacterium acnes*.

Whereas inguinal skin is rich in type 1 and 4 microbiome predominantly sometimes type 5 also co-exists, comprising of *Corynebacterium* species, *Porphyromonas* and *Peptoniphilus* species.[5]

Inguinal skin is prone to various sexually transmitted diseases and other nonvenereal infections such as erythrasma, folliculitis, and dermatophytosis.

Biophysical profile is the study of physiological functions of skin, where the Parameters studied are a)Skin hydration which measures the water content of skin, b)Transepidermal water loss (TEWL) which represents the integrity of physical barrier of skin. c)Skin pH stands for the amount of acidification of skin, and d)Sebum content which measures the secretory function of skin.

This study was undertaken to find out the normal physiological parameters of inguinal region and how they are different from that of the rest of the body to make the skin of inguinal region more prone to infections.

MATERIALS AND METHODS

This was a hospital-based, comparative, cross-sectional study conducted at the Department of dermatology at a tertiary care center in Northern India. Ethical clearance was taken from the institutional ethical committee, and informed consent was taken from each participating subject. The study duration was 6 months (January 2019–June 2019) where consenting 976 patients attending the dermatology outpatient department with diseases other than inguinal dermatosis and accompanying attendants (600 males, 376 females) of age group of 18–60 years were included. Only those subjects who had not applied any topical medications for at least 3 weeks were included in the study.

Biophysical parameters including skin hydration, skin pH, TEWL, and sebum content were measured. For the measurement of skin hydration, Corneometer 825 was used and the reference value of 45 was taken as the normal/sufficient hydration of the skin where all values below 45 were considered abnormal and the skin was rendered as insufficiently hydrated/dry.[6]

pH is the power of hydrogen of the skin and is maintained between 4.5 and 5.5, which is responsible for maintaining homeostasis. Here, pH meter 905 E was used to measure pH of the skin where the cutoff value of 5.5 was taken as the upper limit, all values above that were considered as abnormal.[7]

TEWL was measured using Tewameter TM300 where 10–25 g/h/m^2 was taken as normal range, and the values above 25 were rendered abnormal, which signified increased TEWL.[8]

Sebum content was measured using Sebumeter 815 where the normal range for inguinal area and skin of upper back were 55–130 μg/cm^2, areas with values >130 μg/cm^2, were considered to have a high sebum content.[9]

All the instruments used in the study were supplied by Courage and Khazaka, Germany.

The above-mentioned parameters were measured in all subjects from the right inguinal region and were compared with the readings from the skin of the right upper back of the same subjects.

Upper right back was chosen for comparison because it has similar glandular composition as that of inguinal area and is more accessible for measurement.

Biophysical profile parameters were measured according to international guidelines given by the 5th International Conference on Occupational and Environmental Exposure of Skin to Chemicals for their *in vivo* measurement.[10]

Procedure

The instrument was turned on 15–30 min prior to taking readings. According to the guidelines, study participants were acclimatized with the measuring environment for a period of 15–30 min at an ambient temperature of 20°C–22°C and relative humidity of 50% to avoid errors caused by environmental temperature or sweating. Areas under study were also exposed to ambient air for at least 10 min prior to measurement.[11]

The data thus collected were entered into an MS excel spreadsheet to prepare the master chart.

RESULTS

The results were summarized and presented as proportions (%). Chi-square test was used to compare abnormal findings. $P \leq 0.05$ was taken as statistically significant. Medcalc 16.4 version By Medcalc software ltd.(Belgium) software was used for all statistical calculations. The data collected were fed into a table [Table 1].

The study included 600 male and 376 female subjects comprising age group of 18–60 years.

Raised pH was observed in 776 subjects (79.51%) – 476 males (79.33%) and 300 females (79.79%) over inguinal skin, whereas, raised pH over upper back was observed in 41 subjects (4.20%) – 26 males (4.33%) and 15 females (3.99%), with the cumulative P value being <0.001 [Figure 1].

TEWL was found to be raised in 192 subjects (19.67%) – 100 males (16.67%) and 92 females (24.47%) over inguinal skin, whereas only 4 subjects (0.41%) – 2 males (0.33%) and 2 females (0.53%) – showed raised TEWL over skin of back, with the cumulative $P < 0.001$ [Figure 2].

Sebum content was raised in 812 subjects – 500 males (83.33%) and 312 females (83.98%) over inguinal skin, whereas it was raised in 822 subjects – 476 males (79.33%) and 346 females (92.02%), where the P value was 0.581 [Figure 3].

Subcorneal hydration was decreased in 54 subjects (5.53%) – 26 males (4.33%) and 28 females (7.45%) over inguinal skin, whereas only 79 subjects (8.09%) – 37 males (6.17%) and 42 females (11.17%) – showed decreased subcorneal hydration over the skin of the upper back. P value was <0.031 [Figure 4].

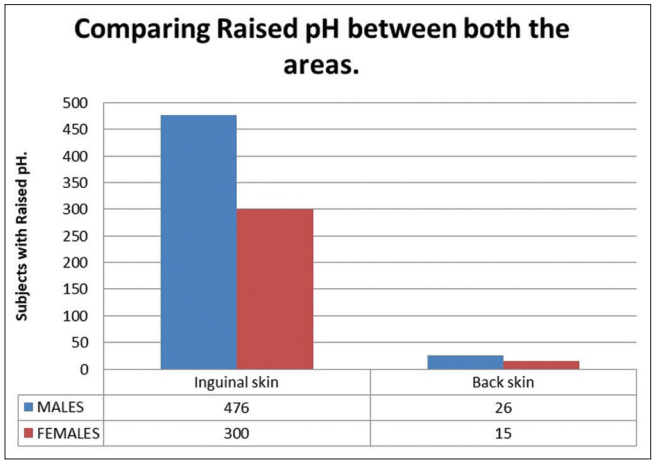

Figure 1: Graph - Comparing raised pH between the skin of inguinal area and skin of upper back

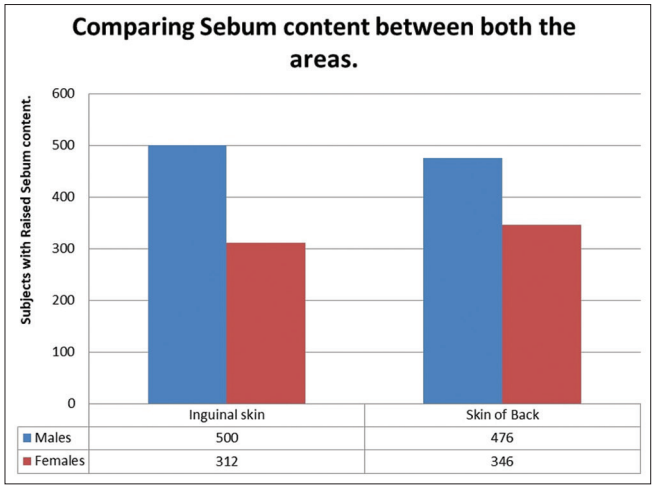

Figure 3: Graph - Comparing raised sebum content between skin of inguinal area and skin of upper back

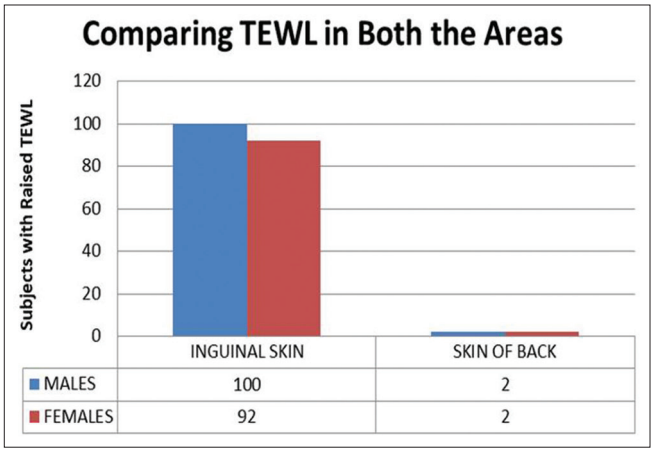

Figure 2: Graph - Comparing raised transepidermal water loss between skin of inguinal area and skin of upper back

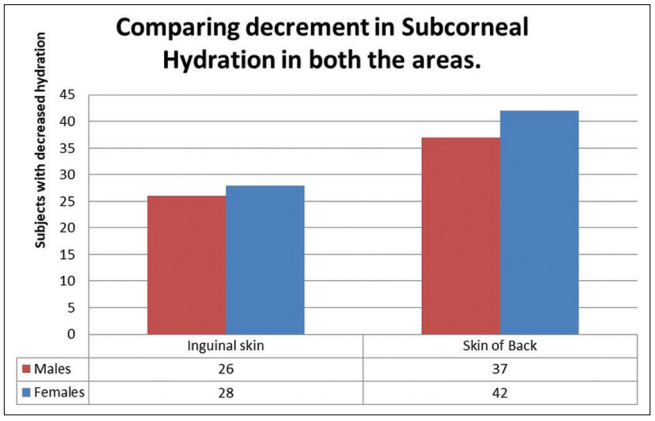

Figure 4: Graph - Comparing decrement in subcorneal hydration between skin of inguinal area and skin of upper back

Table 1: Biophysical profile parameters – transepidermalwaterloss, skin pH, stratum corneum hydration, sebum content being compared between skin of inguinal area and skin of upper back

PARAMETERS	INGUINAL SKIN		BACK SKIN		CHI SQUARE	'p' VALUE
	NO.	%	NO.	%		
RAISED pH						
MALE (N= 600)	476	79.33	26	4.33	690.422	<0.001*
FEMALE (N = 376)	300	79.79	15	3.99	440.618	<0.001*
TOTAL (N= 976)	776	79.51	41	4.20	1134.107	<0.001*
RAISED SEBUM CONTENT						
MALE (N= 600)	500	83.33	476	79.33	2.904	0.088
FEMALE (N = 376)	312	82.98	346	92.02	13.240	<0.001*
TOTAL (N= 976)	812	83.20	822	84.22	0.304	0.581
DECREASED SUBCORNEAL HYDRATION						
MALE (N= 600)	26	4.33	37	6.17	1.675	0.196
FEMALE (N = 376)	28	7.45	42	11.17	2.662	0.103
TOTAL (N= 976)	54	5.53	79	8.09	4.647	0.031
RAISED TEWL						
MALE (N= 600)	100	16.67	2	0.33	100.814	<0.001*
FEMALE (N = 376)	92	24.47	2	0.53	96.304	<0.001*
TOTAL (N= 976)	192	19.67	4	0.41	198.327	<0.001*

P value was statistically significant, i.e., <0.005, when TEWL and skin pH of genital skin were compared with that of upper back.

These results suggested that genital skin has higher pH and more TEWL compared to other areas of body.

DISCUSSION

Skin is the largest organ and forms the outer layer of the body, which comes in contact with environmental toxins and infections; it acts as the primary line of defense of the body. Skin has physical, chemical, microbiological, and immunological barriers.[12]

Physical barrier – The brick and mortar arrangement of stratum corneum which is made of corneocytes and lipid rich matrix present in between them, makes skin impenetrable to the external insults. Tight junctions among keratinocytes along with keratohyaline granules, filaggrin proteins and arrangement of keratin filaments in stratum granulosum form a barrier against water and solutes.[13]

Any disruption in physical cohesion among skin layers is reflected in the TEWL and subcorneal hydration.

Chemical barrier is formed by natural moisturizing factors and lipid matrix of the SC mainly comprising lipids from three distinct classes – cholesterol, free fatty acids, and ceramides – densely packed and stacked in a 3D structure. Lipid bilayer provides a physical layer of protection and help maintaining the integrity of barrier.[14]

Normal skin pH of 4.5–5.5, is slightly acidic in nature. It makes up the chemical barrier by organizing the lipid bilayer and by contributing to desquamation of the SC,and manages antimicrobial defence by regulating serine proteases. This acidification is maintained by generation of free fatty acids, breakdown of filaggrin, and lamellar body secretion.[15]

Microbiological barrier is formed by the antimicrobial peptides which are sequestered from the lamellar bodies of stratum granulosum, e.g., - HBD1, secreted in all layers of epidermis and have potent antimicrobial activity against bacteria and fungus. RNAse 7 produced in high concentrations in stratum corneum prevents the colonization of *Staphylococcus aureus*. CXCL14 chemokine again has inhibitory action against bacteria and fungi. Other AMPs that help maintain homeostasis are cathelicidin LL37, S100A7, psoriasin, and calprotectin. AMPs are under the influence of acidic pH of skin, and shift of pH to alkaline side leads to decreased activity of AMPs, which makes the skin more prone to infections.[16] Furthermore acidic pH ensures that normal flora *S. epidermidis* and *Corynebacterium* thrive and inhibits the growth of *S. aureus*, and *Streptococcus pyogenes*. Immunological barrier - The above discussed barriers provide skin's first interaction with the insults from the environment. Any breach in any of these barriers will lead to entry of the microbes/allergens inside, which are then checked by the immunological barrier of the skin, which is formed by the antigen-presenting cells, innate lymphoid cells, adaptive memory cells, skin associated lymphoid tissue, chemokines, cytokines, and AMPs in action. All of these work in harmony and generate a T-cell response.[17]

Skin pH again plays a central role here as higher pH shifts the T-cell response toward the TH2 and TH17 response that secrete bad cytokines – interleukin (IL) 4, IL 5, IL 13 IL 17A, IL 33[18] [Figure 5].

Inguinal skin pH was found to be less acidic in our subjects; it first disturbs the organization of lipid bilayers, which disturbs the physical barrier; second decreases the lipid processing, which impairs the cohesion between keratinocytes; and finally increases the serine protease and kallikrein (KLK5) activity, which reduces the antimicrobial activity leading eventually to increased susceptibility to dryness and infection.[19]

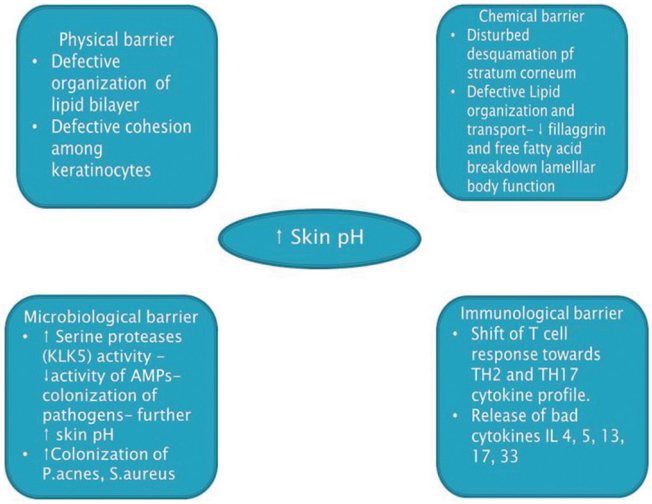

Figure 5: Impact of raised skin pH on different barriers of skin

Our subjects also showed raised TEWL, which represents disruption in the physical barrier of skin, leading to more invasiveness of microbes.

The inguinal skin is subjected to various external insults such as excessive sweating, trauma by rubbing, chronic occlusion, and poor hygiene, which can further add to the results observed and susceptibility to infections.[20]

Following the age old policy of prevention is better than cure; the following recommendations can go a long way in prevention of inguinal sexually transmitted diseases and nonvenereal dermatosis.

Moisturizers which hydrate the skin and act as barrier agents containing occlusive-petrolatum and paraffin, humectants, and emollients should be regularly used in inguinal region to maintain the integrity of skin. Moisturizers in addition to restoring SC hydration also reduce cytokine production, mast cell hypertrophy and degranulation, and epidermal hyperplasia.[21]

Barrier repair creams constituting physiological lipids containing ceramides, cholesterol, and free fatty acids in a ratio of 3:1:1 do not form an occlusive layer in contrast to moisturizers, but they amplify lipid production and delivery to subcorneal intercellular spaces and replenish the lamellar bilayers that are critical for normal barrier function and antimicrobial property.[22]

Further, the creams containing these three physiological lipids exhibit anti-inflammatory activity by inhibition of pathogen colonization with a reduction in attendant superantigen initiated inflammation, activation of two key lipid processing enzymes – β glucocerebrosidases and acidic sphingomyelinase.

Free fatty acids in these creams can activate peroxisome proliferator-activated receptors, which contribute to normal barrier functions.[23] Hence, use of these lipids should be routinely recommended in the inguinal area.

Barrier creams containing petrolatum and dimethicone can also be used in these regions.[24]

As previously discussed, increased skin pH predisposes inguinal skin to infections, hence educating the patients with recurrent inguinal dermatosis regarding the use of buffered solutions of pH ranging 3–4 like emulsions, made of a mix of glycolic acid, ammonia and water,[25] and acidification of inguinal region by newer methods such as use of acidic syndet bars and cleansers containing lipohydroxy acid can help ameliorate recurrent inguinal dermatosis.[26]

Use of loose fitted cotton clothes and friction and trauma prevention by use of antihistamines to interrupt the itch-scratch cycle in various inguinal dermatosis can help in preserving the physical barrier.[27]

Hygiene maintenance by properly grooming the inguinal area using safe grooming practices can help preventing sexually transmitted infections (STIs).[28]

Newer and next-generation barrier repair therapies aiming at lowering the skin pH such as KLK5 inhibitors and alpha 1 antitrypsin inhibitor or soyabean trypsin inhibitor can be used in patients with recurrence.[29]

We have also seen that lamellar body secretion and degradation helps in maintaining acidic skin pH. Plasminogen activator receptor (PAR) 2 can block lamellar body secretions. Hence, PAR2 inhibitors could be part of future therapies in the prevention of frequent infections of inguinal area.[30]

Looking into the growing armamentarium for preserving barrier functions of skin, we can feel that our present and future holds a great promise in the prevention of genital venereal and nonvenereal infections.

Dermatophytic infections, particularly tinea cruris, has assumed epidemic proportions in India. A lot of reasons have been given for its recalcitrant nature. A recent study by Bhargava *et al*.[31] on recalcitrant tinea infections, established barrier function defect as the chief pathogenic mechanism of resistant tinea

infections in the form of abnormalities in BPPs, we had anticipated that raised TEWL is a marker of Recalcitrant Tinea. We had also stated that we are not sure whether the defect in TEWL is primary or is a result of specific fungi. The above study clearly states that abnormal TEWL does exist in inguinal skin and this primary defect can be ameliorated by the above-mentioned measures. However, the secondary fungal specific defect cannot be ruled out.

CONCLUSION

Tthe present study shows that a primary skin barrier function defect exists in skin of inguinal area. Focusing and treating this defect by simple measures can go a long way in preventing sexually transmitted and non-STIs.

Limitations of the study

1. Inherent gender disparity in the study because the area under examination was bathing suit area, hence lesser participation from females was observed
2. Age-related barrier dysfunction was not taken into account in this study
3. We could not find any similar study for comparison in inguinal skin.

Acknowledgment

We would like to acknowledge Dr. Rajeev Yadav, Associate Professor, Department of Preventive and Social Medicine for his help in data analysis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Cheuck L, Chalouhy CE, Gest TR, Atalla CS. Emedicine.Medscape.com/article/2075362-Overview;2017 Aug 5.
2. Thiboutot D. Regulation of human sebaceous glands. J Invest Dermatol 2004;123:1-2.
3. Neumann C, Cohn AE, Burgh GE. A quantitative method for the measurement of the rate of water loss from small areas, with results for finger tip, toe tip and postero-superior portion of the pinna of normal resting adults. Am J Physiol 1941;132:748-56.
4. Taylor NA, Machado-Moreira CA. Regional variations in transepidermal water loss, eccrine sweat gland density, sweat secretion rates and electrolyte composition in resting and exercising humans. Extrem Physiol Med. 2013 Feb 1;2(1):4.
5. Grice EA, Segre JA. The skin microbiome. Nat Rev Microbiol. 2011;9(4):244-53. doi: 10.1038/nrmicro2537.
6. Gerhardt LC, Strässle V, Lenz A, Spencer ND, Derler S. Influence of epidermal hydration on the friction of human skin against textiles. J R Soc Interface 2008;5:1317-28.
7. Ehlers C, Ivens UI, Møller ML. Females have lower skin surface pH than men: A study on the influence of gender, forearm site variation, right/left difference and time of the day on the skin surface pH. Skin Res Technol 2001;7:90-4.
8. Shah JH, Zhai H, Maibach HI. Comparative evaporimetry in man. Skin Res Technol 2005;11:205-8.
9. Man MQ, Xin SJ, Song SP, Cho SY, Zhang XJ, Tu CX, *et al*. Variation of skin surface pH, sebum content and stratum corneum hydration with age and gender in a large Chinese population. Skin Pharmacol Physiol 2009;22:190-9.
10. Berardesca E, Loden M, Serup J, Masson P, Rodrigues LM. The revised EEMCO guidance for the *in vivo* measurement of water in the skin. Skin Res Technol 2018;24:351-8.
11. Stefaniak AB, Plessis Jd, John SM, Eloff F, Agner T, Chou TC, *et al*. International guidelines for the *in vivo* assessment of skin properties in non-clinical settings: Part 1. pH. Skin Res Technol 2013;19:59-68.
12. Strugar TL, Kuo A, Seité S, Lin M, Lio PA. Connecting the dots: From skin barrier dysfunction to allergic sensitization, and the role of moisturizers in repairing the skin barrier. J Drug Dermatol 2019;18:581.
13. Eyerich S, Eyerich K, Traidl-Hoffmann C, Biedermann T. Cutaneous barriers and skin immunity: Differentiating a connected network. Trends Immunol 2018;39:315-27.
14. Han H, Roan F, Ziegler SF. The atopic march: Current insights into skin barrier dysfunction and epithelial cell-derived cytokines. Immunol Rev 2017;278:116-30.
15. Elias PM, Wakefield JS. Mechanisms of abnormal lamellar body secretion and the dysfunctional skin barrier in patients with atopic dermatitis. J Allergy Clin Immunol 2014;134:781-910.
16. Harder J, Dressel S, Wittersheim M, Cordes J, Meyer-Hoffert U, Mrowietz U, *et al*. Enhanced expression and secretion of antimicrobial peptides in atopic dermatitis and after superficial skin injury. J Invest Dermatol 2010;130:1355-64.
17. Brunner PM, Leung DYM, Guttman-Yassky E. Immunologic, microbial, and epithelial interactions in atopic dermatitis. Ann Allergy Asthma Immunol 2018;120:34-41.
18. Volz T, Kaesler S, Biedermann T. Innate immune sensing 2.0 – From linear activating pathways to fine tuned and regulated innate immune pathways. Exp Dermatol 2012;21:61-9.
19. Garcia-Valladares I, Cuchacovich R, Espinoza LR. Comparative assessment of biologics in treatment of psoriasis: Drug design and clinical effectiveness of ustekinumab. Drug Des Devel Ther 2011;5:41-9.
20. Choi EH, Man MQ, Xu P, Xin S, Liu Z, Crumrine DA, *et al*. Stratum corneum acidification is impaired in moderately aged human and murine skin. J Invest Dermatol 2007;127:2847-56.
21. Simpson EL, Chalmers JR, Hanifin JM. Emollient enhancement of the skin barrier from birth prevents atopic cermatitis. J Allergy Clin Immunol 2014;134;818-23.
22. Uchida Y, Il Kim Y, Park K. Signaling roles of ceramide and its metabolites in cutaneous antimicrobial defense. Dermatol Sin 2015;33:78-83.
23. Schmuth M, Haqq CM, Cairns WJ, Holder JC, Dorsam S, Chang S, *et al*. Peroxisome proliferator-activated receptor (PPAR)-beta/delta stimulates differentiation and lipid accumulation in keratinocytes. J Invest Dermatol 2004;122:971-83.
24. Pellicoro C, Marsella R, Ahrens K. Pilot study to evaluate the effect of topical dimethicone on clinical signs and skin barrier function in dogs with naturally occurring atopic dermatitis. Vet Med Int 2013;2013:239186.
25. Blaak J, Dähnhardt D, Dähnhardt-Pfeiffer S, Bielfeldt S, Wilhelm KP, Wohlfart R, *et al.* A plant oil-containing pH 4 emulsion improves epidermal barrier structure and enhances ceramide levels in aged skin.

Int J Cosmet Sci 2017;39:284-91.
26. Behm B, Kemper M, Babilas P, Abels C, Schreml S. Impact of a glycolic acid-containing pH 4 water-in-oil emulsion on skin pH. Skin Pharmacol Physiol 2015;28:290-5.
27. Li Z, Hu L, Elias PM, Man MQ. Skin care products can aggravate epidermal function: Studies in a murine model suggest a pathogenic role in sensitive skin. Contact Dermatitis 2018;78:151-8.
28. Osterberg EC, Gaither TW, Awad MA, Truesdale MD, Allen I, Sutcliffe S, *et al*. Correlation between pubic hair grooming and STIs: Results from a nationally representative probability sample. Sex Transm Infect 2017;93:162-6.
29. Peter G, Viktor M, Hans B. Natural and synthetic inhibitors of kallikrein-related peptidases (KLKs). Biochimie 2010;92:1546-67.
30. Schaefer BM, Maier K, Eickhoff U, Bechtel M, Kramer MD. Alpha 2-Antiplasmin and plasminogen activator inhibitors in healing human skin wounds. Arch Dermatol Res 1996;288:122-8.
31. Bhargava P, Nijhawan S, Singdia H, Mehta T. Skin barrier function defect - A marker of recalcitrant tinea infections. Indian Dermatol Online J 2020;11:566-9

IJSTD & AIDS - Most searched articles
2020 | January-June | Volume 41 | Issue 1

	VIEWS	PDF
ORIGINAL ARTICLE		
• **Prevalence and trends of hepatitis B virus, Hepatitis C virus, Human immunodeficiency virus 1, 2 and syphilis infections among blood donors in a regional transfusion center in Punjab, India: A 3 years study** Sonam Kumari	3,113	156
• **Seroprevalence of syphilis by VDRL test and biological false positive reactions in different patient populations: Is it alarming? Our experience from a tertiary care center in India** Vrushali Vishwas Patwardhan, Sonali Bhattar, Preena Bhalla, Deepti Rawat	2,460	202
• **Effectiveness of structured teaching programme on transmission and prevention of human immunodeficiency virus/acquired immune deficiency syndrome among adolescent girls in Lowry Memorial High School, Bengaluru** Nanbur Stephen, Nanle Joseph Gusen, Patience Ringkat Kumzhi, Bonji Gaknung, Dauda Abimiku Auta, Lydia B Bulndi, Champion Mbursa, Vasantha P Kumari, Nannim Nanvyat	2,285	105
REVIEW ARTICLE		
• **Anogenital lichen sclerosus** Manjyot Manish Gautam, Vasundhara Singh, Nitin J Nadkarni, Sharmila P Patil	2,306	124
CASE REPORTS		
• **Cytomegalovirus retinitis associated with high CD4 counts and DHEA abuse** Gan Yuen Keat, Syed Shoeb Ahmad, Suresh Subramaniam, Shuaibah Abdul Ghani, Amir Samsudin	796	19
• **Pityriasis rubra pilaris type 6: A case report in an AIDS patient** Abhilasha Williams, Anisha George, Emy Abi Thomas, Jency Maria Koshy	737	24
Epidermodysplasia verruciformis with plane warts over lower abdomen and genitals Rochit Rajesh Singhal, Niral Ketan Sheth, Pragya Ashok Nair	619	33