arloo/Shutterstock

THE GUTS OF SKINCARE

Dr Sam Robson focuses on the link between healthy skin and the healthy balance of the bacteria in our gut, our microbiome

Although the skin is the largest organ in the human body, our skin is often viewed more simplistically than our other organs. Over recent years, however, skin health is being linked progressively with complex processes in other organs and with aspects of our lifestyle.

What is the microbiome?

The human body is home to about 100 trillion microorganisms (bacteria, viruses and fungi) that are collectively known as the microbiome.[1] The human microbiome should be viewed as an essential organ given its involvement in immunity, host nutrition and vitamin synthesis.[2] With its influence on energy metabolism and fat storage and its ability to affect behaviour and emotional well-being, it is hardly surprising that it has become a recent focus for research. Its importance is such that it has been referred to as the 'second brain'[3] and the 'conductor of the orchestra', given its role in facilitating communication between the immune system and the nervous system to maintain a state of homeostasis.[4]

The diversity of the microbiome is such that it has been suggested that the collective microbiome may contain more genes than there are stars in the universe[5] and that the human microbiome is more unique to an individual than their fingerprint.[6] Although the microbiome has been referred to as the second human genome,[7] a significant difference between the two is that the microbiome is dynamic and changes during early development[8] and in response to environmental and lifestyle factors[9] (such as diet, sleep and physical activity) as well as to medications and disease.[10]

The relationship between changes in microbiome composition and disease pathogenesis is complex and as yet poorly understood; research is underway into cause and effect – currently, it is believed that the relationship is two-way – that is to say that dysbiosis (microbial imbalance) causes health problems and health problems themselves cause dysbiosis.

Skin Microbiome

When talking about the microbiome, one is generally referring to the gut microbiome but, the skin itself is a rich ecosystem that supports diverse populations of microbes and, in so doing, has its own unique microbiome.[11] The differing habitats of the skin - dry, moist and sebaceous - favour different microbial communities that vary depending on whether their environment is predominantly aerobic or anaerobic.

The skin microbiome plays an important role in homeostasis, partially through its maintenance of the cutaneous immune system. Studies of the gut and skin microbiome have highlighted the symbiotic relationship between the microbes and health - and how when this is disrupted, health suffers. It has also become apparent that microbial diversity of each influences health with evidence that increased microbial diversity is associated with improved physiology and homeostasis.[12]

Recent research looking at the associations between the skin and gut microbiota and dermatologic conditions such as acne, rosacea, and atopic dermatitis have highlighted the significance of microbiome diversity.[11] Looking at each of these conditions, in turn, allows us to consider these relationships further.

Acne

Moderate to severe acne vulgaris is probably the most common complaint seen in aesthetic clinics.[13] The causes of acne are complex and multifactorial, and often an individual will have an underlying genetic predisposition.[13] The pathogenesis of acne involves blocked pores, excess sebum production, bacterial invasion, and subsequent inflammation.[14] The course of acne for an individual will be variable and is susceptible to hormonal changes and any other factor that impacts on these pathogenic features; lifestyle factors such as diet, sleep, and stress have long been known to exacerbate acne.[15-18] On the skin itself, the condition is promoted by intermicrobial interaction rather than by the mere presence of a particular microbe. More recently, attention has been focused on the role of the gut microbiome in acne and whether this plays an important mediating role between lifestyle factors and the condition.[19]

Rosacea

Rosacea is another common chronic skin condition often seen in aesthetic clinics. Usually, it presents as facial flushing, telangiectasia and can feature inflammatory papules and pustules.[20] The pathogenesis of rosacea is not fully understood but is usually postulated to be due to neurovascular hypersensitivity, dysregulated production and release of inflammatory molecules, and disruption of the usual skin microflora.[21] The cutaneous microbiome is thought to play a significant role in rosacea, as can be evidenced by the effectiveness of some treatments which specifically have antimicrobial effects.[22] It has been suggested that the antibiotic therapy may have both an anti-inflammatory and an antibacterial effect.[23]

Research has indicated the role of a gut-skin connection in rosacea with evidence of higher prevalence of GI disturbances including Crohn's disease, Coeliac disease, ulcerative colitis, H.Pylori infection, small intestinal bacterial overgrowth (SIBO) and irritable bowel syndrome (IBS) in patients with rosacea as compared with control subjects. [24]

As with acne, there are individual trigger factors that can exacerbate rosacea flare-ups, and these will vary between individuals. It is well known that dietary factors play a significant role,[25] and many patients will manage their condition by a combination of avoiding known triggers and using pharmacological management.[26] More recently, attention has been focused on the role of the microbiome as a mediator of some of the trigger factors and for its direct implication in gut health - as a means to effectively improve both skin and gut health.[27]

Atopic dermatitis (Eczema)

This chronic skin condition is more commonly known as eczema. Again, it is a multifactorial condition that may be present in aesthetic patients, although, is less commonly the reason for their attendance. The skin is often dry, red and intensely itchy. The pathogenesis is thought to have four distinct contributing factors: genetic predisposition, reduced diversity of the skin microbiome, innate immunity and adaptive immunity.[28] These factors interact to weaken the barrier function of the skin, predisposing the skin's susceptibility to infection and allergens, thus further disrupting the homeostasis of the skin microbiome, which in turn exacerbates the atopic disease.[29] Having previously explained that the gut microbiome plays an important role in immunity,[11] it would seem logical to conclude that it may therefore have an important role in helping to manage eczema.[30,31]

Improving our microbiome, improving our skin

Having established in looking at these three common skin conditions that the microbiome may have a distinct role with each, that a diverse microbiome is an important contributor to health, and that the microbiome is dynamic and changes in response to various lifestyle factors, it is logical to explore how lifestyle factors can impact on the microbiome, and how to maximise the positive effects.

Although overall diversity of the microbiome is the intended goal, it is helpful to think about 'good' and 'bad' bacteria, for simplicity, with the aim of having a higher preponderance of the good bacteria.

These lifestyle factors are briefly described below:

1. **Diet**[32] - This can be split into two broad categories - those groups of foods that support the good bacteria and those that enhance the bad:

Good bacteria are enhanced by:

- Pulses, beans, lentils and legumes Vegetables and fruit
- High fibre foods such as nuts, seeds, dried fruit and whole-grain bread and pasta
- Whole grains such as barley, brown rice and rye
- Probiotic foods (which contain good bacteria) – yoghurt, kefir, kombucha, fermented foods such as kimchi and sauerkraut

Bad bacteria are encouraged by:

- Refined carbohydrates and 'white foods' – white bread, potatoes, rice, pasta, cakes and pastries
- Processed and high sugar foods – This includes 'fast food' and food containing lots of additives
- Soft drinks, including fizzy drinks like colas, lemonades and flavoured sodas
- Salty snacks – crisps, pretzels and pizza
- Artificial sweeteners – aspartame, sucralose, saccharin – all key ingredients in diet foods and drinks

2. **Stress**[33] - Not only does stress damage the balance of good:bad bacteria, it has also been shown to affect gut function. Stress can be reduced by:

- Meditation
- Mindfulness
- Relaxation therapy
- CBT
- Exercise

3. **Sleep**[34] - The relationship between sleep and the microbiome is bi-directional. Research has shown that just two nights of partial sleep deprivation is enough to affect the health and diversity of the gut bacteria; at the same time, the composition of the microbiome can also affect the quality of one's sleep. Furthermore, disruption of normal daily circadian rhythms - caused by jet lag and shift work - can significantly disrupt both sleep patterns and gut bacteria.

4. **Physical Activity**[35, 36] - Exercise has been shown to boost the production of good bacteria by causing both changes in gut function and its internal environment. This can happen with just three hours of moderate exercise per week and is independent of diet but contingent on the sustainment of exercise.

5. **Alcohol**[37,38] - Red wine can have a positive effect on gut bacteria, but too much alcohol promotes an overgrowth of bad bacteria. Research suggests just one glass, every 1-2 weeks, is enough whereas, one night of heavy drinking (more than four drinks) will disturb the microbiome.

6. **Medication**[39,40] - Antibiotics kill bacteria, so unsurprisingly will disturb your microbiome, but other drugs can also cause dysbiosis. New research highlights the impact that gut bacteria can have on the effectiveness of some medications; having a healthier microbiome may make these drugs work better.

7. Smoking[41] - There is increasing evidence that stopping smoking can have a positive effect on the diversity and health of the microbiome. Although somewhat controversially, there is also research that suggests that marijuana has a positive effect on gut bacteria.[42]

As can be seen by considering all of these factors, there can be many ways of changing the microbiome. What is probably obvious is that rarely will any of these factors work in isolation, and there is often a complex inter-relationship, as shown in the diagram below.

If patients can be encouraged to consider these factors as part of an overall management plan, then not only will they benefit from a general boost to their overall health and well-being, but they will also see a greater and longer-lasting improvement in their skin. It is important for both practitioners and patients to be aware of these interactions and thus to appreciate the effective interventions that can have knock-on effects on other areas of health and well-being, as well as enhancing skin health. With the ongoing revelations about the importance of the microbiome and its influence on all areas of health, this is sure to be an area worth following, as it is likely to offer opportunities to enhance quality of life with potentially minimal intervention.

CPD CERTIFIED
The CPD Certification Service

The content of the following has been certified by the CPD Certification Service as conforming to continuing professional development principles.

Article: The Guts of Skincare
Literature

CONSULTINGROOM.COM
(1376)

Date: March 2021
Certificate No: A026754

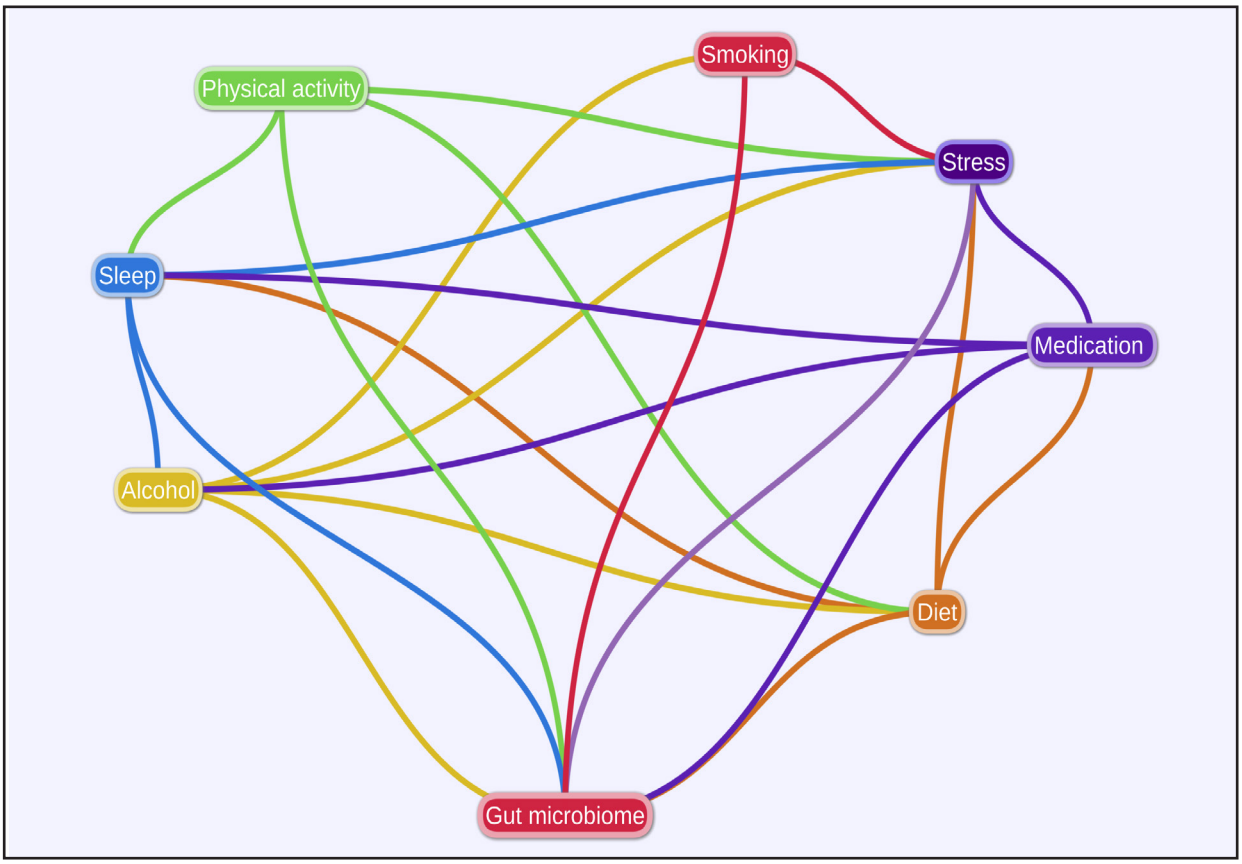

Image provided by author

To download a CPD Reflective Learning Form, produced in association with the British Association of Cosmetic Nurses (BACN) & the British College of Aesthetic Medicine (BCAM), please use the QR code or visit bit.ly/CR-CPD in your web browser.

References

1. "Microbiome." Merriam-Webster.com Dictionary, Merriam-Webster
2. Amon P, Sanderson I What is the microbiome?Archives of Disease in Childhood - Education and Practice 2017;102:257-260.
3. Ochoa-Repáraz, J., & Kasper, L. H. (2016). The Second Brain: Is the Gut Microbiota a Link Between Obesity and Central Nervous System Disorders?. Current obesity reports, 5(1), 51–64.
4. El Aidy S, Dinan TG, Cryan JF. Gut Microbiota: The Conductor in the Orchestra of Immune-Neuroendocrine Communication. Clin Ther. 2015 May 1;37(5):954-67.
5. Tierney, B., Yang, Z., Luber, J., Beaudin, M., Wibowo, M., Baek, C., Mehlenbacher, E., Patel, C. and Kostic, A., 2019. The Landscape of Genetic Content in the Gut and Oral Human Microbiome. Cell Host & Microbe, 26(2), pp.283-295.e8.
6. Franzosa, E., Huang, K., Meadow, J., Gevers, D., Lemon, K., Bohannan, B. and Huttenhower, C., 2015. Identifying personal microbiomes using metagenomic codes. Proceedings of the National Academy of Sciences, 112(22), pp.E2930-E2938.
7. Grice, Elizabeth A, and Julia A Segre. "The human microbiome: our second genome." Annual review of genomics and human genetics vol. 13 (2012): 151-70.
8. Meropol SB , Edwards A Development of the infant intestinal microbiome: a bird's eye view of a complex process. Birth Defects Res C Embryo Today 2015;105:228–39
9. Conlon, Michael A, and Anthony R Bird. "The impact of diet and lifestyle on gut microbiota and human health." Nutrients vol. 7,1 17-44. 24 Dec. 2014,
10. Lozupone CA , Stombaugh JI , Gordon JI , et al Diversity, stability and resilience of the human gut microbiota. Nature2012;489:220–30.
11. Ellis, Samantha R et al. "The Skin and Gut Microbiome and Its Role in Common Dermatologic Conditions." Microorganisms vol. 7,11 550. 11 Nov. 2019
12. Eckburg P.B., Bik E.M., Bernstein C.N., Purdom E., Dethlefsen L., Sargent M., Gill S.R., Nelson K.E., Relman D.A. Diversity of the human intestinal microbial flora. Science. 2005;308:1635–1638
13. Bhate K, Williams H. Epidemiology of acne vulgaris. British Journal of Dermatology. 2013;168(3):474-485.
14. Knor T. The pathogenesis of acne. Acta Dermatovenerol Croat. 2005;13(1):44-9.
15. Mahmood SN, Bowe WP. Diet and acne update: carbohydrates emerge as the main culprit. J Drugs Dermatol. 2014 Apr;13(4):428-35.
16. Bowe WP, Joshi SS, Shalita AR. Diet and acne. J Am Acad Dermatol. 2010 Jul;63(1):124-41. doi: 10.1016/j.jaad.2009.07.043.
17. Dall'Oglio F, Nasca MR, Fiorentini F, Micali G. Diet and acne: review of the evidence from 2009 to 2020. Int J Dermatol. 2021 Jan 18.
18. Chlebus E, Chlebus M. Factors affecting the course and severity of adult acne. Observational cohort study. J Dermatolog Treat. 2017 Dec;28(8):737-744.
19. Lee, Young Bok et al. "Potential Role of the Microbiome in Acne: A Comprehensive Review." Journal of clinical medicine vol. 8,7 987. 7 Jul. 2019,
20. Wilkin J., Dahl M., Detmar M., Drake L., Feinstein A., Odom R., Powell F. Standard classification of rosacea: Report of the National Rosacea Society Expert Committee on the Classification and Staging of Rosacea. J. Am. Acad. Dermatol. 2002;46:584–587.
21. Two A.M., Wu W., Gallo R.L., Hata T.R. Rosacea. J. Am. Acad. Dermatol. 2015;72:749–758.
22. Kim, H.S. Microbiota in Rosacea. Am J Clin Dermatol 21, 25–35 (2020).
23. Rivero, Alexis Lara, and Margot Whitfeld. "An update on the treatment of rosacea." Australian prescriber vol. 41,1 (2018): 20-24.
24. Egeberg A, Weinstock LB, Thyssen EP, Gislason GH, Thyssen JP. Rosacea and gastrointestinal disorders: a population-based cohort study. Br J Dermatol. 2017;176(1):100–106.
25. Weiss, Emma, and Rajani Katta. "Diet and rosacea: the role of dietary change in the management of rosacea." Dermatology practical & conceptual vol. 7,4 31-37. 31 Oct. 2017,
26. Buddenkotte, Joerg, and Martin Steinhoff. "Recent advances in understanding and managing rosacea." F1000Research vol. 7 F1000 Faculty Rev-1885. 3 Dec. 2018,
27. Daou, H., Paradiso, M., Hennessy, K. et al. Rosacea and the Microbiome: A Systematic Review. Dermatol Ther (Heidelb) 11, 1–12 (2021).
28. Eyerich, K., Eyerich, S. and Biedermann, T., 2015. The Multi-Modal Immune Pathogenesis of Atopic Eczema. Trends in Immunology, 36(12), pp.788-801.
29. Williams M.R., Gallo R.L. The Role of the Skin Microbiome in Atopic Dermatitis. Curr. Allergy Asthma Rep. 2015;15:65.
30. Kim, Jung Eun, and Hei Sung Kim. "Microbiome of the Skin and Gut in Atopic Dermatitis (AD): Understanding the Pathophysiology and Finding Novel Management Strategies." Journal of clinical medicine vol. 8,4 444. 2 Apr. 2019,
31. Lee, So Yeon et al. "Microbiome in the Gut-Skin Axis in Atopic Dermatitis." Allergy, asthma & immunology research vol. 10,4 (2018): 354-362.
32. Singh, Rasnik K et al. "Influence of diet on the gut microbiome and implications for human health." Journal of translational medicine vol. 15,1 73. 8 Apr. 2017
33. Karl, J Philip et al. "Effects of Psychological, Environmental and Physical Stressors on the Gut Microbiota." Frontiers in microbiology vol. 9 2013. 11 Sep. 2018
34. Benedict, Christian et al. "Gut microbiota and glucometabolic alterations in response to recurrent partial sleep deprivation in normal-weight young individuals." Molecular metabolism vol. 5,12 1175-1186. 24 Oct. 2016,
35. Allen JM, Mailing LJ, Niemiro GM, Moore R, Cook MD, White BA, Holscher HD, Woods JA. Exercise Alters Gut Microbiota Composition and Function in Lean and Obese Humans. Med Sci Sports Exerc. 2018 Apr;50(4):747-757.
36. Monda, Vincenzo et al. "Exercise Modifies the Gut Microbiota with Positive Health Effects." Oxidative medicine and cellular longevity vol. 2017 (2017)
37. Le Roy, C., Wells, P., Si, J., Raes, J., Bell, J. and Spector, T., 2020. Red Wine Consumption Associated With Increased Gut Microbiota α-Diversity in 3 Independent Cohorts. Gastroenterology, 158(1), pp.270-272.e2.
38. Engen PA, Green SJ, Voigt RM, Forsyth CB, Keshavarzian A. The Gastrointestinal Microbiome: Alcohol Effects on the Composition of Intestinal Microbiota. Alcohol Res. 2015;37(2):223-36.
39. Weersma, R., Zhernakova, A. and Fu, J., 2020. Interaction between drugs and the gut microbiome. Gut, 69(8), pp.1510-1519.
40. Vich Vila, Arnau et al. "Impact of commonly used drugs on the composition and metabolic function of the gut microbiota." Nature communications vol. 11,1 362. 17 Jan. 2020,
41. Nolan-Kenney R, Wu F, Hu J, Yang L, Kelly D, Li H, Jasmine F, Kibriya MG, Parvez F, Shaheen I, Sarwar G, Ahmed A, Eunus M, Islam T, Pei Z, Ahsan H, Chen Y. The Association Between Smoking and Gut Microbiome in Bangladesh. Nicotine Tob Res. 2020 Jul 16;22(8):1339-1346.
42. Zamil Al-Ghezi Z et al (2019) Combination of cannabinoids, delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD), mitigates experimental autoimmune encephalomyelitis (EAE) by altering the gut microbiome. Brain, Behavior, and Immunity, 82: 25-35.