

## Bölüm 3

### GEBELİK ve MİKROBİYOM

Refika Genç Koyucu<sup>1</sup>

#### MİKROBİYOM KAVRAMI

İnsan mikrobiyotası, çeşitli anatomik alanların yanı sıra dokular, sıvılar ve vücut boşlukları üzerinde ve içinde bulunan arkeler, protistalar, bakteriler, mantarlar ve virüsler dahil olmak üzere bir dizi mikroorganizmadır. Mikrobiyom ise, yerleşik mikrobiyotanın genetik materyallerinin bir toplamıdır.<sup>(1)</sup> Yetişkin vücudundaki bakterilerin insan hücrelerine oranının en son tahmini yaklaşık 1: 1'dir.<sup>(2)</sup> Mikrobiyom olarak bilinen insan mikrobiyotasında bulunan genlerin, bireysel insan genomunda bulunanlardan 150 kat daha büyük olduğu da tahmin edilmektedir.<sup>(3)</sup>

Bu mikrobiyota, insan fizyolojisinde, beslenmesinde ve en önemlisi bağışıklık kazandırmada vazgeçilmez bir rol oynar. Mikrobiyal topluluklar, patojen mikroorganizmaların rekabetçi olarak dışlanmasıyla insan vücudunun birinci basamak savunmasının bir bölümünü teşkil ederler. Önemli sayıda mikroorganizma insan vücudunda karşılıklı, uyumlu bir ilişki içinde yaşarken, bunlardan birkaçı bağışıklık sistemi baskılanmış koşullarda fırsatçı hale gelerek akut, ölümcül ve kronik koşullara yol açar.<sup>(4)</sup>

İnsan vücudundaki farklı bölgeler, farklı mikroorganizma popülasyonlarını barındırır. Örneğin deri, ağız, burun boşluğu, bağırsak, üreme sistemi ve muhtemelen plasenta benzersiz mikrobiyal topluluklara ev sahipliği yapmaktadır. Yakın zamana kadar, insan vücudunda yaşayan mikroorganizmalar hakkında bilgi, belirli bir vücut bölgesinden sıvı veya epitel sürüntülerinin kültür ortamına yerleştirildiği ve büyüyen organizmaların fenotipik ve genetik olarak karakterize edildiği geleneksel kültür tabanlı mikrobiyoloji teknikleriyle elde ediliyordu. Bununla birlikte, insan mikrobiyomunun ortak bileşenleri olan türlerin %50 kadarı kültürde yetiştirilememektedir. Son teknolojik gelişmeler ile insan mikrobiyomu derinlemesine aydınlatılmıştır. İnsan mikrobiyomunun sağlığın korunmasında bir rol oynadığı ve aynı zamanda hem genetik hem de çevresel riskleri hafifletmeye veya şiddetlendirmeye hizmet edebileceği giderek daha açık hale gelmektedir.<sup>(5)</sup>

<sup>1</sup> Dr.Öğr.Üyesi, İstinye Üniversitesi Doğum ve Kadın Hastalıkları Hemşireliği, refika\_genc@hotmail.com.

## **KAYNAKLAR**

1. Peterson J, Garges S, Giovanni M, McInnes P, Wang L, Schloss JA, et al. The NIH Human Microbiome Project. *Genome Res.* 2009 Dec;19(12):2317–23.
2. Sender R, Fuchs S, Milo R. Revised Estimates for the Number of Human and Bacteria Cells in the Body. *PLoS Biol.* 2016 Aug;14(8):e1002533.
3. Power SE, O'Toole PW, Stanton C, Ross RP, Fitzgerald GF. Intestinal microbiota, diet and health. *Br J Nutr.* 2014 Feb;111(3):387–402.
4. Gupta P, Singh MP, Goyal K. Diversity of Vaginal Microbiome in Pregnancy: Deciphering the Obscurity. *Front public Heal.* 2020;8:326.
5. Dunlop AL, Mulle JG, Ferranti EP, Edwards S, Dunn AB, Corwin EJ. Maternal Microbiome and Pregnancy Outcomes That Impact Infant Health: A Review. *Adv neonatal care Off J Natl Assoc Neonatal Nurses.* 2015 Dec;15(6):377–85.
6. Edwards SM, Cunningham SA, Dunlop AL, Corwin EJ. The Maternal Gut Microbiome During Pregnancy. *MCN Am J Matern Child Nurs.* 2017;42(6):310–7.
7. Borre YE, O'Keefe GW, Clarke G, Stanton C, Dinan TG, Cryan JF. Microbiota and neurodevelopmental windows: implications for brain disorders. *Trends Mol Med.* 2014 Sep;20(9):509–18.
8. Mayer EA, Savidge T, Shulman RJ. Brain-gut microbiome interactions and functional bowel disorders. *Gastroenterology.* 2014 May;146(6):1500–12.
9. Cani PD, Osto M, Geurts L, Everard A. Involvement of gut microbiota in the development of low-grade inflammation and type 2 diabetes associated with obesity. *Gut Microbes.* 2012;3(4):279–88.
10. Griffin C. Probiotics in obstetrics and gynaecology. *Aust N Z J Obstet Gynaecol.* 2015 Jun;55(3):201–9.
11. Kashtanova DA, Popenko AS, Tkacheva ON, Tyakht AB, Alexeev DG, Boytsov SA. Association between the gut microbiota and diet: Fetal life, early childhood, and further life. *Nutrition.* 2016 Jun;32(6):620–7.
12. Gomez-Arango LF, Barrett HL, McIntyre HD, Callaway LK, Morrison M, Dekker Nitert M. Increased Systolic and Diastolic Blood Pressure Is Associated With Altered Gut Microbiota Composition and Butyrate Production in Early Pregnancy. *Hypertens (Dallas, Tex 1979).* 2016 Oct;68(4):974–81.
13. Mayer EA, Knight R, Mazmanian SK, Cryan JF, Tillisch K. Gut microbes and the brain: paradigm shift in neuroscience. *J Neurosci.* 2014 Nov 12;34(46):15490–6.
14. Gareau MG. Microbiota-gut-brain axis and cognitive function. *Adv Exp Med Biol.* 2014;817:357–71.
15. Angelakis E, Merhej V, Raoult D. Related actions of probiotics and antibiotics on gut microbiota and weight modification. *Lancet Infect Dis.* 2013 Oct;13(10):889–99.
16. Collado MC, Isolauri E, Laitinen K, Salminen S. Distinct composition of gut microbiota during pregnancy in overweight and normal-weight women. *Am J Clin Nutr.* 2008 Oct;88(4):894–9.
17. Ravel J, Gajer P, Abdo Z, Schneider GM, Koenig SSK, McCulle SL, et al. Vaginal microbiome of reproductive-age women. *Proc Natl Acad Sci U S A.* 2011 Mar;108 Suppl(Suppl 1):4680–7.
18. Callahan BJ, DiGiulio DB, Goltsman DSA, Sun CL, Costello EK, Jeganathan P, et al. Replication and refinement of a vaginal microbial signature of preterm birth in two racially distinct cohorts of US women. *Proc Natl Acad Sci U S A.* 2017 Sep;114(37):9966–71.
19. Santiago GLDS, Cools P, Verstraelen H, Trog M, Missine G, El Aila N, et al. Longitudinal study of the dynamics of vaginal microflora during two consecutive menstrual cycles. *PLoS One.* 2011;6(11):e28180.
20. Verstraelen H, Verhelst R, Claeys G, De Backer E, Temmerman M, Vaneechoutte M. Longitudinal analysis of the vaginal microflora in pregnancy suggests that *L. crispatus* promotes the stability of the normal vaginal microflora and that *L. gasseri* and/or *L. iners* are more conducive to the occurrence of abnormal vaginal microflora. *BMC Microbiol.* 2009 Jun;9:116.

21. Kindinger LM, Bennett PR, Lee YS, Marchesi JR, Smith A, Cacciatore S, et al. The interaction between vaginal microbiota, cervical length, and vaginal progesterone treatment for preterm birth risk. *Microbiome*. 2017 Jan;5(1):6.
22. Gonçalves LF, Chaiworapongsa T, Romero R. Intrauterine infection and prematurity. *Ment Retard Dev Disabil Res Rev*. 2002;8(1):3–13.
23. Farage MA, Miller KW, Sobel JD. Dynamics of the Vaginal Ecosystem—Hormonal Influences. *Infect Dis Res Treat*. 2010 Jan 1;3:IDRT.S3903.
24. DiGiulio DB, Romero R, Kusanovic JP, Gómez R, Kim CJ, Seok KS, et al. Prevalence and diversity of microbes in the amniotic fluid, the fetal inflammatory response, and pregnancy outcome in women with preterm pre-labor rupture of membranes. *Am J Reprod Immunol*. 2010 Jul;64(1):38–57.
25. Brocklehurst P, Gordon A, Heatley E, Milan SJ. Antibiotics for treating bacterial vaginosis in pregnancy. *Cochrane database Syst Rev*. 2013 Jan;(1):CD000262.
26. Aagaard K, Ganu R, Ma J, Racusin D, Arndt M, Riehle K, et al. 8: Whole metagenomic shotgun sequencing reveals a vibrant placental microbiome harboring metabolic function. *Am J Obstet Gynecol*. 2013 Jan 1;208(1):S5.
27. Michalowicz BS, Hodges JS, DiAngelis AJ, Lupo VR, Novak MJ, Ferguson JE, et al. Treatment of Periodontal Disease and the Risk of Preterm Birth. *N Engl J Med*. 2006 Nov 2;355(18):1885–94.
28. Shen J, Obin MS, Zhao L. The gut microbiota, obesity and insulin resistance. *Mol Aspects Med*. 2013 Feb;34(1):39–58.
29. Koren O, Goodrich JK, Cullender TC, Spor A, Laitinen K, Bäckhed HK, et al. Host remodeling of the gut microbiome and metabolic changes during pregnancy. *Cell*. 2012 Aug;150(3):470–80.
30. Mukhopadhyay I, Hansen R, El-Omar EM, Hold GL. IBD-what role do Proteobacteria play? *Nat Rev Gastroenterol Hepatol*. 2012 Feb;9(4):219–30.
31. Krakowiak P, Walker CK, Bremer AA, Baker AS, Ozonoff S, Hansen RL, et al. Maternal metabolic conditions and risk for autism and other neurodevelopmental disorders. *Pediatrics*. 2012 May;129(5):e1121-8.
32. Rasmussen KM, Yaktine AL, editors. No Title. Washington (DC); 2009.
33. Cox LM, Blaser MJ. Pathways in microbe-induced obesity. *Cell Metab*. 2013 Jun 4;17(6):883–94.
34. Aitken JD, Gewirtz AT. Gut microbiota in 2012: Toward understanding and manipulating the gut microbiota. *Nat Rev Gastroenterol Hepatol*. 2013 Feb;10(2):72–4.
35. Collado MC, Laitinen K, Salminen S, Isolauri E. Maternal weight and excessive weight gain during pregnancy modify the immunomodulatory potential of breast milk. *Pediatr Res*. 2012 Jul;72(1):77–85.
36. Penders J, Thijs C, Vink C, Stelma FF, Snijders B, Kummeling I, et al. Factors influencing the composition of the intestinal microbiota in early infancy. *Pediatrics*. 2006 Aug;118(2):511–21.
37. Barrett E, Kerr C, Murphy K, O'Sullivan O, Ryan CA, Dempsey EM, et al. The individual-specific and diverse nature of the preterm infant microbiota. *Arch Dis Child Fetal Neonatal Ed*. 2013 Jul;98(4):F334-40.
38. Bezirtzoglou E, Tsiotsias A, Welling GW. Microbiota profile in feces of breast- and formula-fed newborns by using fluorescence in situ hybridization (FISH). *Anaerobe*. 2011 Dec;17(6):478–82.
39. Johnson CL, Versalovic J. The human microbiome and its potential importance to pediatrics. *Pediatrics*. 2012 May;129(5):950–60.
40. Duda-Chodak A, Tarko T, Satora P, Sroka P. Interaction of dietary compounds, especially polyphenols, with the intestinal microbiota: a review. *Eur J Nutr*. 2015 Apr;54(3):325–41.
41. Santacruz A, Marcos A, Wärnberg J, Martí A, Martín-Matillas M, Campoy C, et al. Interplay between weight loss and gut microbiota composition in overweight adolescents. *Obesity (Silver Spring)*. 2009 Oct;17(10):1906–15.

42. Brantsaeter AL, Myhre R, Haugen M, Myking S, Sengpiel V, Magnus P, et al. Intake of probiotic food and risk of preeclampsia in primiparous women: the Norwegian Mother and Child Cohort Study. *Am J Epidemiol.* 2011/08/05. 2011 Oct 1;174(7):807–15.
43. Myhre R, Brantsæter AL, Myking S, Gjessing HK, Sengpiel V, Meltzer HM, et al. Intake of probiotic food and risk of spontaneous preterm delivery. *Am J Clin Nutr.* 2011 Jan;93(1):151–7.
44. Vitali B, Cruciani F, Baldassarre ME, Capursi T, Spisni E, Valerii MC, et al. Dietary supplementation with probiotics during late pregnancy: outcome on vaginal microbiota and cytokine secretion. *BMC Microbiol.* 2012 Oct;12:236.
45. Polatti F. Bacterial vaginosis, *Atopobium vaginae* and nifuratel. *Curr Clin Pharmacol.* 2012 Feb;7(1):36–40.
46. Ilmonen J, Isolauri E, Poussa T, Laitinen K. Impact of dietary counselling and probiotic intervention on maternal anthropometric measurements during and after pregnancy: a randomized placebo-controlled trial. *Clin Nutr.* 2011 Apr;30(2):156–64.
47. Luoto R, Laitinen K, Nermes M, Isolauri E. Impact of maternal probiotic-supplemented dietary counselling on pregnancy outcome and prenatal and postnatal growth: a double-blind, placebo-controlled study. *Br J Nutr.* 2010 Jun;103(12):1792–9.
48. Hickey RJ, Zhou X, Pierson JD, Ravel J, Forney LJ. Understanding vaginal microbiome complexity from an ecological perspective. *Transl Res.* 2012 Oct;160(4):267–82.
49. Ait-Belgnaoui A, Durand H, Cartier C, Chaumaz G, Eutamene H, Ferrier L, et al. Prevention of gut leakiness by a probiotic treatment leads to attenuated HPA response to an acute psychological stress in rats. *Psychoneuroendocrinology.* 2012 Nov;37(11):1885–95.
50. Cryan JF, Dinan TG. Mind-altering microorganisms: the impact of the gut microbiota on brain and behaviour. *Nat Rev Neurosci.* 2012;13(10):701–12.
51. Bilder DA, Bakian A V, Viskochil J, Clark EAS, Botts EL, Smith KR, et al. Maternal prenatal weight gain and autism spectrum disorders. *Pediatrics.* 2013 Nov;132(5):e1276-83.