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CORRECTION
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Corrigendum: The Composition and Function of Pigeon Milk Microbiota Transmitted From Parent Pigeons to Squabs

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A Corrigendum on

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In the original article, there was an error. A portion of the text in the introduction was reproduced from another article, this has now been rephrased and appropriately attributed. A correction has been made to the second paragraph of the **Introduction**, paragraph two, the corrected paragraph appears below:

There is a symbiotic relationship between microbiota and their hosts (Rees et al., 2018; Dietz et al., 2019). The main benefit of microbes was to obtain a relatively stable habitat and adequate food source (Kohl, 2012; McFall-Ngai et al., 2013). Meanwhile, microbes play an important role in many aspects of host physiology, including nutrition, metabolism, and intestinal homeostasis (Walker et al., 2017). Early colonization of microbiota can have long-standing consequences on host such as determining the production of essential metabolites which facilitate postnatal development and enhance immune function (Lee and Mazmanian, 2010; Funkhouser and Bordenstein, 2013; Gensollen et al., 2016; Stinson et al., 2017). Neonates of mammals can acquire maternal microbiota through the placenta, amniotic fluid, vagina, and breast milk (Digiulio et al., 2008; Satokari et al., 2009; Albesharat et al., 2011; Stout et al., 2013; Aagaard et al., 2014). The prenatal exposure is an important step in modulating the embryonic development and the maturation of immune system (Nylund et al., 2014). Fetuses are highly susceptible to disease infections, not only because their immature immune system is less capable of generating adaptive immune effectors, such as antibodies, but also because they lack diverse commensal microbiota that can antagonize pathogens independently of host responses (Basha et al., 2014; Simon et al., 2015; Zheng et al., 2020). Although the chicken embryo is isolated from the mother, the core microbial colonizers of maternal hens can be transmitted to the embryos in the process of fertilization and egg formation in the oviduct (Ding et al., 2017). Likewise, prenatal bacteria transfer may occur in other birds. The relatively high percentage of shared operational taxonomic units (OTUs) between neonates and females is a strong indication that neonates of rock pigeons obtain bacteria through prenatal transfer (Dietz et al., 2019). Research has shown that lactobacilli is important in maintaining a healthy microbial balance in the chicken crop (Fuller, 1977), but as regard to crop secretions, it is not known the pigeon milk microbial composition and function, and whether these microbes can be transmitted from parent pigeons to squabs.

The authors apologize for error and state that this does not change the scientific conclusions of the article in any way. The original article has been updated.

REFERENCES

Aagaard, K., Ma, J., Antony, K. M., Ganu, R., Petrosino, J., and Versalovic, J. (2014). The placenta harbors a unique microbiome. *Sci. Transl. Med.* 6:237ra65. doi: 10.1126/scitranslmed.3008599

Albesharat, R., Ehrmann, M. A., Korakli, M., Yazaji, S., and Vogel, R. F. (2011). Phenotypic and genotypic analyses of lactic acid bacteria in local fermented food, breast milk and faeces of mothers and their babies. *Syst. Appl. Microbiol.* 34, 148–155. doi: 10.1016/j.syapm.2010.12.001

Basha, S., Surendran, N., and Pichichero, M. (2014). Immune responses in neonates. *Expert Rev. Clin. Immunol.* 10, 1171–1184. doi: 10.1586/1744666X.2014.942288

Dietz, M. W., Salles, J. F., Hsu, B. -Y., Dijkstra, C., Groothuis, T. G. G., van der Velde, M., et al. (2019). Prenatal transfer of gut bacteria in rock pigeon. *Microorganisms* 8:61. doi: 10.3390/microorganisms8010061

Digiulio, D. B., Romero, R., Amogan, H. P., Kusanovic, J. P., Bik, E. M., Gotsch, F., et al. (2008). Microbial prevalence, diversity and abundance in amniotic fluid during preterm labor: a molecular and culture-based investigation. *PLoS One* 3:e3056. doi: 10.1371/journal.pone.0003056

Ding, J., Dai, R., Yang, L., He, C., Xu, K., Liu, S., et al. (2017). Inheritance and establishment of gut microbiota in chickens. *Front. Microbiol.* 8:1967. doi: 10.3389/fmicb.2017.01967

Fuller, R. (1977). The importance of lactobacilli in maintaining normal microbial balance in the crop. *Br. Poult. Sci.* 18, 85–94. doi: 10.1080/00071667708416332

Funkhouser, L. J., and Bordenstein, S. R. (2013). Mom knows best: the universality of maternal microbial transmission. *PLoS Biol.* 11:e1001631. doi: 10.1371/journal.pbio.1001631

Gensollen, T., Iyer, S. S., Kasper, D. L., and Blumberg, R. S. (2016). How colonization by microbiota in early life shapes the immune system. *Science* 352, 539–544. doi: 10.1126/science.aad9378

Kohl, K. D. (2012). Diversity and function of the avian gut microbiota. *J. Comp. Physiol. B.* 182, 591–602. doi: 10.1007/s00360-012-0645-z

Lee, Y. K., and Mazmanian, S. K. (2010). Has the microbiota played a critical role in the evolution of the adaptive immune system? *Science* 330, 1768–1773. doi: 10.1126/science.1195568

McFall-Ngai, M., Hadfield, M. G., Bosch, T. C. G., Carey, H. V., Domazet-Loso, T., Douglas, A. E., et al. (2013). Animals in a bacterial world, a new imperative for the life sciences. *Proc. Natl. Acad. Sci. U. S. A.* 110, 3229–3236. doi: 10.1073/pnas.1218525110

Nylund, L., Satokari, R., Salminen, S., and de Vos, W. M. (2014). Intestinal microbiota during early life—impact on health and disease. *Proc. Nutr. Soc.* 73, 457–469. doi: 10.1017/S0029665114000627

Rees, T., Bosch, T., and Douglas, A. E. (2018). How the microbiome challenges our concept of self. *PLoS Biol.* 16:e2005358. doi: 10.1371/journal.pbio.2005358

Satokari, R., Gronroos, T., Laitinen, K., Salminen, S., and Isolauri, E. (2009). *Bifidobacterium* and *Lactobacillus* DNA in the human placenta. *Lett. Appl. Microbiol.* 48, 8–12. doi: 10.1111/j.1472-765X.2008.02475.x

Simon, A. K., Hollander, G. A., and McMichael, A. (2015). Evolution of the immune system in humans from infancy to old age. *Proc. Biol. Sci.* 282:20143085. doi: 10.1098/rspb.2014.3085

Stinson, L. F., Payne, M. S., and Keelan, J. A. (2017). Planting the seed: origins, composition, and postnatal health significance of the fetal gastrointestinal microbiota. *Crit. Rev. Microbiol.* 43, 352–369. doi: 10.1080/1040841X.2016.1211088

Stout, M. J., Conlon, B., Landeau, M., Lee, I., Bower, C., Zhao, Q., et al. (2013). Identification of intracellular bacteria in the basal plate of the human placenta. *Am. J. Obstet. Gynecol.* 208:226.e1-7. doi: 10.1016/j.ajog.2013.01.018

Walker, R. W., Clemente, J. C., Peter, I., and Loos, R. J. F. (2017). The prenatal gut microbiome: are we colonized with bacteria in utero? *Pediatr. Obes.* 12, 3–17. doi: 10.1111/ijpo.12217

Zheng, W., Zhao, W., Wu, M., Song, X., Caro, F., Sun, X., et al. (2020). Microbiota-targeted maternal antibodies protect neonates from enteric infection. *Nature* 577, 543–548. doi: 10.1038/s41586-019-1898-4