



Editorial

Why medical community should take biodiversity loss seriously?



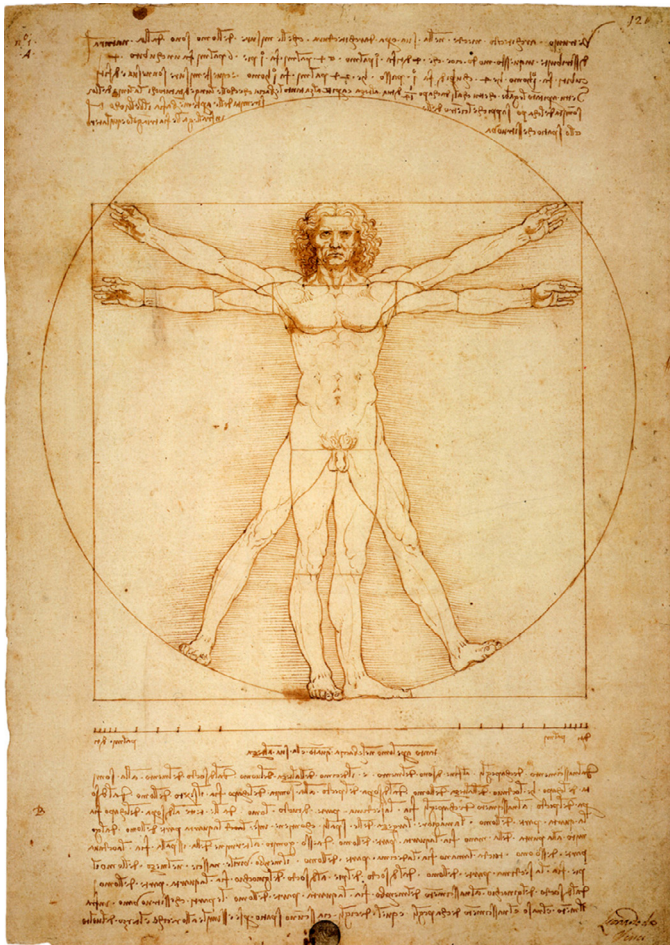
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At the end of the 15th century, Leonardo da Vinci made his famous drawing “*Vitruvian Man*”.¹ It is a study of the proportions of the human body, but also represents Leonardo’s attempts to relate man to nature. According to Encyclopaedia Britannica “Leonardo envisaged the great picture chart of the human body he had produced through his anatomical drawings and *Vitruvian Man* as a *cosmografia del minor mondo* (cosmography of the microcosm). He believed the workings of the human body to be an analogy for the workings of the universe.” Human body is an expression of the microcosm reflected and connected to the macrocosm and universe.

How right Leonardo was, although he did not know anything of microbes, microbiome or genes altogether.

In the 2016 Living Planet Report, World Wildlife Foundation gives an alarming message: “Wildlife populations show continuous decline, on average by 58% since 1970 and are likely to reach 67% by the end of the decade”.² Biodiversity loss is the most dangerous global megatrend, even exceeding the risks of global warming.³ In 2015, for the first time, United Nations recognizes biodiversity as an essential determinant of human health.⁴

The world is urbanizing faster than ever, and UN predicts that close to 70% of the human populations live in cities by 2050.⁵ At the same time non-communicable diseases, e.g. allergies, asthma, inflammatory bowel diseases, diabetes, neurological and mental disorders and obesity, are on increase everywhere in the urban environments. The human immune system has run to an adaptation crisis not having time to adjust to the fastly changing life-style and environment.

Biodiversity loss (tigers, rhinos, whales, . . .) worries us, but the problem seems to be far away from the rushing and growing cities. The threat is, however, close to us, in and on us.^{6,7} Some examples for evidence. Loss of macrodiversity affects microdiversity, immune response and allergy risk.⁸ Traditional farming and life-style with diverse bacterial endotoxin exposure modifies gene expression, immune responses and protects from asthma.⁹ Increase of age-adjusted prevalence of Alzheimer disease strongly associates with urban environments.¹⁰

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We are protected by *two nested layers of biodiversity*, consisting of microbes residing in our bodies and those of the environment we live in.^{11,12} The diversity and composition of the *inner layer* is dependent on microbial colonization from the *outer layer*, a process that depends on our behaviour and environment. To preserve our inner biodiversity – which closely interacts with the immune system – we need to preserve the outer biodiversity and change our everyday practices. Everything we eat, drink, inhale and touch affect online the composition of our microbiota and function of the microbiome.

The number of bacteria in the body is about the same as the number of our own cells.¹³ Around 3 million genes are encoded in the genomes of our microbiota, compared to 23,000 genes of human genome.¹⁴ The microbiome is our “second genome” to which we have externalized many protective and life supporting functions.

Development of diverse microbiota is mostly promoted in early childhood,¹⁵ but the interaction of the outer and inner layers never stops. Innate immunity needs constant, life-long exposure with harmless microbes, “old friends”,¹⁶ to create and maintain tolerance. Immigrant studies indicate that already in 10 years people from very different environments start to acquire same health problems as the original population.

Leonardo would be thrilled of the huge scientific progress revealing the secrets of both micro- and macrocosm. But he may wonder, why are we not stopping the environmental destruction and using the new knowledge for the best of mankind and health of citizens?

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