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Multi-omics in research: epidemiology, methodology, and advanced data analysis

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STELLINGEN

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Multi-Omics in Research: Epidemiology, Methodology, and Advanced Data Analysis

1. Choosing the method to impute missing metabolite data, or not to impute at all, depends on the study characteristics and the nature of measured metabolites – this thesis (chapter 3)
2. The alluring quantity of big data in OMICs research does not necessarily reflect its quality. – this thesis (chapter 2)
3. Network analysis methods in OMICs can be used to identify novel biological pathways, enrich insight in disease etiology, and reveal potential drug targets. – this thesis (chapter 5)
4. Genes associated with a reduction of body weight do not necessarily associate with a favorable metabolomic profile. – this thesis (chapter 7)
5. “The metabolic patterns of individuals are crucial in connection with their susceptibility to disease” (Roger J. Williams, *Biochemical Institute Studies IV*, 1951) but their understanding requires advanced analytical, epidemiological, and biological approaches.
6. Although copy-number variations are ignored in most genome wide association studies, they are an important type of genomic variation that can help resolve the infamous “missing heritability problem” – (Génin, E., *Hum Genet*, 2020).
7. Minimum risk levels (MRL) of PFAS in drinking water and in the environment are claimed to be safe for humans (Sunderland, EM. et al., *J Expo Sci Environ Epidemiol.*, 2019). Constantly adjusting the MRL guidelines only facilitates opportunistic interpretation by the manufacturers. The ideal solution is to ban and remove all forms of PFAS from our environment.
8. Despite the strong associations between metabolites and some diseases, based on genetic causal inference studies, these associations do not seem to be causal. This may be explained by “common antecedents” that result both in altered metabolite levels as well as disease (Surendran, P. et al. *Nat Med.*, 2022), but also by the pleiotropic nature of many metabolites.
9. “Nature considered rationally, that is to say, submitted to the process of thought, is a unity in diversity of phenomena; a harmony, blending together all created things, however dissimilar in form and attributes; one great whole animated by the breath of life.” The recent technological developments in multi-OMICs research make it realistic to address nature as this great whole (Alexander von Humboldt, *Cosmos*, 1845).
10. Let’s embrace Carl Sagan’s words: “Like it or not, we are stuck with science. We had better make the best of it. When we finally come to terms with it and fully recognize its beauty and its power, we will find, in spiritual as well as in practical matters, that we have made a bargain strongly in our favor”. (*The Demon-Haunted World*, 1997).
11. “All we have to decide is what to do with the time that is given us.” (J.R.R. Tolkien, *The Fellowship of the Ring*, 1954). We should pursue what is important and meaningful to us, even if it is a hard a path to take.