

Translational research on exhaled volatile organic compounds from bedside to bench

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Translational Research on Exhaled Volatile Organic Compounds From Bedside to Bench

Rianne R. R. Fijten

Maastricht, 11 december 2017

1. External study validation is paramount to assess the reliability of a predictive model in exhaled breath research, yet only 3% of studies performed thus far have included such validation. (this thesis)
2. When the use of exhaled breath is investigated to diagnose a disease with a heterogeneous rather than homogenous manifestation, a larger number of patients is required due to the variability of VOC concentrations detected in the exhaled breath. (this thesis)
3. A cell contains many layers of information of which VOCs represent only the upper layer. When information from the remaining layers is added, associations can be found between exhaled VOCs and underlying cellular processes. (this thesis)
4. The exposure of cells to a foreign compound induces metabolic responses leading to changed excretion of VOCs. (this thesis)
5. Exhaled breath collection carries no health risks, which makes it, in contrast to the current invasive golden standard diagnostic tools, very suitable for use in critically ill patients and other vulnerable patient populations. (this thesis)
6. Machine learning transforms incomprehensible data into knowledge, but if not properly used and validated this presumed knowledge may be incorrect.
7. Within the field of breathomics, standard operating procedures need to be developed to improve the standardization of breath collection and analysis.
8. The field of breath research is in nature a multidisciplinary field ranging from clinical research, analytical chemistry and sensor technologies to machine learning and therefore relates to the quote of Naomi Oreskes: "Science is not based on any individual, no matter how smart that individual may be. It is based on the collective wisdom of all of the scientists who have worked on a particular problem."
9. In the future, a handheld breath analysis device could be developed that would allow doctors to remotely monitor disease progression of patients.
10. Open science must become the norm, not the exception, as science belongs to all of society.
11. Even though the PhD student is the "captain of her ship", a PhD cannot be concluded successfully without a team effort.