ALL. 1

Traccia 4

1) Si descrivano le differenze tra le tipologie di consenso nel contesto del trattamento dei dati personali
2) Si definisca il meccanismo di chiave privata e chiave pubblica nell'ambito della tecnologia blockchain
3) Si definisca la tossicità acuta per inalazione di una miscela di gas tecnici
4) Si fornisca la definizione di file compresso

TRACCIA 4

elimination of biomarkers in the body and its response to interventions. Moreover, spatiotemporal information on the respiratory tract and lung can be obtained from exhalation profiles recorded during the breathing cycle. Finally, analysis of breath gas immediately after exhalation without preconcentration and storage simplifies sample handling and reduces the risk of sample contamination. Ideally, several biomarkers are measured simultaneously to reliably assess a health condition, but fast and accurate quantitative multispecies detection in exhaled breath is very challenging with any of the current techniques.

The main analytical techniques associated with breath gas analysis today are variants of mass spectrometry (MS) (cf. Chapters 9, 10, and 15). MS is very useful in the exploratory phase of research and for the detection of larger volatile organic compounds (VOCs). However, accurate quantification is difficult, and on-site clinical application is problematic, since MS-based instruments are often large and expensive, and, depending on the type of system, the analysis can be time consuming. Soft ionization MS techniques allow for online, multispecies analysis, but detection of smaller molecules can be challenging.

Thus, it is not surprising that of the few clinically available breath tests, most are based on optical devices. Among the tests approved by the US Food and Drug Administration (FDA) are capnography to detect exhaled carbon dioxide (CO_2), the $^{13}CO_2/^{12}CO_2$ urea breath test for detection of *Helicobacter pylori* bacterial infection (both nondispersive infrared spectroscopy [NDIR]; see Chapter 17), and the fraction of exhaled nitric oxide (F_ENO) test (chemiluminescence; "semioptical"; see Chapters 4 and 5). In general, many of the proven breath biomarkers, in particular nitric oxide (NO), carbon monoxide (CO), and carbon dioxide (CO_2) isotopes, but also ammonia (NH_3) and methane (CH_4), are organic or inorganic molecules of low molecular weight and as such are perfectly suited for optical analysis.

The main advantages of optical spectroscopy include reasonable cost and size, online and real-time capability, reliable quantification, and high sensitivity and selectivity for small molecules and for isotope-resolved measurements. While optical spectroscopy is less suitable for biomarker identification and fingerprinting, it complements MS and helps in driving breath gas analysis into the clinical practice. Optical techniques are also useful in the exploratory research phase, when it comes to detailed physiological studies of low molecular weight biomarkers. Emerging application include real-time detection coupled to physiological modeling, lung function testing, and in vitro studies.

14.2 Basic principles

Depending on the wavelength region used, optical spectroscopy is sensitive to either the electronic structure (ultraviolet and visible, UV-VIS) or the intramolecular bond vibrations (infrared, IR) of an analyte. An optical spectrometer probes transitions between energy levels associated with these electronic or vibrational degrees of freedom.[1] Together with the excitation of molecular vibrations, IR photons also

All. 3

Traccia 1

1) Si descrivano gli statuti e i regolamenti riguardanti l'autonomia normativa, in merito alla legislazione universitaria
2) Si relazioni sull'Art. 15 dello Statuto del Politecnico di Bari – Nucleo di Valutazione di Ateneo
3) Si descrivano le foni di incertezza che influenzano la stima della concentrazione di miscele gassose certificate, ottenute con tecnica gravimetrica
4) Si descrivano le principali caratteristiche e finalità di un database

TRACIA 1

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