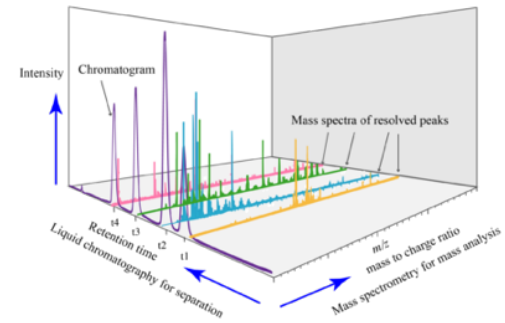


Data mining for metabolomics data

Metabolites represent **the end result of gene and protein function and activity** (e.g. glucose, amino acids), so they constitute the unique biochemical fingerprint of **on going cellular processes**. Untargeted or targeted metabolomics generate thousands of peak intensities or hundreds of metabolites.

AIMS 1) to identify changes in metabolite patterns associated to pathology progression (i.e. sepsis) and/or patient response to treatment (i.e. cancer)
2) to provide a **list of putative relevant pathways** determine novel targets for the administration of a timely and effective therapy, thus providing the basis for **personalized medicine**.



Required skills: signal processing techniques, basic knowledge of data mining techniques

In collaboration with



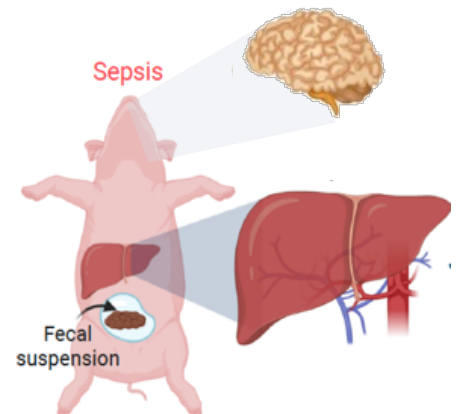
Monitoring and searching for new therapy target in sepsis

“Sepsis is a **syndrome** shaped by pathogen factors and host factors with characteristics that evolve over time. What differentiates sepsis from infection is **an aberrant or dysregulated host response** and the **presence of organ dysfunction**”. [JAMA. 2016 Feb 23; 315(8): 801–810]

- **Clinical impact:** high incidence (20-30% of intensive care unit admissions) mortality of about 40% and long term physical and cognitive impairment in survivors (5-year mortality rate of 75%).
- **An accurate and early diagnosis is still a challenge**
- **Current therapies acts only on symptoms**, not tailored on each patient and on their response

AIM: to study vital signs recorded during animal experiments in order to identify patterns associated to long term comorbidities (i.e. cognitive impairment) to improve drugs therapies and clinical monitoring.

Required skills: signal processing techniques, Matlab



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Hemodynamic modeling and cardiovascular physiology for bedside monitoring

Acute inflammation and sepsis are known to impair **endothelial functions** and to trigger a dysfunction of the autonomic nervous system (ANS), leading to a condition of prolonged and often irreversible hypotension.

AIM: to study the autonomic alteration in the **blood pressure regulatory mechanisms**, the coupling between the heart and the arterial circulation (afterload) and the clinical implications **in drugs therapy and monitoring**. Data from **animal experiments** of long term sepsis condition (5 days) or short term (couple of hours), from **patients** in intensive care unit (ICU).



Required skills: signal processing techniques, Matlab

In collaboration with



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