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Innovative (electro-driven) sample preparation tools for metabolomics study of muscle aging

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PROPOSITIONS

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1. The goal of sample preparation is enrichment, cleanup, and signal enhancement. Sample preparation is often the bottleneck in analysis workflow, as they are often time- and labor-intensive.
Mitra, S. Sample preparation techniques in analytical chemistry. 2003.
2. Fast, miniaturized, automated, high-throughput, low-energy, and operator-safe methods are preferred for greening sample preparation.
López-Lorente, et al. TrAC Trends in Analytical Chemistry 2022, 116530.
3. Three-phase electro-extraction provides a fast, simple, and online sample preparation method with high enrichment for basic and acidic compounds in small volume and/or low concentration samples.
Chapter 2&3, this thesis
4. A stable automated electro-extraction setup was developed with evaluation of machine vision for the acceptor droplet size and current monitoring during extraction process.
Phase 1 in Chapter 4, this thesis
5. The fully automated and high-throughput electro-extraction setup was successfully applied to human plasma samples and utilized for acylcarnitines analysis in progeroid (*Erc1^{Δc}*) mice muscle tissues.
Phase 2 in Chapter 4, this thesis
6. Muscle mass usually starts to decline from about 30 years old, with on average 40% of muscle mass lost by the age of 80 years. Worldwide, 11–50% of those aged 80 or above suffer from sarcopenia, and this number is increasing with the linear rise of average life expectancy.
N. Garatachea, et al., Rejuvenation Res, 2015, (18), 57-89.
S. von Haehling, et al., J Cachexia Sarcopenia Muscle, 2010 (1), 129-133.
7. Dietary restriction delays accelerated aging and retards many symptoms of aging.
W. P. Vermeij, et al., Nature, 2016, 537(7620), 427-431.
8. Dietary restriction attenuates sarcopenia by downregulating oxidative stress-related and pro-inflammatory metabolites, upregulating several anti-inflammatory metabolites, improving energy generation and storage pathways, and increasing the consumption of energy source in progeroid mice.
Chapter 6, this thesis
9. Keep it simple, stupid. (KISS principle)
- Kelly Johnson.
10. There have to be reasons that you get up in the morning and you want to live.
- Elon Musk.
11. This short life, we will eventually lose, you might as well be bold: Love a person, climb a mountain, chase a dream.
- Big Fish & Begonia.
12. Most of time, it is because of a choice that there is an opportunity, and belief that there is possibility.
- Kazuo Inamori.