On the road to a better understanding of the teamwork of multiple commercial emulsifiers and their consequence for intestinal lipid digestion

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In the past decades, researchers have improved understanding on how emulsifiers affect oil-in-water (O/W) emulsion properties, as well as on the consequences for *in vitro* lipid digestion kinetics (i.e. rate and extent). However, the majority of these studies focused on singular emulsifiers, while commercial products most often contain and require multiple emulsifiers. Therefore, this research aimed to comprehend the influence of a commercial emulsifier combination on O/W emulsion properties and subsequent lipolysis kinetics. The emulsifiers were studied individually, as well as in various combinations by applying different concentrations, and compared to the commercial combination itself. The influence of emulsifiers on the dynamic interfacial tension, to estimate their affinity for the interface, and the microstructure of resulting O/W emulsions were evaluated. Afterwards, emulsions were subjected to *in vitro* digestion during which its microstructure and lipolysis kinetics were assessed. Significant differences were observed in terms of interfacial tension, microstructure, and lipolysis kinetics between different preparations. Monoolein was unable to substantially reduce the interfacial tension (>18 mN/m). However, the addition of the synthetic emulsifier or lysolecithin to monoolein resulted in a substantial reduction of the interfacial tension (<14 mN/m). Furthermore, emulsions containing solely monoolein were unstable during digestion, resulting in a significantly lower initial rate and extent of digestion (2.32 min^{-1}, 37.98 %) in contrast to emulsions containing solely lysolecithin or the synthetic emulsifier (5.43 and 7.02 min^{-1}, 58.60 and 68.42 %, respectively). However, addition of more than 50 % of the latter two improved rate and extent of lipolysis to maximally 6.32 min^{-1} and 61.59 %, which was linked to increased emulsion stability. Lastly, dynamic interfacial tension and lipolysis results led to the hypothesis that mainly the synthetic emulsifier and lysolecithin resided at the interface, thereby mainly influencing emulsion stability and lipolysis. Overall, this study showed that different mixes of commercial emulsifiers strongly impact lipid digestion kinetics and small adjustments in such mixes can substantially influence lipolysis kinetics. Aforementioned understandings can be applied to optimize and design emulsions to obtain targeted lipolysis kinetics.