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The effects of algal extracellular substances on algal growth, metabolism and long-term medium recycle, and inhibition alleviation through ultrasonication

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Abstract: The algal extracellular substances (AESs), mainly excreted in the lag and stationary phases, inhibited the algal growth and culture recycle. The AESs consisted of protein-like substances and saccharides, which restrained the algal lipid and protein biosynthesis. Moreover, the increasing reactive oxygen species and anti-oxidative enzymes caused by AESs led to the oxidative damage and suppressed the cell activity. The AESs affected the cells through two possible ways: one is the AESs adhered to the cell surfaces; another is the cells yielded signal molecules in response to the AESs. Fortunately, the ultrasound degraded the AESs into small molecules, which clearly alleviated the limitation and recovered the algal biomass and metabolism to recover. This study demonstrated that ultrasonication is a promising way to alleviate the AESs,