



2016 中技社境外生研究獎學金

CTCI Science and Technology Research Scholarship

CTCI Science and Technology Research Scholarship 2016

Carbonaceous disinfection by products from different origins of algogenic organic matter



Presenter: Lap-Cuong Hua, 3rd Ph.D candidate

Institute of Environmental Engineering, National Chiao Tung University

Advisor: Prof. Chihpin Huang



Research focus: Water safety for daily drinking purpose has been attracted great attention of the public health concern. The formation of disinfection-by-products (DBPs) in treated water, which are carcinogens, is the biggest challenge for drinking water safety. A better understanding of DBP precursors and formation pathways is very crucial for water treatment plants. My work is aiming to investigate and characterize the organic matter derived from various algae, which is considered as an important precursor to disinfection-by-products when algal eutrophication occurs in fresh water. This work will give a thorough insight into the understanding the role of algae as the precursor to DBPs for a better control of DBP formation in drinking water.

Main results:

1. Algal growth behavior: An axenic culture of a commonly found green alga *Chlorella* sp. was conducted in a photobioreactor. Its growth phases were determined by chlorophyll *a* and OD₆₈₀ (Fig. 1). We selected the algal suspension in day 25 for further algogenic organic matter (AOM) characterization and DBP formation potential test due to its highest magnitudes in DOC and UV₂₅₄ absorbance DBPs.

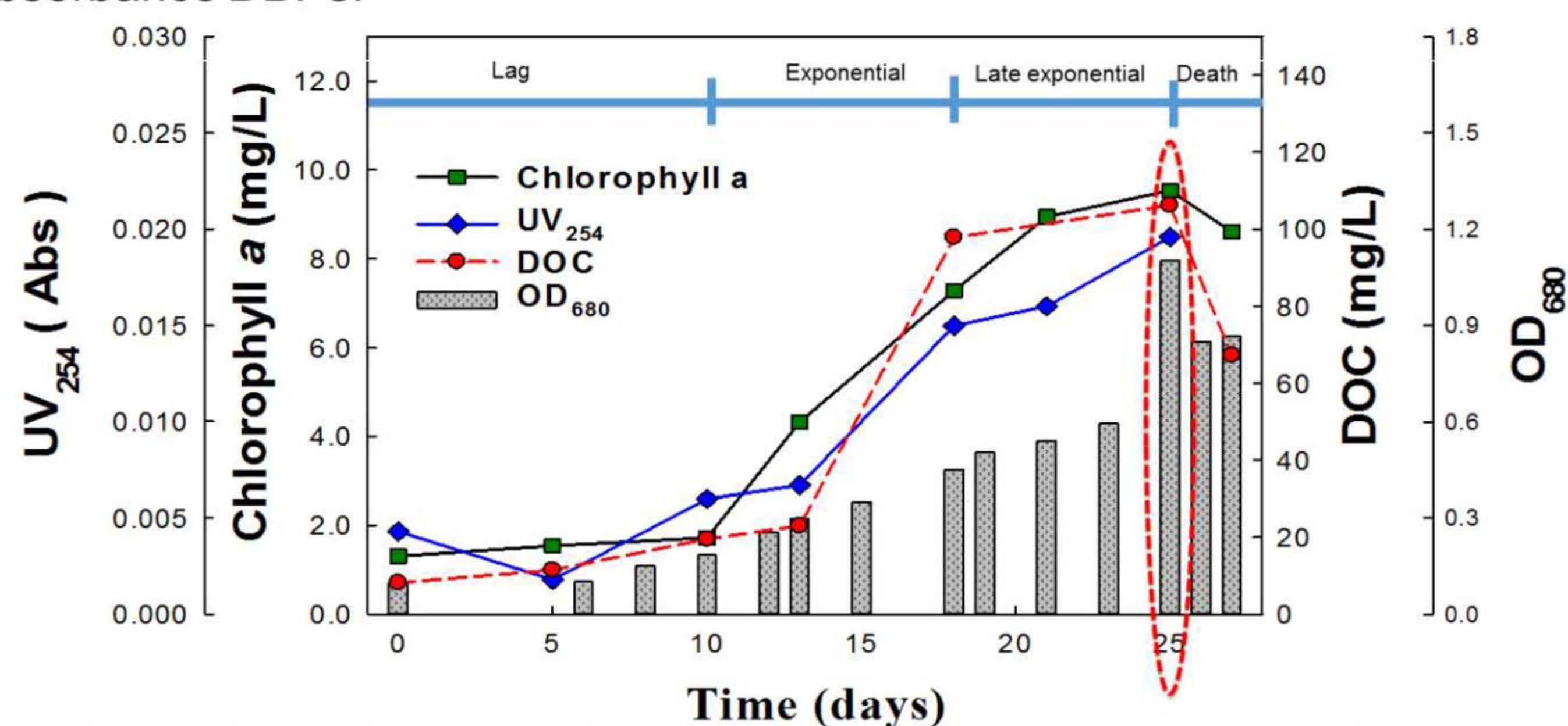


Fig.1 Behavior of *Chlorella* growth (UV₂₅₄: UV absorbance at 254 nm; OD₆₈₀: optical density at 680 nm; DOC: dissolved organic carbon)

2. Characterization of AOM origins: Three origins of AOM, including IOM, EOM, and COM, were characterized their chemical properties. IOM was richest content of organic nitrogen but lowest aromaticity, while these trends was reversely obtained in EOM. The characteristics of COM was likely similar to IOM.

Table 1 Chemical properties of IOM, EOM, and COM

Parameters	IOM	EOM	COM
DOC/DON	0.54	2.21	1.31
SUVA (L/mg-m)	0.25	0.94	0.29

IOM: intracellular organic matter
EOM: extracellular organic matter
COM: cellular organic matter

DOC/DON: dissolved organic carbon/ dissolved organic nitrogen

3. AOM origins as precursors to THMs and HAAs: The highest magnitude of specific THMFP and HAAFP was yielded by IOM, following by EOM and COM (Fig. 2). This is attributed to the different characteristics of these AOM origins. These results also implied that AOM precursors preferentially produced HAAs than THMs. This tendency is mostly reverse from the chlorination trends of natural organic matter, which yielded more THMs than HAAs.

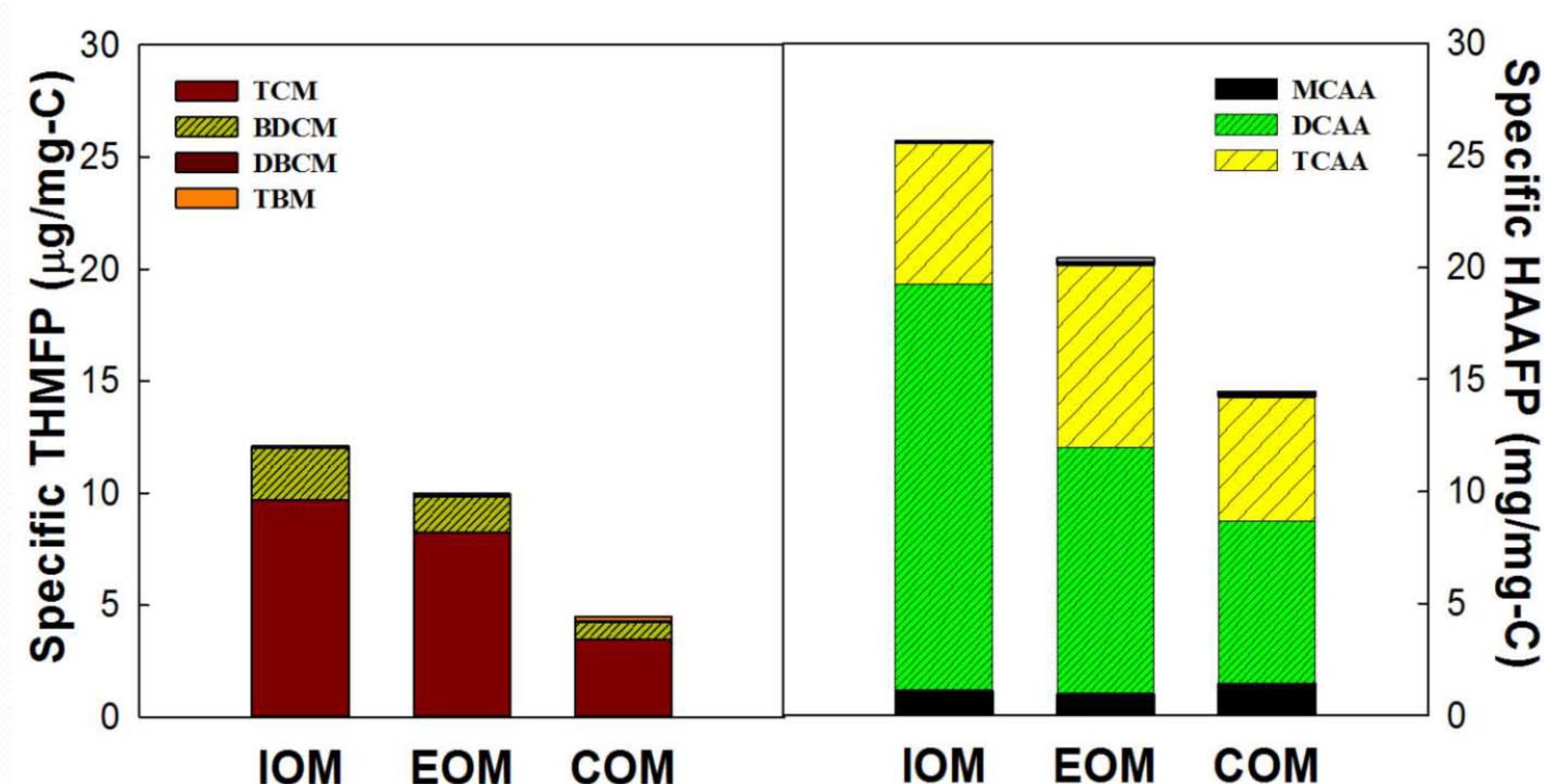


Fig.2 Formation potential of THMs and HAAs yielded by IOM, EOM and COM (THMs: trihalomethanes; HAAs: Haloacetic acids; Chlorination condition: pH 7; 25°C; in dark, and for 7 days)

Conclusions: The AOM derived from *Chlorella* sp. has high potential to yield HAAs than THMs. Among three origins of AOM, the IOM is a highest-yielding precursor to either THMs or HAAs. Thus, the IOM or the organic matter inside algal cell plays an important role on the formation of DBPs in water treatment.



交通大學

National Chiao Tung University



財團
法人

中技社

CTCI FOUNDATION