

# 毒性化學物質對於月芽藻(*Pseudokirchneriella subcapitata*)低 影響抑制濃度 NOEC、LOEC、EC<sub>10</sub> 及 NEC 之研究

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## 摘要

本研究主要是針對本實驗室過去所做的 108 種毒性化學物質所做的密閉式藻類毒性試驗數據，其中包括了苯類、烷類、酚類、腈類、醛類、苯胺類、醇類、烯類、酮類、PAHs 以及農藥，求得其 EC<sub>10</sub>、NEC、NOEC 以及 LOEC。在比較此四項觀測終點參數後，其敏感度的關係為 NOEC ≥ EC<sub>10</sub> > LOEC = NEC。在 ACR 的部份則發現月芽藻急慢毒性間，在三大作用機制下：非急性麻醉性、急性麻醉性以及反應性，皆有良好的線性關係。

QSARs 的關係中，對於基線毒性 (Baseline toxicity) 在 EC<sub>10</sub>、NEC、NOEC 以及 LOEC 中，回歸方程式的 R<sup>2</sup> 以及 Q<sup>2</sup> 皆大於 0.85 以上，表示本研究對於非急性麻醉性毒性化學物質的低影響抑制濃度，具有良好的預測性。至於急性麻醉性化學物質，是以 Log P 以及 E<sub>LUMO</sub> 兩項參數進行回歸，亦有良好的結果。除此之外，本研究亦對於其文獻中的月芽藻 (*Pseudokirchneriella subcapitata*) 的結果以及其他物種水蚤 (*Daphnia magna*) 以及鱒魚 (*Pimephales promelas*) 進行敏感度的比較，結果發現以密閉式藻類毒性試驗的藻類毒性和鱒魚有良好關係性。

Toxicity assessment of low effect concentration (NOEC, LOEC,  
EC<sub>10</sub> and NEC) to *Pseudokirchneriella subcapitata*

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ABSTRACT

This research is aimed to estimate the low effect concentrations of 108 chemicals on *Pseudokirchneriella subcapitata* (green algae) assessed by a closed system BOD bottle test. Toxicants including benzenes, alkanes, phenols, anilines, aldehydes, nitrile, alcohols, ketones, pesticides, and PAHs were obtained NOEC, LOEC, EC<sub>10</sub> and NEC. Among these parameters, NOEC was found to be generally smaller than EC<sub>10</sub> and were apparently lower than LOEC and NEC. For non-polar narcotics, polar narcotics and reactive toxicants, distinct linear relationship were identified between EC<sub>50</sub> and low effect concentration.

For non-polar narcotic chemicals, the Quantitative structure-activity relationships (QSAR) of four parameters were based on the octanol-water partition coefficient (Log P) was established with R<sup>2</sup> and Q<sup>2</sup> above 0.85. Further, for polar narcotic chemicals, the discriminating parameters including log P, E<sub>LUMO</sub> (Energy of the lowest unoccupied molecular orbital) were chosen to predict the toxicity effectively. These equations also show a good prediction.

Finally, compared to literature data, results from this study show that the

closed system BOD bottle test is greater sensitivity than conventional batch test and a good correlation was found in comparison with the fish (*Fathead minnow*). Hence, algal toxicity test can be considered as a surrogate test for estimating the toxicity of chemicals to Fathead minnow.

