海洋暖化與酸化對水產品中重金屬累積之影響與風險

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大綱

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二、海洋暖化情境下影響牡蠣中金屬之生物累積與生物利用度

三、海洋酸化情境下影響海洋橈足類中鎘之毒性

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摘要

人類活動使大量 CO_2 與甲烷等溫室氣體釋放到大氣中，使海洋溫度上升與 pH 值下降，導致海洋暖化與酸化。海洋暖化與酸化會影響海水中重金屬之形態、吸附、及氧化還原過程速率，尤其是以氧化物、氫氧化物、碳酸鹽形式存在之重金屬。本篇報告探討海洋暖化與酸化對海洋生物中重金屬濃度之影響，並評估人類攝入海洋酸化下受重金屬污染貝類之風險。首先，採集福建省發電廠附近不同溫度位點之牡蠣，測定銅、鋅、鉛、鎘、汞、及砷濃度，並估算生物累積與生物利用度。另外，將日本虎斑猛水蚤於不同 CO_2 與鎘濃度下海水中分析總鎘累積、基因表現、及生化分析。最後，再利用以生理為基礎之藥理動力學(physiologically based pharmacokinetic, PBPK)模型模擬民眾攝入受鎘污染文蛤與牡蠣後，尿液與血液中鎘濃度，並使用危害商數(hazard quotient, HQ)來評估對人體腎功能障礙與骨質疏鬆之風險。結果顯示海洋暖化情境下牡蠣中重金屬累積增加。海洋酸化會使橈足類鎘累積增加，且也會降低 Cd 排出體外，產生能量與抗氧化能力減少，以及增加解毒/壓力反應與細胞凋亡。海洋酸化會增加貝類體內鎘累積，雖不影響全體族群攝食貝類之風險，但會增加僅攝食者男性攝食貝類造成腎功能障礙之風險。這些研究強調未來須關注海洋暖化與酸化對海洋生物體內金屬累積之影響，並進一步評估攝入金屬污染之其他水產品或水產加工品對民眾潛在健康風險。

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