Using DNA Barcoding Assays to Identify Diatoms in New York City Waterways for Drowning Investigations

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Abstract

Diatoms are single-celled eukaryotes that are found in different bodies of water. Diatoms have been used in forensic investigation to help determine if someone died from drowning. Our aim was to generate a method to confirm when an individual drowned by identifying the diatom species present in the victim’s bloodstream and the crime scene. To address this issue, we carried out a pilot study to find out if diatom species at a particular site vary at different times (intra-day variations) and days (inter-day variations). Our results showed that the predominant genus of diatom is constantly present in the intra-day and inter-day samples. This finding indicates that identification of diatom species can potentially be useful for drowning investigations in New York City waterways.

Results

Intra-day variation studies consist of two types of samples: samples collected at high tide and low tide (Figure 3). For inter-day variation studies, five pairs of water samples at different days were collected. Some of these samples produced DNA sequences of multiple species, which cannot be resolved using Sanger sequencing thus they were not analyzed further. The analyzed sequences were compared and the most abundant diatom species are described in Table 1. The electropherograms of representative inter-day variation samples are shown (Figure 5).

Discussion

Our results indicated that the Bacterosira and/or Thalassiosira genus are the most abundant diatoms present in all the samples collected (Table 1). It is known that Thalassiosira is the predominant genus of marine diatoms [1]. In this pilot study, it was observed that Thalassiosira was constantly present in most of our samples collected. Additionally, the same sequences were matched to Bacterosira in many of the samples (Table 1). The DNA sequences of the barcoding region used in this study are identical between Bacterosira spp. and Thalassiosira spp. (Li et al., unpublished). Recently, studies have revealed that Bacterosira was closely related to Thalassiosira [1]. Based on these findings, a phylogenetic re-definition of the genus Bacterosira, to belong to Thalassiosira, is proposed [1]. The results of this pilot study imply that the predominant genus of diatom is constantly present in the intra-day and inter-day samples. This finding indicates that identification of diatom species can potentially be useful for drowning investigations in New York City waterways. In future studies, detailed profiles of diatom species at additional locations of New York City waters will be studied.

References


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