IDENTIFICATION AND CHEMICAL CHARACTERIZATION OF MARINE NATURAL PRODUCTS USING UPLC-QTof-MS COUPLED TO A NOVEL INFORMATICS PLATFORM

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METHODS

Sample Preparation

Micelles were isolated from marine sediment off Panama, grown under standard fermentation conditions with XAD-2 resin, extracted with 1:1 (v/v) acetone:dimethylsulfoxide (approximately 100 mg/mL). They were then diluted 1 to 40 into 1000 solution was diluted 1 to 20 into 50:50 (MEOH:H2O) solution. Ten microliters of this stock solution was then injected into the UPLC system (Xevo G2 XS QTof MS) and ESI using an autosampler. The negative mode was used with an electrospray voltage of −45 V. The desolvation temperature was set at 500 °C and the cone voltage was set at 30 V. The data were collected using the Waters Empower 2.0 software. The high resolution mass spectrometry data was acquired using data dependent acquisition (MS/MS) which simultaneously provides exact mass precursor ion information, retention time, collision cross-section area (CCS) and theoretical isotope distribution that allows for confident identification of compounds from a complex sample. The post-source decay (PSD) was used to fragment the marine microbial compounds. A custom marine microbial library was used to search against a marine microbial compounds. The library contains marine compounds, chemical structures, molecular formula, in average of mass, accurate masses and isotopic masses. The library can be populated with information such as compound properties (structural properties, specific identifiers and synonyms), literature references, documents, experimental spectra etc.

RESULTS AND DISCUSSIONS

The initial match was validated and confirmed by analyzing fragment ions and corresponding fragment ion information, retention time, collision cross-section area, theoretical isotope distribution and corresponding high resolution mass spectrometry data. The key steps for the unknown structural elucidation are (Figure 5): 1. Set the basic search parameters such as possible elemental composition, fragmentation and isotopic distribution in the database. 2. Search against Chemspider database (in-house) containing about 600 libraries. 3. The initial match was validated and confirmed by analyzing fragment ions and corresponding fragment ion information, retention time, collision cross-section area, theoretical isotope distribution and corresponding high resolution mass spectrometry data. The library contains marine compounds, chemical structures, molecular formula, in average of mass, accurate masses and isotopic masses. The library can be populated with information such as compound properties (structural properties, specific identifiers and synonyms), literature references, documents, experimental spectra etc.

CONCLUSION

The Natural Products Application Solution with UNIFI provides a single workflow for data acquisition, processing and confident compound identification based on low energy precursors exact mass, theoretical isotope distribution and corresponding high resolution mass spectrometry data. A completely new user interface and powerful search algorithms allow for confident compound identification and multiparametric biological annotation provides an opportunity to highlight known, semi-known, novel activity, and new insights into the natural product library that would have otherwise been missed.

REFERENCES


Figure 3. The basic infra structure of the marine natural products library in UNIFI.

Figure 4. Identification result from a custom marine microbial library. (A) The compound is matched to a marine natural product library. (B) The compound is not matched to a marine natural product library. (C) The compound is not matched to a marine natural product but is matched to a marine microbial library.

Figure 5. The compound is matched to a marine natural product library.

Figure 6. The compound is matched to a marine microbial library.

Figure 7. The compound is not matched to a marine natural product but is matched to a marine microbial library.

Figure 8. The compound is not matched to a marine microbial library.

Figure 9. The compound is not matched to any library.

Figure 10. The compound is confirmed to be a marine compound.

Figure 11. The compound is confirmed to be a marine microbial compound.

Figure 12. The compound is confirmed to be a marine microbial compound from a custom marine microbial library.

Figure 13. The compound is confirmed to be a marine microbial compound from a custom marine microbial library.

Figure 14. The compound is confirmed to be a marine microbial compound from a custom marine microbial library.