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Making performance-based chemistry work: How we created comparable data among laboratories as part of a southern California marine regional assessment

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ABSTRACT

Quality assurance procedures to ensure consistency among chemistry laboratories typically involves the use of standard methods and state certification programs that require laboratories to demonstrate their ability to attain generic performance criteria. To assess whether these procedures are effective for ensuring comparability when processing local samples with potentially complex matrices, seven experienced, state-certified laboratories participated in an intercalibration exercise. Each laboratory was permitted to use their typical methodology for quantifying PAHs, PCBs, and DDT on shared samples collected from Santa Monica Bay and the Palos Verdes Shelf, two sites with a complex mix of constituents. In the initial intercalibration exercise, results from these laboratories differed by as much as an order of magnitude for all three chemical groups. Much, but not all, of the difference was attributable to differences in detection capability. A series of studies was conducted to identify the reasons for the observed differences, which varied among laboratories and included methodological differences, instrument sensitivity differences, and differing interpretations of chromatograms. Following these investigations and resulting modifications to laboratory procedures, the exercise was repeated. The average coefficient of variation among laboratories across all chemical parameters was reduced to less than 30%. Our results suggest that performance-based chemistry can produce comparable results, but the certification processes presently in place that focus on general laboratory procedures and simple matrices are insufficient to achieve comparability.

Full Text

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