Measuring Physicochemical Properties to Inform the Scope of Existing QSAR/QSPR Models.

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Chemical structures and their properties are important for determining their potential toxicological effects, toxicokinetics, and routes of exposure. These data are needed to prioritize thousands of environmental chemicals, but are often lacking. In order to fill data gaps, robust quantitative structure-activity relationship (QSAR) and quantitative structure property relationship (QSPR) models are routinely used in risk assessment for both well-known and new chemicals. However, all QSAR and QSPR models are limited in part by the training-set of data available for model development. In order to both calibrate and inform the scope of currently available QSPR models, physicochemical measurements were attempted for 200 chemicals selected for a mix of both those with previously measured physicochemical properties as well as chemicals with moieties that were expected to be challenging to existing models from the USEPA DSSTox database. Among the properties measured were octanol:water partitioning coefficient (K_{ow}), vapor pressure (VP), water solubility (WS), Henry's law constant (HLC), and acid dissociation constant (pKa). The numbers of chemicals successfully measured for each property were: 176 (Kow,) 168 (VP), 129 (WS), 110 (HLC), and 100 (pKa). An analysis was performed comparing these measurements against previous experimental and prediction data, which includes those from ACD Labs, EPI Suite™, OPERA, and NICEATM. Results demonstrate that VP, WS, and K_{ow} have relatively similar predictive accuracies for chemicals with successful measurements across all databases. Case studies are presented in order to demonstrate the impact of the new data on various models that depend on them. *This abstract does not necessarily reflect U.S. EPA policy.*