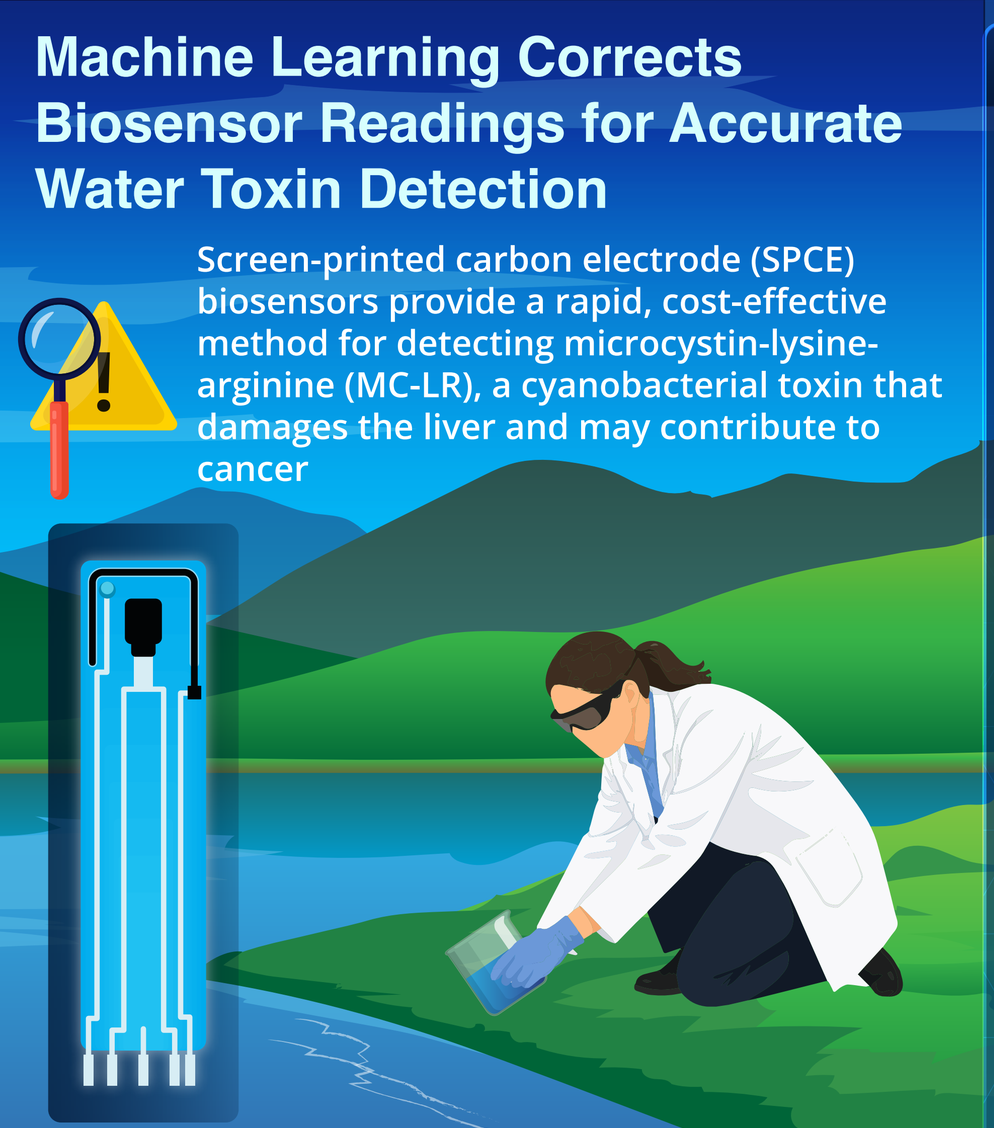
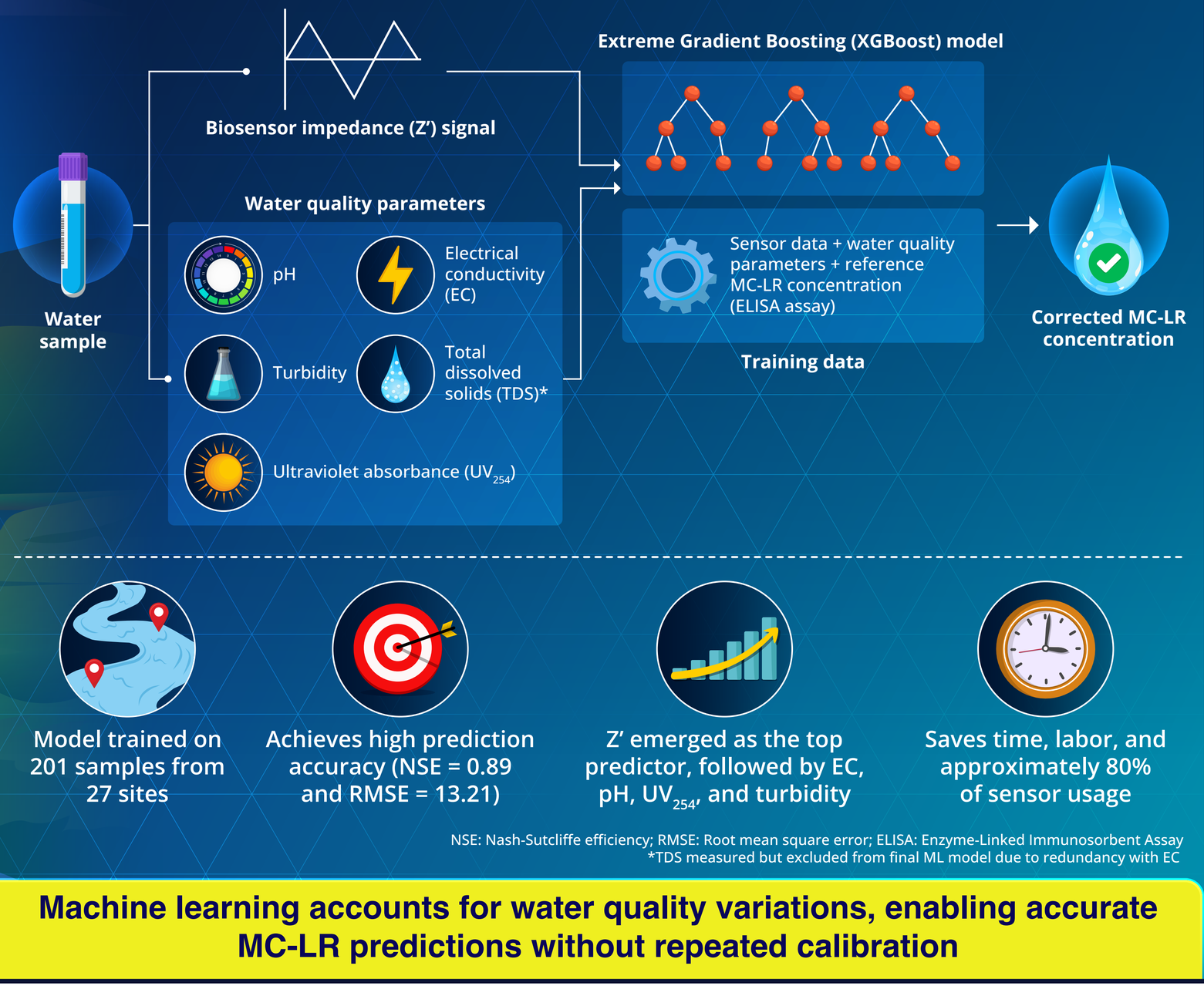
Machine Learning Corrects Biosensor Readings for Accurate Water Toxin Detection

Screen-printed carbon electrode (SPCE) biosensors provide a rapid, cost-effective method for detecting microcystin-lysine-arginine (MC-LR), a cyanobacterial toxin that damages the liver and may contribute to cancer



The electrochemical responses of these biosensors are strongly influenced by water quality conditions, often requiring repeated calibration for different water sources

Machine learning-based calibration for SPCE biosensors



Model trained on 201 samples from 27 sites

Achieves high prediction accuracy (NSE = 0.89 and RMSE = 13.21)

Z' emerged as the top predictor, followed by EC, pH, UV_{254}, and turbidity

Saves time, labor, and approximately 80% of sensor usage

NSE: Nash-Sutcliffe efficiency; RMSE: Root mean square error; ELISA: Enzyme-Linked Immunosorbent Assay
*TDS measured but excluded from final ML model due to redundancy with EC

Machine learning accounts for water quality variations, enabling accurate MC-LR predictions without repeated calibration

Calibration-free on-site detection of microcystin-LR using integrated biosensing, multi-parameter water quality monitoring, and machine learning
Kim *et al.* (2026) | *Water Research* | DOI: 10.1016/j.watres.2026.125832

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