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High Performance Liquid Chromatography method optimization and validation for potassium bromate detection in bread using a quality-by-design approach

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Background: Potassium bromate ($KBrO_3$) is a flour additive that strengthens dough and increases bread volume. However, the International Agency for Research on Cancer (IARC) has labeled it as a possible human carcinogen. Despite being banned in many countries, potassium bromate is still found in bread, particularly in resource-limited settings like Ethiopia, which can pose serious health risks.

Methodology: A reverse-phase HPLC method was developed and optimized using Central Composite Design (CCD) expert. Chromatographic analysis was performed on a C18 column with a mobile phase consisting of acetonitrile and phosphate buffer. . The method was validated following the ICH Q2(R1) guidelines. Fifteen commercial bread samples were collected from each sub-city of Mekelle and analyzed using the developed method.

Conclusion: The validated HPLC method provides a reliable and accurate tool for routine monitoring of potassium bromate in bread. The results highlight significant public health risks associated with excessive bromate use in local bread production and call attention to the urgent need for strengthened regulatory controls and enforcement of food safety standards in Ethiopia.

Biography

Tesfamichael Gebretsadikan is a researcher with expertise in analytical chemistry, food safety, and quality assurance, with a particular focus on the development and validation of analytical methods for food contaminant analysis. His research interests include chromatographic method development, food quality assessment, chemical risk evaluation, and the application of Quality by Design (QbD) principles to optimize analytical procedures.