Microscale GC Analysis of Cholesterol in Fast Food Dishes, Fresh and Processed Meat, Fish and Poultry Products

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INTRODUCTION

Cardiovascular Disease (CVD)
- Since 1990, heart disease is consistently the leading cause of death among the Filipino people.

Cholesterol
- Produced in the liver and can be obtained from consumption of animal products.
- One of the leading risk factors for CVDs (recommended max. intake: 300 mg/day).
- Declaration in food labels is mandatory.

OBJECTIVES OF THE STUDY
- To develop a rapid and reliable microscale GC method for cholesterol determination.
- To apply the validated method in determining the cholesterol content of various animal products.

GAS CHROMATOGRAPHY (GC)
- Preferred method for cholesterol analysis due to its:
  - Accuracy and Precision
  - Sensitivity
  - Linearity
  - Robustness

MATERIALS AND METHODS

Process Flow
- Optimization and evaluation of microscale method
- Sampling and sample preparation
- Cholesterol extraction and moisture analysis
- PT Participation and Statistical analysis

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RESULTS

**Method Validation Data**

### Figure 5: Chromatogram Peaks of Internal Standard (2.55 mins.) and Cholesterol Standard (5.40 mins.)

**Advantages of Microscale Method**

* Compared with AOAC Method

- Shorter Extraction and Analysis Time (Faster by 60%)
- Higher Sensitivity (Able to detect low cholesterol concentration)
- Lesser amount of hazardous solvent (Reduced by 86%)
- More Efficient (Derivatization step already omitted)

**Microscale Method vs. AOAC Method**

- **Accuracy**
  - Obtained SRM 1546a Value: 71.53 ± 1.20 mg/100g
  - *Acceptable Range: 71.70 ± 2.20 mg/100g
  - Bias: -0.15 (N = 7 days)

- **Precision**
  - Repeatability Horwitz Ratio: 1.24* (N = 12)
  - Intermediate Precision Horwitz Ratio: 1.26* (N=7)
  - *Acceptable Horwitz Ratio: <1.30

- **Sensitivity**
  - Limit of Detection (LOD): 0.000501 mg/mL
  - Limit of Quantitation (LOQ): 0.00505 mg/mL

- **Linearity**
  - Range: 0.008 to 0.072 mg/mL
  - Mean Correlation Coefficient: 0.995 (N = 7)

- **PT Participation**
  - FAPAS PT Result: 128.50 ± 4.05 mg/mL
  - Acceptable Value: 99.08 to 138.0 mg/mL
  - Z-score: 1.0 (acceptable value: < 2.0)

Key performance characteristics of the validated microscale method. Accuracy and PT results were within the acceptable limits. In addition, the obtained low Horwitz Ratio and low LOQ value is a great measure of the method's precision and sensitivity, respectively.

![Figure 6: Cholesterol content of fast food dishes using the Microscale and AOAC method.](image)

- **Application of the Microscale Method to Animal Products**
- **Application of the Microscale Method to Various Commonly Consumed Animal Products**

**CONCLUSION AND RECOMMENDATIONS**

Validation data of the cholesterol microscale method was able to demonstrate its rapidness, reliability and fitness for use. Values obtained using the microscale method may be used as viable data for future researches on food and nutrition.

![Figure 7: Cholesterol Content of Fresh and Processed Meat, Pork and Fish](image)

![Figure 8: Cholesterol Content of Muscle Meat, Poultry and Dried Fish](image)

- **Statistical analysis using paired t-test show no significant difference between the two methods, as shown by the overlapping error bars (P<0.05).**

- Application of the microscale method to various commonly consumed animal products show that fresh and processed meat and fish samples have low cholesterol content (<300 mg/100g). The top 3 samples with high cholesterol values are salted duck egg, dried dills and quail eggs.