
Longevity Testing of QuinTron Single-Use Collection Bags

Abstract

Patient breath samples collected in QuinTron single-use collection bags (QT00830-P & QT00834-P) can be held for three hours with minimal losses in H₂, CH₄ and CO₂ concentration. If samples cannot be analyzed within the three hour time period, they can be transferred to a sample holding bag (QT00842-P).

Introduction

When bacteria digest (or ferment) food substances, they produce acids, water and gases. The major gases produced by bacteria include, primarily, hydrogen (H₂), methane (CH₄), carbon dioxide (CO₂) and small concentrations of aromatic gases.¹ These gases are absorbed into the blood circulating near the site of digestion and are carried to lungs, where they are equilibrated with the air in the alveoli. When a patient exhales, gases contained in alveolar air can be captured and measured.

QuinTron manufactures instruments and accessories which are designed to capture and analyze the contents of a patient's breath sample. Specifically, our instrumentation measures concentrations of breath hydrogen (H₂) and methane (CH₄) in parts per million (ppm) and the percentage of exhaled carbon dioxide (CO₂). Using the GaSampler breath collection system, patients exhale into a collection bag which holds the alveolar air sample until it is ready to be analyzed.

QuinTron single-use collection bags (QT00830-P & QT00834-P) are made of a proprietary aluminum foil-laminate similar to the type used for the multi-use collection bags (QT00841-P & QT00844-P). Hydrogen, being the smallest element, can easily diffuse through many materials; one exception to this being metal foils due to their low permeability rating. Unlike the sample holding bag (QT00842-P), the collection bags have two port openings: one small opening for a sample to be extracted from the bag by a syringe and another large port opening for the tee-connector to connect to, which allows the patient to breathe into the bag. The large port opening has a one-way valve, permitting air to flow into the bag but preventing air from escaping. A blue cap covers the port once the patient has finished breathing into the bag to further prevent the breath sample from escaping the bag. Single-patient collection bags are meant to collect multiple samples from an individual patient for immediate analysis.

The purpose of this study was to determine how long the single-use collection bags could adequately hold a sample without significant losses in H₂, CH₄ and CO₂ concentration.

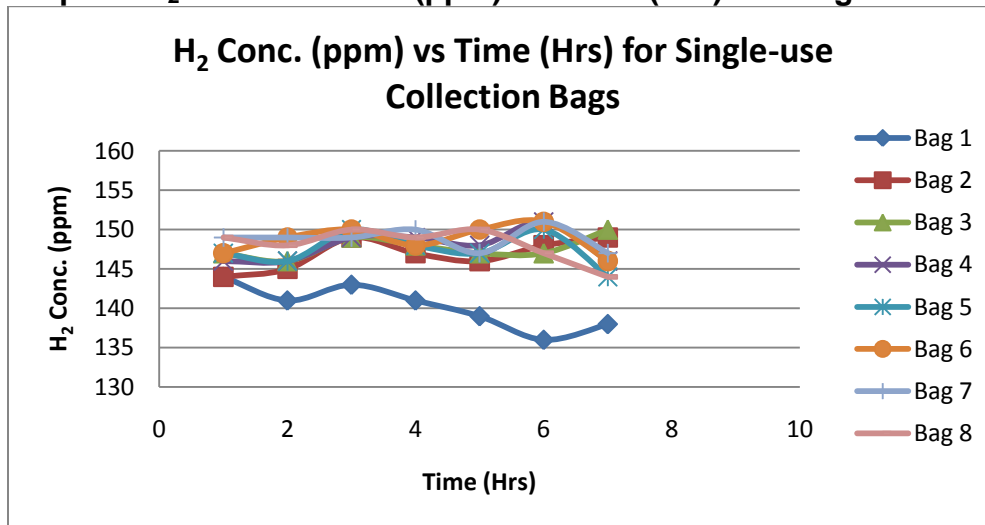
Materials/Method

Eight single-use bags were filled with calibration gas. The calibration gas tank values were H₂=150ppm, CH₄=75ppm, CO₂=6.2%, with an uncertainty of ±2ppm for H₂ and CH₄ and ±0.2% for CO₂. The H₂, CH₄ and CO₂ concentrations in each bag were measured every hour for seven hours on a calibrated BreathTracker SC.

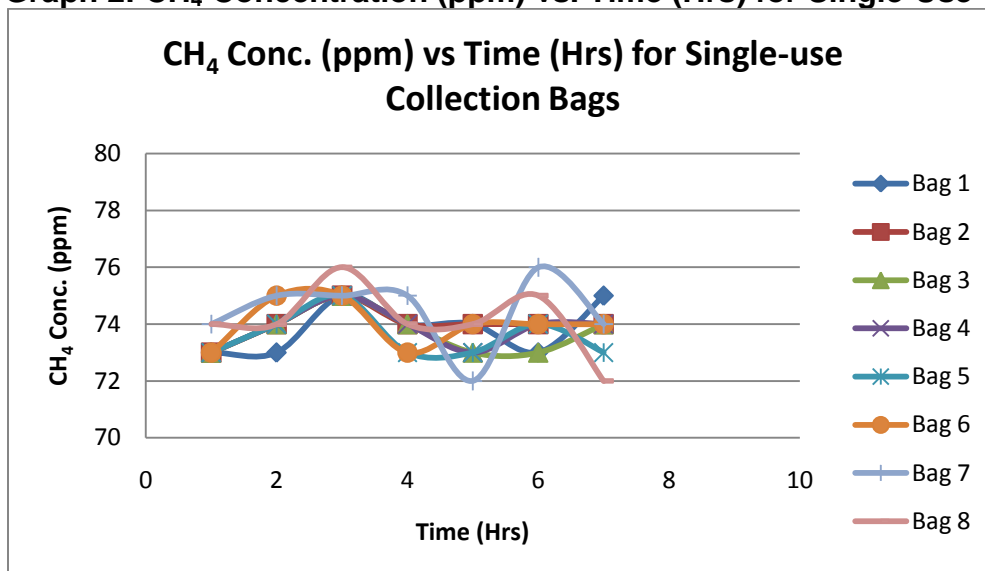
Results

Graphs 1 & 2 show the concentrations of H₂ and CH₄ corrected for dilutions using the CO₂ concentration (see www.QuinTron-usa.com for an explanation of the CO₂ Correction Factor). Graph 3 shows the concentration of CO₂ over time in the bags.

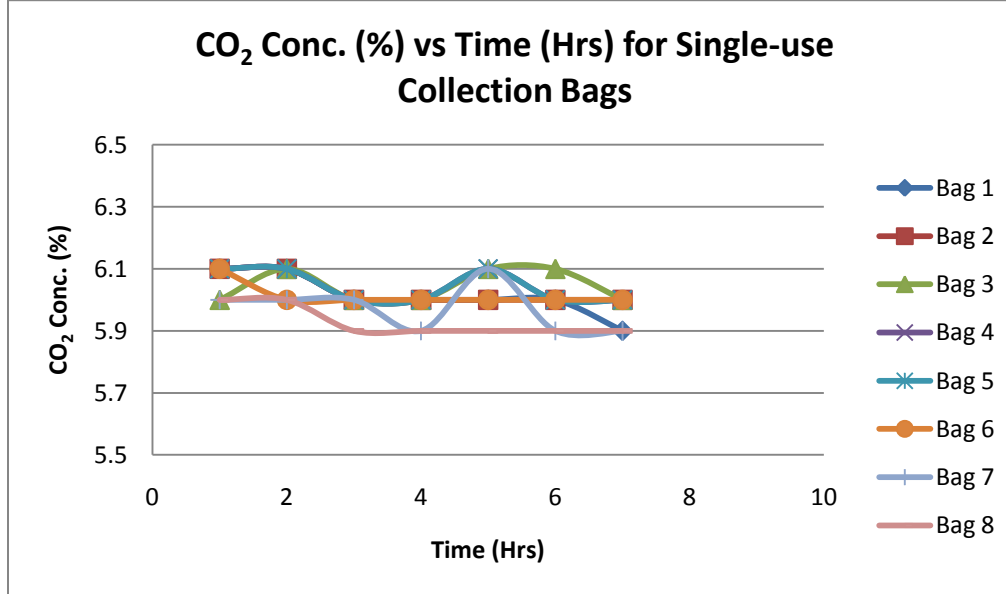
Graph 1: H₂ Concentration (ppm) vs. Time (Hrs) for Single-Use Collection Bags



Graph 2: CH₄ Concentration (ppm) vs. Time (Hrs) for Single-Use Collection Bags



Graph 3: CO₂ Concentration (ppm) vs. Time (Hrs) for Single-Use Collection Bags



Graphs 1-3 show that the bags can hold calibration gas for up to seven hours. After about three hours though, various fluctuations in the concentrations of H₂ and CH₄ were observed. Bag 1 displayed an unexpected drop in H₂ concentration over time. This bag was visually inspected and it was discovered that multiple creases along the seal caused it to leak. QuinTron now visually inspects every bag during assembly for wrinkles in the seal.

Conclusion

The data shows that QuinTron's single-use collection bags can adequately store calibration gas for up to seven hours without significant losses in H₂, CH₄ and CO₂ concentrations. In order to maintain the sample integrity, QuinTron recommends a maximum holding time of three hours in the single-use collection bags. If the sample cannot be analyzed within this time frame, it can be transferred to a QuinTron holding bag (QT00842-P) and held for up to two weeks. QuinTron Application Notes #1 & 2 detail testing of the holding bags.

For further information on the history and science of breath-testing, sample protocols and collection techniques please reference [Breath-Tests & Gastroenterology, 1998 edition](#), written by Lyle Hamilton Ph.D. or request information from QuinTron directly.

References

1. Bond, J.H., Levitt, M.D. Quantitative measurement of lactose absorption. *Gastroenterol.* 1976; 70(6):1058-62