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Report #: H2AR-250930-1

Laboratory Report

Introduction

This report summarizes our testing of the Hydrogen Prebiotic manufactured by Echo Technologies LLC, Spanish Fork, UT, USA.

Product Description

Echo Hydrogen Prebiotic

Serving size: 1 pouch (5 g) in 12 oz (350 mL) of water

The product was received for testing on 9/21/2025. The powder was packaged in single-serving tear-open pouches and is designed to be placed into water and consumed by drinking immediately after it dissolves. The powder contains elemental magnesium (Mg) that reacts with water to produce hydrogen gas (H_2) according to the equation $Mg + 2H_2O \Rightarrow Mg(OH)_2 + H_2$.

Tests Performed

1) Determine the concentration of H_2 using static headspace gas chromatography (HS-GC) and calculate the delivered dose when one pouch is placed into 350 mL (12 oz) of water.

2) Determine the concentration of H_2 using HS-GC and calculate the delivered dose after adding acid to the headspace (HS) vial when one pouch is placed into 350 mL (12 oz) of water.

Test Equipment & Materials

SRI 8610C gas chromatograph, Hayesep-D 6M; detector, TCD; carrier gas, N_2; column temp, 60ºC
GC test method: static headspace; equilibration time, 20 min.
Calibration: performed on the day of testing using calibration gas; PQL: 50 µg/L; LOD: 20 µg/L
Centrifuge: H2 Analytics, H2A-TE-3001 (2400 RPM)
Acetic acid (distilled white vinegar), generic source, 5%
Water: distilled, generic; water temperature, 25ºC ± 1ºC
Lab elevation 864 meters (914M/0.90 atm). All measurements were adjusted to SATP.

The explanation for using acid during GC testing to determine the effective H_2 dose

The reaction between magnesium and water that produces H_2 gas is not instantaneous and can take hours to complete. After an equilibration time of 20 minutes, the test sample in the HS vial still contains some magnesium metal that has not yet reacted. As a result, the H_2 concentration and calculated dose represent only the H_2 gas produced in the test vial during the equilibration period. Since an acidic environment accelerates the hydrogen evolution reaction and the stomach is typically acidic, the delivered dose calculated from the H_2 concentration measured after the equilibration period will underestimate the actual delivered H_2 dose. This is because additional H_2 will be produced in the stomach, which the GC cannot measure. To accurately determine the powder's total H_2 production capacity and *effective* dose, we can add a small amount of acid to the HS vial to drive the reaction between the Mg and water to completion. A second GC test can then be done to measure the additional H_2 produced in the HS vial.

H_2 concentration and dose test description (no acid)

The hydrogen water test samples were prepared using the source water described above. For each test, 350 mL of water was added to a 500 mL glass beaker. One pouch was opened and the entire contents (~ 5 grams) were added to the beaker; the solution was gently stirred and allowed to react for 20 seconds. A 2000 uL sample was then drawn from the solution at a depth of 20 mm using a gastight syringe and injected into the HS vial. The vial was placed on a centrifuge for 1 minute, then removed and set aside for 19 more minutes to allow the dissolved H_2 in the test sample to equilibrate with the HS. After the equilibration period was completed, a 1000 uL sample of the HS was drawn and injected into the GC for analysis. After performing three GC test runs, the results were averaged, and the dose was calculated based on the dissolved H_2 concentration and water volume.

Using acid during testing to determine the effective H_2 concentration and dose

After the initial HS sample was drawn and injected into the GC, a syringe was used to inject 200 uL of acetic acid into the HS vial. This was done to convert any unreacted Mg metal still present in the test sample into H_2 gas. After 4 minutes, a second 1000 uL HS sample was drawn and injected into the GC to measure any additional H_2 that may have been produced. The results of this second GC test indicate the “effective” dissolved H_2 concentration and dose after considering all of the H_2 gas that will be produced after drinking the water.

Attachments 1 & 2 show sample chromatograms.

Results

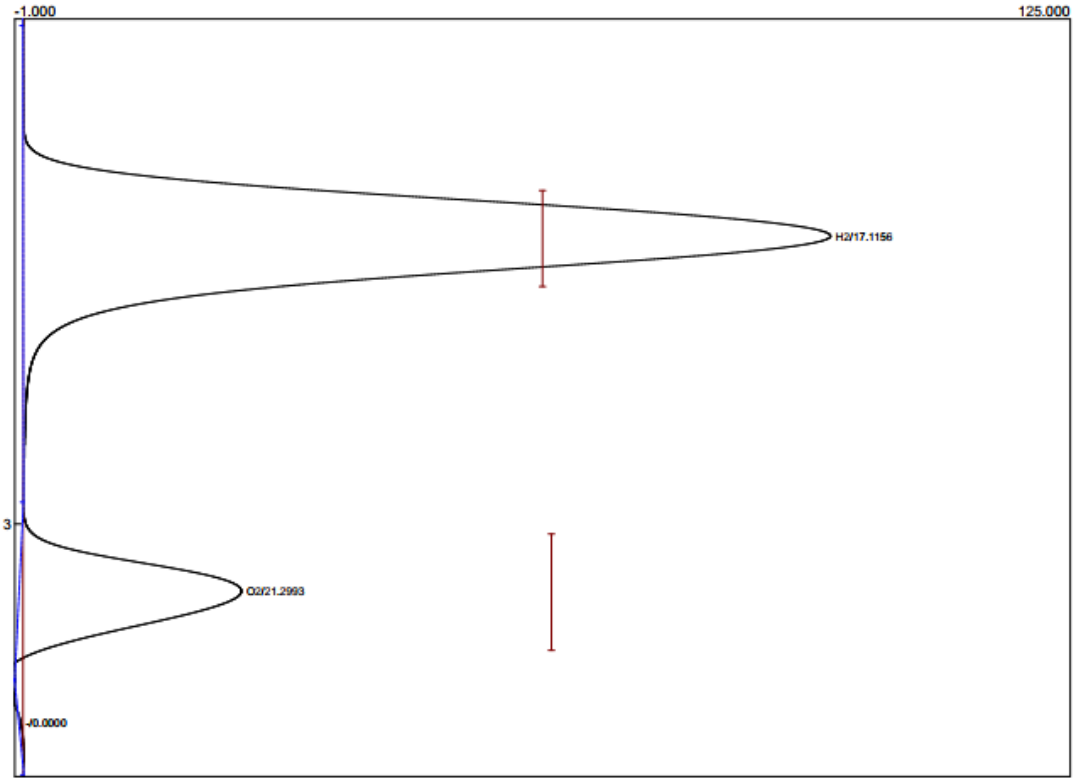
Dissolved H_2 :	(no acid):	Mean: 16.15 mg/L;	SD: 1.78	H_2 dose: 5.65 mg
Effective H_2:	(acid):	Mean: 16.55 mg/L;	SD: 1.78	H_2 dose: 5.79 mg

Approved By: Randy Sharpe Title: Director of Testing Report Date: 9/30/2025

Attachment 1

Hydrogen Water Testing & Certification

Lab name: H2 Analytics
Client: Echo
Client ID: H2A-1003
Collected: 9-29-25
Holding time: 20 min
Analysis date: 09/29/2025 14:40:30
Method: Static HS Analysis (GCHS)
Lab ID: HNV
Description: TCD CH1 60C
Column: Hayesep-D 6 meters 60C
Carrier: N2 @ 20psi (20 mL/min)
Integration: Peak sens=90.0 Base sens=60.0 Min area= 1.00 Standard= 1.000 Sample= 1.000 Tangents=off
Data file: Prebiotic(350)01..CHR ()
Sample: Prebiotic
Operator: rs
Comments: 5g in 350mL
QC batch: B509007



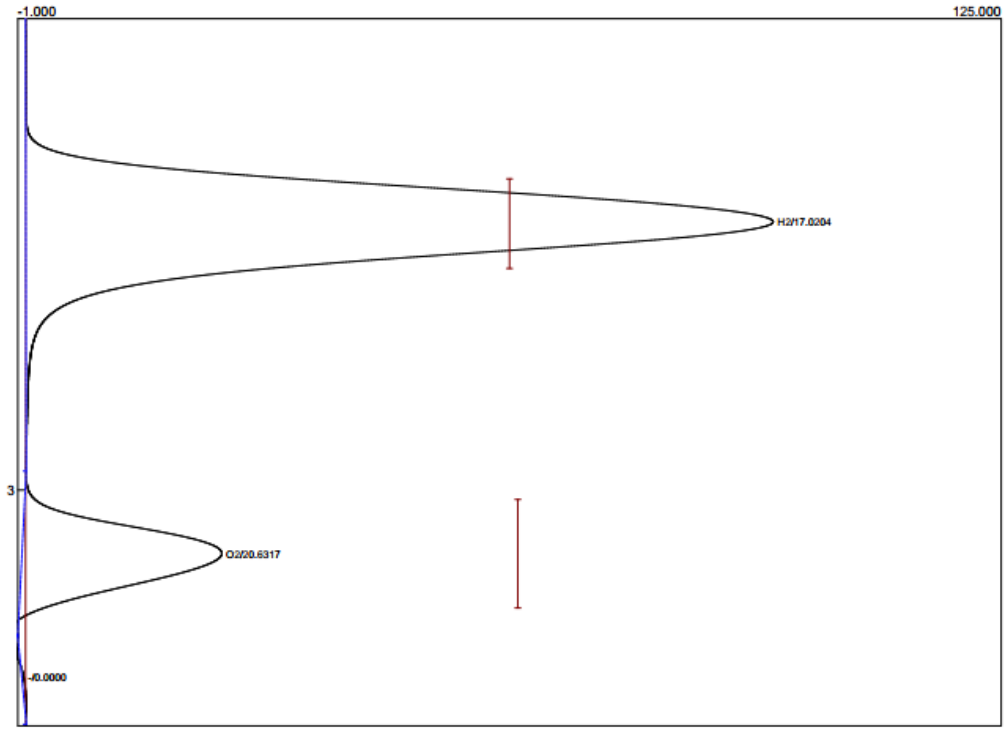
Component	Retention	Area	Internal	Units
H2	2.430	951.8814	17.1156	mg/L
O2	3.133	225.8396	21.2993	%eff

Echo Technologies Hydrogen Prebiotic Sample Chromatogram (no acid)

Attachment 2

Hydrogen Water Testing & Certification

Lab name: H2 Analytics
Client: Echo
Client ID: H2A-1003
Collected: 9-29-25
Holding time: 20 min
Analysis date: 09/29/2025 14:45:37
Method: Static HS Analysis (GCHS)
Lab ID: HNV
Description: TCD CH1 60C
Column: Hayesep-D 6 meters 60C
Carrier: N2 @ 20psi (20 mL/min)
Integration: Peak sens=90.0 Base sens=60.0 Min area= 1.00 Standard= 1.000 Sample= 1.000 Tangents=off
Data file: Prebiotic(350)02..CHR ()
Sample: Prebiotic
Operator: rs
Comments: 5g in 350mL
QC batch: B509007



Component	Retention	Area	Internal	Units
H2	2.430	946.5901	17.0204	mg/L
O2	3.136	218.7612	20.6317	%eff

Echo Technologies Hydrogen Prebiotic Sample Chromatogram (with acid)