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H_2HUBB Official Test Report

Evaluation Introduction

This report provides a comprehensive analysis of the 1800PRO Hydrogen inhalation therapy device from HYDRO 4 HEALTH®, a company based in Europe. H_2HUBB classifies this device as a Household-Grade, high-flow-rate hydrogen inhalation system. It is equipped with an hydrogen electrolytic cell utilizing a PEM/SPE membrane, ensuring the production of pure hydrogen gas with only deionized or distilled water required for operation. The device supports continuous hydrogen gas production, allowing users to extend inhalation sessions up to 8 hours. We thoroughly evaluated the system's hydrogen gas output in mL/min to verify its performance. Additionally, we assessed its safety features and operations to confirm the presence of appropriate mechanisms for safe and reliable usage. Our investigation determines whether the 1800PRO device meets our H_2 product performance standards required for approval and recommendation by H_2HUBB. For more information about our performance standards for hydrogen inhalation systems, please visit **H_2HUBB.**

H_2 Products

- Company: HYDRO 4 HEALTH®
- Product Name: 1800PRO
- Type: Pure H_2 Inhalation Device (≥99.99%/4N)
  - PEM/SPE
  - High Flow Rate
- Mfgr rated H_2 Output: 1200 mL/min
- URL Link: https://hydro4health.com

Method and Procedure

- Distilled Water (used for testing): 6.0 pH
- Water Temperature: 65~70F/ 18~21C
- Reservoir Vol Size: 2 L/2000 mL (0.53 gals)
- H_2 Output: up to 1200 mL/min or 98.93 mg/min (@ SATP)
- Test Location: 277 meters (909 ft elevation)
- H_2 Flow Test: mL/min, normal timing for a breathing session (1 hr)
- Test methodology:
  - Alicat H_2 Mass Flow Meter
- All measurements converted to SATP where applicable

Test Results

To evaluate the hydrogen gas flow rate, the system was assembled according to protocol and filled with distilled water to the manufacturer's recommended level. The device was tested at the highest designated output mode—1800 mL/min of H_2/O_2—and operated for a 1-hour session per setting. A 10-minute warm-up period preceded each measurement to allow for system stabilization. During operation, the produced hydrogen gas was routed through a drying column, followed by a humidity and temperature sensor, before entering an Alicat Mass Flow Meter for precise measurement of molecular hydrogen output. To ensure measurement accuracy, a 5–10 minute stabilization period was observed to eliminate ambient air interference. Minor flow corrections were made to compensate for resistance or moisture-induced losses in the system. Each output mode was tested a minimum of three times, and the flow rate values reported herein represent the average of these measurements.

H_2 Flow Rate Test Results at SATP:

Mode: 1800 mL/min Setting

- Device H_2 Flow Rate (mL/min) (mg/min) avg:≅ 1254 mL/min H_2, ± 0.46% (≈103.40 mg/min)
- Device O_2 Flow Rate (mL/min) avg: ≅ 627.01 mL/min
- Total H_2/O_2 Flow Rate (mL/min) avg:≅ 1881.0 mL/min

Claimed Mfgr's H_2 mL/min (mg/min) confirmed: Yes

H_2HUBB Hydrogen Flow Rate Assessment

- H_2HUBB's hydrogen gas flow rate testing confirms—and modestly exceeds—the manufacturer's performance claims for the 1800PRO. Under standard atmospheric pressure (SATP), the device produced an average of 1254 mL/min of hydrogen gas on its 1800 mL/min setting, slightly surpassing the specified output. This overperformance reflects a conservative rating approach by the manufacturer, underscoring the device's reliability and consistency in real-world operating conditions. When operated at this setting with a single-user nasal cannula, the device delivers an estimated inhaled hydrogen concentration of approximately 7–8%, remaining well within the safe and effective range documented in human clinical studies. These results exceed **H_2HUBB's minimum performance standards** and qualify the 1800PRO as a **Level 5 hydrogen inhalation device** within our performance ranking system.

INTERNAL BREAKDOWN AND PERFORMANCE:

Manufacturer's Rated Electrical Values:

Type of Device / Electrolytic Cell:

- Pure H_2: PEM/SPE Membrane

Power Supply Rating (per label):

- Voltage Output Rating: 12 V
- Current Output Rating: 40 A
- Rated Power: 480 Watts

Confirmed Electrical Values:

- Applied Voltage at Stack: 8.4 V DC
- Total Measured Current: 42.56 A DC
- Total Electrical Power: 357.50 Watts (8.4 V × 42.56 A)

Cell Configuration:

- Number of Stacks: 1 stack
- Cells per Stack: 4 (wired in series)
- Total Number of Electrolytic Cells: 4 PEM cells

Electrolytic Cell Stack Characteristics:

- Voltage per Stack: 8.4 V
- Voltage per Cell: 2.1 V (8.4 ÷ 4)
- Current per Cell: 42.56 A (same as stack current in series configuration)
- Effective Electrochemical Current (for H_2 production): 170.24 A (42.56 × 4)
- Power per Stack: 357.50 W (8.4 × 42.56)
- Total System Power: 357.50 W (single-stack system)

H_2 Production: (Based on measured amperage @SATP)

- Total Theoretical Max H_2 production (@ 100% cell efficiency)
  - Total: 1295.69 mL/min (106.82 mg/min)
- Measured H_2 production
  - 1254 mL/min (103.40 mg/min)
- Electrolytic cell efficiency
  - 96.80%

Product Assessment

Functionality:

- **Power input/Power cord:**
  - Located on the back of the system; supplies power to the device.
- **Digital Display and Control Panel**
  - Displays the session duration
  - Shows the combined hydrogen and oxygen gas production in mL/min
  - Allows the user to select hydrogen/oxygen gas production settings: 600, 1200, 1800 mL/min
  - Allows the user to select and adjusts session time in 2-hour increments, up to 8 hours
- **Power Start/Stop Button:**
  - Initiates electrolysis for hydrogen inhalation
  - Pressing the button while the device is running will stop gas production
- **Reservoir (2.0 L or 0.53 gal):**
  - Requires 2.0 liter of distilled water
- **H_2 Port (1x):**
  - Outputs hydrogen gas for single-user inhalation
- **O_2 Vent (1x):**
  - Vents oxygen gas produced during electrolysis
- **Drain Port:**
  - Allows the user to empty the distilled water reservoir using a special drain port and tubing located on the back of the system.

Product Safety

Safety Components:

- The system has 6 fundamental safety mechanisms for ensuring the device's safety.
  - Low-water protection
    - Protects cells from excessive heat
  - Large distilled water reservoir
    - Protects cells from excessive heat
  - Internal Fans
    - Prevents hydrogen gas build-up in case of leaks and may also aid in preventing overheating
  - Internal gas separator
    - The apparatus helps to improve H_2 gas purity.
  - Internal deionization resin filters
    - Improves gas purity and reduces ions (mineral, metal, etc.)
  - Heat Vents
    - Prevents excessive heat in the system

The system theoretically should only be combustible at the tip of the nasal cannula as the system produces >99% pure hydrogen gas. As with all inhalation devices that produce pure hydrogen gas, care should be taken to avoid exposing the cannula tip to any source of ignition (such as an open flame or a spark) which could result in the combustion of the gas.

Overall Opinion

The 1800PRO Hydrogen Inhalation Device has been confirmed through H_2HUBB testing to be a well-engineered and high-performing system for hydrogen inhalation. The manufacturer specifies a hydrogen gas output of 1200 mL/min at >99.99% purity under standard operating conditions. Our independent testing verified these claims, demonstrating that the device consistently achieves and slightly exceeds the stated hydrogen output. Notably, the device exhibited overperformance of 5-7% during multiple flow tests, indicating that the manufacturer has taken a conservative approach in its performance claims. This suggests an emphasis on reliability and consistency in the device's design and manufacturing, reinforcing its credibility as a therapeutic hydrogen inhalation system.

Hydrogen gas output flow rates are a critical performance parameter for inhalation devices. At H_2HUBB, the minimum standard for hydrogen generators or inhalation units (whether pure hydrogen, oxyhydrogen, or H_2 mixed with air) is 120 mL/min of H_2. This rate corresponds to approximately 0.7-1.3% H_2 at typical resting breathing rates (4-6 L/min) when using a nasal cannula for an average adult. Scientific studies on molecular hydrogen inhalation therapy generally utilize concentrations between 0.5% and 4% or more at resting breathing rates, a range that has been shown to provide therapeutic benefits. Given these findings, H_2HUBB establishes 120 mL/min of H_2 as the baseline requirement for hydrogen inhalation devices to ensure effectiveness. The 1800PRO H_2 inhalation device significantly exceeds this minimum standard, delivering performance well within the therapeutic range.

The 1800PRO is equipped with an advanced PEM/SPE electrolytic cell system, configured as a single stack containing four PEM cells wired in series. This design is engineered to consistently produce high-purity hydrogen gas (>99.99%). During H_2HUBB's performance evaluation, the system's electrical characteristics were confirmed at 8.4 V DC and 42.56 A DC, resulting in a total power draw of 357.50 watts. Each cell operated at approximately 2.1 V and 42.56 A, yielding a total effective electrochemical current of 170.24 amps (42.56 A × 4 cells). Based on these verified electrical values, the measured hydrogen gas output averaged 1254 mL/min (103.40 mg/min) at standard atmospheric pressure (SATP), closely aligning with the theoretical maximum output of 1295.69 mL/min (106.82 mg/min), assuming 100% cell efficiency. This corresponds to an impressive electrolytic cell efficiency of 96.80%, which is considered highly efficient for a PEM/SPE-based hydrogen inhalation system. At its maximum setting, the 1800PRO delivers hydrogen gas concentrations of approximately 7–8% when used with a single-user nasal cannula—concentrations that are within the safe and therapeutically relevant range supported by human clinical research. As such, the 1800 mL/min setting is appropriate for both single-user and dual-user inhalation applications, offering an effective and safe method of therapeutic hydrogen delivery. **According to our flow-rate test results, the product will be featured on our website as a Level 5 hydrogen inhalation device.**

You can view the meaning of this ranking **here**.

The 1800PRO Hydrogen Inhalation Device provides a moderate-to-high flow rate of pure hydrogen gas, making it important to assess whether its output falls within the safety limits for hydrogen inhalation when delivered through a nasal cannula. According to NASA **[1]** and other sources **[2][3]**, the detonability concentration of hydrogen in ambient air ranges from 18% to 59% (vol/vol). Furthermore, several studies have indicated that hydrogen inhalation concentrations for humans should remain below 10% **[4][5][6][7]** to ensure safety. Other sources suggest that 15% H_2 concentration may cause a small, non-harmful combustion event (a "pop") **[8]**. Taking into account both the lower detonability threshold of 18% and the recommended safety range of 10–15%, we identify a hydrogen concentration caution zone between 11–18%, which warrants special attention.

H_2HUBB maintains a conservative safety approach and advises restricting hydrogen inhalation concentrations to no more than 15% in residential or uncontrolled environments. This recommendation mitigates risk, though it is important to note that the gas remains flammable at the nasal cannula tip.

To assess the real-world hydrogen concentration delivered by systems like the 1800PRO, it is important to consider the combined effects of nasal cannula delivery and human respiratory dynamics. Based on hydrogen's physical properties—including its small molecular size **[9]**, high diffusivity **[10]**, and the dynamics of tidal breathing **[11]**—a significant portion of gas is lost to the atmosphere during use, specifically during exhalation. At H_2HUBB, we estimate an average hydrogen loss of 66-67% when delivered via nasal cannula.

At its maximum setting, the 1800PRO produces 1254 mL/min of pure hydrogen gas. After accounting for a 66-67% loss, the actual administered hydrogen flow rate becomes:

- 1254 × 0.334 = 418 mL/min

Assuming an average minute ventilation of 6 L/min (6000 mL/min), the estimated inhaled hydrogen concentration is:

- 418 ÷ 6000 = 0.0697 → 6.97%

This means that the 1800PRO delivers an inhaled hydrogen concentration of approximately 7%, which is safely below the commonly referenced safety limit of 10–15% and aligns with many concentrations studied in human clinical trials. As such, this output is appropriate for single-user therapeutic use via nasal cannula in home and clinical settings. Because each hydrogen concentration delivers a unique physiological dose based on Henry's Law, the 1800PRO's flow rate represents a specific, measurable therapeutic level. While it may seem that inhaling from a lower-output device for longer durations could compensate for lower flow, the data does not support this assumption. The concentration of hydrogen that dissolves into the blood (expressed in µmol/L) depends on the inhaled partial pressure, not simply the total volume of gas over time. For example, a 4% H_2 inhalation will never reach the same tissue saturation or blood concentration as a 6% or 10% H_2 concentration, no matter how long it is inhaled. Each concentration reaches its own equilibrium point in blood and tissues **[12]**.

Therefore, the 1800PRO offers a strong therapeutic potential at a safe inhaled concentration, while avoiding the safety concerns that may arise at higher delivery rates. Its flow output compares favorably with other hydrogen systems used in human and preclinical research, and its performance exceeds that of many entry-level inhalation units on the market. Users can feel confident that they are receiving a substantial therapeutic dose without compromising safety.

Ensuring the safety of hydrogen inhalation systems is critical. Several high-output hydrogen devices have been used in clinical research, showing a strong safety profile when operated properly. Inhaled H_2 concentrations can remain safely below 15% with appropriate equipment and technique. For instance, the Asclepius Meditec Co. AMS-H-03 hydrogen-oxygen nebulizer (3 L/min oxyhydrogen unit) has been used in multiple major clinical trials **[13]** and is designated as a Class III medical device **[14]**. Despite delivering around 2000 mL/min of hydrogen gas, its actual inhaled hydrogen concentration—when delivered via nasal cannula—remains well below 15% for most adult users. This supports the concept that therapeutic dosing and safety are compatible when using properly designed systems and delivery methods.

In conclusion, the 1800PRO provides a reliable, high-purity hydrogen output with a therapeutic dose that remains within safe inhalation limits. It is well suited for both clinical and home use, delivering meaningful hydrogen exposure without exceeding the 10–15% inhaled H_2 safety threshold. H_2HUBB considers the 1800PRO a strong performer in the hydrogen inhalation category, particularly for those seeking a balance between therapeutic efficacy and conservative safety margins.

The manufacturer's claims regarding the molecular hydrogen output flow rate have been validated by our tests, and the device's performance aligns well with the product's marketing materials. No safety concerns were identified, as the system appears to incorporate adequate safety measures. Overall, we are satisfied with the device's performance. The 1800PRO device exceeded H_2HUBB's minimum performance standards, and in our assessment, it is both safe and effective for in-home hydrogen inhalation. Based on these findings, we are confident in recommending this product to the public.

Approved by:

Tywon Hubbard

CEO, H_2HUBB LLC

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