

2016 年 1 月 12 日 氫氣在「中道自然醫學」上的運用

氫分子醫學未來必將徹底改變人類現行醫療產業的面貌，中國在推動 H₂ 成為法定醫療氣體的工作方面已由國家發動，如火如荼進行中，有可能在 2016 年就完成法律程序；但台灣醫學界卻未聞動靜，台灣在科技發展被邊緣化的罄竹難書紀載上，勢必將再添加一筆錯失先機的紀錄。中華人民共和國於 2014 年 03 月 19 日成立國家級專業機構，負責推展氫分子醫學（如下圖）

中國醫促會氫分子生物醫學專業委員會 2014/03/19 成立



中國醫促會氫分子生物醫學專業委員會 成立大會劇照 2014/03/19



中國泰山醫學院成立氫分子醫學研究實驗室



1. Different ways to produce H₂ hydrogen 製造

H₂ 氫氣的各種方法

a、 Traditional production : Using NaOH as conducting medium, the water is electrolyzed using high voltage current but can only generate a mixture of hydrogen and oxygen.

傳統古老方法：以 **NaOH** 作為導電介質，使用高壓電流及電極棒將水電解，只能產生 **H₂+O₂** 混合氣體。

b、 CH₃OH methanol conversion : for industrial use.

以甲醇作為原料轉換成 **H₂**：僅供工業用。

c、 State-of-art Proton Exchange Membrane technology : To convert pure water into H₂ and O₂ seperately. State of art proton exchange membrane technology can separate hydrogen and oxygen generated from water into different tubes, and collectively converge into hydrogen and oxygen to use.

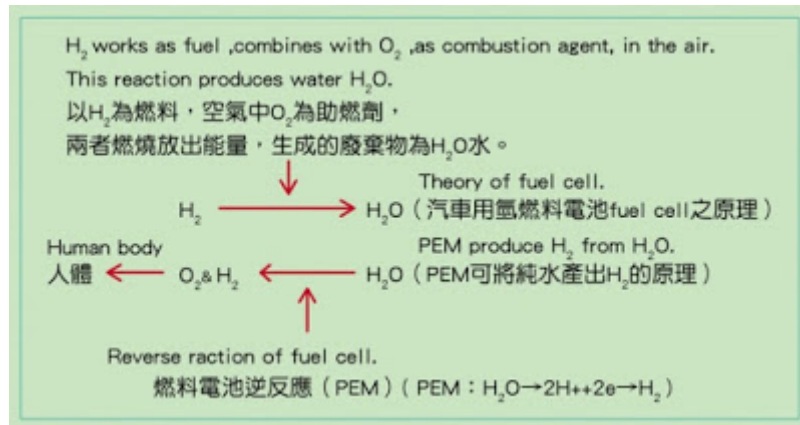
質子交換子膜精密新科技質：可將 **H₂O** 生成之 **H₂** 及 **O₂** 由不同管道產出，分開收集，再用 Y 型管匯合成 **H₂+O₂** 使用。

2. The application of PEM in aerospace technology

質子交換膜技術之航太用途

This extraordinary and innovative way to generate hydrogen and oxygen from pure water in PEM500 is achieved by incorporating the patented Proton Exchange Membrane (PEM) designed by the world-famous company DuPont. PEM is the reverse reaction of fuel cell (as illustrated as below) ,and is also the safest and cleanest way to produce hydrogen and oxygen.

此為世界知名杜邦高科技公司獨家專利的質子交換膜 (**Proton Exchange Membrane, PEM**) 卓越創新 **H₂** 及 **O₂** 生成法，只需添加純水，即可產生氫及氧氣。可將純 **H₂** 及純 **O₂** 分開產出，為最乾淨安全的製造法。



Hydrogen fuel cells are the common power source for unmanned aerial vehicles (UAVs), but the UAVs have to land before the hydrogen fuel runs out. For solar-powered UAVs, they can fly unlimitedly in the daylight, but have to land at night when there's no solar power. By installing PEM on the solar-powered UAVs, the solar power not only can be used as the power source for the engine, but in the meantime can also be used to electrolyze H₂O into H₂ and O₂ then compressed into storage separately. At night without sunlight H₂ and O₂ will be released and used as complementary energy source for flight when solar is not available. The combustion process then will convert oxygen and hydrogen into H₂O and this H₂O can be reused again and again.

氫燃料電池是無人飛機之普遍動力來源，但是所攜帶的 H₂ 燃料用罄前必須降落到陸地上；太陽能飛機則可在白天無限時飛行，但夜晚無日光必須降落地面。若把質子交換膜裝設在太陽能飛機上，太陽能飛機在白天直接利用太陽能發電推動引擎，同時利用太陽電能把 H₂O 交換解離成 H₂ 及 O₂，分開壓縮儲存起來，夜晚無陽光時則釋放出 H₂ 及 O₂ 燃燒，就可持續在夜間發動飛機引擎，不必降落。H₂ 及 O₂ 行密閉式離子層次燃燒後又再合成 H₂O，H₂O 可被週而復始利用。

This PEM in space and defense applications has become one of the most classified and heavily guarded secrets, because it makes solar-powered UAVs able to sustain long airtime and stay in the low orbit for different purposes such as communication and defense. It is also cheaper compared with satellites that need to be launched into higher orbits by the rockets. Therefore, all the venture capitalists see the huge potential of this technology to become multi-billion-dollar industry in the near future.

這被太空俱樂部國家列為極高機密的航太國防科技，可利用來製造能長期定點滯空的太陽能飛機，不但可取代地面基地台的通訊功能，也具有軍事國防上的重大意義；跟須仰賴火箭發射的人造衛星比較起來，其造價極低廉，因此創投界均看好此低軌道類人造衛星太陽能飛機之研發生產，被視為有兆兆美元產值潛能的未來明星產業。

3.The application of PEM technology in medical field

質子交換膜技術在醫學領域的應用

PEM is the first in the world healthcare machine based on latest innovations on Proton Exchange Membrane technology. It has a lot of advantages over the traditional electrolysis production of hydrogen which requires high voltage currents applying to NaOH water with high temperature conditions. The machine provides steady and pure (purity up to 99.99995%) hydrogen and oxygen output from pure water under low voltage current in low temperature. It makes up the insufficient hydrogen production by human probiotics (daily output of 14 liters in healthy body condition) in our larger intestine. It is safe, light-weight only 6.5Kg, small-size and energy efficient. It can be carried like a carry-on luggage and works as easy as any house-hold appliances and comes with quick start-up, easy operations and low maintenance.

傳統的水電解氫氧生成機，乃是採用高壓交流電及正負電極棒，利用氫氧化鈉之導電作用，直接將水電解來產生氫氧混合氣體，但會產生高溫。而採用質子交換膜技術，在直流低電壓低溫下生成 H_2 及 O_2 ，此項精密經久耐用的高科技關鍵核心組件，原本僅被應用於航太、國防、軍方及高科技精密儀器界，也可以用來做保健用質子交換膜產 H_2 及 O_2 機。人體內大腸益菌可日產 14 公升 H_2 ，當 H_2 產量不足時可經由人為補足。

PEM 500 consumes 35c.c. of pure water without adding additives such as NaOH. It requires the user to add 1.6 liter every time the low water LED alert signals then it lasts another 40~45 hours of 99.9995% H_2 and O_2 production. The output production of H_2 hydrogen is 500c.c./min, O_2 oxygen output is 166c.c./min. It runs 24 hours non-stop so it's perfect for patients who needs continuous use of hydrogen even during sleep with the nasal cannula.

PEM 機使用純水為原料，不必添加氫氧化鈉。耗水量為每小時 35c.c.，缺水燈亮起時，只要加 1.6 公升純水，就可持續 40~45 小時產生 99.9995% H_2 純氫及純 O_2 氧氣， H_2 產氣量為 500c.c./min， O_2 產氣量為 166c.c./min。可 24 小時持續使用不必休機，方便人在睡覺時經由使用鼻吸管吸入，很適合需要長時間使用者。

The consumables are water, electricity, nasal cannula (can be used repeatedly) and water filtration canister (DIY replace it when water filtration canister alert LED lights up).

The proton exchange membrane lasts over six thousand hours.

常備耗材為純水或蒸餾水、電力、鼻吸管（可重複使用）及水濾芯。濾芯半年 DIY 更換。質子交換膜則可使用六千小時以上。

4. PEM 500 H₂ hydrogen output vs. international standards

氫氣產出氣量必須符合國際安全標準

Hydrogen is considered as safe and inert under 4% concentration, over 4% H₂ is flammable and needs to be away from fire. Hydrogen output of PEM 500 is 500c.c/min. Normal breathing rates of human is about 20 breathes/min while a breath is equivalent to 600c.c of air inhalation, therefore air inhalation for human is approximately 12,000c.c/min. Considering 500c.c./min of hydrogen mixed with air coming from nasal cannula into our body, the density of hydrogen is 4% ($500 \div 12,000 \times 100\% = 4\%$). There are over 800 published research papers confirming the safety and effectiveness of H₂ to human bodies without side effects. Users should avoid hydrogen source higher than 500c.c/min (thus H₂ hydrogen density over 4%) for continuous period of time.

H₂ 濃度在 4% 以下時為安全惰性氣體，4% 以上 H₂ 則需遠離火源；PEM 之 H₂ 產氣量為 500c.c/min，人的正常呼吸速率為每分鐘約 20 下，每吸入一口空氣的量為 600c.c，即每分鐘吸入的空氣為 12,000c.c，因此本機所產出之 500c.c./min H₂ 氫氣，以開放性鼻吸管混合空氣同時吸入體內，其濃度剛好為 4% ($500 \div 12,000 \times 100\% = 4\%$)。空氣中的天然 H₂ 濃度只有 0.5ppm，已有 H₂ 相關 800 多篇研究文獻證實 H₂ 之安全及有效性；未曾被發現對人體有任何副作用；出氣量若高於 500c.c/min，亦即 H₂ 濃度高於 4% 的產氣量者，應縮短使用時間且避免長時間使用以策安全。

Drinking so called “hydrogen water”, originated in Japan to improve health has been so popular worldwide for more than 10 years. Under normal condition of 1 atm (air pressure) and 21°C (room temperature), the solubility of hydrogen in water is 0.00016%. In other words, by drinking 1 ton of saturated hydrogen water, we can only get 160 cc. of H₂. In comparison, by inhaling the 4% H₂ produced by PEM 500, we can obtain 28,000 cc. of H₂ per hour into our blood stream for much greater benefits.

起源於日本的喝氫水（水素）保健風潮流行遍及全世界已有十餘年歷史。H₂ 在 1 atm 大氣壓及 21 °C 的條件下，其溶解度為 0.00016%，也就是說喝下 1 噸的飽和氫水，就可以吸收到 160c.c. 的 H₂，但如果改為吸入 PEM 500 所產生的 4% H₂，每小時就吸收到 28,000c.c. 的 H₂ 進入人體血液中，H₂ 與氫水的效價比實有天壤之別。

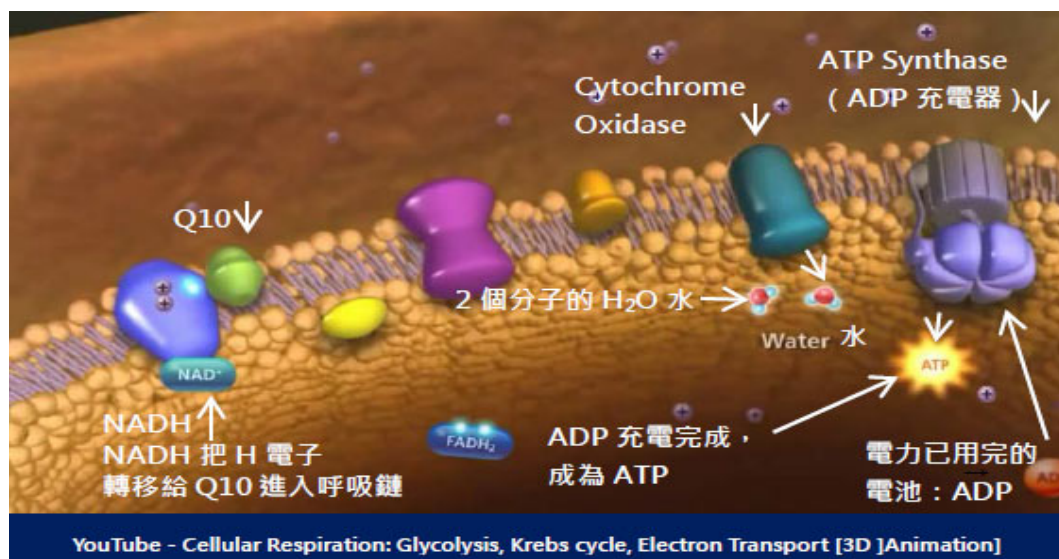
5. Functional similarity between hydrogen fuel cells and cells mitochondria

氫燃料電池與活體細胞粒腺體的功能原理雷同

Hydrogen fuel cells utilize H_2 as a fuel source for energy, and can release kinetic electricity and waste product H_2O when reacting with oxygen.

氫燃料電池是以氫氣（ H_2 ）為燃料，在 O_2 的助燃下，釋放出動能電力及排放廢棄物 H_2O 。

On the other hand, cells mitochondria utilize hydrogen atom (H) gained from food composition, and the hydrogen (H_2) generated from probiotics in the gut or through inhalation as fuel source to recharge the dying battery (ADP) to a fully charged ATP utilizing oxygen. The process simultaneously synthesizes endogenous water and eliminates free radical $OH\bullet$, and expels toxin out of the cells, which is also known as the basis of Krebs' cycle. Hydrogen gas is highly selective for the neutralization of the most toxic free radicals $OH\bullet$, and can exerts powerfull anti-inflammatory effects. The effects could be immediately proven by 3D Electroencephalogm (3D EEG) and Heart Rate Variability (HRV).



H_2O synthesis and energy recharge are synchronized in cell mitochondria.

細胞粒腺體內的製水及充電同步完成

細胞中的粒腺體（細胞之引擎）則是以食物中的氫原子（ H ）及腸道益生菌產生或經由鼻子吸入的氫氣（ H_2 ）為燃料，在 O_2 的助燃下，將電力不足的電池（ ADP ）充飽電成為 ATP ，並同步在細胞內生出內源性生成水（Endogenesis water），將細胞內的自由基 $OH\bullet$ 消除，並把細胞內毒素排出細胞外，此即為克氏循環（Krebs' cycle）的原理步驟。由於 H_2 對體內毒性最強的 $OH\bullet$ 自由基之還原具有高度選擇性，因此可發揮最強大的抗發炎效果，尤其對神經系統的效果最為立即明顯，其成效可利用 3D 立體腦波來證明；吸入一小時的 H_2 ，可令異常高亢的腦波降低，使過低之腦波提升（雙向調節）。亦可利用自律神經檢測證明 H_2 可降低過高的交感（陽亢）與提升過低的副交感（陰虛）神經活性； H_2 屬陰，為最佳還原劑， O_2 屬陽，為強力氧化劑，過度氧化會使人體處在「陰陽離決，精氣乃絕」的劣境， H_2 進入人體後，就可發揮還

原作用，矯正過度氧化的結果，使人體調整成「陰平陽秘，精神乃治」（源自「黃帝內經」）的陰陽平衡狀態。

By drinking, the water (H_2O) will only enter the blood stream and extra-cellular space in our body, whereas through inhaling the H_2+O_2 into our lung (from breaking down the H_2O in PEM 500), the hydrogen can enter the intracellular matrix and be used to synthesize water, and nourishing the cells in our whole body. The process actually provides intra-cellular hydration and anti-inflammation benefits to the cells. This explains why the natural ingredients such as H_2+O_2 (produced from H_2O) have more powerful anti-inflammation effects than most of the anti-inflammation drugs even steroids. It is shown in the clinical practice that inhaling 4% H_2 can reduce the inflammatory indices such as ESR、hsCRP、RA, etc.

人用嘴巴喝下的 H_2O 只會進入血管及細胞外液，但把 H_2O 分解成 H_2+O_2 後再用鼻吸入， H_2 可卻經由肺臟進入細胞內再合成水，滋潤了全身細胞內部，滅掉細胞內的「火」。這也就可以解謎為什麼 H_2+O_2 雖然只是來自 H_2O 的雙合氣體天然物質而非藥物，但其抗發炎效果卻超越所有已知抗發炎藥物，甚至強過類固醇（激素）藥物，吸入 4% H_2 氣體對於 ESR、hsCRP、RA 等發炎指數之降低亦有口皆碑。

6.The future of hydrogen medicine 氫分子醫學的願景

The application of H_2 hydrogen has become increasingly important in marine medicine and space medicine, as the research crews in the submarines and space stations frequently suffered from severe ANS (Autonomous Nerve System) imbalance. Aerospace and military research have discovered that by inhaling hydrogen for 60 minutes, symptoms of ANS imbalance could be alleviated. The mechanism was due to the ability of hydrogen to reverse and neutralize the toxic effects of free radical $OH\bullet$ throughout our body and brain by converting them into neutral H_2O water. From these scientific numbers gathered by brain-wave, HRV, blood and urine tests we can reach the conclusion that H_2 can reduce the oxidative stress in our body (ROS) : $2OH\bullet+H_2\rightarrow 2H_2O$ and adjust the acidic body condition back to healthy range of pH7.35~7.45, and make sure that pH in our body, oxidation-reduction process, and metabolism process are in balance.

H_2 在深海及太空醫學上的重要性日益彰顯，潛水艇及太空站工作人員在高度壓力下，常產生嚴重的自律神經失調問題，航太及軍方研究發現，只要吸入質子交換 H_2 60 分鐘，自律神經失調症狀就可立即舒緩，其機轉乃是因為 H_2 能還原中和腦內及全身具毒性的 $OH\bullet$ 自由基，將之轉換成中性的 H_2O 水；其成效可用腦波、自律神經變異、血液生化、尿液檢測等科學數據來證明；所觀察到的結論就是： H_2 可降低人體內之氧化壓力 (ROS) : $2OH\bullet+H_2\rightarrow 2H_2O$ ，且可將酸性體質調整恢復至 pH7.35~7.45 的正常鹼性範圍內，確保氧化還原、酸鹼及新陳代謝反應處於平衡狀態。

Therefore the role of hydrogen on disease prevention, symptoms alleviation, and reversing adverse health conditions will become increasingly important.

可斷言，H₂對人體疾病之預防，症狀之緩解及亞健康狀態之逆轉上所扮演的角色，將會日益突顯。

註：以上文字乃是根據「台灣氫氣應用研究推廣學會」所收集發表的資料編寫。