

Hydrogen Inhalation and Athletic Recovery

A plain-English summary of a randomized, double-blind, placebo-controlled crossover trial in professional rugby players.

THE SHORT VERSION

What did the researchers investigate?

The researchers wanted to know whether breathing hydrogen-rich gas before demanding exercise could influence the way professional athletes responded to a week of high-intensity training. They focused on nitric oxide signalling, inflammation and oxidative stress - processes that can affect circulation, training adaptation and recovery.

22

professional male rugby
players completed the
trial

20 min

of inhalation before
training

6 days

of high-intensity
training in each test
week

24 h

follow-up after the final
training day

The study found that hydrogen inhalation was associated with better preservation of nitric oxide availability, lower levels of selected inflammatory and oxidative-stress markers, and greater total antioxidant capacity compared with placebo.

Why this study stands out

- It tested hydrogen inhalation, making it directly relevant to inhalation therapy.
- The participants were professional athletes undertaking their normal, demanding training programme.
- The trial was randomized, double-blind and placebo-controlled.
- It used a crossover design, so each athlete received both hydrogen and placebo in separate weeks.

A strong trial design - explained simply

Study element	What it means
Participants	24 professional male rugby players enrolled; 22 completed both interventions.
Hydrogen protocol	Hydrogen-rich gas was inhaled through a mask for 20 minutes, beginning one hour before training, on six training days.
Comparison	Compressed normal air was used as the placebo.
Crossover	After a lower-intensity washout week, each group switched to the other intervention.
Training	Daily training included physical work, high-intensity intervals, rugby skills and recovery work.
Measurements	Blood was assessed before the training week, after day six and after 24 hours of rest.

Main findings

Nitric oxide (NO)	NO levels were higher with hydrogen than placebo after the sixth training day and remained higher after 24 hours of rest. NO helps blood vessels relax and supports blood flow.
Inflammation	Interleukin-6 (IL-6) was lower during the hydrogen week after exercise and following rest. IL-6 is one marker used to assess inflammatory response.
Oxidative stress	The DNA-oxidation marker 8-OHdG was lower with hydrogen than placebo. Not every oxidative marker measured changed significantly.
Antioxidant capacity	Total antioxidant capacity was higher with hydrogen than placebo after the rest period.

WHAT THE RESULTS REALLY MEAN

Promising evidence - with important limits

The results suggest that hydrogen inhalation may help moderate some of the biological stress created by repeated high-intensity training. Preserving nitric oxide and reducing selected inflammatory and oxidative markers could be relevant to recovery and training adaptation.

However, this study does not prove that hydrogen makes athletes recover faster, prevents injury or improves match performance. It measured blood biomarkers rather than return-to-play time, muscle soreness, strength recovery or competitive outcomes.

WHAT THE STUDY SUPPORTS	WHAT IT DOES NOT PROVE
• Hydrogen inhalation may support the body's response to strenuous training. • It may help preserve nitric oxide availability. • It was associated with lower selected markers of inflammation and oxidative stress.	• Guaranteed or faster recovery. • Better match performance or fewer injuries. • The same effects in women, recreational athletes or every sport. • That every hydrogen device or protocol will produce the same result.

A careful plain-English takeaway

A randomized controlled trial in professional rugby players found that breathing hydrogen-rich gas before high-intensity training was associated with better nitric oxide availability and lower selected markers of inflammation and oxidative stress. The findings are encouraging, but larger studies measuring real-world recovery and performance are still needed.

READ THE ORIGINAL RESEARCH

[Zhao Y, Li C, Zhou S, et al. \(2024\). Hydrogen gas inhalation prior to high-intensity training reduces attenuation of nitric oxide bioavailability in male rugby players. PeerJ 12:e18503.](#)

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Research information only. This summary does not provide medical advice, promise specific outcomes or replace guidance from a qualified healthcare or sports-medicine professional.