

# Hyperbaric oxygen therapy increases insulin sensitivity in overweight men with and without type 2 diabetes

Dr David Wilkinson

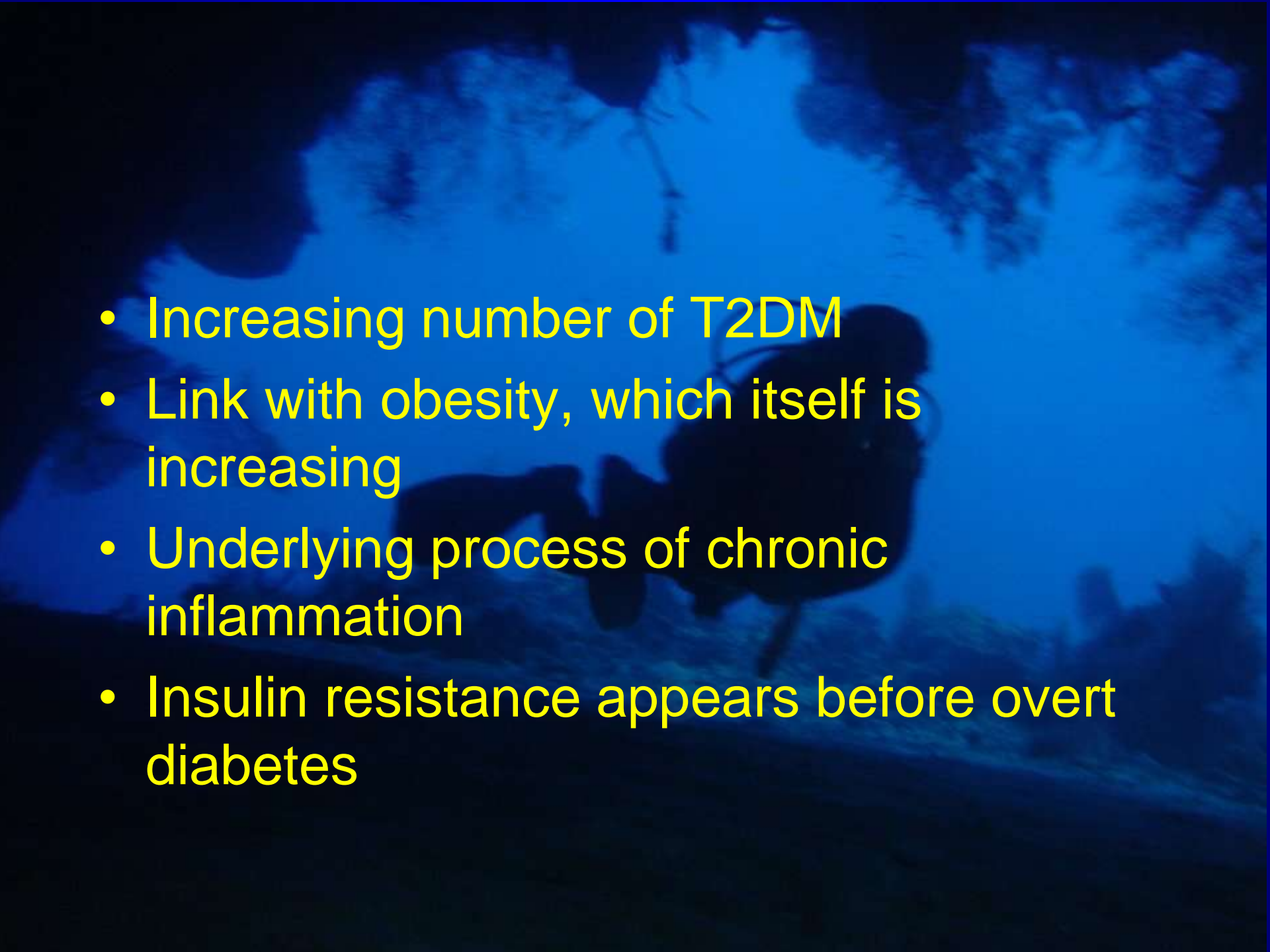
Dr Mirjam Nolting

Mohd K Mahadi

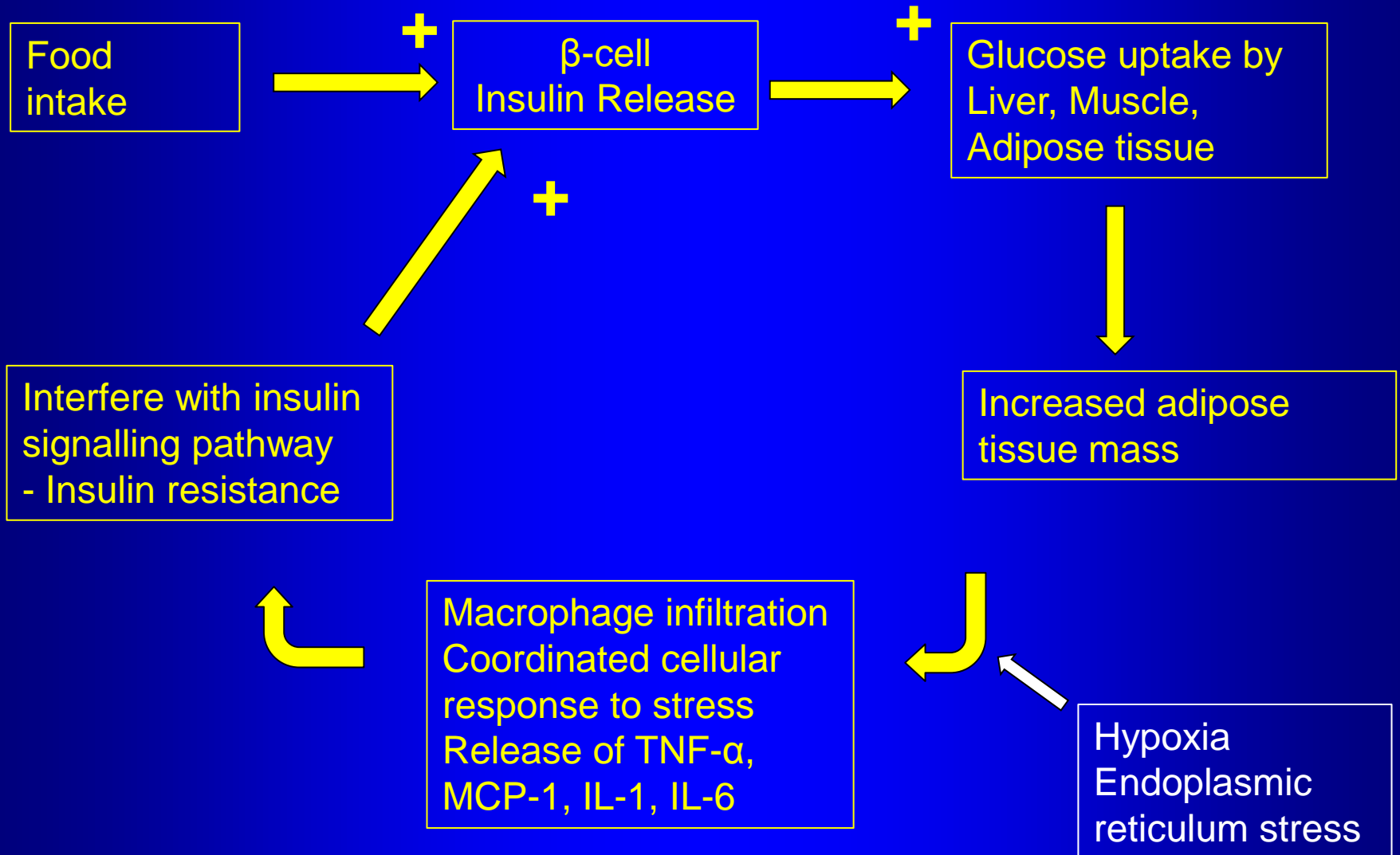
Assoc Prof Leonie Heilbronn

Prof Ian Chapman



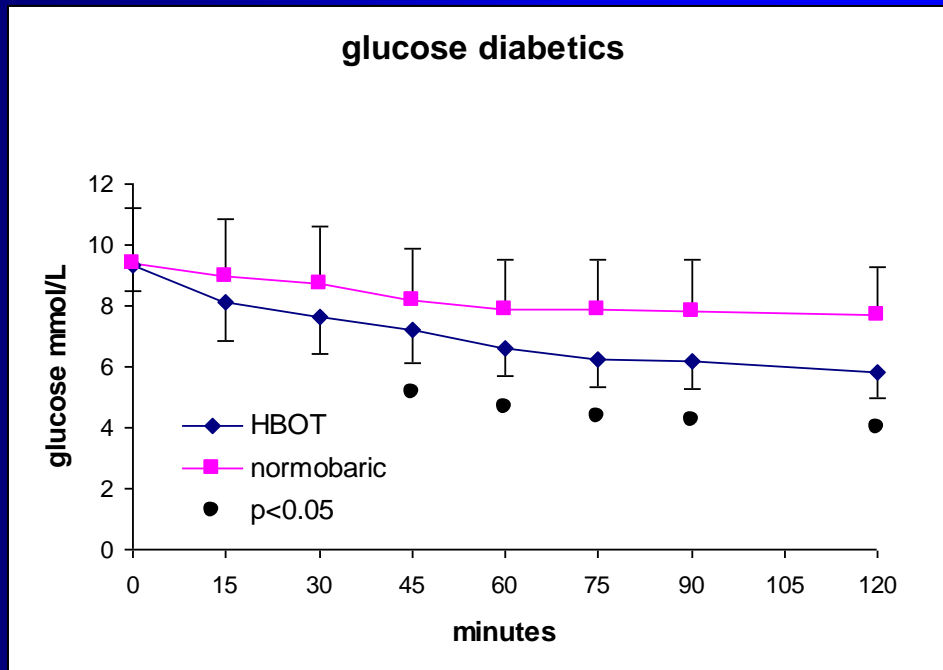
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- Increasing number of T2DM
  - Link with obesity, which itself is increasing
  - Underlying process of chronic inflammation
  - Insulin resistance appears before overt diabetes





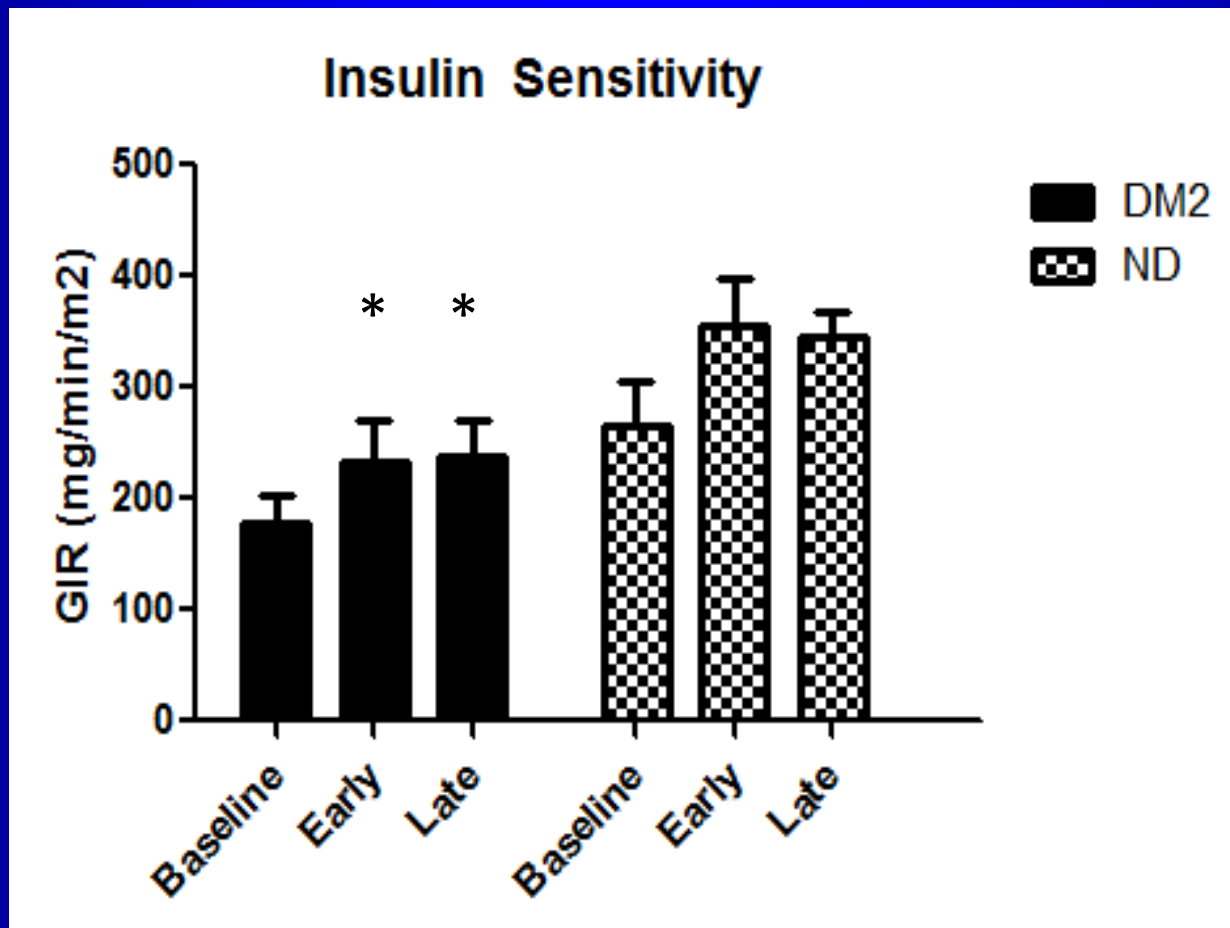


# Blood sugar tends to fall in those with diabetes during HBOT



- Mean fall in BSL 3.5 mmol/L ( $\pm 0.7$  SE)
- No change in non-diabetic

*Ekanayake, South Pacific Underwater Medicine Journal, 2001*



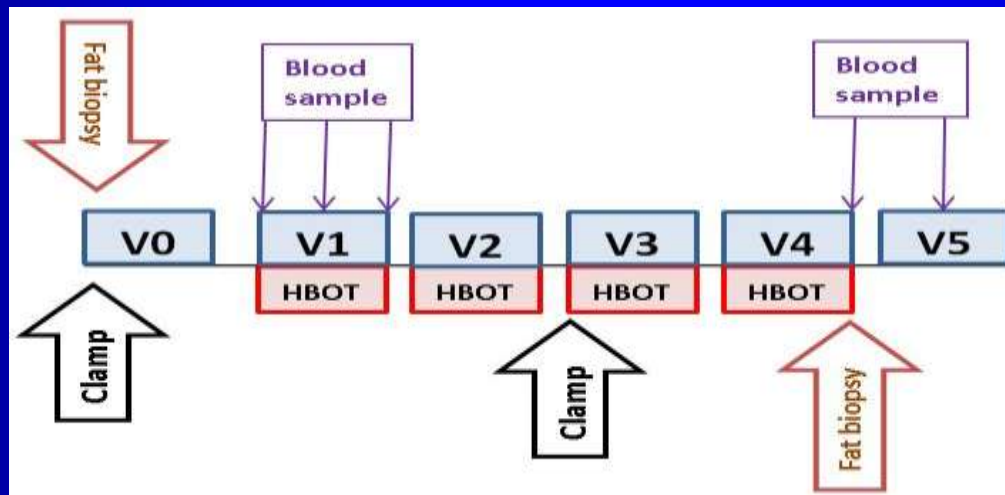
DM2 (n=5)  $p=0.008$

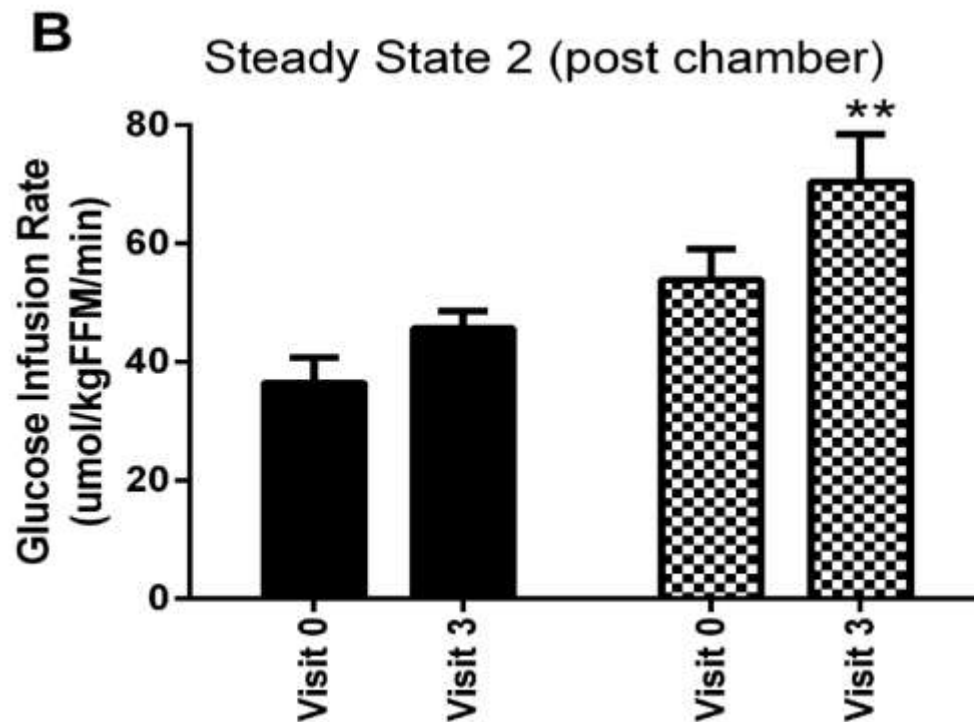
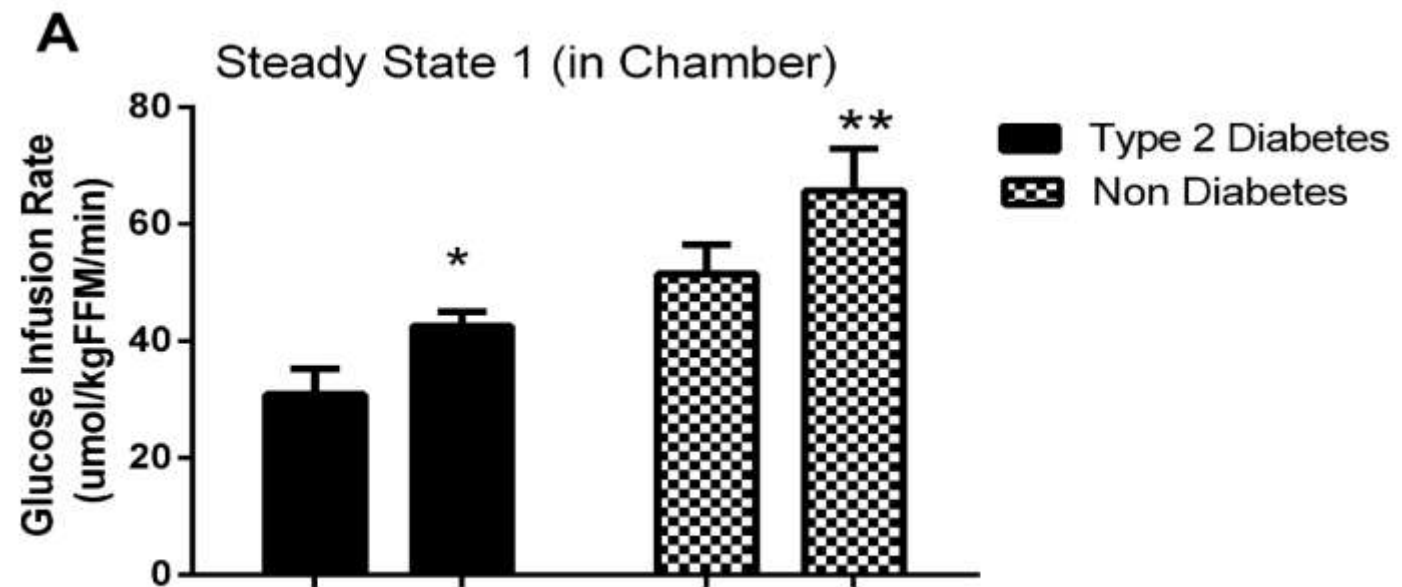
ND (n=5) 4 out of 5 improved insulin sensitivity  $p=0.1$

(Diabetic Medicine, 2012)

# Current Study

- Non-patient volunteers
  - T2DM (n=8), control (n=11)
- Clamp on third HBOT
- Blood samples and adipose tissue biopsies for inflammatory cytokines
  - $\text{TNF-}\alpha$ , MCP-1, IL1ra, IL-18, IL-6





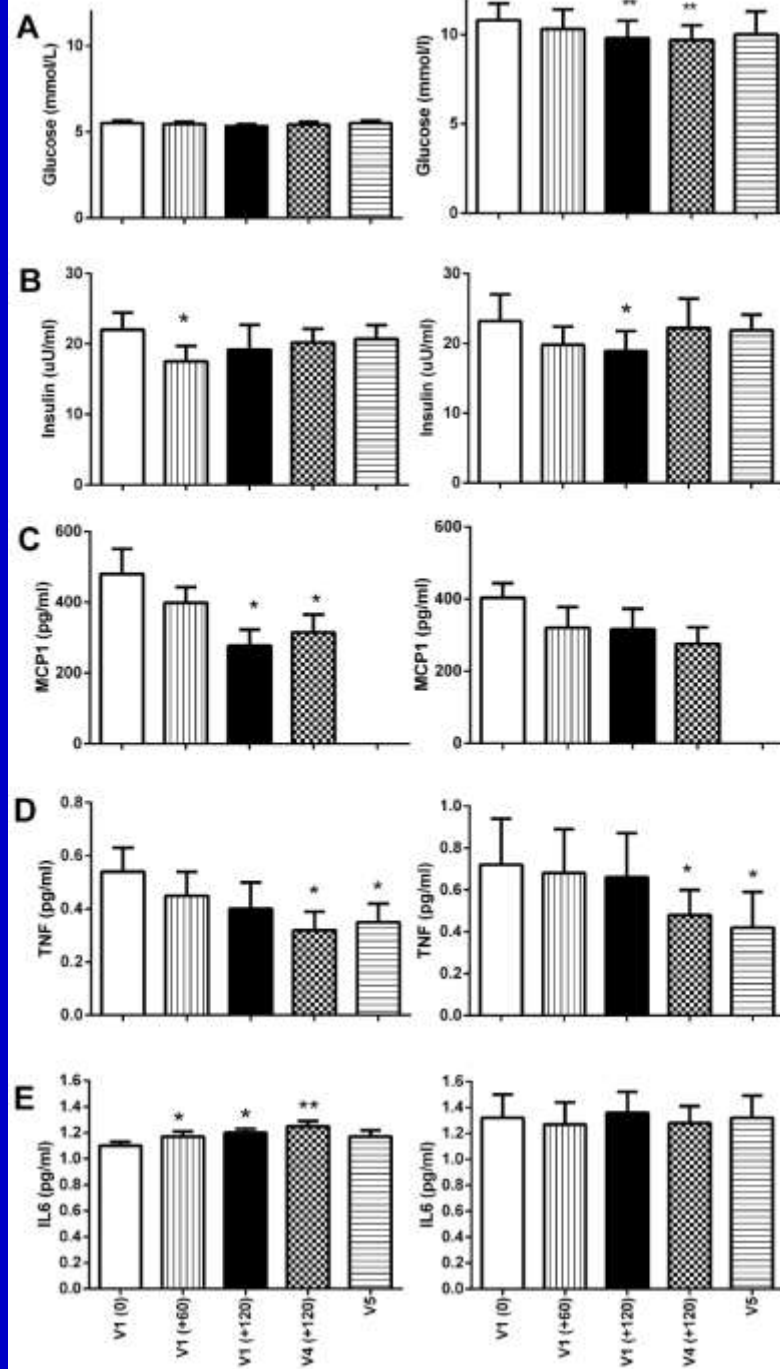
T2DM  $\uparrow 57 \pm 66\%$   
( $p=0.04$ )

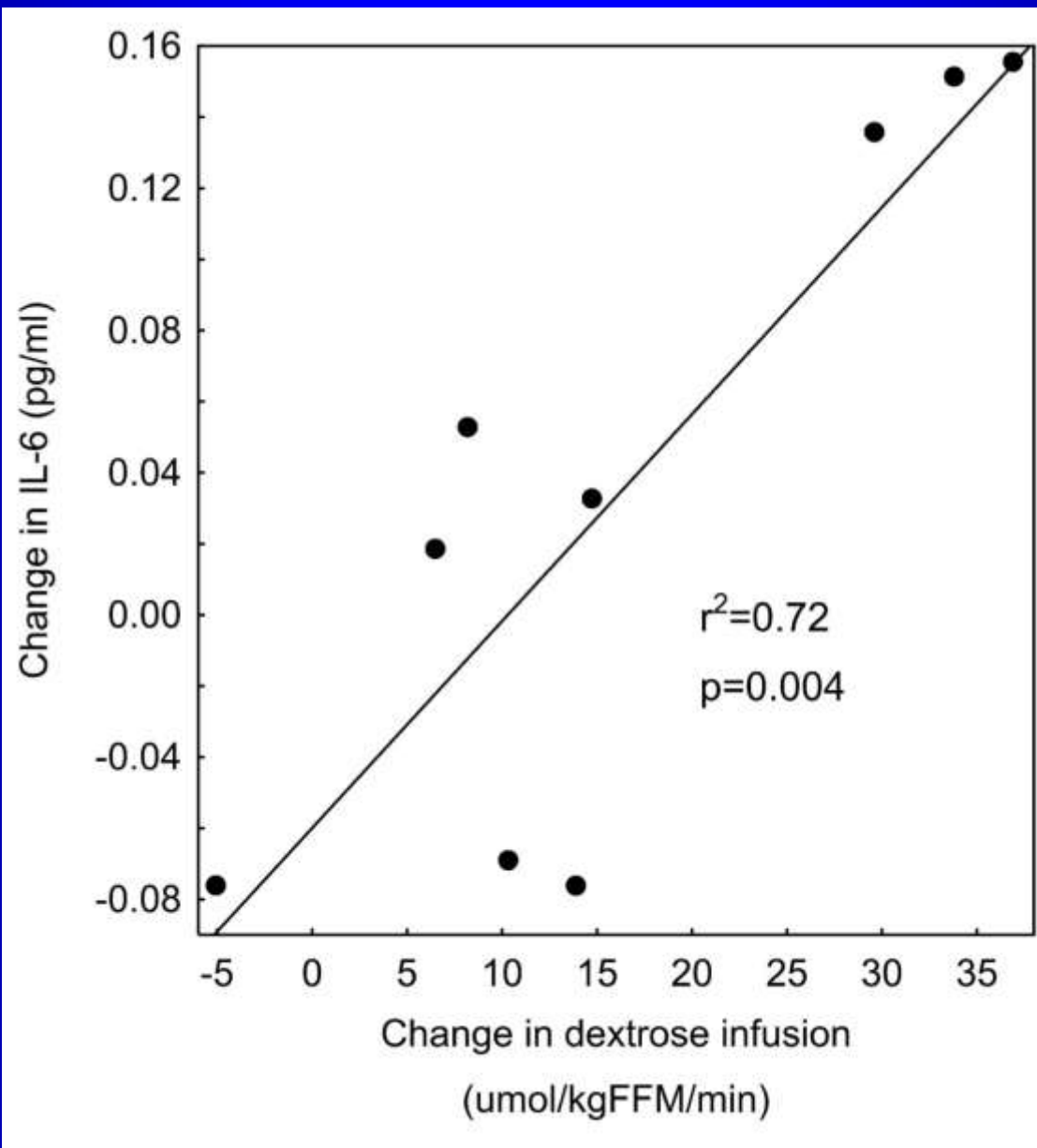
No D  $\uparrow 29 \pm 32\%$   
( $p=0.01$ )



## No Diabetes

## Type 2 Diabetes





# HBOT and inflammation

- Some in vitro monocyte models
  - Reduced cytokine release to LPS
- inflammation/improved survival in animal models of
  - Peritonitis, sepsis, atherosclerosis
- Ischaemia-reperfusion injury
  - Specific effect on CD11/18
- Preconditioning agent
- Decompression illness

# Conclusions

- HBOT increases insulin sensitivity in male volunteers with and without diabetes
- The effect appears to continue for at least 30 minutes after finishing HBOT
- There is a favourable modulation of inflammatory markers that may partly explain the effect



# Further questions

- Mechanism?
  - Continue looking at inflammatory markers
  - Adipose tissue hypoxia?
  - Endoplasmic reticulum stress?
  - The effect of reactive oxygen species may not be uniform throughout the cell
- Duration of effect?
  - Does it occur during the first HBOT exposure?
  - How long does it last for?

**Thanks**

