

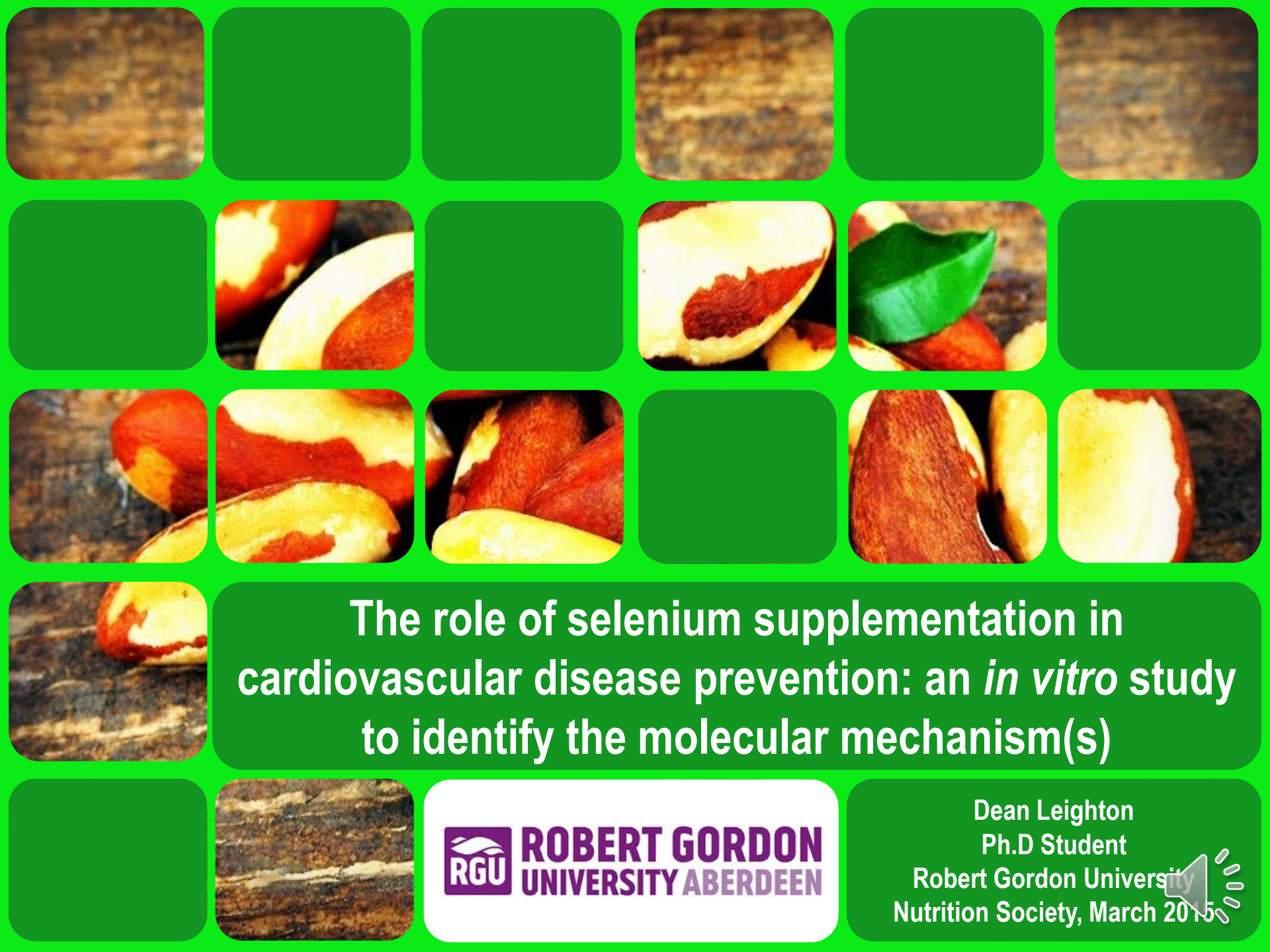
LEIGHTON, D., GOUA, M., DOLAN, E., BURGESS, K. and BERMANO, G. 2015. The role of selenium supplementation in cardiovascular disease prevention: an in vitro study to identify the molecular mechanism(s). Presented at the 2015 Nutrition Society Scottish section meeting: diet, gene regulation and metabolic disease, 25-26 March 2015, Aberdeen, UK.

The role of selenium supplementation in cardiovascular disease prevention: an in vitro study to identify the molecular mechanism(s).

LEIGHTON, D., GOUA, M., DOLAN, E., BURGESS, K. and BERMANO, G.

2015

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The role of selenium supplementation in cardiovascular disease prevention: an *in vitro* study to identify the molecular mechanism(s)

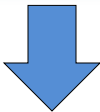
 **ROBERT GORDON**
UNIVERSITY ABERDEEN

Dean Leighton
Ph.D Student
Robert Gordon University
Nutrition Society, March 2015



A role for selenium supplementation to prevent cardiovascular disease in obese individuals : Exercise and Nutrition-based Interventions

Exercise



High Intensity Interval Training

Nutrition



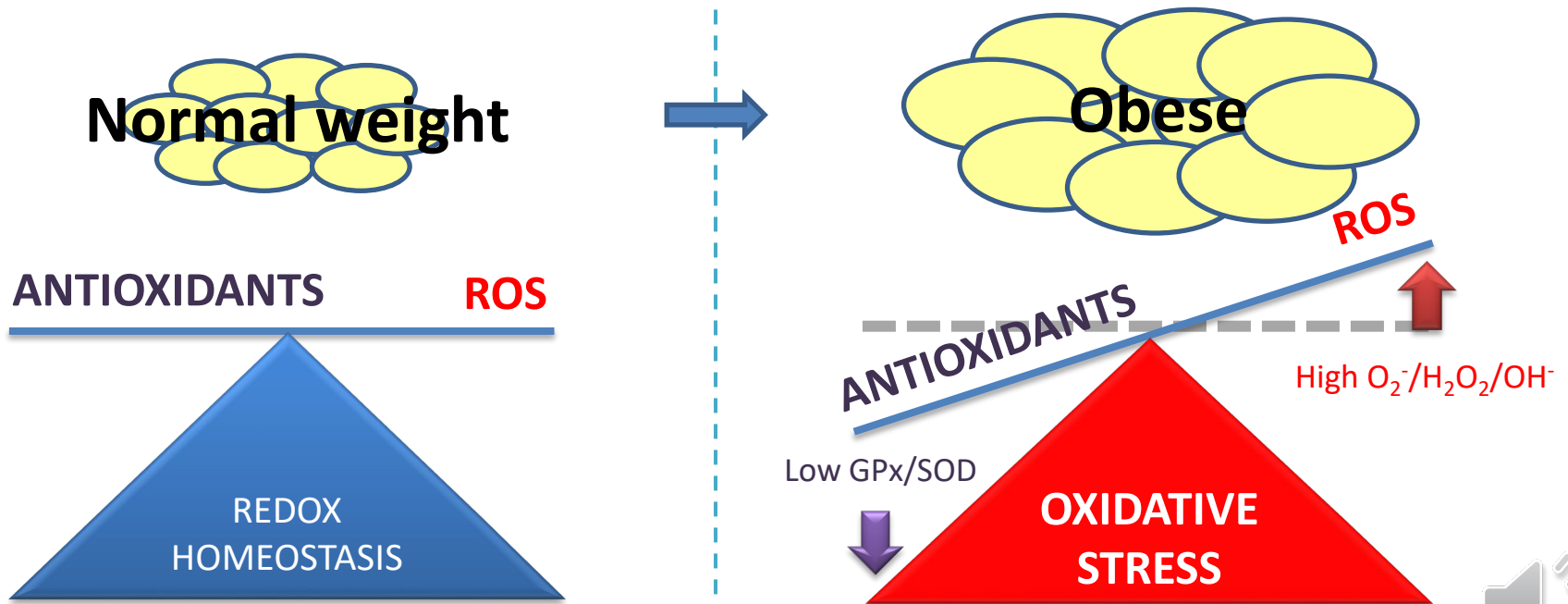
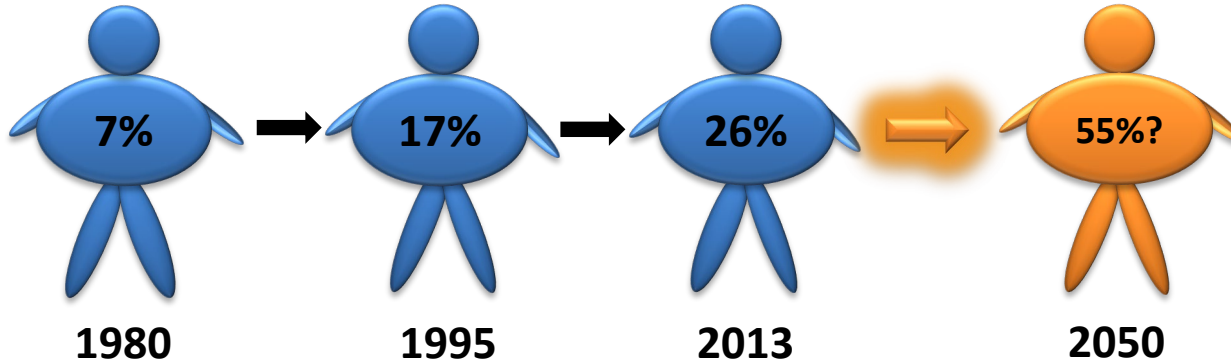
Selenium Supplementation

In-vivo

In-vitro

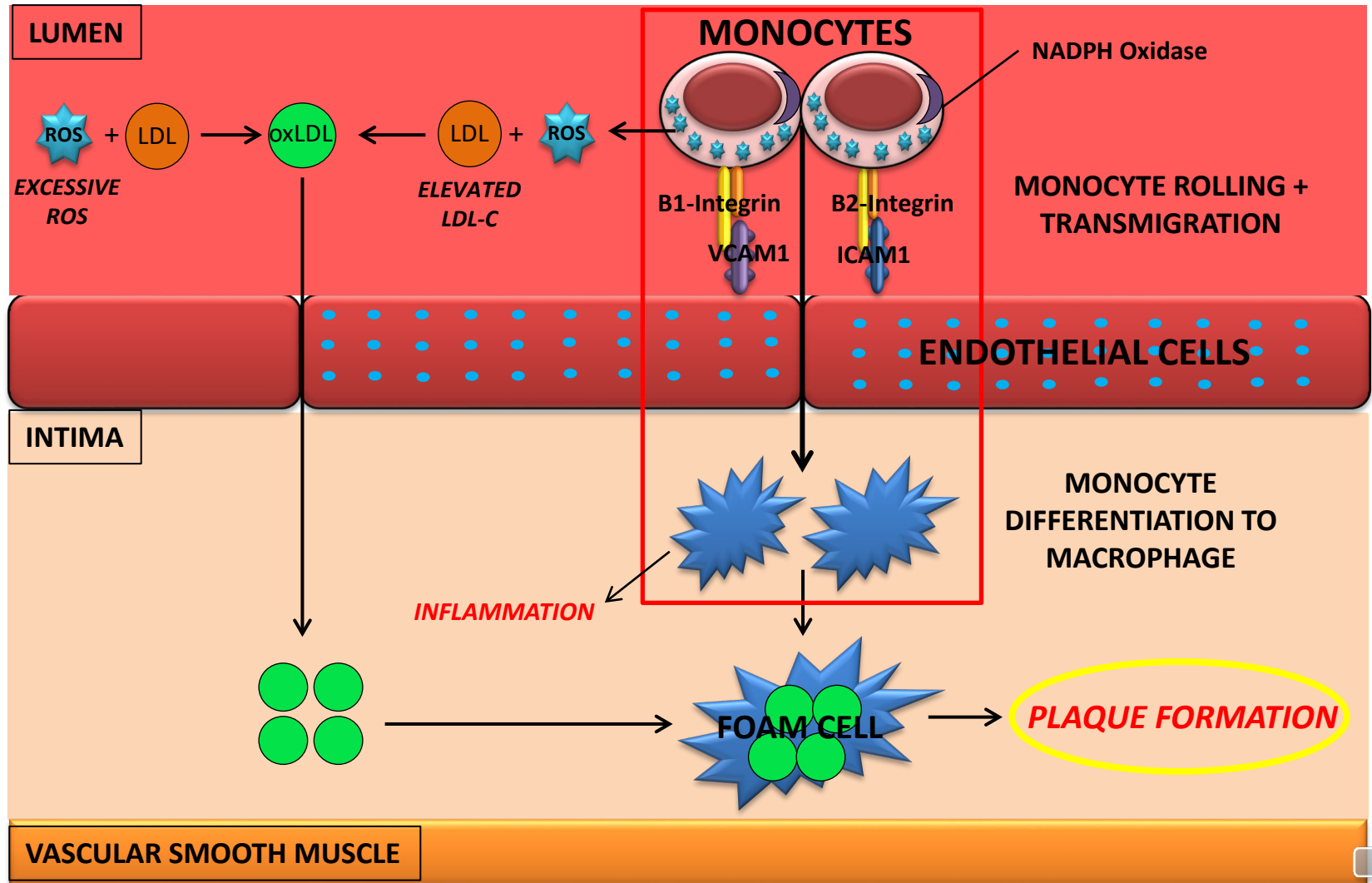


Obesity is characterised by systemic oxidative stress



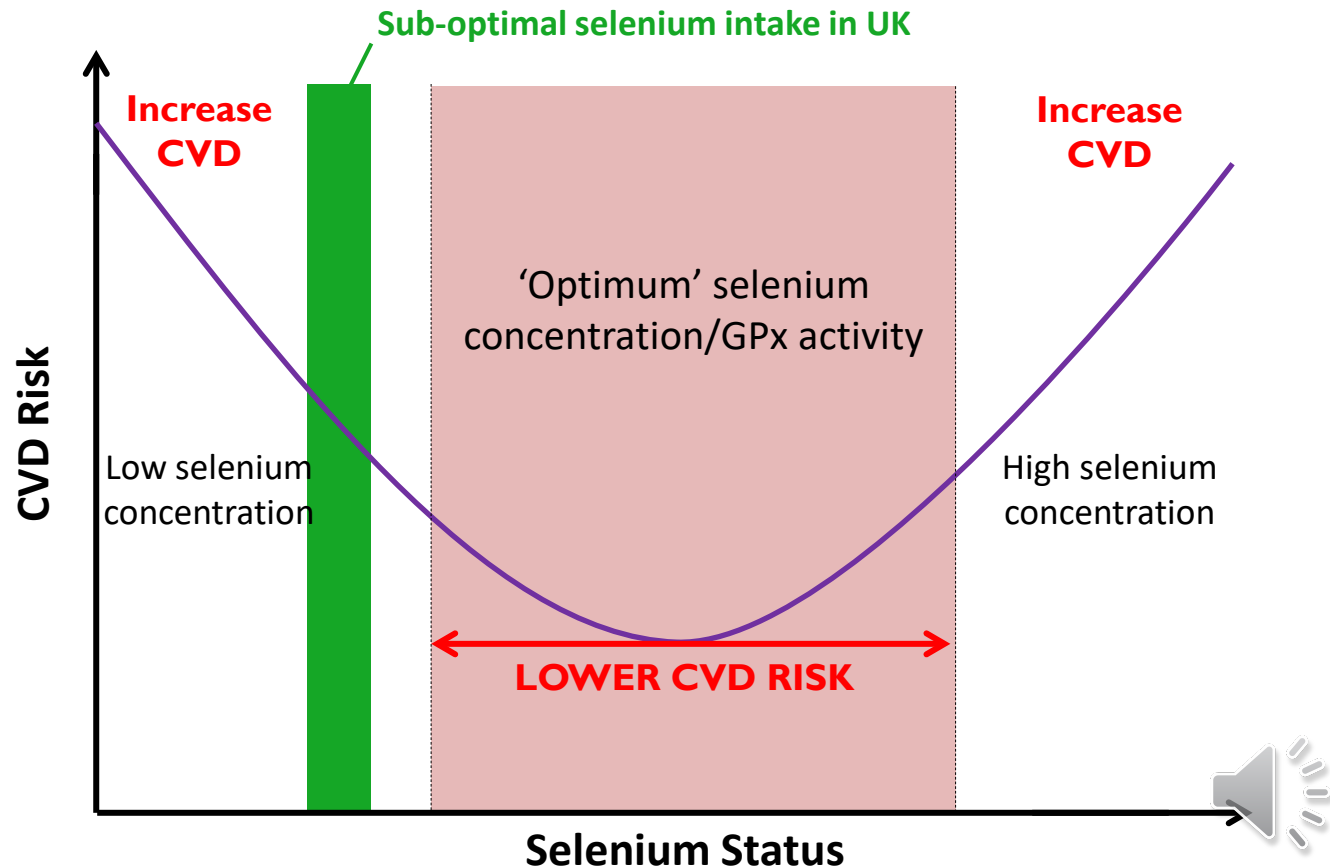
Atherosclerosis is driven by systemic oxidative stress

OBESSE ARTERY



An optimum selenium status for cardiovascular health?

- Essential micronutrient incorporated as selenocysteine into selenoproteins
- Important selenoproteins (glutathione peroxidase – GPx) have antioxidant capacity
- Reference nutrient intake = 55-70ug/day
- GPx-1/GPx-4 are ubiquitously expressed and their enzymatic activity is dependent on selenium status.
- Lack of knowledge on monocyte and endothelial cell oxidative stress response to selenium supplementation



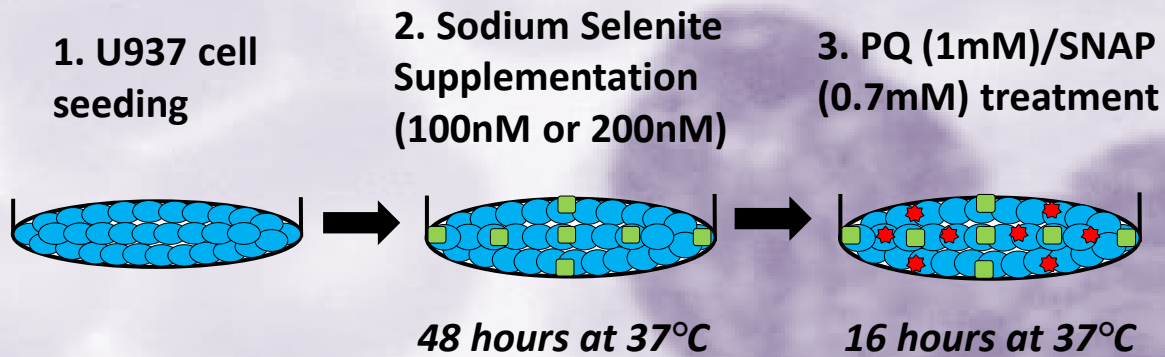
Aims

To investigate the effect of selenium supplementation to modulate oxidative stress in U937 monocytes (*in-vitro*) in relation to:

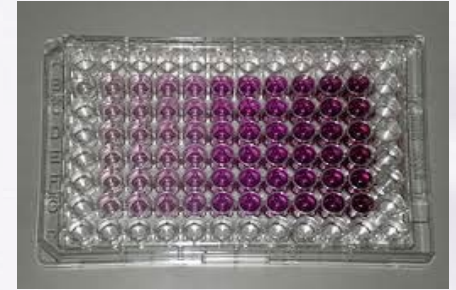
1. **Cell viability** (MTS assay)
2. **ROS levels** (CM-H₂DC-FDA flow cytometry)
3. **GPx-1/GPx-4 antioxidant enzyme gene expression** (RT-PCR)



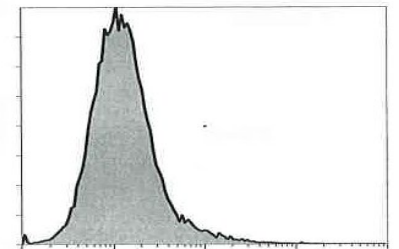
Protocol



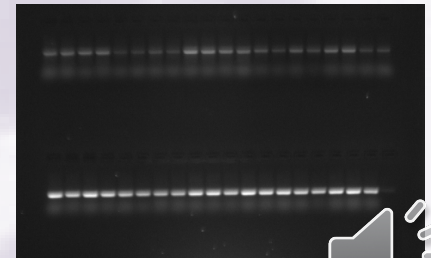
MTS Assay



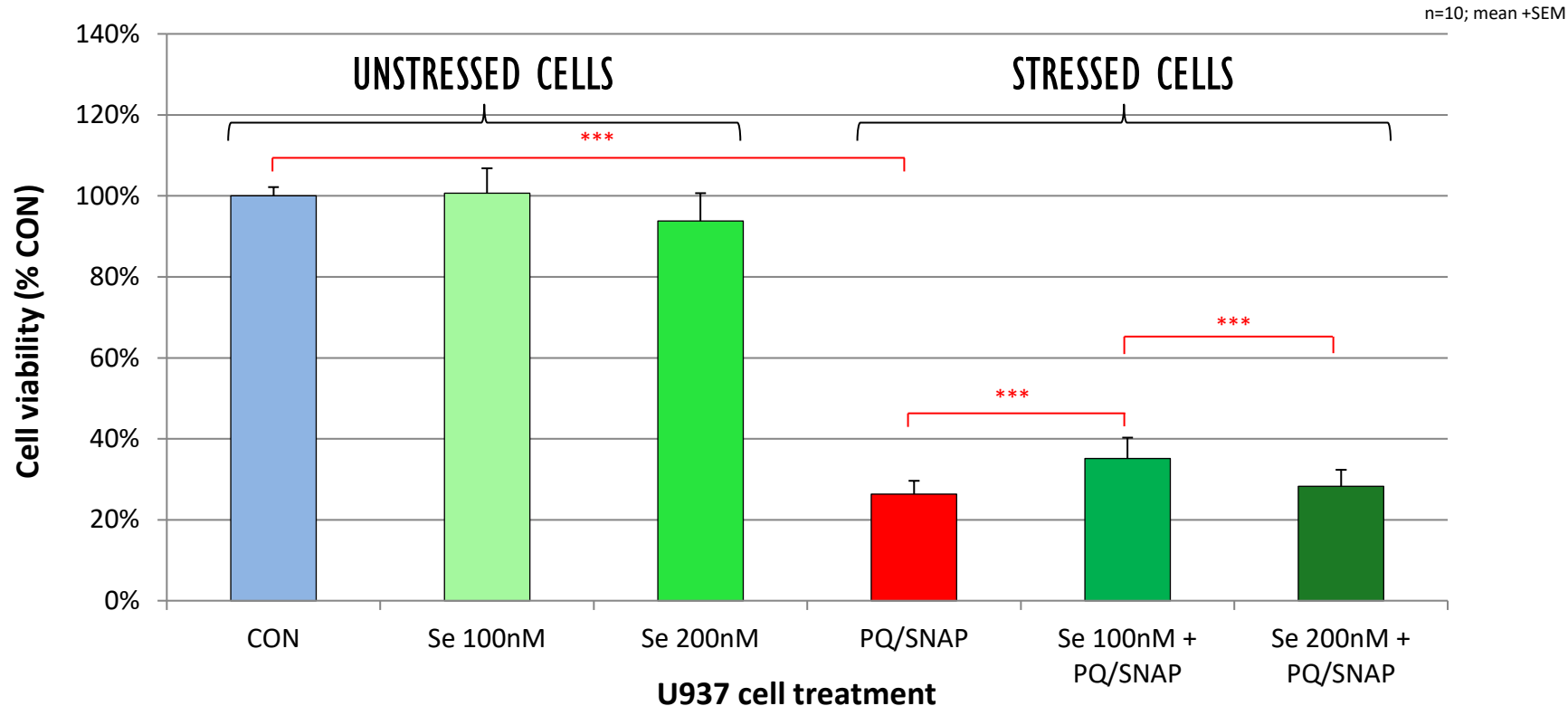
CM-H₂DC-FDA Flow Cytometry



Reverse Transcription PCR (GPx-1/GPx-4)



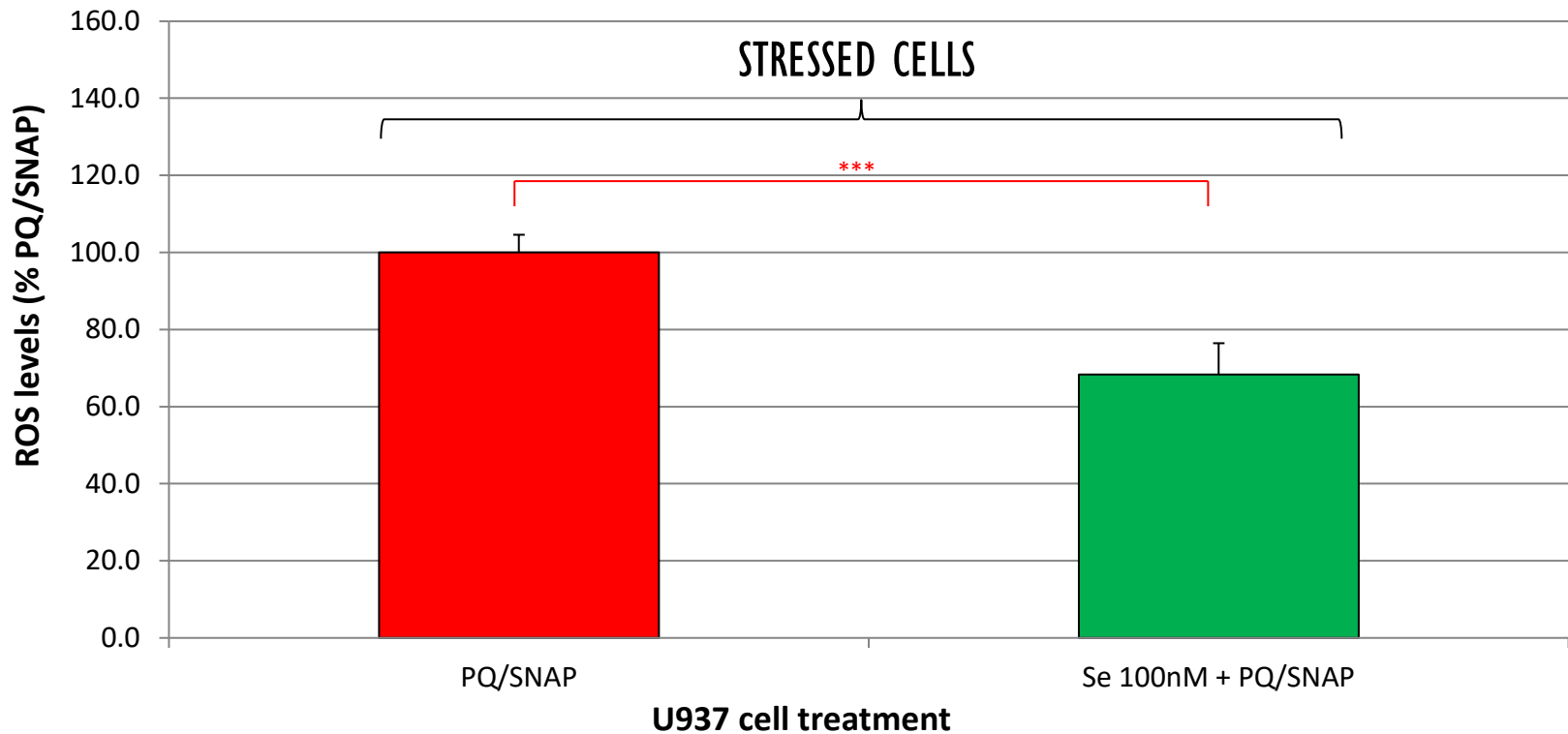
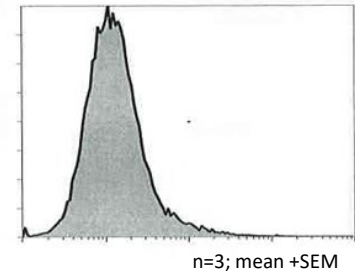
100nM selenite ensures greater cellular protection than 200nM selenite under stress conditions



- Selenium supplementation (100nM/200nM Na_2SeO_3) of unstressed cells did not significantly change cell viability compared to control cells (no PQ/SNAP).
- Monocytes pre-supplemented with **100nM Na_2SeO_3** before PQ/SNAP treatment, **significantly increased cell viability by 33%** ($p < 0.001$) compared to PQ/SNAP treated cells.
- Monocytes pre-supplemented with **200nM Na_2SeO_3** before PQ/SNAP treatment, did **not significantly improve cell viability** compared to PQ/SNAP treated cells.



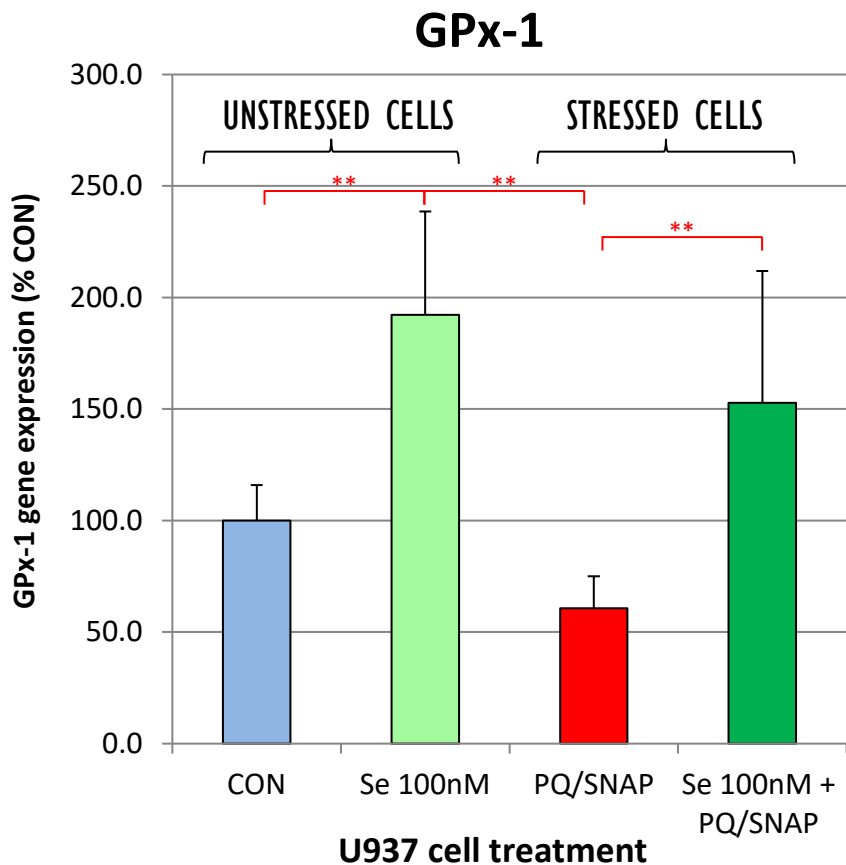
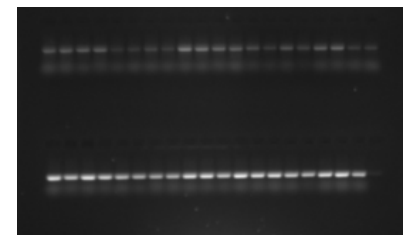
100nM selenite attenuates reactive oxidative species levels under stress conditions



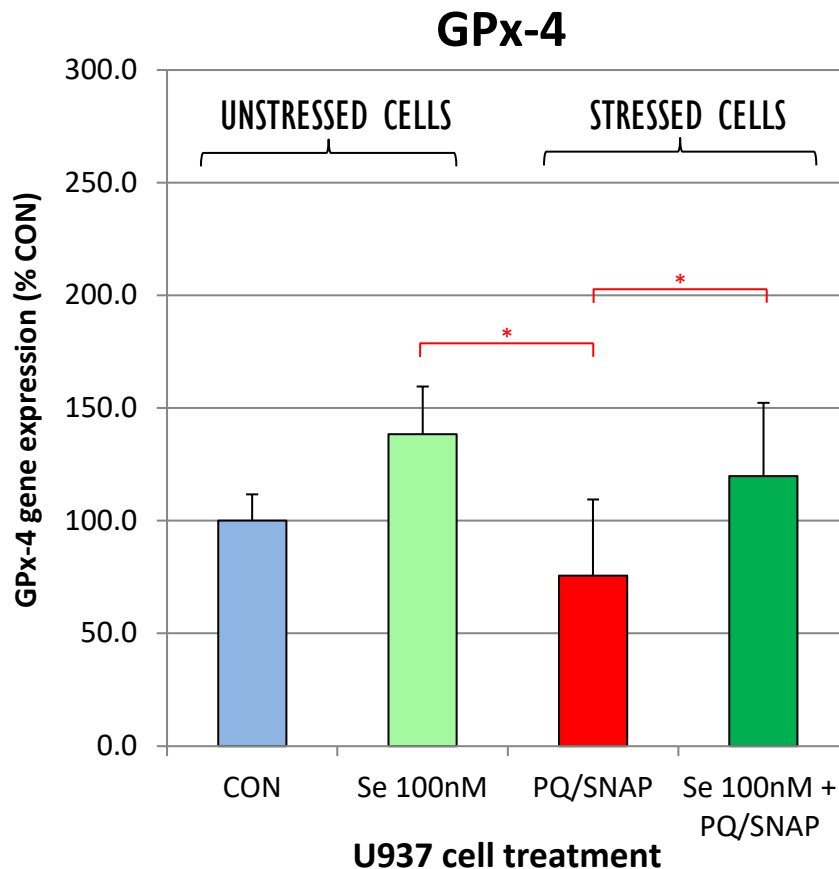
- Selenium supplementation (100nM Na_2SeO_3) of unstressed cells did not significantly change ROS levels compared to control cells (no PQ/SNAP).
- Monocytes pre-supplemented with **100nM Na_2SeO_3** before PQ/SNAP treatment, **significantly reduced ROS levels by 32%** ($p < 0.001$) compared to PQ/SNAP treated cells.



100nM selenite augments both GPx-1 and GPx-4 gene expression under stress conditions



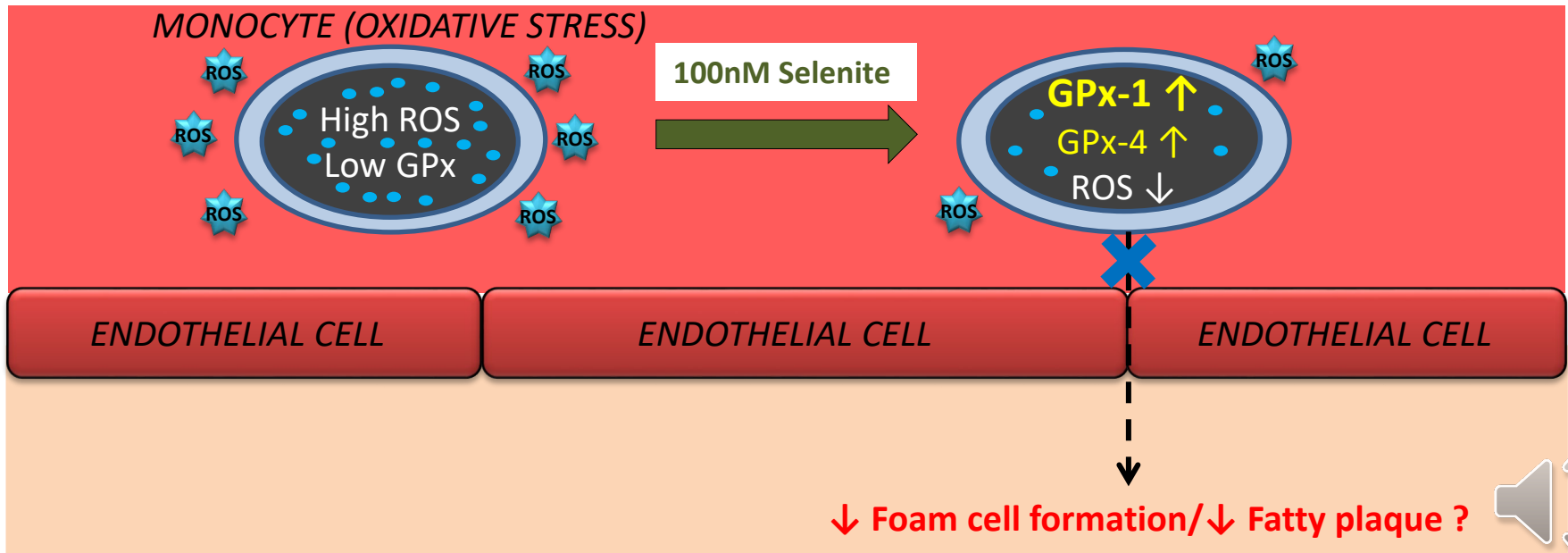
Monocytes pre-supplemented with **100nM Na₂SeO₃** before PQ/SNAP treatment, **significantly increased GPx-1 expression by 146%** (p<0.01) compared to PQ/SNAP treated cells.



Monocytes pre-supplemented with **100nM Na₂SeO₃** before PQ/SNAP treatment, **significantly increased GPx-4 expression by 77%** (p<0.05) compared to PQ/SNAP treated cells.

Discussion

Potential beneficial effects of 100nM selenium supplementation:



Future Directions

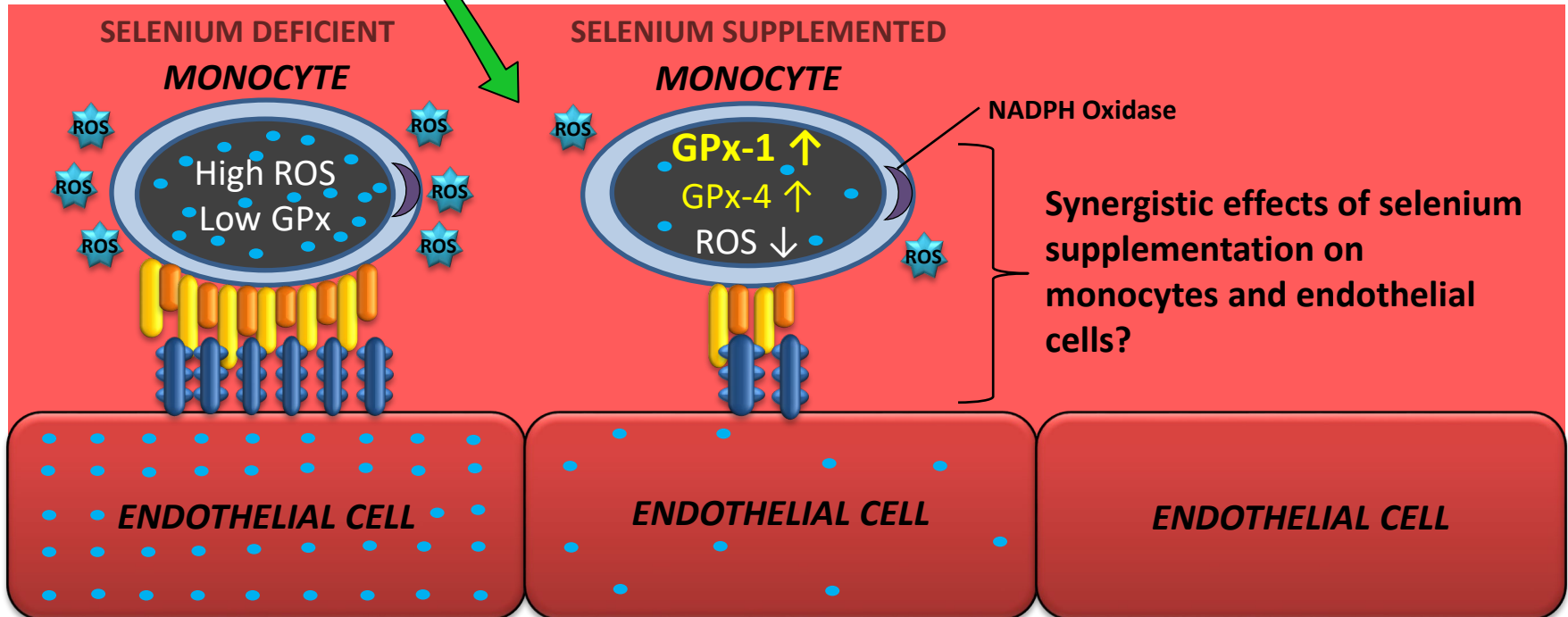


100nM
Selenite

Ability selenium supplementation:

- Modify ROS/GPx-1 + GPx-4 in endothelial cells under OS.
- Modify CAM expression in both monocyte and endothelial cells under OS.

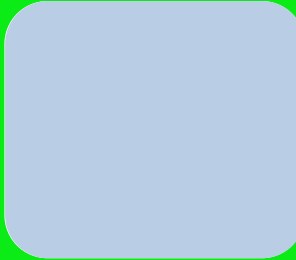
First study to investigate effect selenium supplementation on both ROS/antioxidant enzymes AND CAM expression.



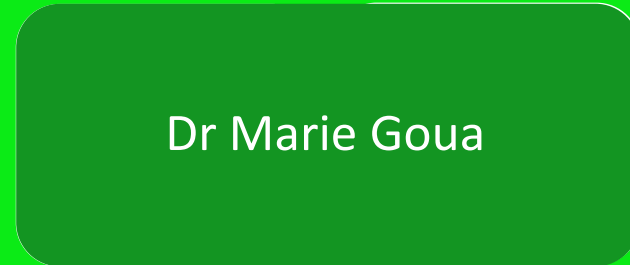
Acknowledgements



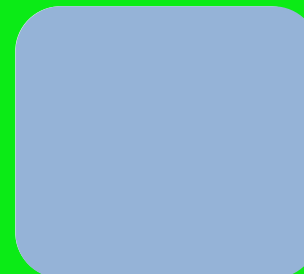
Dr Giovanna Bermano



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Dr Katherine Burgess



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