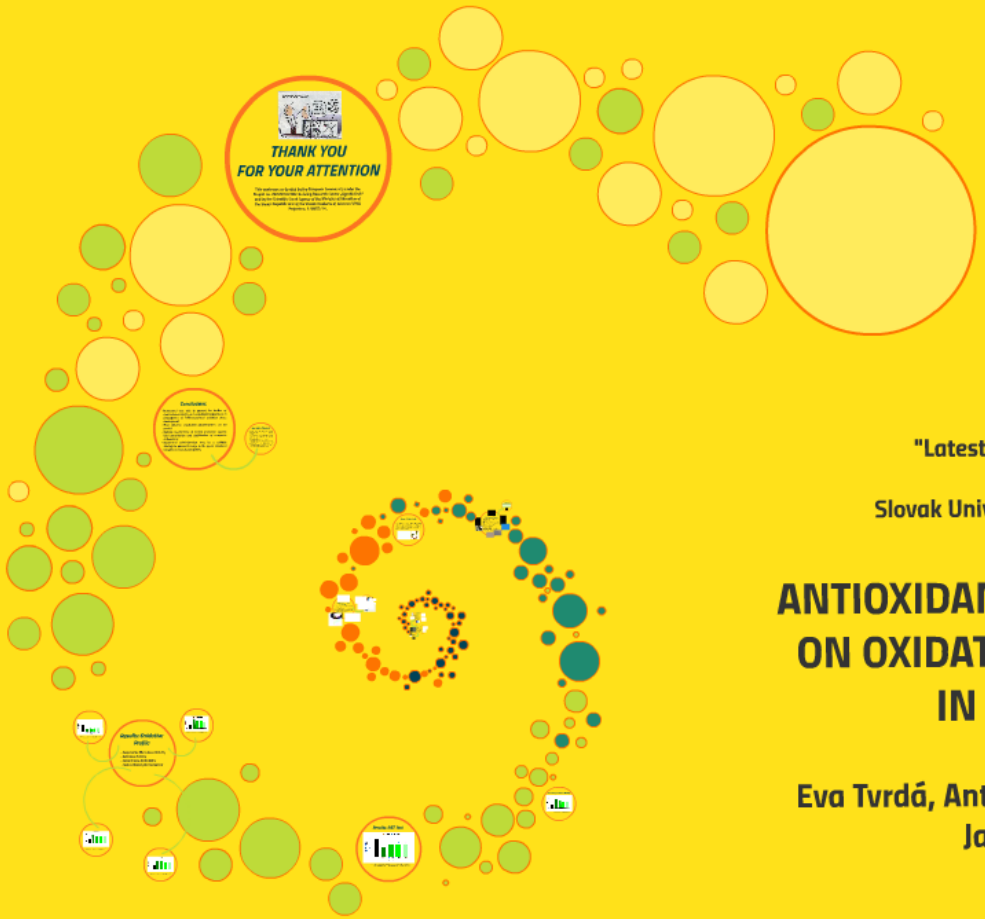

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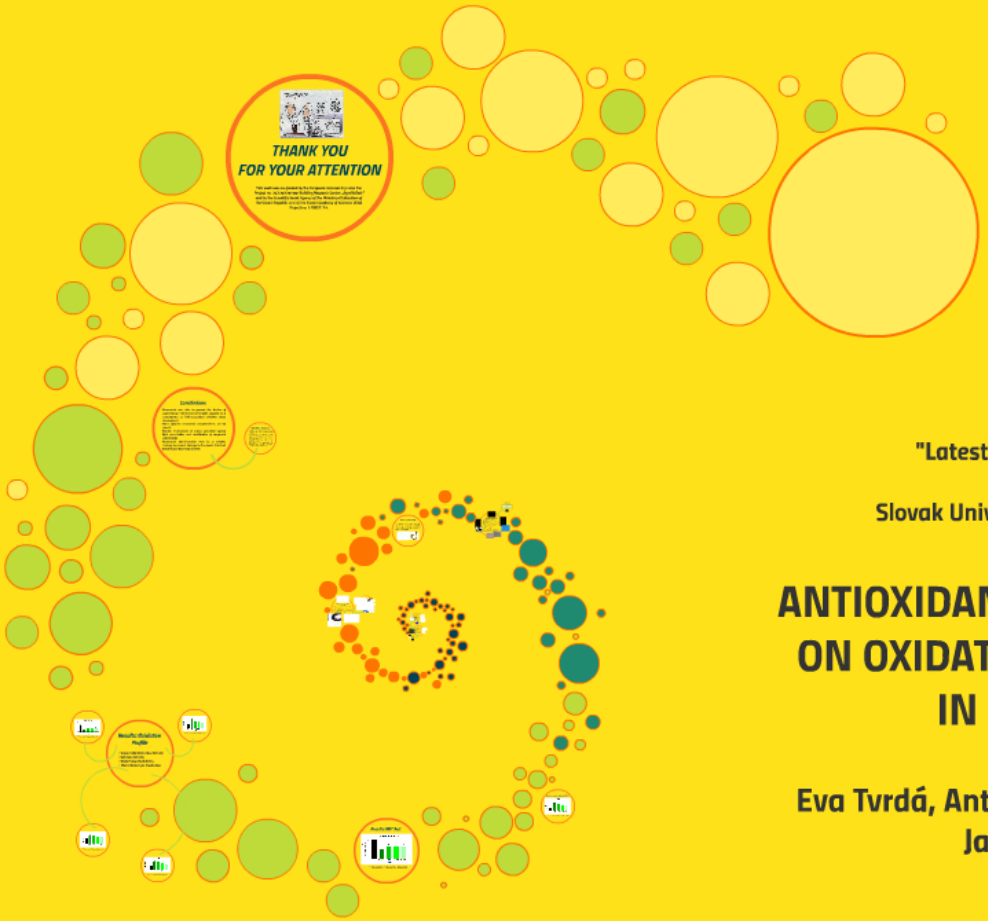
ANTIOXIDANT EFFICIENCY OF RESVERATROL ON OXIDATIVE STRESS-INDUCED DAMAGE IN BOVINE SPERMATOZOA

Eva Tvrdá, Anton Kováčik, Eva Tušimová, Norbert Lukáč, Jana Lukáčová, Peter Massányi



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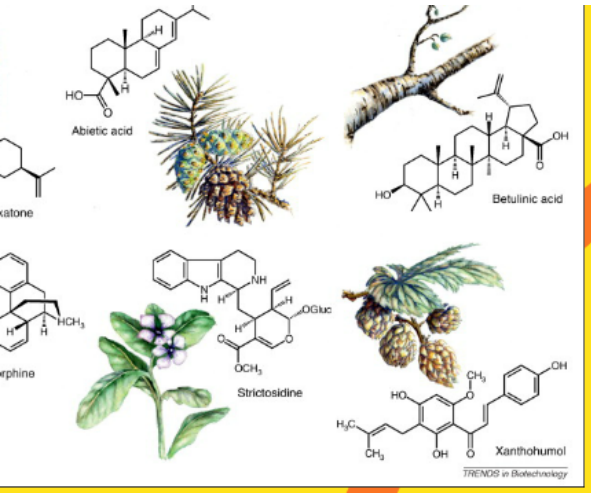
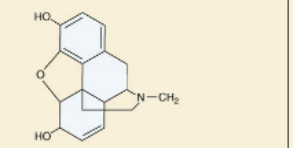
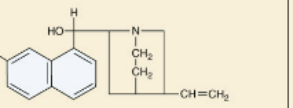
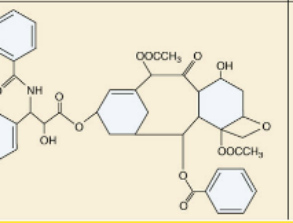
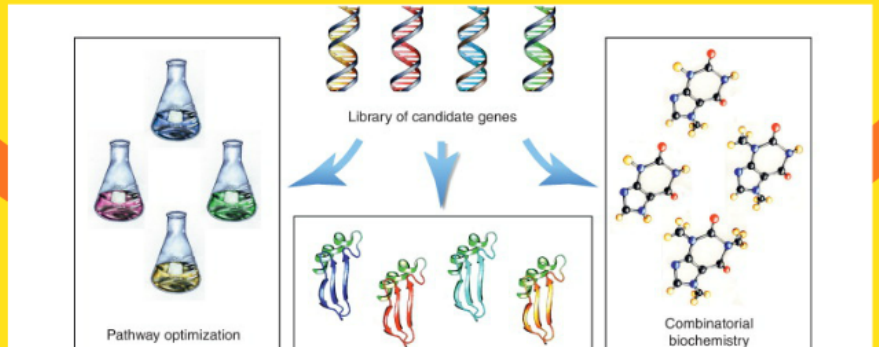


Natural Biologically Active Substances

Individual compounds extracted from vegetable raw materials reveal a wide range of biological activities used in healthcare, nutrition, intensive production and scientific research

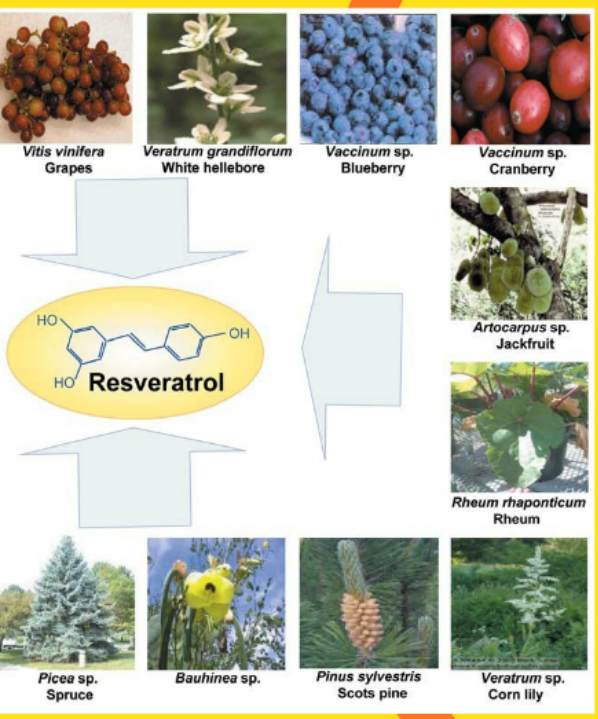
- **Higher safety**
- **Potent pharmacological properties**
- **Chemical diversity, structural complexity, availability**
- **Lack of significant toxic effects, intristic biological activity**

Structure	Effect on humans
	Narcotic pain killer
	Antimalarial drug
	Anticancer drug



Prezi

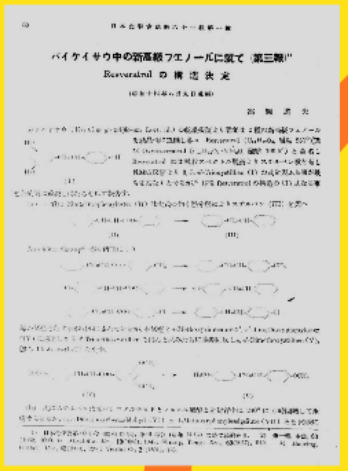
Resveratrol



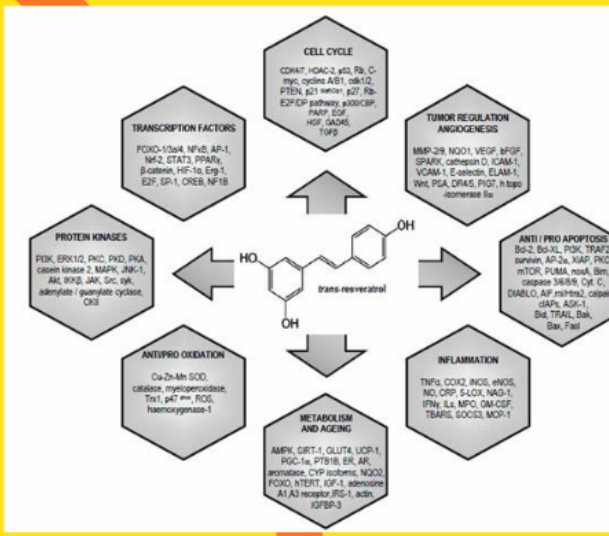
- (3,5,4'-trihydroxy-trans-stilbene) - a stilbenoid and a natural phenolic compound
- Phytoalexin produced naturally by several plants in response to injury, stress or when the plant is under attack by pathogens
- Food sources: skin of grapes, peanuts, cocoa, blueberries, raspberries, and mulberries

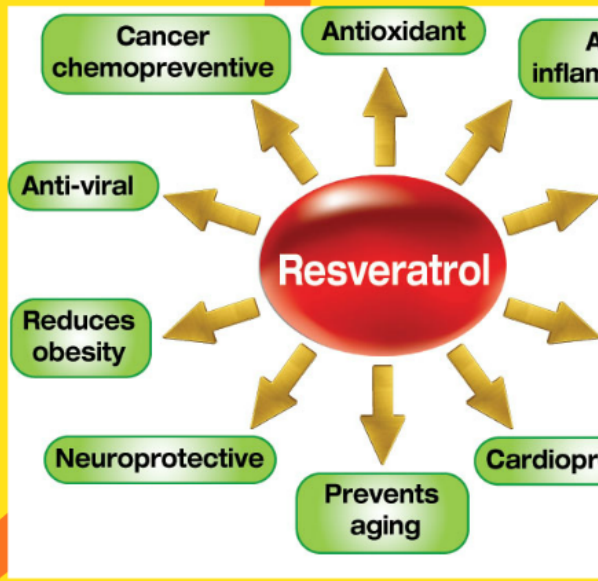
Product	Serving Size	TotalRes Ave
Red Wines	150 ml	656
Red Wines (Calif.)	150 ml	26
Roasted Peanuts	28 g	1.
Peanut Butter	32 g	9.(
Cocoa Powder	10 g	**18.**
Baking Chocolate	15 g	**18.**
Dark Chocolate	40 g	**14.**
Semisweet Baking Chips	15 g	7.
Milk Chocolate	40 g	4.
Chocolate Syrup	39 g	3.

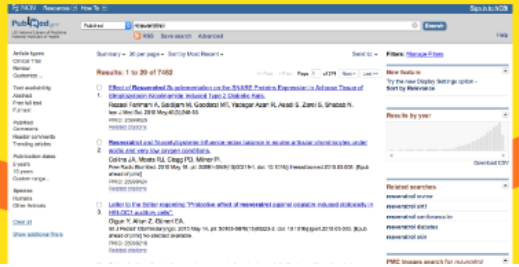
Health Effects of Resveratrol



- a Fountain of Youth?
- the French Paradox
- Possible health benefits
  - Slows the aging process
  - Prevents cancer
  - Prevents heart disease
  - Improves cognitive function
  - Reduces appetite
  - Antioxidant properties







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1. Effect of **Resveratrol** Supplementation on the SNARE Proteins Expression in Adipose Tissue of Stroptozotocin-Nicotinamide Induced Type 2 Diabetic Rats.
   Rezaei Farimani A, Saidijam M, Goodarzi MT, Yadegar Azari R, Asadi S, Zarei S, Shabab N.
   Iran J Med Sci. 2015 May;40(3):248-55.
   PMID: 25999625
   Related citations

2. **Resveratrol** and N-acetylcysteine influence redox balance in equine articular chondrocytes under acidic and very low oxygen conditions.
   Collins JA, Moots RJ, Clegg PD, Milner PI.
   Free Radic Biol Med. 2015 May 18. pii: S0891-5849(15)00219-1. doi: 10.1016/j.freeradbiomed.2015.05.008. [Epub ahead of print]
   PMID: 25998424
   Related citations

3. Letter to the Editor regarding "Protective effect of **resveratrol** against cisplatin-induced ototoxicity in HEI-OC1 auditory cells".
   Olgun Y, Altun Z, Güneri EA.
   Int J Pediatr Otorhinolaryngol. 2015 May 14. pii: S0165-5876(15)00223-2. doi: 10.1016/j.ijporl.2015.05.003. [Epub ahead of print] No abstract available.
   PMID: 25998215
   Related citations

4. Determination of naturally occurring **resveratrol** analog trans-4,4'-dihydroxystilbene in rat plasma by liquid chromatography-tandem mass spectrometry: application to a pharmacokinetic study.
   Chen W, Yeo SC, Elhennawy MG, Xiang X, Lin HS.
   Anal Bioanal Chem. 2015 May 22. [Epub ahead of print]
   PMID: 25998136
   Related citations

5. Stimulating basal mitochondrial respiration decreases doxorubicin apoptotic signaling in H9c2 cardiomyoblasts.
   Deus CM, Zehowski C, Nordgren K, Wallace KB, Skildum A, Oliveira PJ.
   Toxicology. 2015 May 18. pii: S0300-483X(15)00089-X. doi: 10.1016/j.tox.2015.05.001. [Epub ahead of print]
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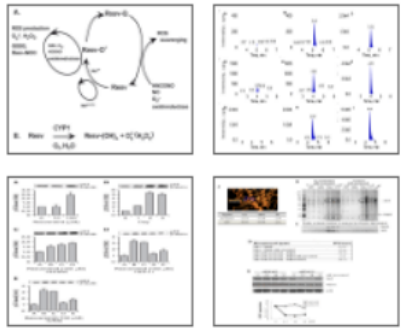
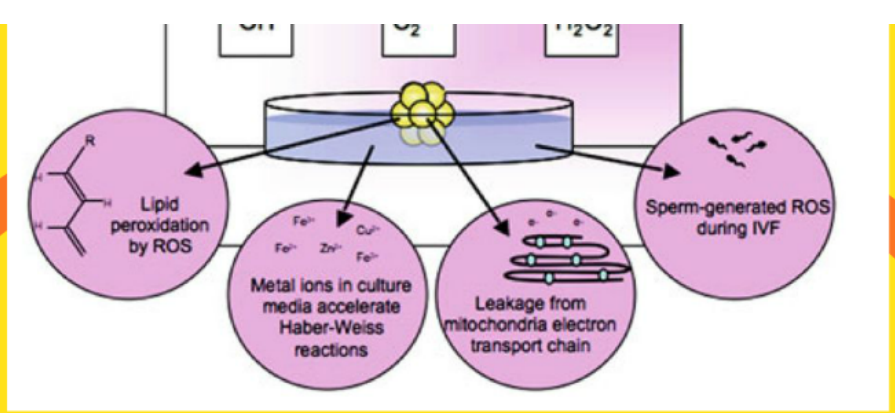
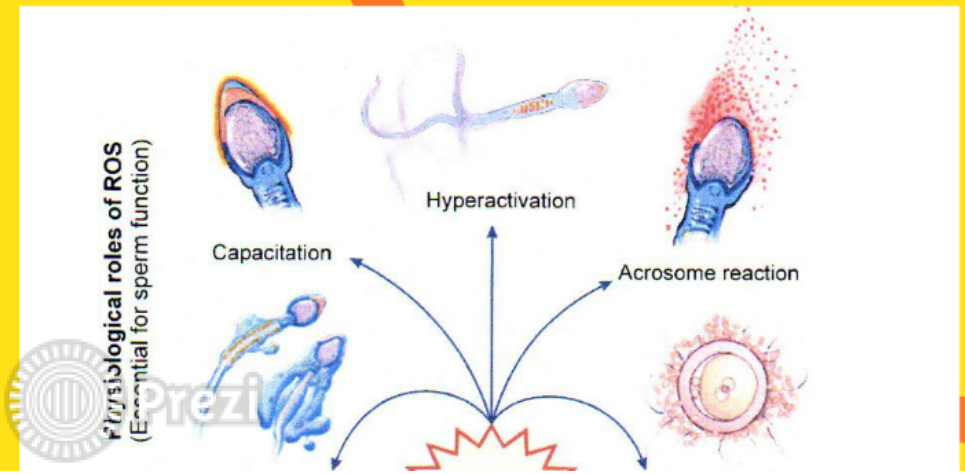
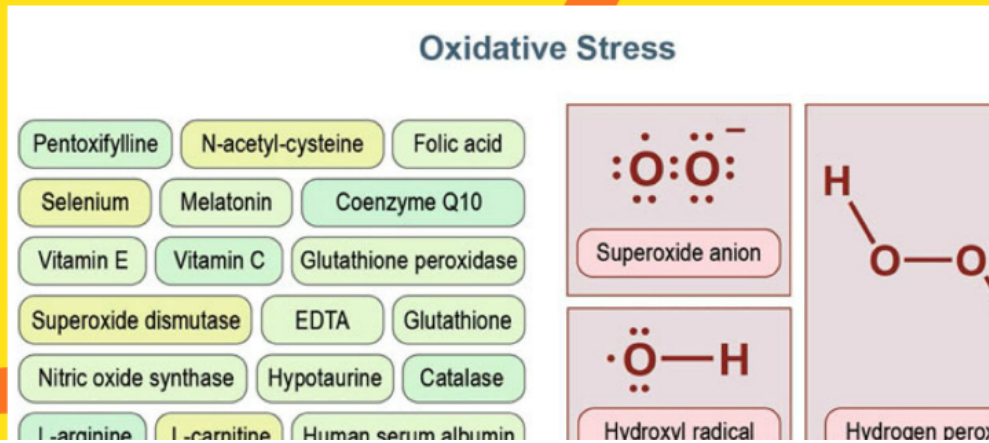




Oxidative Stress: a Key Factor in Subfertility

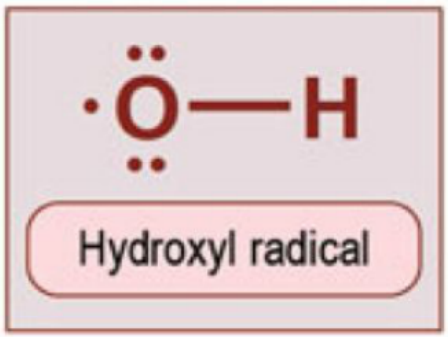
- **Spermatozoa: particular sensitivity to oxidative stress development**
- **Diverse antioxidants may protect the spermatozoon against oxidative injury and subsequent dysfunction**
- **Essential for spermatozoa processing and culture routinely performed in andrology**

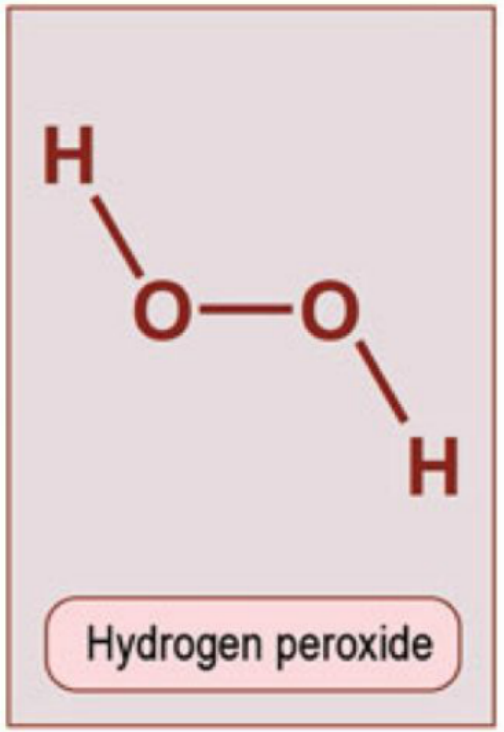




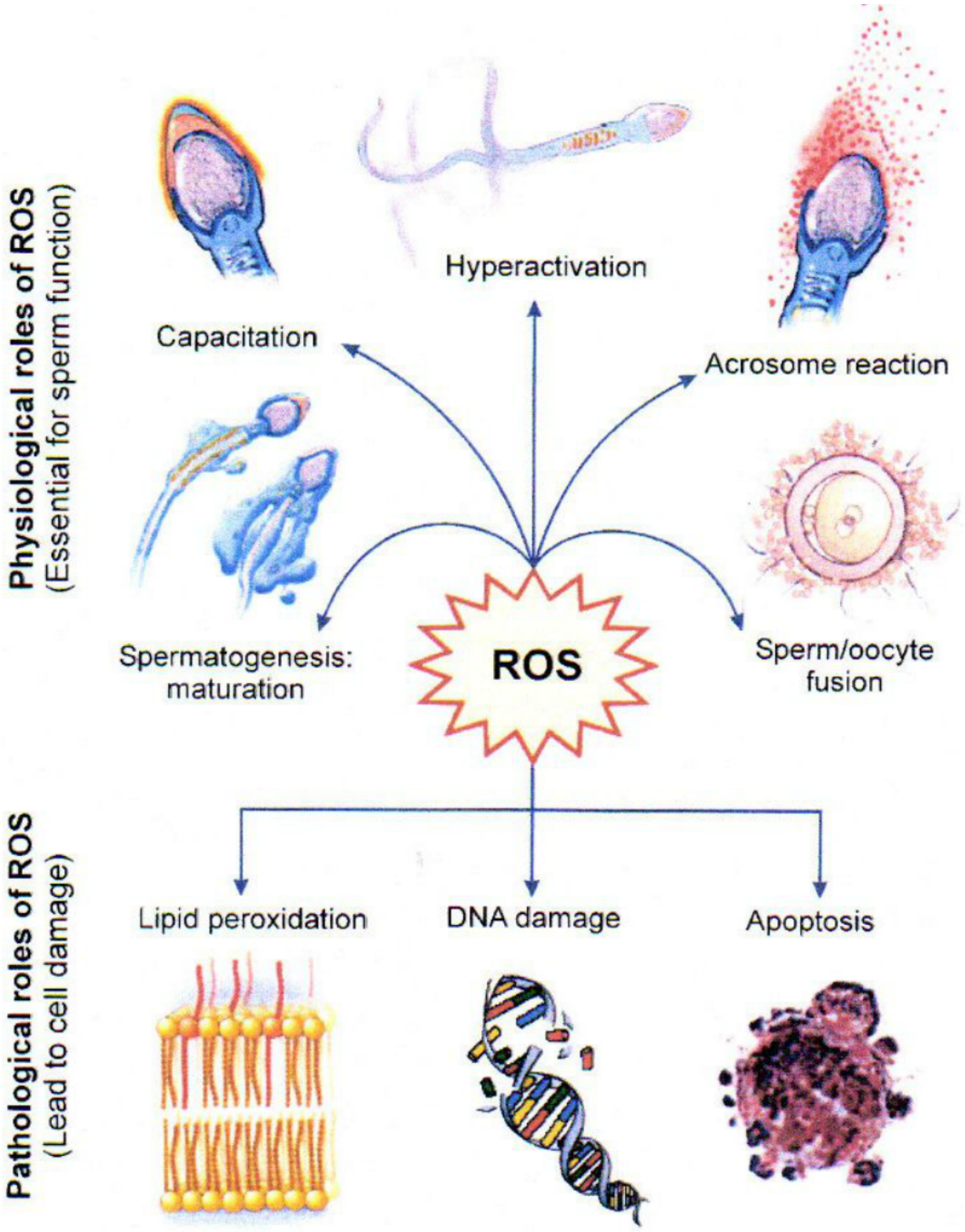
Oxidative Stress

- Pentoxifylline
- N-acetyl-cysteine
- Folic acid
- Selenium
- Melatonin
- Coenzyme Q10
- Vitamin E
- Vitamin C
- Glutathione peroxidase
- Superoxide dismutase
- EDTA
- Glutathione
- Nitric oxide synthase
- Hypotaurine
- Catalase
- L-arginine
- L-carnitine
- Human serum albumin





Antioxidants | **ROS**


Physiological roles of ROS
(Essential for sperm function)
Hyperactivation
Capacitation
Acrosome reaction
Spermatogenesis:
maturation
ROS
Sperm/oocyte
fusion
Pathological roles of ROS
(Lead to cell damage)
Lipid peroxidation
DNA damage
Apoptosis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First International Journal of Andrology
ANDROLOGIA
Original Article
Resveratrol appears to protect against oxidative stress and steroidogenesis collapse in mice fed high-calorie and high-cholesterol diet
H.-J. Wang, Q. Wang, Z.-M. Lv, C.-L. Wang, C.-P. Li and Y.-L. Rong
Article first published online: 23 JAN 2014
DOI: 10.1111/and.12231
© 2014 Blackwell Verlag GmbH
Andrologia
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Keywords:
Leydig cell; obesity; oxidative stress; resveratrol; steroidogenesis
Summary
The detrimental effects on Leydig cells steroidogenesis in mice on high-calorie and high-cholesterol diet (HCD) were determined, and the
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J Reprod Dev. 2014 Apr; 60(2): 115–127.
Published online 2014 Feb 1. doi: 10.1262/jrd.2013
Resveratrol Reverses Cadmium Subfertility by Downregulating and Bcl-2 gene Expression
Samy M ELEAWA, Mahmoud A ALKHATEEB, Hesham M ELREFAEY, Abbas O ELKARIB, SHATOOR, and Mohammad A KHALIL
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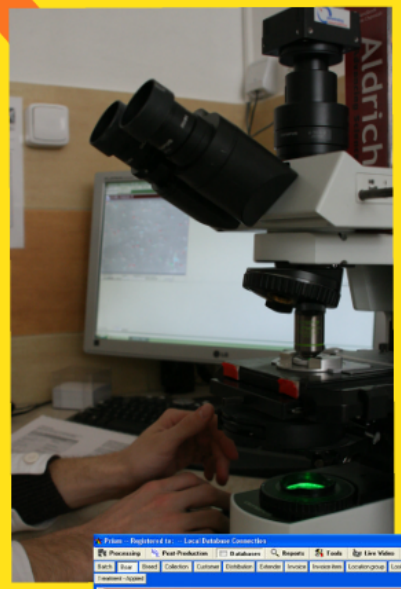
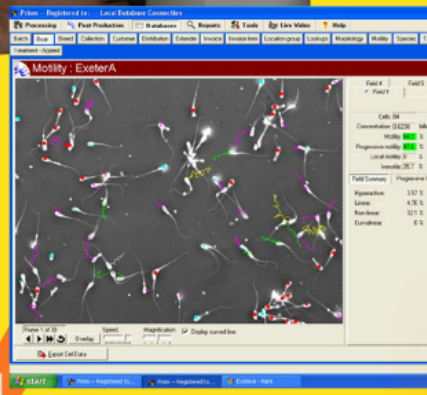
Aims of the Study

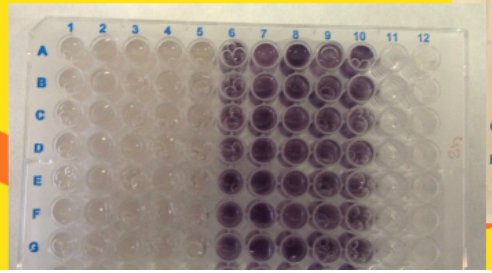
To evaluate the *in vitro* antioxidant activity of resveratrol against oxidative stress induced by ferrous ascorbate in bovine spermatozoa

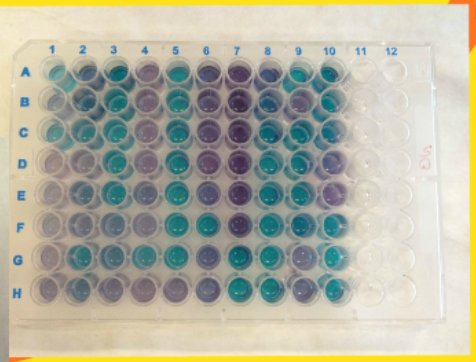
Material and Methods

- Semen samples from 25 breeding bulls
- Sperm isolation and re-suspension in 2.9% sodium citrate
- *In vitro* culture (37 °C, 6h)
- Sperm motility analysis: Computer-aided sperm analysis (CASA)
- Superoxide production: Nitroblue-Tetrazolium (NBT) Test
- Cell lysis
- Colorimetric/spectrophotometric analysis of:
  - Superoxide dismutase activity
  - Catalase activity
  - Glutathione availability
  - Lipid peroxidation/Malondialdehyde production
- Statistical analysis: Descriptive statistical characteristics, One-way ANOVA, Dunnett's test





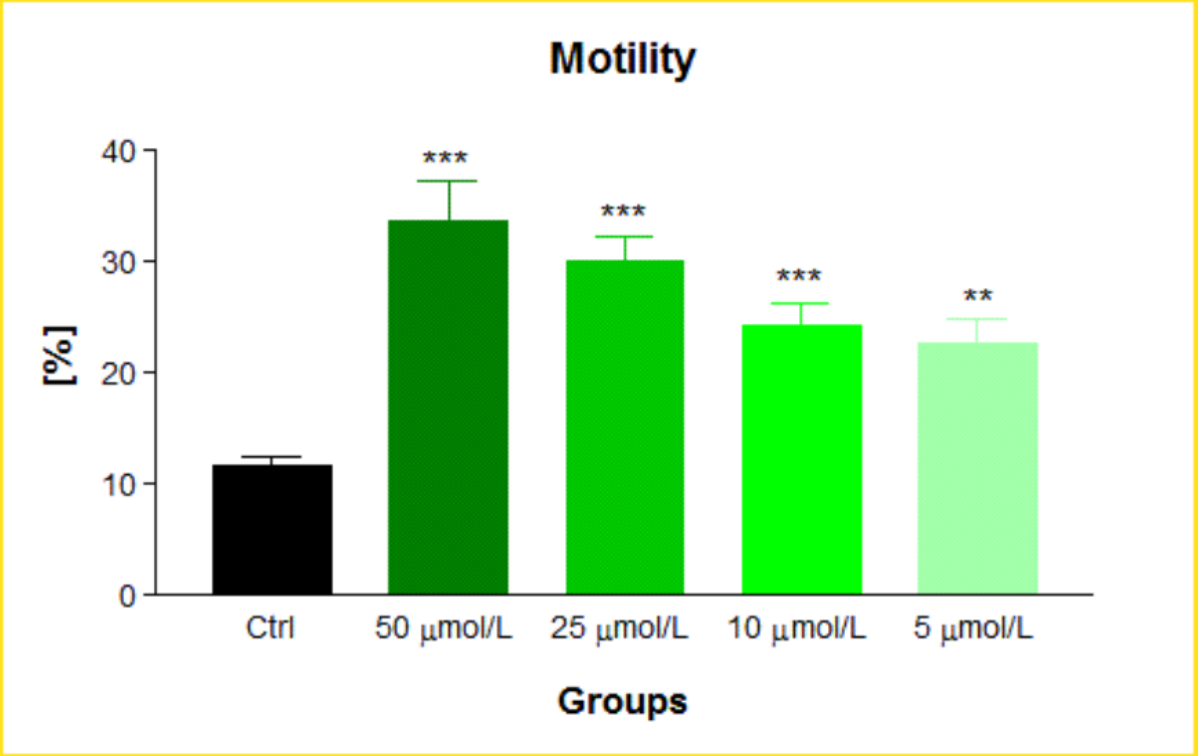




Experimental Groups

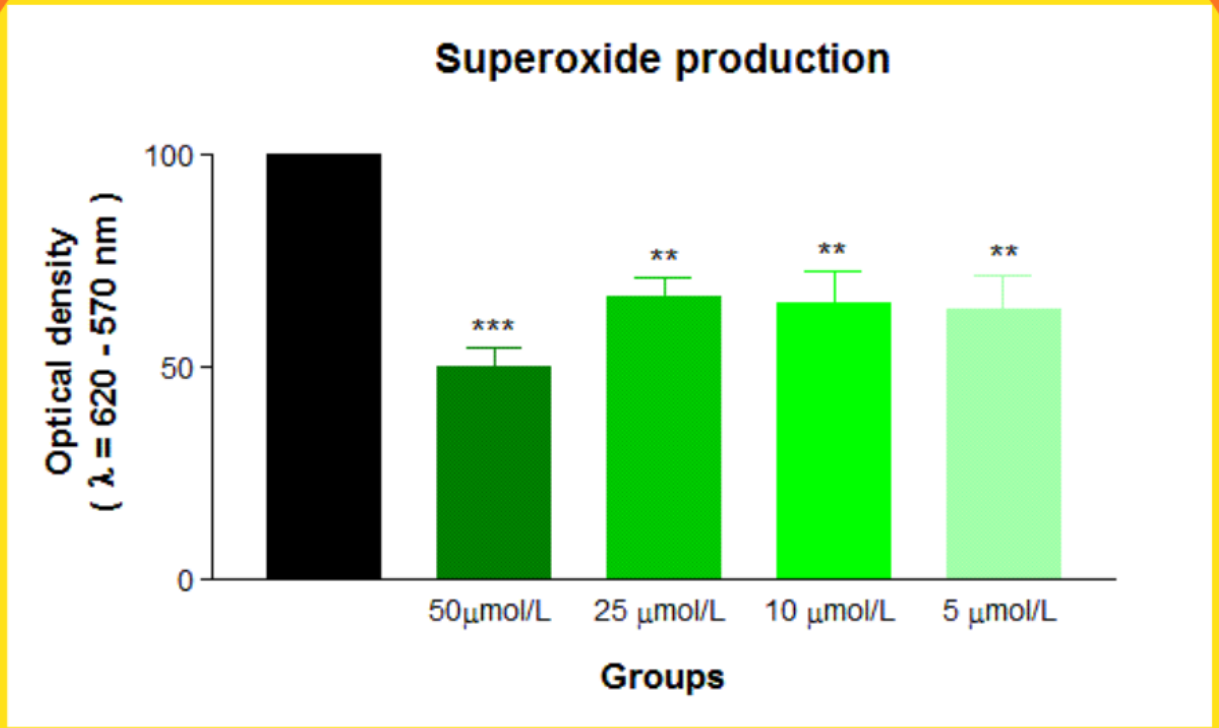
GROUP	TREATMENT
Ctrl	Ferrous Ascorbate (FeAA) 150 µmol/L $FeSO_4.7H_2O$ + 750 µmol/L ascorbic acid
A	FeAA + 50 µmol/L RES
B	FeAA + 25 µmol/L RES
C	FeAA + 10 µmol/L RES
D	FeAA + 5 µmol/L RES

Results: Spermatozoa Motility

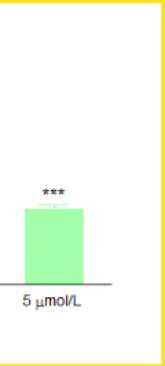


*** (P<0.001); ** (P<0.01); * (P<0.05)

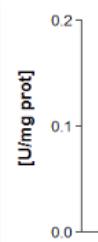
Results: NBT Test



*** (P<0.001); ** (P<0.01); * (P<0.05)



P<0.05)



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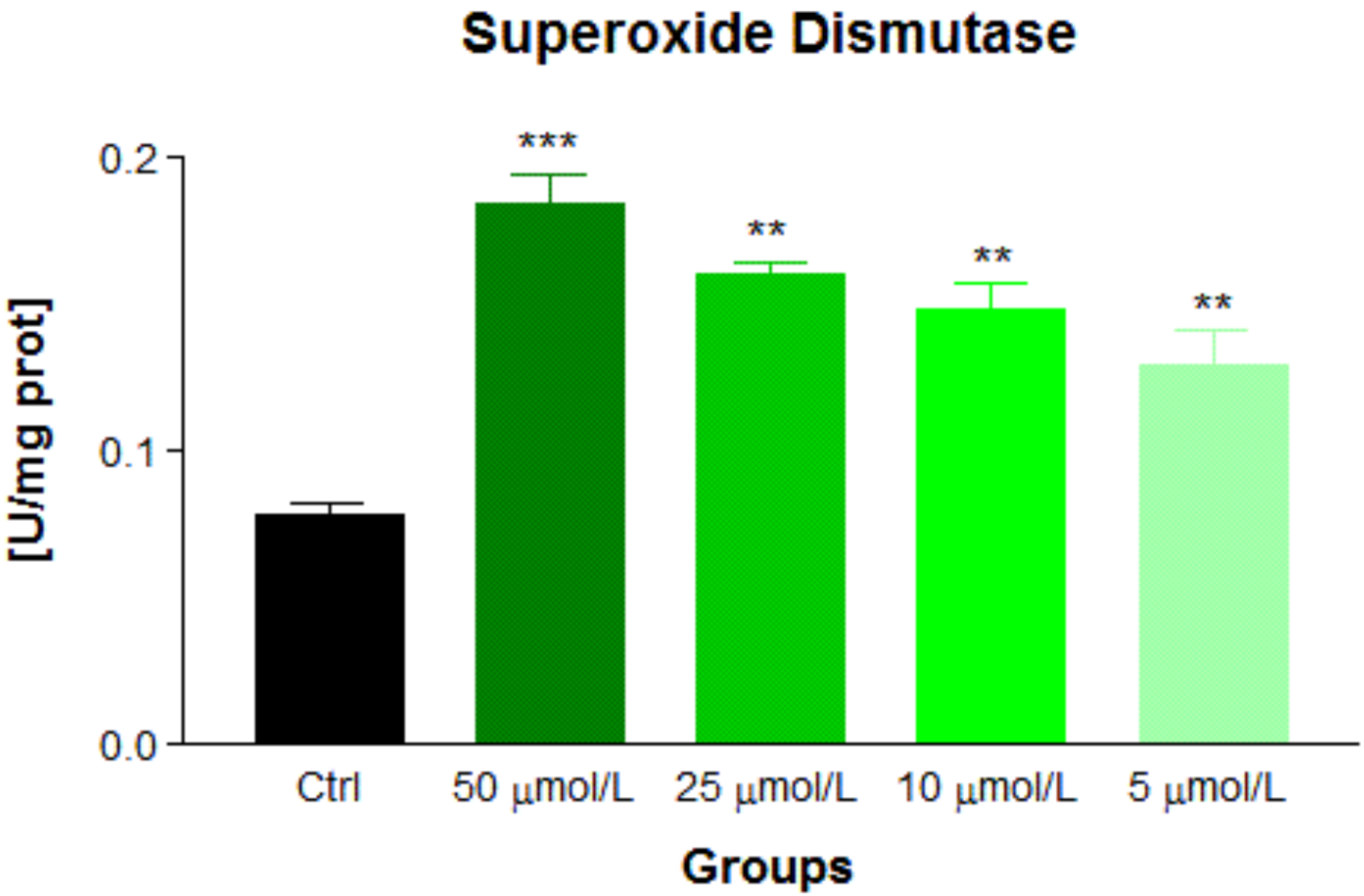
Results: Oxidative Profile

- Superoxide Dismutase Activity
- Catalase Activity
- Glutathione Availability
- Malondialdehyde Production



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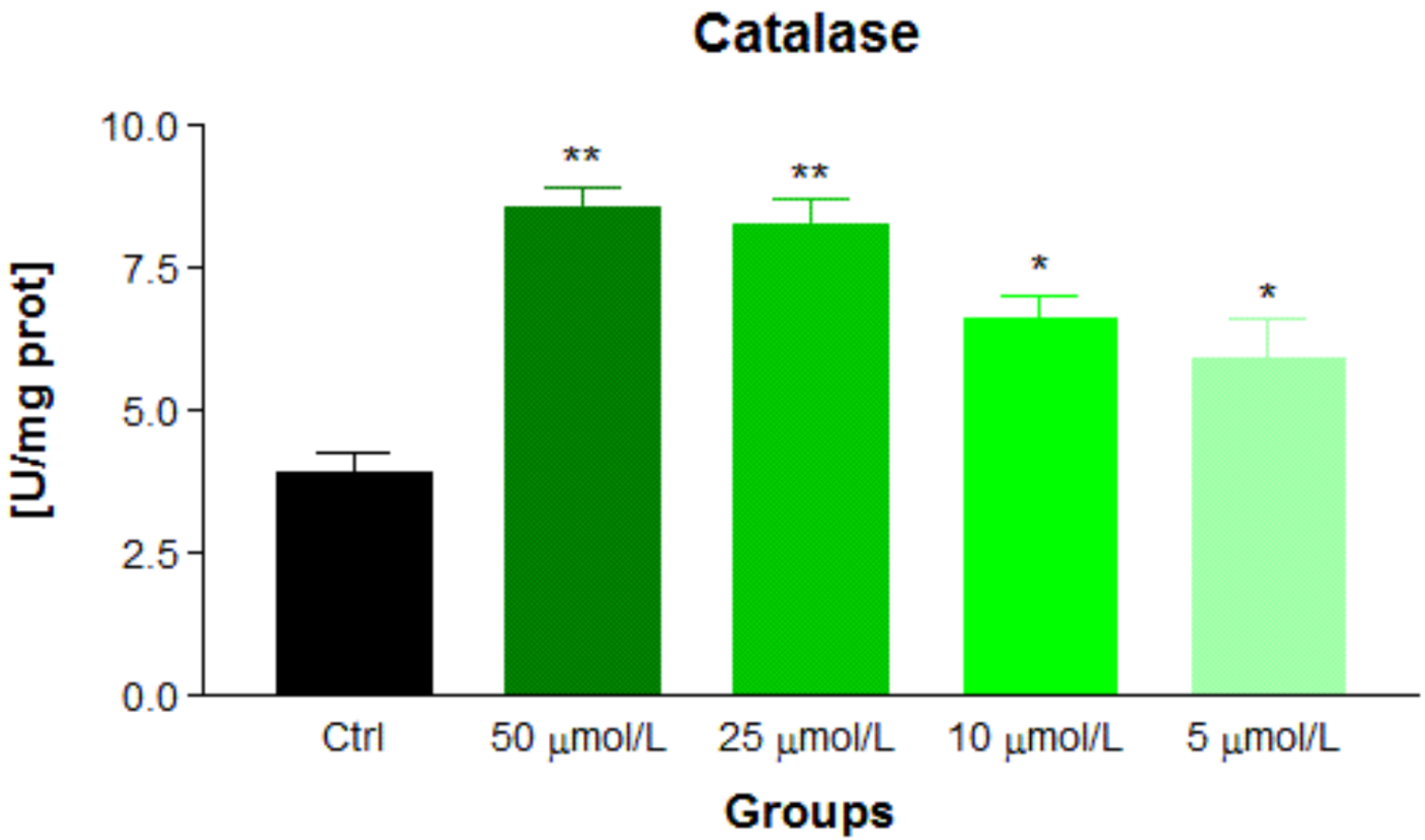

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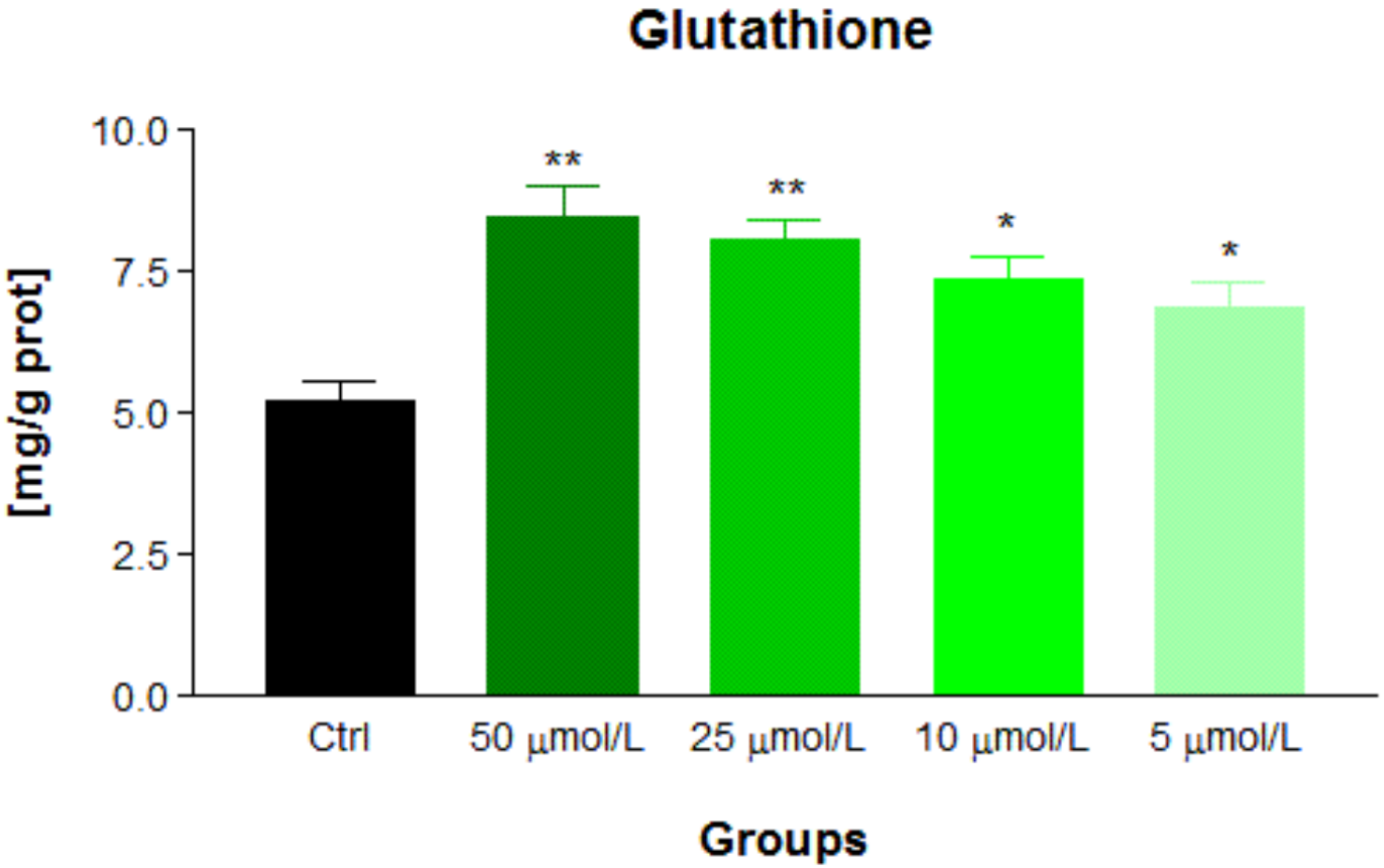

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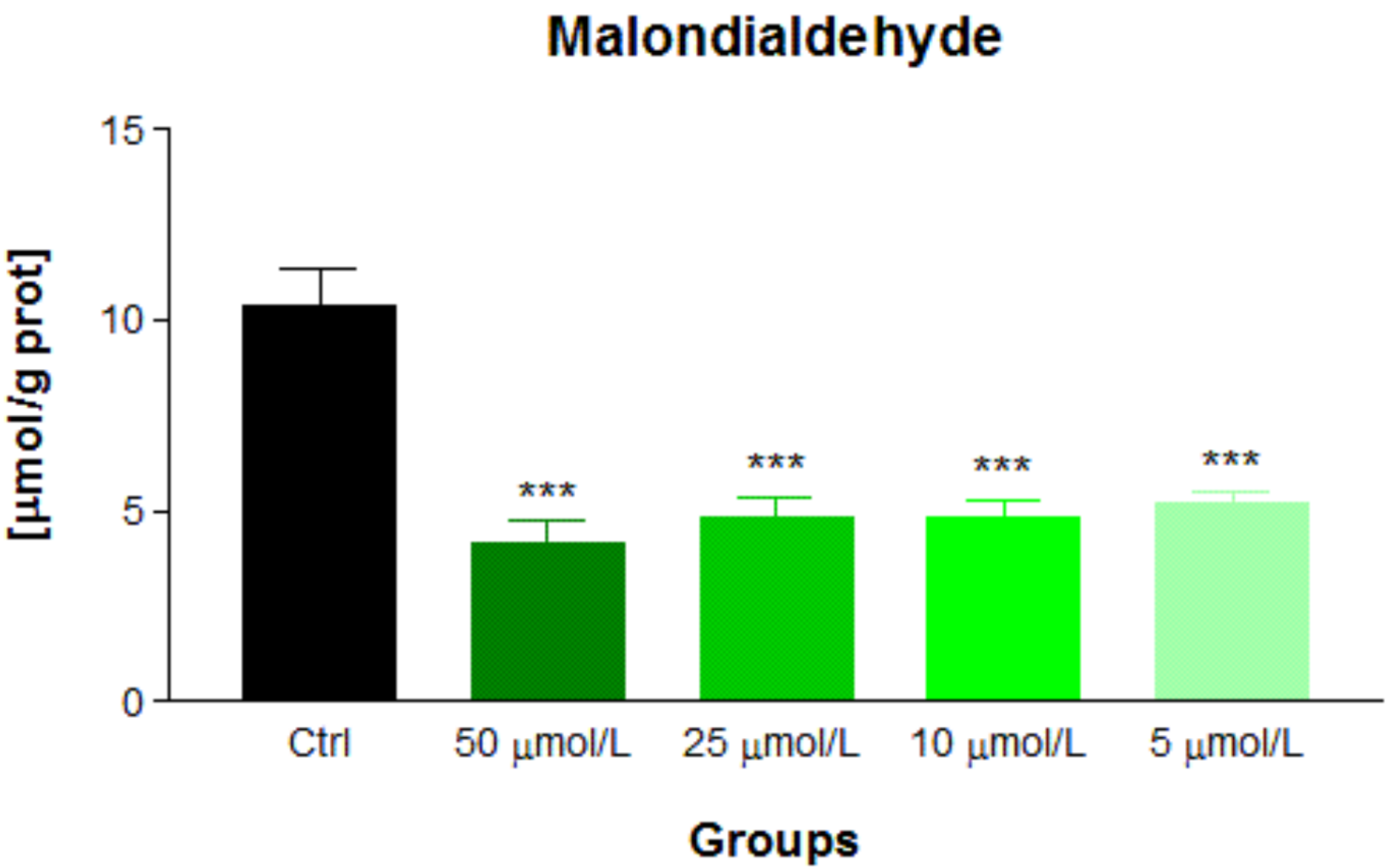


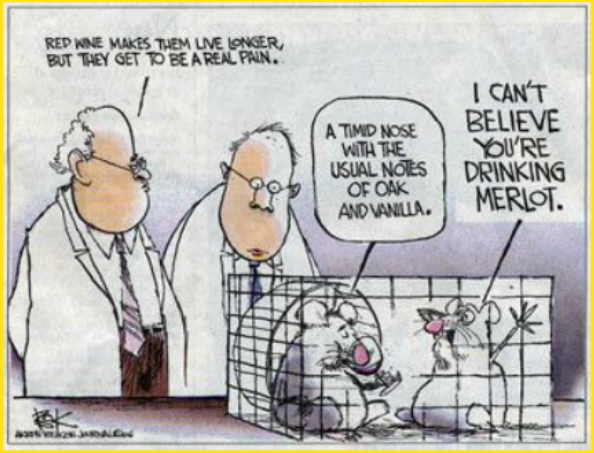
*** (P<0.001); ** (P<0.01); * (P<0.05)

Conclusions

- Resveratrol was able to prevent the decline of spermatozoa vitality and antioxidant capacity as a consequence of FeAA-associated oxidative stress development
- Most effective resveratrol concentrations: 25–50 µmol/L
- Notable mechanisms of action: protection against lipid peroxidation and stabilization of enzymatic antioxidants
- Resveratrol administration may be a suitable strategy to prevent damage to the sperm structural integrity and functional activity

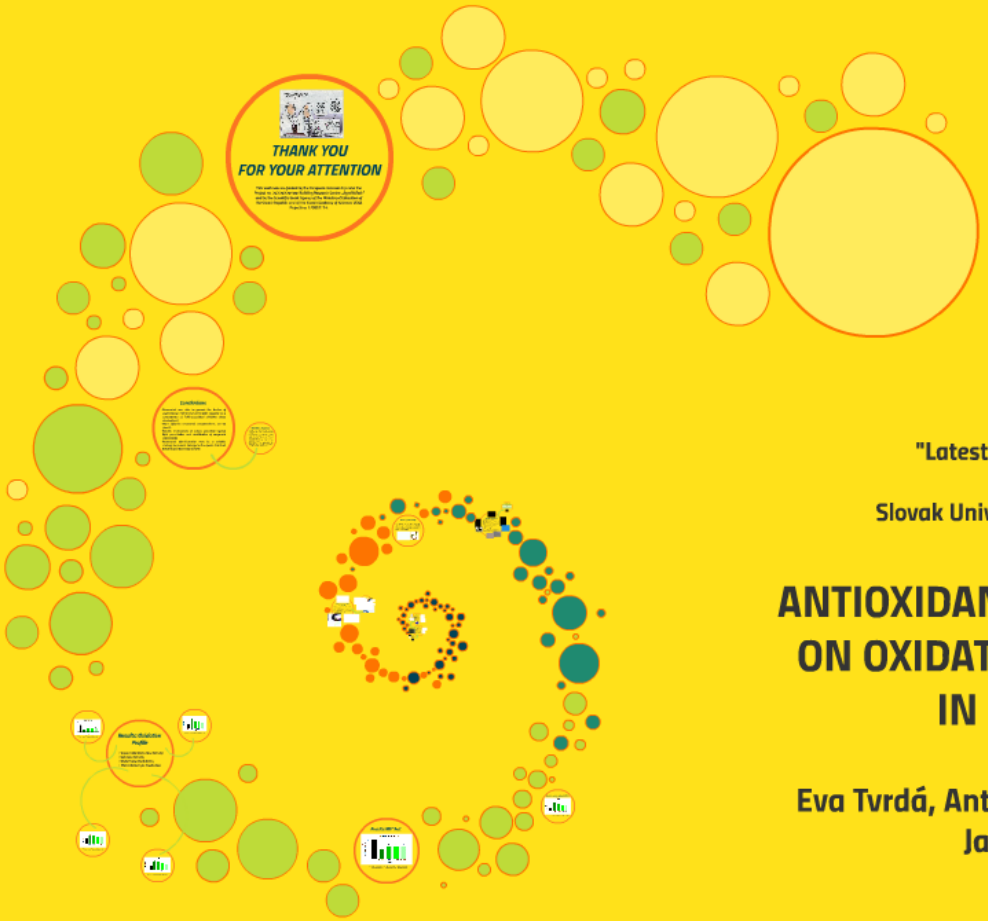
TAKE HOME MESSAGE

- A combination of iron and ascobic acid may have deleterious effects on sperm vitality and function
- Resveratrol offers antioxidant stimulation and protection to spermatozoa under oxidative stress conditions
- Resveratrol may have modulating effects on antioxidant enzymes
- Spermatozoon may autoregulate its antioxidant defense mechanisms in response to changing environmental conditions



THANK YOU FOR YOUR ATTENTION

This work was co-funded by the European Community under the Project no. 26220220180: Building Research Centre „AgroBioTech" and by the Scientific Grant Agency of the Ministry of Education of the Slovak Republic and of the Slovak Academy of Sciences VEGA Project no. 1/0857/14.



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