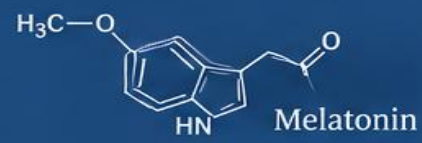
GEROPROTECTIVE EFFECTS OF MELATONIN ON HEPATIC REDOX HOMEOSTASIS AND GLUTATHIONE SYSTEM DURING AGING

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Background

Aging is associated with disruption of redox homeostasis, increased lipid peroxidation, and alterations in the functioning of the glutathione antioxidant defense system, which may contribute to structural and functional disturbances in the liver. Owing to its antioxidant and regulatory properties, melatonin is considered a promising agent for correcting age-related disturbances in redox balance.

Objective

To evaluate the effect of prolonged melatonin administration on oxidative stress markers and the functional state of the glutathione antioxidant defense system in the liver of rats of different ages.

Materials and Methods



40 male non-linear white rats

Age groups:
- Adult (4 months)
- Old (20 months)

n = 10 per subgroup

Adult control | Adult melatonin | Old control | Old melatonin

Melatonin: 10 mg/kg, intragastrically once daily for 14 days (evening)

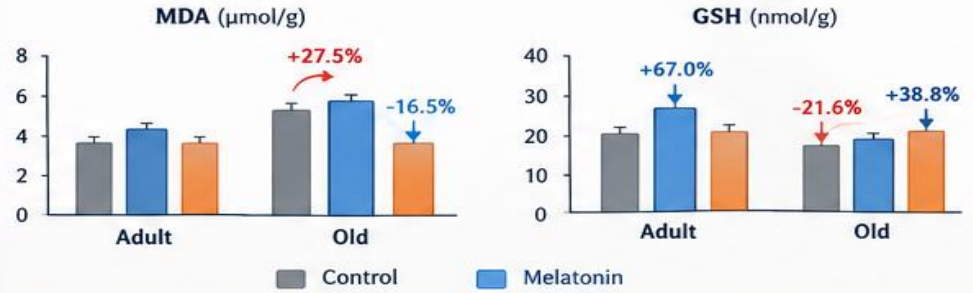
Liver parameters:



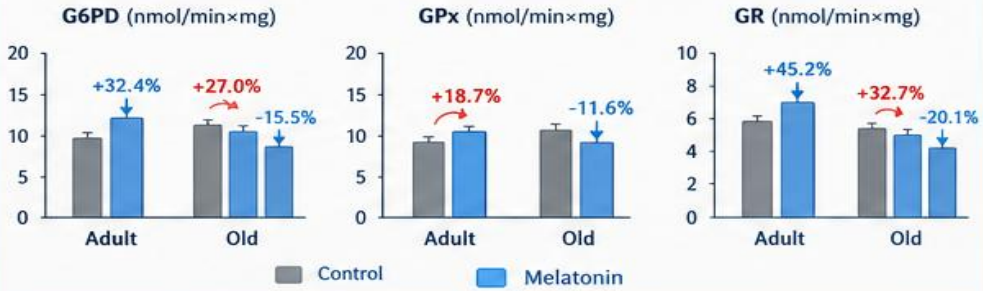
- MDA (thiobarbituric acid reaction)
- GSH (Ellman's reagent)
- G6PD (NADPH formation rate)
- GPx (spectrophotometric method)
- GR (spectrophotometric method)

Results

1. Oxidative stress marker and glutathione level



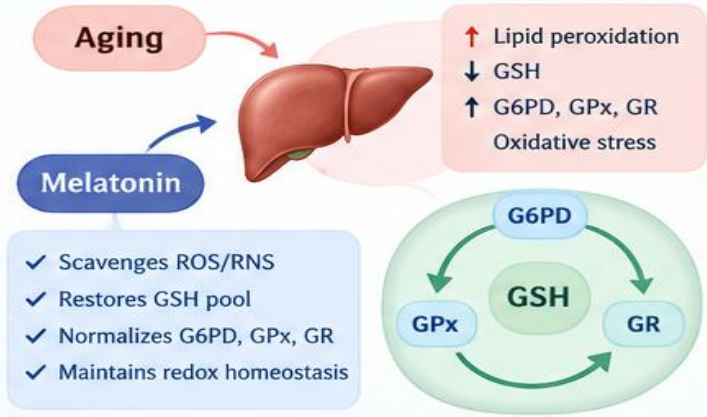
2. Antioxidant enzyme activities



Summary of changes

Parameter	Aging (old vs adult)	Melatonin effect (adult)	Melatonin effect (old)
MDA	↑ 27.5%	↓ 8.8%	↓ 16.5%
GSH	↓ 21.6%	↑ 67.0%	↑ 38.8%
G6PD	↑ 27.0%	↑ 32.4%	↓ 15.5%
GPx	↑ 18.7%	–	↓ 11.6%
GR	↑ 32.7%	↑ 45.2%	↓ 20.1%

Mechanism of geroprotective action



Conclusions

- Aging is accompanied by increased lipid peroxidation, depletion of the reduced glutathione pool, and compensatory activation of antioxidant defense enzymes in the liver.
- Prolonged melatonin administration attenuates oxidative stress, restores the glutathione component of the antioxidant defense system, and normalizes G6PD, GPx, and GR activities, particularly in old rats.
- These findings indicate the potential geroprotective properties of melatonin and its ability to maintain hepatic redox homeostasis during aging.

Keywords

melatonin, aging, liver, oxidative stress, antioxidant defense.