



# PHYSICAL CHEMISTRY 2004

## *Proceedings*

*of the 7<sup>th</sup> International Conference  
on Fundamental and Applied Aspects of  
Physical Chemistry*

*Volume I and II*

September 21-23, 2004  
Belgrade, Serbia and Montenegro



# PHYSICAL CHEMISTRY 2004

## *Proceedings*

*of the 7<sup>th</sup> International Conference  
on Fundamental and Applied Aspects of  
Physical Chemistry*

*Volume I and II*

Editors

A. Antić-Jovanović and S. Anić

ISBN 86-82457-12-x  
Title: Physical Chemistry 2004. (Proceedings)  
Editors A. Antić-Jovanović and S. Anić  
Published by: The Society of Physical Chemists of Serbia, Student-  
ski trg 12-16, P.O.Box 137, 11001 Belgrade, Serbia  
and Montenegro  
Publisher: Society of Physical Chemists of Serbia  
Printed by: "Jovan" Printing and Published Comp;  
300 Copies; Number of Pages: x + 906; Format B5;  
Printing finished in September 2004.  
Text and Layout: Aleksandar Nikolić

*300 – copy printing*

## LEVELS OF SELENIUM IN THE RAT PINEAL GLAND: THE EFFECTS OF SELENIUM SUPPLEMENTATION

M. A. Demajo, O. N. Jozanov-Stankov and I. S. Đujić<sup>1</sup>

*Institute of Nuclear Sciences "Vinča", P.O.Box 522, 11001 Belgrade,*

*<sup>1</sup>Institute of Chemistry, Technology and Metallurgy,  
Njegoševa 12, 11000 Belgrade, Serbia and Montenegro*

### Abstract

Levels of selenium (Se) were measured in the pineal glands of rats aged 4,5,8 and 12 months and the following corresponding levels of Se were determined: 1.058 nmol/gland, 0.63 nmol/gland, 0.58 nmol/gland and 0.43 nmol/gland. In the rat pineal glands obtained from rats which drank water containing Se coupled to brewers yeast (average daily intake of Se per animal was 0.5µg) the following increased levels of Se were determined: 0.87 nmol/gland, 0.72 nmol/gland and 0.59 nmol/gland at the ages of 5,8 and 12 months respectively. Since Se participates in the antioxidative defense of the mammalian organism, the increased levels of Se in the pineal glands of rats supplemented with Se in drinking water, may be of physiological benefit during ageing.

### Introduction

The pineal gland is a neuroendocrine organ of a multitarget regulative role, inhibitory rather than stimulatory. It is instrumental in the coordination and synchronization of homeostasis and behaviour under physiological and stress-inducing microambient influences. Melatonin is the chief secretory product of the pineal gland and has a role as a free radical scavenger and antioxidant [1]. Since selenium (Se) is known to be part of the "antioxidant defense system" [2], the purpose of this study was to analyse the content of Se in the rat pineal gland and to study the effects of Se supplementation *via* drinking water.

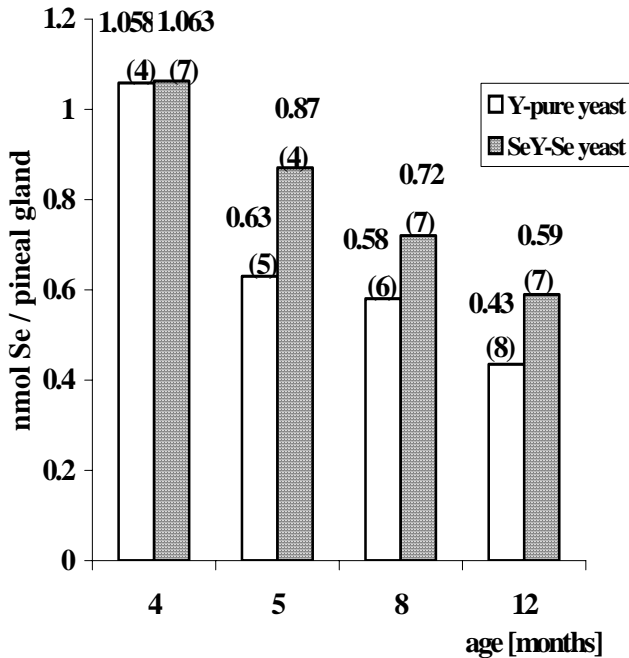
### Materials and Methods

Male rats of a Wistar strain aged 3 months were used and maintained under standard conditions. At this age, one group of animals started receiving continuously pure brewery yeast dissolved in drinking water (Y:control animals), while the second group of animals received Se enriched yeast also in drinking water (SeY group). The SeY emulsion in water provided on average a daily intake of 0.5µg Se/animal. Both groups of animals were subsequently sacrificed between 9:00 and 12:00 hrs. at the ages of 4, 5, 8 and 12 months. Se in the excised and consequently ashed pineal glands was measured by gaseous hydride generation atomic spectrometry, using a Perkin Elmer 5000 atomic absorption spectrometer equipped with MHS-10 vapour generator accessory. As the pineal glands are very small, 4-8 glands were pooled. The results are expressed as nmol/gland of Se. The comparison between SeY and Y groups are expressed as the % of increase of Se in respect to the Y control group, its value taken as 100%. The origin 5.0 graphic programme was used to integrate the surface below the

line connecting the Se concentrations during the whole time period the animals were investigated (between 4-12 months of age).

## Results and Discussion

At the age of 4 months, the level of Se in the pineal gland was the highest in the Y group (1.058 nmol/gland). With increased age, Se levels fell gradually from 0.63 nmol/gland at 5 months to 0.58 nmol/gland and 0.43 nmol/gland at the ages of 8 and 12 months respectively (Fig.1).



**Figure 1.** Changes of Se levels in the rat pineal glands at various ages. (n)-number of pineal glands pooled.

In the SeY supplemented rats, the pineal gland Se level was 1.063 nmol/gland at 4 months, gradually falling to 0.87 nmol/gland, 0.72 nmol/gland and 0.59 nmol/gland at the ages of 5, 8 and 12 months respectively (Fig. 1). Starting from the age of 5 months, the pineal gland Se concentrations from the SeY supplemented rats were higher by 38.16%, 25.04% and 35.17% at the ages of 5, 8 and 12 months respectively, when compared to the Se concentrations in the corresponding ages of the Y control group. The differences in the integrated surfaces of the age variables were not markedly different between the Y group (4.68) and the Se supplemented animals (5.98). This may result from the fact that at the age of 4 months, both groups of animals had similar levels of Se in the pineal gland.

There is not much data in the literature concerning the presence of microelements in the pineal gland, especially under different physiological conditions. By electron probe X-ray microanalysis [3], it has been shown that the rat pineal gland contains a range of elements: S, Ca, Al, Si, P, Fe, Na, Mg, Cl, K, Ti, Cr, Mn, Ni, Cu and Zn. We detected the presence of Se in the rat pineal gland. Our study also shows that Se levels increase in the rat pineal gland when the animals consume Se through drinking water. Considering that melatonin plays a role as an antioxidant [4] and that Se is involved in the antioxidant defense system [2], [5], the increased Se levels in the pineal glands from rats supplemented with Se in drinking water may be beneficial, especially with progressing age.

### **Conclusion**

From our present study, it may be concluded that Se is a microelement present in the rat pineal gland. The levels of Se change in the pineal gland with age. Consuming Se coupled to yeast in drinking water, its levels increase in the rat pineal gland.

### **Acknowledgement**

This study was supported by the Serbian Ministry of Science and Environmental Protection, Project No. 544.

### **References**

- [1] R.Reiter *et al.*, Life Sci., 1997, 60, 2255.
- [2] Y. Xia *et al.*, J.Nutr.Biochem., 1992, 3, 202.
- [3] W.Humbert *et al.* J.Pineal Res., 1996, 20, 39.
- [4] R. Reiter *et al.* J. Pineal Res., 1995, 18, 1.
- [5] O. Jozanov-Stankov *et al.*, J.Env.Pathol.Tox.Oncol., 1998, 17, 251.