Analyzing fluorescence lifetime parameters to calculate MAO enzyme activity in biological tissue

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Introduction

DISTURBANCE OF MAO-A/MAO-B ACTIVITY

Violation of the catabolism of monoamines

Level violation endogenous monoamines

METABOLISM DISTURBANCE

Depression | **Cerebral ischemic complication** | **Migraine** | **Disease Parkinson's** | **Disease Alzheimer's** | **Aggression**

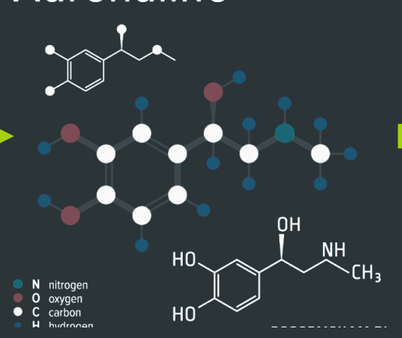
The monitoring of subcellular functions and structural changes is essential for detecting healthy tissue development and diagnosing disease progression. In recent years, monoamine oxidases have been extensively studied. Even so, monitoring its activity in vivo is an interesting endeavour. The amount of endogenous fluorescent protein-bound cofactor FAD can be correlated with MAO activity. This observation led to the development of a promising method for monitoring MAO activity in human skin based on its fluorescence lifetime parameters.

Materials and methods

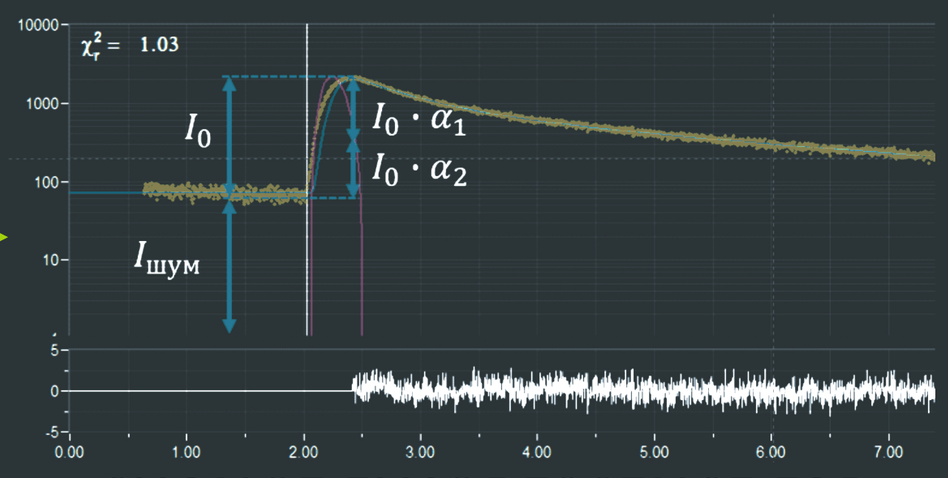
Measurement of skin fluorescence lifetime:

BASAL

Adrenaline $C_9H_{13}NO_3$



MAO ACTIVATION



SKIN TISSUE ELECTROPHORESIS

CHANGE FLUORESCENCE FAD

Results and discussion

QUANTIFICATION OF MAO ACTIVITY:

Short lifetime component $\tau_{1_{uv}}$ **- Protein bound flavins**

Reference value: $\tau_{\,background}$ - τ_1 *without adrenaline*

τ_1 **after the introduction of adrenaline where the contribution appearsfluorescence of FAD binding to the MAO enzyme:**

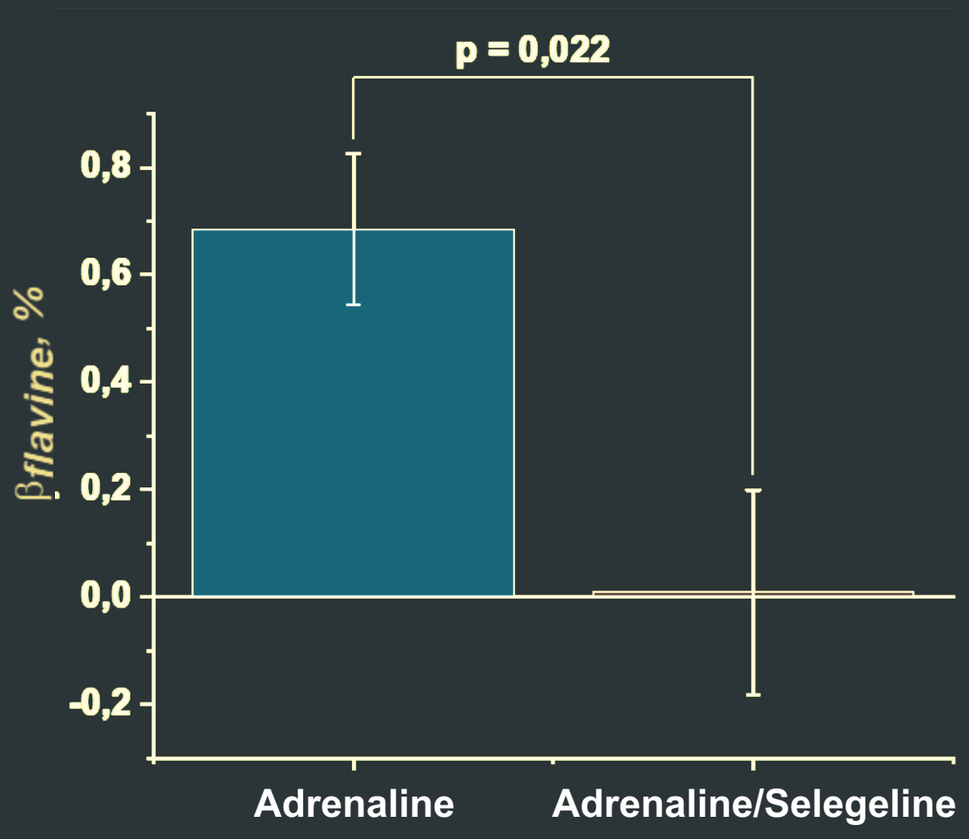
$$\tau_1 = \frac{\tau_{flavin} - \tau_{background}}{\alpha_1}\beta_{flavin} + \tau_{background}$$

$\alpha_1 = \beta_{flavin} + \beta_{background}$ **the share of the first components in the total share fluorescence after substrate addition**

$\tau_{flavin} = \sim 0{,}15$ ns **is the lifetime of FAD associated with MAO**

$\tau_{background}$ **is the lifetime before the injection of adrenaline**

$$\beta_{flavin} = \frac{\tau_{background} - \tau_1}{\tau_{background} - \tau_{flavin}}\alpha_1.$$



SELEGELIN AN ADRENALINE INHIBITOR

Conclusions

This approach enabled the measurement of MAO activity in both the inhibited and active states. A model presented here may assist in the optical diagnosis of metabolic disorders in living cells and tissues.

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