

## Abstract

Author: Kateřina Breiterová

Title: Neurotropic and antioxidative activity of some selected species of monocotyledonous alkaloidal plants *in vitro*. VIII.

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Charles University in Prague, Faculty of Pharmacy in Hradec Králové, Department of Pharmaceutical Botany and Ecology

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More than 50 % cases of dementia are nowadays caused by Alzheimer's disease (AD). AD is a progressive neurodegenerative disease and it causes gradual memory loss, disorientation and behavioral disorders which affect patient's social and occupational life. AD is characteristic by loss of neurons in some regions of brain – for example hippocampus and cortex. Etiopathogenesis of this disease is not completely known – that is why the treatment is still just symptomatic. Formation of  $\beta$ -amyloid deposits in brain tissue plays an important role - it is a protein which creates extracellular plaques around neurites and causes their degeneration and death. Intracellular tangles are made up of the changed  $\tau$ -protein. These tangles also cause death of the neuronal cell. The degeneration of neurons is supported by reactive oxygen radicals too. The another problem is a glutamatergic system disorder. This set of excitatory amino acids is important for correct long-term memory formation. Patients with AD suffer from glutamatergic system overactivation which leads to the formation of neuronal perturbation, excitotoxicity and apoptosis of neuronal cells. In patients with AD the acetylcholine (ACh) production is damaged. ACh is a neurotransmitter and its lack participates in the development of AD. ACh is physiologically decomposed by enzyme acetylcholinesterase (AChE). The second enzyme taking part in ACh degradation is a butyrylcholinesterase (BuChE). In severe forms of AD, levels of AChE and cholineacetyltransferase are decreased by as much as 90 % compared with normal condition, while the concentration of BuChE increases. That's why the new inhibitors with dual enzymatic activity against AChE and also BuChE are sought.

*Galanthus*, *Leucojum* and *Narcissus* species belong to *Amaryllidaceae* family. Plants of this family produce wide range of specific chemical substances called *Amaryllidaceae* alkaloids.

These alkaloids have various biological effects like anti-inflammatory, antiviral, antineoplastic, antiparasitic, antimycotic and they are also able to inhibit erythrocytic AChE (HuAChE) and serum BuChE (HuBuChE).

Alkaloidal extracts of seven selected species and cultivars (*Galanthus elwesii*, *Galanthus woronowii*, *Leucojum vernum*, *Leucojum aestivum* cv. GRAVETYE GIANT, *Narcissus* cv. PROFESSOR EINSTEIN, *Narcissus* cv. QUIRINUS and *Narcissus* cv. VIRGINIA SUNRISE) were analysed by GC/MS and alkaloids were identified from their mass spectra, retention times and retention indexes. Summary extracts were tested *in vitro* for their ability to inhibit HuAChE and HuBuChE using Ellman's method. Inhibitory activity of summary alkaloidal extracts were compared with positive standard galanthamine ( $IC_{50, \text{HuAChE}} = 1.710 \pm 0.007 \mu\text{M}$ ;  $IC_{50, \text{HuBuChE}} = 42.30 \pm 1.30 \mu\text{M}$ ).

## Keywords

Amaryllidaceae, alkaloids, GC/MS, Alzheimer's disease, acetylcholinesterase, butyrylcholinesterase, *Galanthus*, *Leucojum*, *Narcissus*.