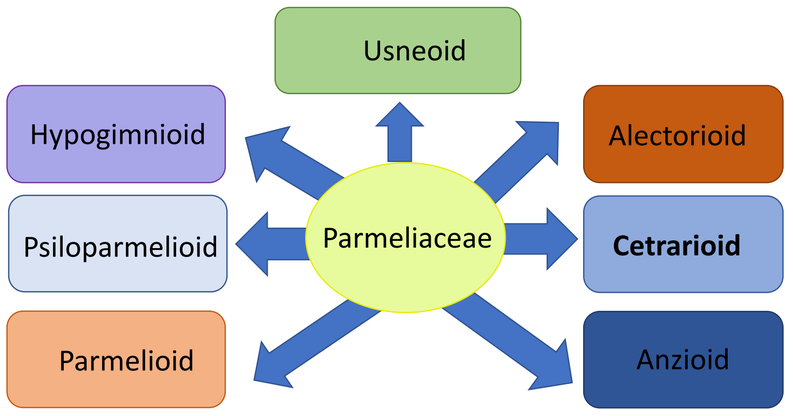
5th International Electronic Conference on Medicinal Chemistry
1-30 November 2019
chaired by Dr. Jean Jacques Vanden Eynde
sponsored by pharmaceuticals

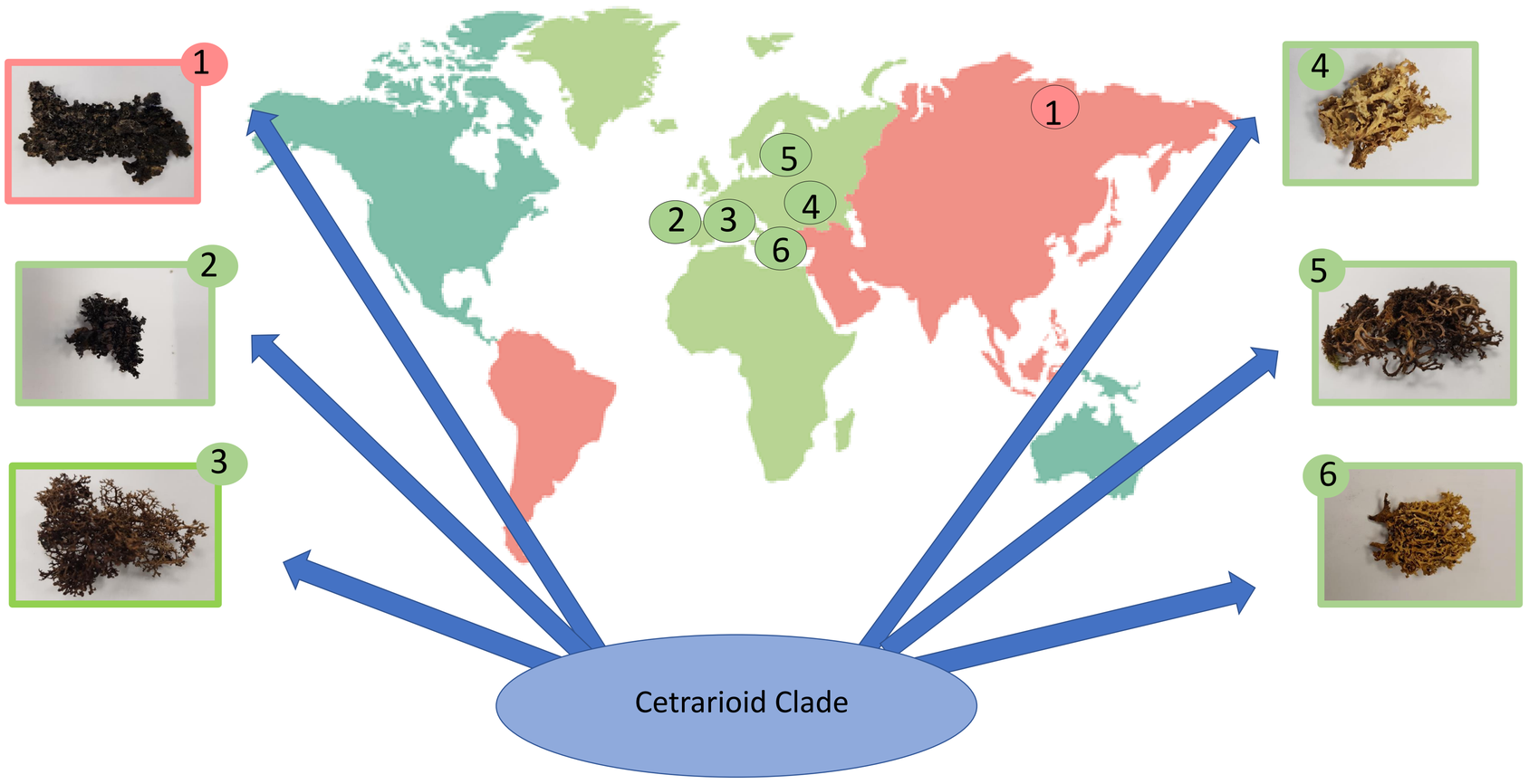
BIOLOGICAL EVALUATION OF LICHENS OF CETRARIOID CLADE AS CHOLINESTERASE INHIBITORS

Noelia Fraga Matías, Isabel María Ureña-Vacas, Elena González-Burgos, M. Pilar Gómez-Serranillos
Department of Pharmacology, Pharmacognosy and Botany, Faculty of Pharmacy, University Complutense of Madrid (Madrid, Spain)

INTRODUCTION

Lichens are organisms formed by a symbiotic association between a fungus and, an algae and/or a cyanobacterium. Parmeliaceae family is the most numerous (87 genera; 2,700 species grouped into seven clades), highlight Cetrarioid clade. Some lichens have activity as acetylcholinesterase inhibitors (AchE) and butyrylcholinesterase (BchE) which are responsible for acetylcholine degradation. Acetylcholine deficiencies have been linked to the pathogenesis of Alzheimer's disease (AD). Therefore, cholinesterase inhibitors are potentially effective in the symptomatic treatment of AD.





OBJETIVE

To evaluate the activity of six methanol extracts of lichens of Cetraroid clade as acetylcholinesterase (AchE) and butyrylcholinesterase (BchE) inhibitors

MATERIAL AND METHODS

Preparation of extracts
Lichen thallus (50 mg) were under maceration in methanol for 24 h

Assesment of enzymatic inhibitory activity
AChE and BuChE activities were evaluated using Ellman's method. Lichen extract concentrations assayed were 25, 50 and 100 µg/ml.

Phytochemical analysis
HPLC-UV. Agilent 1260 instrument. Reversed-phase Mediterranea Sea18 column (150 mm × 4.6 mm, 3 µm). Phases: A) 1% orthophosphoric acid in milli-Q water/(B):methanol. Flow rate: 0.6 ml/min

Statistic analysis
Results were expressed as mean ± SD. Significance level $p < 0.05$.

RESULTS

Lichens	AchEi IC_{50} (mg/mL ± SD)	BchEi IC_{50} (mg/mL ± SD)
Asahinea scholanderi (Llano) 1	0.11 ± 0.006	0.29 ± 0.004
Cetraria commixta (Nyl.) Th. Fr 2	0.35 ± 0.017 [a,b,c,d,e,]	0.49 ± 0.018 [a,d]
Cetraria crespoae (Barreno & Vazquez) Karnefelt 3	0.24 ± 0.05 [a,b,d,e,f]	1.26 ± 0.004 [a,b,c,d,e,f]
Cetraria cucullata (Bell.) Ach. 4	0.18 ± 0.014 [a]	0.31 ± 0.001 [a,d]
Cetraria ericetorum Opiz 5	0.19 ± 0.016 [a]	0.52 ± 0.013 [a,d]
Cetraria nivalis (L.) Ach 6	0.16 ± 0.013 [a]	0.75 ± 0.018 [a,b,d,e]

Table 1. Inhibition of acetylcholinesterase (IC50 values) and butyrylcholinesterase (IC50 values) of six methanol lichen species of Cetrarioid clade. Statistical significance ($p < 0.05$) is shown in superscripts. a: statistically significant differences *versus Asahinea scholanderi*; b: *versus Cetraria commixta*; c: *versus Cetraria crespoae*; d: *versus Cetraria cucullata*; e: *versus Cetraria ericetorum*; f: *versus Cetraria nivalis*

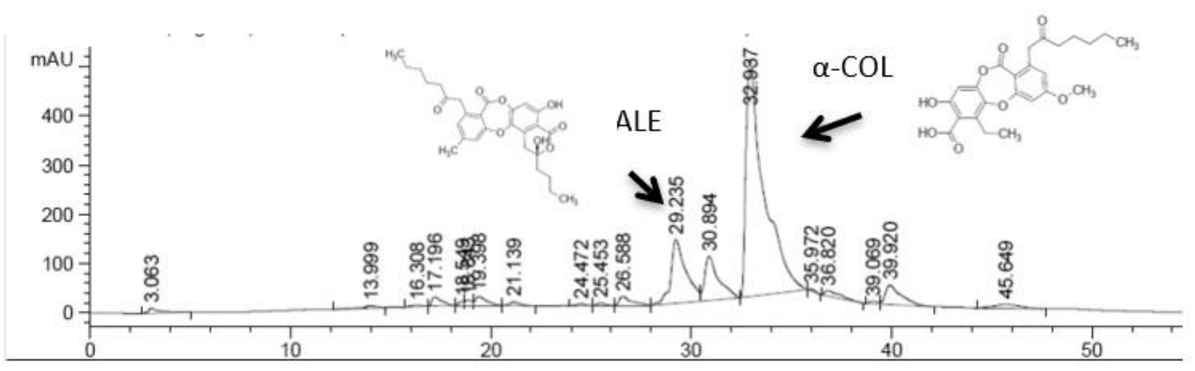


Figure 1: Representative HPLC chromatogram for *Asahinea scholanderi* methanol extract at 254 nm

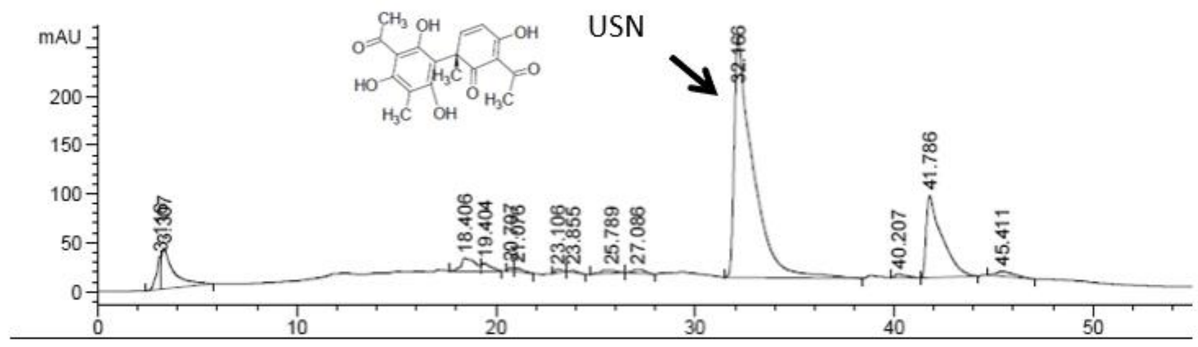


Figure 2: Representative HPLC chromatogram for *Cetraria cucullata* methanol extract at 254 nm

The greatest AchE and BchE inhibitory activities were for *Asahinea scholanderi* and *Cetraria cucullata* methanol extracts.

Phytochemical analysis, carried out using HPLC-UV method, revealed that the major secondary metabolites in *A. scholanderi* were alectoronic and α-collatolic and in *C. cucullata* was usnic acid.

CONCLUSIONS

- This study shows *in vitro* inhibitory activity (AchE and BchE) of methanol lichen extracts of different species of Cetrarioid clade.
- The most active lichen specie was *Asahinea scholanderi.*

REFERENCES

- Ellman, G. L., Courtney, K. D., Andres, V., and Feather-Stone, R. M. (1961) A new and rapid colorimetric determination of acetylcholinesterase activity. Biochem. Pharmacol. 7, 88–95.
- Kumar, S. (2015) Dual inhibition of acetylcholinesterase and butyrylcholinesterase enzymes by allicin. Indian J. Pharmacol. 47, 444–446.
- Luo, H., Li, C., Kim, J. C., Liu, Y., Jung, J. S., Koh, Y. J., and Hur, J. S. (2013) Biruloquinone, an acetylcholinesterase inhibitor produced by lichen-forming fungus Cladonia macilenta. J. Microbiol. Biotechnol. 23 (2), 161–166.