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BIOLOGY CENTRE CAS

Review of the Ph.D. thesis „Evolution of sex chromosomes and karyotypes in iguanas (Squamata: Pleurodonta)“ by Mgr. Marie Altmanová

When I was asked to review Marie Altmanova's Ph.D. thesis, I accepted immediately since our research group studies sex chromosomes in moths and butterflies using similar approaches, and work of Lukáš Kratochvíl's lab is well known to us. I knew some of the papers from the thesis already and enjoyed reading the rest of them.

The submitted Ph.D. thesis by Marie Altmanová consists of an Introduction, five papers published (in very good journals), one submitted manuscript, one manuscript in preparation, and Conclusions. The author's contribution included obtaining and care of experimental animals, lab work, result documentation and evaluation, and manuscript preparation, i.e. everything which production of a scientific paper requires. It is noteworthy that papers included in the thesis represent only a part of the author's scientific production, which so far counts 12 papers, some of them quite frequently cited.

The Introduction and Conclusions present contribution of individual papers and manuscripts to our knowledge of not only karyotype evolution in iguanas, but the evolution of sex chromosomes in general. It shows that topics of all papers are related and gradually amplify the knowledge on the matter. I especially enjoyed the phylogeny-based approach to selecting species for study, an attitude which importance is often overlooked or not understood by scientists working with a single model species. I was also impressed with the number of investigated species and I highly appreciate ambitions of the authors to fill every gap in species sampling in spite of difficulties with obtaining some specimens. Finally, I like the clever combination of classic and molecular cytogenetics with molecular methods and bioinformatics.

I have following questions and suggestions, which shall not, however, diminish the high quality of the presented work:

1) The author mentions that the leading hypothesis on the stability of sex chromosomes in birds and mammals vs. their rapid changes in fish and amphibians was ability of these animals to keep their body temperature. What was the explanation at the time of the stability of sex

chromosome in poikilotherm snakes? Could the sex chromosome turnover be connected with a quite high tolerance of fish and amphibian genomes to polyploidy (apparently they can do with their genomes whatever they like)?

2) According to paper VI, high frequency and variability of ITS in iguanas indicate cryptic chromosomal rearrangements. Has anyone tried to prove this hypothesis by comparative mapping of molecular markers in situ? I learned that there is a BAC library of *Anolis carolinensis* available. In case that there are more BAC libraries of other iguana species, it would make this task quite feasible.

3) According to papers II and III, sex chromosomes of all iguanas except for basilisks are homologous. Do you intend to identify which pair of autosomes became the sex chromosome pair in this clade, e.g. using qPCR with markers for individual chromosomes or analysis of SNPs?

4) In paper IV the authors suggested, based on a collection of data from 133 amniote species, that meiotic drive can be responsible for the low frequency of multiple sex chromosomes in species with female heterogamety in contrast to species with male heterogamety. In the end, they suggest, however, that holokinetic centromeres in Lepidoptera, i.e. a taxon with female heterogamety, could influence the strength of meiotic drive and thus be responsible for the relatively high rate of multiple neo-sex chromosomes. What about selection against changed sex ratio, the presumed cause of low frequency/absence of multiple sex chromosomes in amniotes with WZ/ZZ sex chromosome system?

To conclude, in my opinion the Ph.D. thesis of Mgr. Marie Altmanová represents an excellent scientific work and the author should be awarded by a Ph.D. title. I believe this is a good start of the author's career in research, in which I wish her good luck.

In České Budějovice

30.8. 2017

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