Morphological studies of the sand lizard *Lacerta agilis* L.* (Reptilia, Lacertidae) embryos

Weronika Rupik[1], Elwira Swadźba[1], Magdalena Kowalska[1], Hanna Jackowiak[2], Robert Maślak[3]

[1]*Department of Animal Histology and Embryology, University of Silesia, Bankowa 9, 40-007 Katowice, Poland, e-mail: weronika.rupik@us.edu.pl, elwira.swadzba@us.edu.pl, magda222360@wp.pl*
[2]*Department of Histology and Embryology, Poznan University of Life Sciences, Wojska Polskiego 71C, 60-625 Poznań, Poland, e-mail: hannaj@up.poznan.pl*
[3]*Department of Vertebrate Biology and Conservation, University of Wrocław, Sienkiewicza 21, 50-225, Wrocław, Poland, e-mail: maslak@biol.uni.wroc.pl*

For oviparous animals such as many reptilian species, oviposition marks the transition between embryonic development within the mother and in the environment. The stage of development at oviposition differs among reptilian groups. For example, for the great majority of squamates, development proceeds normally while eggs are in utero, and by the time of oviposition, embryos are approximately one-third through development (Andrews and Mathies, 2000). The purpose of this study was to examine external morphological development between oviposition and hatching of the sand lizard embryos. The sand lizard is most common lizard species in Poland and Europe and west Asia. The eggs of *Lacerta* were incubated in the laboratory in constant temperature at 30°C and the embryos were isolated in regular sequence of time from egg lying till hatching. The material was fixed in 10% formalin solution and maintained in 1:1 mixture of absolute alcohol and glycerol. The model collection included 60 embryos isolated during each incubation day from hatching. Morphological description was based on the analysis of embryonic developmental characters examined under stereo microscope. The list of diagnostic characters was similar as were used for morphological description of grass snake embryos (Rupik, 2002). This morphological study will be the base for the construction of the developmental table.

All specimens used in experiment were captured according to Polish legal regulations concerned with wild species protection (Dz.U. nr 2 poz. 11 z 1984 r., Dz.U. nr 114 poz. 492 z 1991 r.). Department of Histology and Embryology obtained approval of Polish Ministry of Environment Protection and Forestry for performing studies on protected species (DOPog-4201-02-94/05/aj). The sand lizard *Lacerta agilis* L. is not included in Washington Convention of 1973, ratified by Poland in 1991(Dz.U. nr 27 poz.112).

REFERENCES

Andrews RM, and Mathies T. 2000 Natural History of Reptilian Development: Constraints on the Evolution of Viviparity. *BioScience* 50: 227–238.

Rupik W. 2002. Normal developmental table in early development of adrenal glands in grass snake *Natrix natrix* L. (Lepidosauria, Serpentes). *Advances in Anatomy Embryology and Cell Biology* 164: 24–32.

The shape of fetal ossification centers may indicate malformation of vertebral column

Agnieszka Skórzewska, Małgorzata Grzymisławska, Małgorzata Bruska, Joanna Łupicka, Witold Woźniak

Department of Anatomy, University of Medical Sciences, Święcickiego 6, 60-781 Poznań, Poland, e-mail: a.skorzewska@gmail.com

The vertebral clefts being the variations of the endochondral ossification if coexists with additional abnormalities of skeletal system or internal organs may indicate malformations of the vertebral column (Tanaka and Unthoff, 1983; Westvik and Lechman, 1996).

The number and shape of ossification centers were evaluated in nine fetuses aged 11–21 weeks in computed tomography study.

It was observed that ossification of vertebrae commences at the end of 10th week. In neural arches it appears first in the cervical and upper thoracic vertebrae and proceeds in craniocaudal direction. In vertebral centra ossification was observed in the lower thoracic and first lumbar vertebrae in fetus aged 10 weeks and in two lower cervical, all thoracic and lumbar, and three upper sacral vertebrae at age 11 weeks. Ossification centers for C5 center were visible at age 12 weeks and at age 13 weeks in vertebral centra C2 to C4. Particular attention was paid to the shape of ossification centers for vertebral centra. In all investigated fetuses they were round or oval in cervical and sacral vertebrae but varied in shape in thoracic and lumbar vertebrae. The mushroom-shaped, C-shaped or irregular ossification centers were observed as well as consisting of two parts connected by thin bony bridges and resembling the shape of letter H or horizontally oriented letter U.

In fetus aged 18 weeks two parts of ossification centers for thoracic and lumbar vertebral centra were completely separated. The fetus did not demonstrate any other abnormalities.

Observed coronal vertebral cleft is considered as a variation of normal endochondral ossification and usually disappears until the second year of life. Coronal cleft appearing in rare congenital malformations of skeletal system coexists with craniofacial dysmorphia and multiple skeletal anomalies such as shortening of long bones, hemivertebrae, butterfly or hypoplastic vertebrae, supernumerary ribs, polydactyly, and congenital disorders of internal organs.

REFERENCES

Tanaka T and Unthoff HK. 1983. Coronal cleft of vertebrae, a variant of normal enchondral ossification. *Acta Orthopaedica Scandinavica* 54: 389–395.

Westvik J and Lechman R. 1998. Coronal and sagittal clefts in skeletal dysplasias. *Pediatric Radiology* 28: 764–770.