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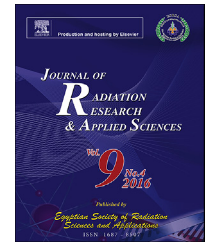

Retina damage after exposure to UVA radiation on the early developmental stages of the Egyptian toad *Bufo regularis* Reuss

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ABSTRACT

The present study was carried out to investigate the histological and histochemical changes in the retina on different developmental stages of Egyptian toad *Bufo regularis*. Our experiment started when tadpoles begin to feed. The adapted embryos are divided into 3 large tanks of 200 embryos each, collections of samples started from feeding age every three days. Both histological and histochemical results showed that the general architecture of the retina organ is correlated with the state of development. Therefore, it displayed different characteristic features depending on the investigated developmental stage starting from the larval stage (feeding began, stage 44) and ending with the post-metamorphic stage 66. Also, the present work aimed to study the chronic effects of UVA on the retina structure of *B. regularis* during development and metamorphosis for the first time.

1. Introduction

The vertebrate eye develops three distinct embryological tissues (Akat & Arikan, 2013; Cvekl & Tamm, 2004; Fadool & Dowling, 2008; Trainor & Tam, 1995). During eye development, the initially undifferentiated, seemingly homogeneous, retinal progenitor cells develop into a layered array of seven cell types with different capabilities (Zhang et al., 2003). These include sensitive photoreceptor cells (bipolar interneurons), that transmit electrical stimulus from the photoreceptor to the ganglion cells and the ganglion cells, that transmit the information from the eye to the brain. The formation of these cell types, and their correct proportionality, is necessary for the proper function of the vertebrate eye (Zhang et al., 2003). In early embryological development the epidermis covering the eye is pigmented cells containing pigment granules derived from the egg (Balinsky, 1981).

Various histological studies were undertaken on retina (Link, Roth, & Rottluff, 1986; Vecino, Hernández, & García, 2004). At certain stage of embryonic development the cell of the retina undergo changes which results in a precise

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specification of their projection on to the optic tectum (Stone, 1960). It has been shown by (Jacobson, 1968) that in *Xenopus laevis* these changes occur at embryonic stage 30–31, as tabulated by (Nieuwkoop & Faber, 1956). Dixon and Cronly-Dllon (1972) studied the fine structure of the developing retinal cells in *X. laevis* from stages 26–36 and they focused on the intercellular junctions between cells of the optic vesicle. The growth of retina in *X. laevis* by using auto radiographic methods was studied by (Straznicky & Gaze, 1971).

Amphibian populations are declining throughout the world (Blaustein & Kiesecker, 2002; Houlahan et al., 2000). More than 500 populations of frogs and salamanders are in decline and many are listed as of special conservation concern (Alford & Richards, 1999). In some regions, declines of amphibian populations appear to be greater than declines in other taxonomic groups (Pounds, Fogden, & Campbell, 1999). Numerous factors, including pathogens, introduced non-native species, UV radiation, contaminants, habitat destruction and global environmental changes are contributing to population declines in amphibians (Alford & Richards, 1999; Blaustein & Kiesecker, 2002; Blaustein, Romansic, Kiesecker, & Hatch, 2003).

The ultrastructure of the developing retina in many anuran has been extensively studied in *Rana pipiens* by Nilsson (1964); *X. laevis* by Fisher and Jacobson (1970), and Dixon and Cronly-Dllon (1972), however a study of the ultrastructure of the retina of the tadpole *Bufo regularis*, to our knowledge, has not yet been carried out. Also, the effect of ultraviolet radiation on the eye of the developing *B. regularis* has not been studied neither by light nor electron microscope. These studies were devoted to the photoreceptor cells as well as the retinal pigmented epithelia. As such we undertook this study with considerable interest, realizing that a better knowledge of its ultrastructure could be beneficial to other research workers, serving as a model for future experiments and studies on the retina.

2. Material and methods

2.1. Sample collection

This was described in details in previous study of the present author (Sayed, Elballouz, & Wassif, 2014).

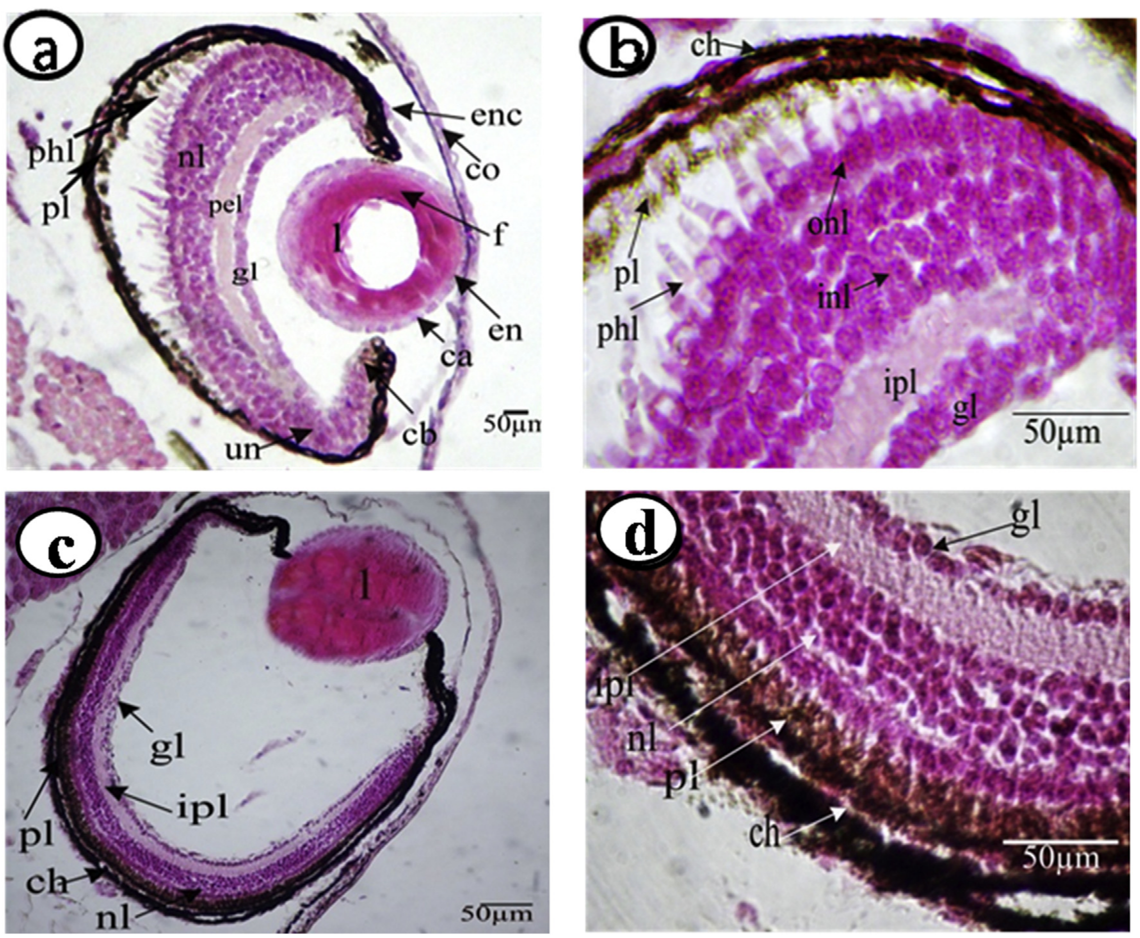

Fig. 1 – Sagittal sections of the eye of *Bufo regularis* tadpoles (a & b) stage 44, (c & d) stage 46 showing, choroid (ch), cornea (co), pigmented layer (pl), nuclear layer (nl), photoreceptor layer (phl), outer nuclear layer (onl), inner nuclear layer (inl), inner plexiform layer (ipl), ganglion cell layer (gl), lens (l), capsule (ca), endothelial cells (en), fibers (f), endothelial cell layer (enc), ciliary body (cb), undifferentiated cells (un). H & E, (a & c, X 100), (b & d, X 400) and scale bar = 50 µm.