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Effect of UV Rays on Embryogenesis of Eggs of *Ascaridia galli* (Schrank, 1788) (Nematoda : Ascaridida)

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Ascaridia galli, a common intestinal nematode of poultry has direct life cycle. Unembryonated viable eggs passed out of the infected animals require about two weeks to become infective outside the body. Environmental factors play an important role in the viability of these eggs. Effects of X rays and Gamma rays on the infectivity and embryonation of eggs of *A. galli* have been studied by Babero (1952), Shikhobalova *et al.* (1958, 1959), Varga (1964) and Ruff *et al.* (1965, 1967). But studies on their embryonation after exposure to Ultraviolet rays (UV) are very limited (Dubinsky, 1968, 1969, 1971).

Materials and Methods

Source of UV rays was a Hanovia Chromatolite Shortwave Germicidal lamp that generates over 80% of its output at a wavelength of 254 nm from a distance of 10.5 cm (10 cm up to the surface of water +0.5 cm depthness of water).

The adults of *A. galli* were collected from the intestine of freshly slaughtered fowl. The females were picked up mechanically and kept in 0.85% saline for 24 hours at 38C (±1C) for egg laying. Eggs thus obtained were thoroughly washed four to five times with 0.5% sodium hydroxide. One hundred and twenty culture dishes were prepared at one time, each dish contianing 500 eggs in 2 ml of 2% sterilised formalin. The dishes were divided into three batches, each consisting of 35 experimental and five control dishes. Batch I was exposed immediately to different doses of UV rays; Batch II was left as such for early cleavage and then 2 to 8 cell stages were picked out mechanically and exposed to the same doses; and Batch III was left as such for three days, and then morula to gastrula stages were picked up and irradiated. All control and experimental dishes (pre and post irradiated) were maintained at a temperature of 30C (±1C) for observing embryoantion in the eggs. Fresh medium of the same temperature was replaced after each exposure and after every 24 hours. All dishes sterilized and during embryogenesis cultures were mainatined at constant temperature incubator.

Results

Batch I (unembryonated eggs): Percentage of fully embryonated eggs in control dishes after 10 days was 93.8 (S.D.±2.24). After 10 days percentage of embryonated eggs following exposure of 5 and 10 minutes was 26.08 (S.D.±3.68) and 11.60 (S.D.±2.81) respectively. Exposure for 15 minutes retarded growth of embryo and none could reach the stage of complete embryo. The percentage of eggs found in different stages of cleavage i.e. from 2 to 8 cell stage to fully embryonated stage after each exposure is plotted in Fig. 1. An exposure for 45 minutes proved to be totally lethal and cleavage did not start. The percentage of eggs that remained completely unembryonated after each exposure is plotted in Fig. 2. The number of eggs showing gradual degen-

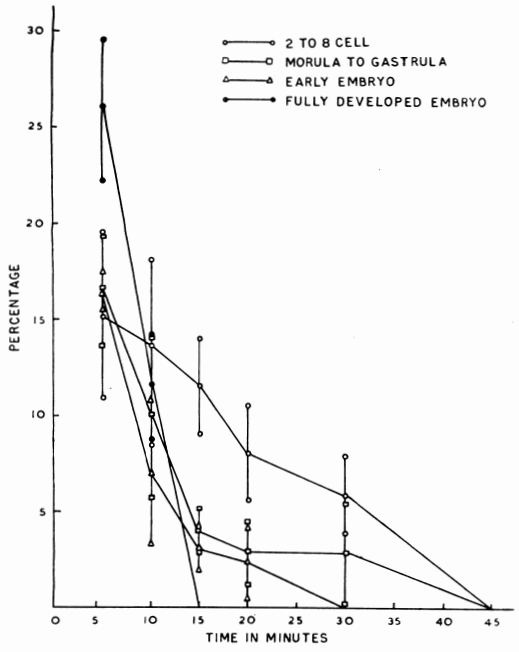

Fig. 1 Effect of UV rays on unembryonated eggs of *Ascaridia galli*.

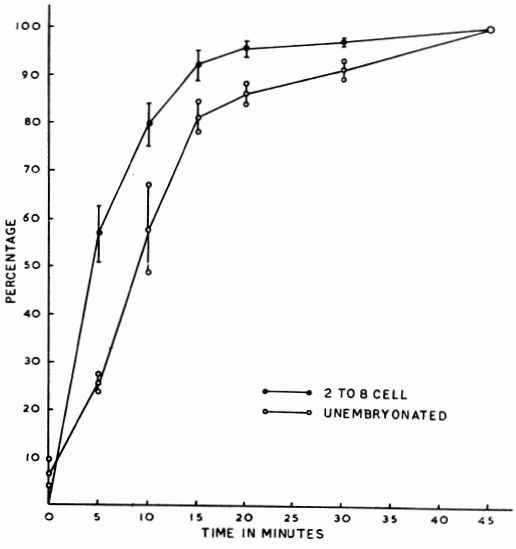

Fig. 2 Percentage of eggs of *A. galli* showing complete inhibition after exposure to UV rays.

eration in development are given in Table 1 (a).

Batch II (2 to 8 cell stage): Eggs in control showed cent percent embryonation. These eggs were found to be more susceptible to UV rays and showed only 16.72% (S.D. ±4.05) and 5.92% (S.D.±2.58) complete embryonation when exposed to 5 and 10 minutes respectively. The rest of the eggs remained in different stages of embryonation. An exposure of 15 minutes retarded cletavage in more than 90% and an exposure of 45 minutes proved to be completely lethal.

Table 1 Number of eggs of *A. galli* in developmental stages after exposure to UV rays

Time of exposure (Minutes)	5		10		15		20		30		45		60	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
Unembryonated eggs	637		1452		2036		2160		2282		2500		2500	
2-8 cell stage	379	1421	335	1994	289	2306	201	2394	147	2429	—	2500	—	2500
Morula to gastrula stage	414	390	249	240	99	194	73	106	71	71	—	—	—	—
Early embryonated stage	418	271	174	118	76	—	66	—	—	—	—	—	—	—
Fully embryonated stage	652	418	290	148	—	—	—	—	—	—	—	—	—	—

(a) Developed from unembryonated eggs.
(b) Developed from 2-8 celled eggs.
Note: Each result of control and experiment calculated from 2,500 eggs.
Control for (a) Number of fully embryonated eggs-2,345.
Control for (b) Number of fully embryonated eggs-2,500.

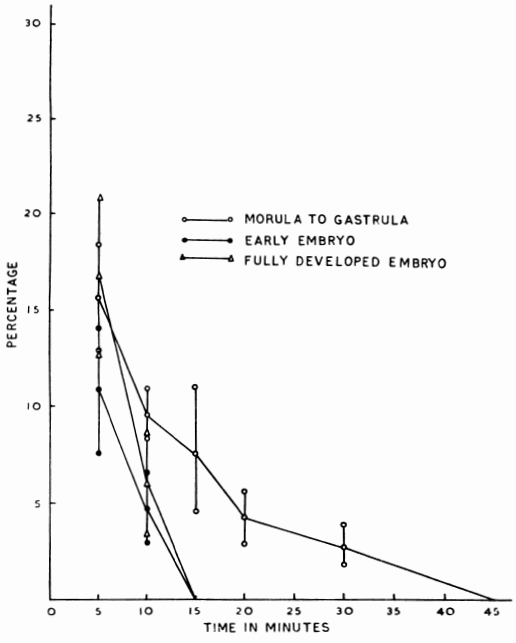

Fig. 3 Effect of UV rays on early cleavage (2-8 cell) stages of *A. galli*.

The percentage of eggs in different stages of development after each exposure is plotted in Fig. 3. Percentage of eggs that did not show any development beyond initial 2 to 8 cell stage after exposure to different doses is plotted in Fig. 2. The number of eggs showing gradual degeneration in develop ment are given in Table 1 (b).

Batch III (Morula to gastrula stages): Eggs exposed for 5 minutes or more did not show any further development, revealing thereby that they are most susceptible to UV rays. Control showed cent percent embryonation.

Discussion

Babero (1952) observed morphological abnormalities in the larvae of *A. galli* when eggs were exposed to 20,000 and 40,000 Roentogen units and observed no difference in the sizes of the larvae. Shikhobalova *et al.* (1958) stated that the eggs of *A. galli* and *Ascaris lumbricoides* were most sensitive at the blastula, morula and early gastrula stages when irradiated with Roentogen and Gamma rays of Cobalt 60. Later Shikhobalova (1959) observed that X rays and Gamma rays affected more males than females. Varga (1964) observed that segmentation in uncleaved eggs of *A. galli* was inversely proportional to the dose of X ray beyond 5000 R.

Dubinsky (1968) observed that although there is negligible effect of UV radiations on the vitality of the infective stage of *A. galli*, it affects their capability of infecting the host and more males developed than females. Further in 1969, he observed that after exposure to UV rays, ova of *A. galli* died due to irregular cleavage caused by damage to the nucleus. Later he observed that visible light essentially decreases the lethal effect of monochromatic UV irradiation of *A. galli* eggs (Dubinsky, 1971).

During present studies it was noticed that in control experiments 90 to 95% of eggs of *A. galli* embryonated in about 10 days, but only one fourth of the eggs embryonated when unembryonated eggs were exposed to UV rays even for 5 minutes. An exposure for 15 minutes retarded the growth of embryo, and exposure of 45 minutes did not permit any cleavage in these eggs. When the eggs in early cleavage stage (2 to 8 celled) were exposed to these rays, percentage of embryonated eggs was still lower and a maximum of 16 to 17% eggs showed fully developed embryos after an exposure of 5 minutes. The effect of these rays on eggs in later stages of development i.e. morula to gastrula stages was most marked and it was seen that an exposure for 5 minutes was lethal to these eggs. Shikhobalova *et al.* (1958) also observed that the morula and gastrula stages of the eggs of *A. galli* were more susceptible to exposure of Roentogen and Gamma rays. Further it was revealed that the eggs when exposed even to sublethal doses of UV rays led to morphological abnormalities and did not permit normal embryonation.

Summary

The effect of UV rays at a wavelength of 254 nm was observed on the development of

eggs of *Ascaridia galli*. Eggs in unembryonated stages, 2 to 8 cell stages, and morula to gastrula stages were exposed to these rays. An exposure of even 5 minutes was lethal to 75% of the eggs in unembryonated stages, 84% in 2 to 8 cell stages and cent percent in morula to gastrula stages. Control always showed 90 to 95% embryonation.

Acknowledgements

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