

STUDY OF ANTIGENIC PROPERTIES OF TISSUES AND ORGANS OF  
ANIMALS DURING THEIR ONTOGENETIC DEVELOPMENT  
PART I. ANTIGENIC SPECIES SPECIFICITY OF THE CRYSTALLINE LENS

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The problem of whether the crystalline lens of adult animals possesses antigenic species specificity has not yet been resolved. Some authors [1, 2, 5, 7] claim that it does not contain any species specific antigens, while others [4, 8] have demonstrated its well-marked species specificity.

It appeared to us that a study of the antigenic properties of the crystalline lens during its ontogenetic development could contribute towards answering this question. We could find only one reference in the literature dealing with this aspect; Szily [9], using a precipitation test, found that the crystalline lens of 12-14 day chick embryos possess well-defined species specificity, but was unable to extend this finding to adult birds. He drew the conclusion that the loss of species specificity by the lens is a secondary phenomenon. Hektoen [3] has reported species specificity for the crystalline lens of 8 week human embryos.

We studied the antigenic properties of the crystalline lens of Pekin duck embryos, by means of anaphylactic reactions.

EXPERIMENTAL METHODS

Guinea pigs weighing 300-350 g were sensitized by subcutaneous injection of suspensions of lenses from duck embryos at various stages of incubation (Table 1). The lenses were freed of adventitious tissue, and were thoroughly washed in physiological saline. A challenging dose of antigen (duck serum) was given intravenously 21 days later. In some experiments we used saline extracts of lens tissue, prepared by thorough trituration of the decapsulated lens with 9 volumes of saline, shaking the resulting suspension for 2 hours, and centrifuging (15-20 minutes at 2000 r. p. m.). The reaction was evaluated according to the following scale:

- + tremor, chewing movements, scratching of nose and ears, fur ruffled, panting, frequency of micturition and defecation, slight fall in temperature,
- ++ the same symptoms, but more pronounced; frequent sneezing,
- +++ the same symptoms, but still more pronounced; convulsive movements, cough, the animal lies on its side, but all survive,
- ++++ the above symptoms in a very acute form; the animal dies,
- symptoms of anaphylactic shock absent,
- injection not given.

All guinea pigs sensitized by suspensions from 90-360 hour embryos, and from adult ducks, gave a positive anaphylactic reaction to challenging injections of duck serum, which is an antigen possessing well-marked species specific properties (Table 1).

As appears from the data of Table 1, guinea pigs sensitized with lens suspensions from early embryos react more violently to the antigen than do later ones. The almost complete absence of transgression is evidence of the absolute reliability of the results.

TABLE 1

Anaphylactic Reaction of Guinea Pigs Sensitized with Suspensions of Duck Embryo Lenses, in Response to Injection of Adult Duck Serum

No. of guinea pig	Sensitized with		Challenging injection		
	antigen	dose	antigen	dose (mg)	réaction
102	Duck embryo lens incubation period 90 hr.	80 lenses	Duck serum	200	++
1241	Ditto	80 "	Ditto	200	++
1211	Ditto	80 "	" "	200	++
273	Duck embryo lens incubation period 130 hr.	1.6 mg	" "	200	+
299	Ditto	1.6 "	" "	200	++
938	Ditto	1.6 "	" "	200	++
865	Duck embryo lens incubation period 192 hr.	1.6 "	" "	200	+
400	Ditto	1.6 "	" "	200	++
968	Ditto	1.6 "	" "	200	++
38	Duck embryo lens incubation period 264 hr.	1.6 "	" "	200	++
690	Ditto	1.6 "	" "	200	+
238	Ditto	1.6 "	" "	200	+
219	Duck embryo lens incubation period 360 hr.	1.6 "	" "	200	++
825	Ditto	1.6 "	" "	200	+
258	Ditto	1.6 "	" "	200	+
94	Adult duck lens	1.6 "	" "	200	+
529	Ditto	1.6 "	" "	200	+
229	Ditto	1.6 "	" "	200	+
14	.	.	" "	300	-
20	.	.	" "	300	-

Thus the species specificity of the lens diminishes with increasing age of the embryo, and this may explain why a number of other workers were unable to demonstrate the presence of species specific antigens in the lens of adult animals. In spite of the lowering of the antigenic activity of the lens of the adult duck, however, it still contains species specific antigens, as is shown by the data of Table 2.

As is shown in Table 2, guinea pigs sensitized with embryonic lens tissue, and desensitized with adult lens tissue, do not react to injection of duck serum. It may be concluded that injection of adult lens extract completely abolishes sensitivity to the species specific antigen.

As has been shown by us, the morphophysiological peculiarities of development of two not distantly related species (duck and hen) are more pronounced at early than at late stages of embryo genesis. Thus the most pronounced antigenic species specificity of the lens coincides in time with the most marked morphophysiological specificity of development of this organ, in the early stages of embryogenesis.

Our experiments show that developing embryonic lens tissue possesses pronounced species specificity, and that this becomes much smaller after 264 hours of incubation. By that time the cell nuclei have disappeared from the central part of the lens, leaving a sclerotizing kernel, which increases in size and density as development proceeds. It might be thought that lowering of the species specificity of the lens is in some way related to the formation of this morphological structure. Krusius [6] has suggested that the species specificity of the adult lens resides in its cortical parts, which are still in process of growth, and are an ontogenetically young part of the lens. This suggestion agrees well with the results of our experiments.

TABLE 2

Desensitization of Guinea Pigs Sensitized with Suspensions of Crystalline Lens Tissue of Embryonic and Adult Ducks

	Sensitized with		Desensitized* with			Test for completeness of desensitization			Challenging injection		
	antigen	dose (mg)	antigen	dose (mg)	reaction	antigen	dose (mg)	reaction	antigen	dose (mg)	reaction
160	Lens of embryo incubation for 130 hr.	1.6	Extract of adult duck lens tissue	500	++	Extract of adult duck lens tissue	300	—	Duck serum	250	—
832	ditto	1.6	ditto	500	++	ditto	300	—	ditto	250	—
674	» »	1.6	» »	500	++	» »	300	—	» »	250	—
36	Lens of embryo incubated for 192 hr.	1.6	» »	500	++	» »	300	—	» »	250	—
26	ditto	1.6	» »	500	++	» »	300	—	» »	250	—
649	» »	1.6	» »	500	++	» »	300	—	» »	250	—
461	Lens of embryo incubated for 360 hr.	1.6	» »	500	++	» »	300	—	» »	250	—
31	ditto	1.6	» »	500	++	» »	300	—	» »	250	—
86	» »	1.6	» »	500	++	» »	300	—	» »	250	—

\* In order to avoid death of the guinea pigs, desensitization was achieved by giving two subcutaneous injections, each of 250 mg, on the morning and evening of the day before the challenging reaction was given.

Our experiments show that the crystalline lens of the Pekin duck possesses antigenic species specificity at all stages of development, and that this specificity is most pronounced at the early stages of development (90-192 hours of incubation), and diminishes thereafter.

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