Some Experiments on Sea-urchin Eggs with Desoxynucleic Acids from Sea-urchin Sperms

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DR. J. JOAN LORCH, of King's College, London, and I have made some experiments on sea-urchin eggs with desoxynucleic acids (DNA) prepared from sperms of several sea-urchin species by Professor Erwin Chargaff, of Columbia University, New York.

Unfertilized eggs did not react when put into a solution of DNA in sea-water. Injection of a small amount of DNA dissolved in Callan's solution had the following consequences. If the DNA did not mix with the cytoplasm but remained as a distinct droplet, the egg could be fertilized. The droplet moved slowly towards the surface and ran out of the egg. This sometimes only occurred after several cleavages. Such eggs developed normally. If, on the other hand, the DNA mixed with the cytoplasm the egg became activated. A fertilization membrane was raised. The surface layer in dark field changed in colour from yellow to white as is the case upon fertilization. But sooner or later the cytoplasm precipitated. Lower concentrations did not cause the raising of a membrane but prevented subsequent penetration of sperm and caused precipitation of cytoplasm. The very lowest concentrations, however, did not prevent a subsequent fertilization and a normal development. The time between injection and raising of a membrane was as a rule less when higher concentrations were injected. The precipitation time varied as a rule inversely with the concentration.

The initial idea was to test if DNA from the same species was less injurious than DNA from more or less distantly related species, but the problem could not be solved because of the impossibility of measuring the exact amount of solution injected.

Animal halves of Paracentrotus lividus were reared in different concentrations of DNA in sea-water. DNA of the same species as well as of Arbacia lixula and Echinocardium cordatum were used. All three caused a definite animalization. No injurious effect was found with DNA acting on eggs of its own species, which is contrary to the statement made by Mazia about amphibian and starfish eggs.

Experiments were also made with synthetic nucleoside solutions. The substances were put at our disposal by Dr. Jack J. Fox and brought from the Laboratoire de morphologie animale in Brussels (director, Professor Jean Brachet).

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Animalization was achieved with glucopyranosylcytosine, xylopyranosylcytosine, and arabinopyranosylcytosine, whereas tests with galactopyranosylcytosine and galactopyranosyluracil did not lead to any change in differentiation. It is of interest that some of these substances, analogous to breakdown products of DNA, have a similar effect to DNA.

It should, perhaps, finally be pointed out that we have in desoxynucleic acid a substance causing both activation and animalization.

REFERENCES