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Biogenesis of mitochondria during *Xenopus laevis* development

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The unfertilized egg of *Xenopus laevis* contains 10 μ g of mitochondrial protein and a cytochrome oxidase activity of 0.03 μ atom oxygen/min/egg. During embryogenesis these values remain constant for about 2 days to stage 38, then increase coordinately and double by the feeding tadpole stage (45).

The unfertilized egg contains 3.8 ng mitochondrial DNA. Incorporation of precursors into mitochondrial DNA proceeds at a low rate before stage 30 and increases more than 4-fold around stage 32. Apparently linear accumulation leads to a doubling of the mitochondrial DNA content by stage 45.

Mitochondrial RNA consists predominantly of the two RNA components of the mitochondrial ribosome (rRNA),² and of 4 S RNA. Eggs contain 13.0 ng of the large and 6.9 ng of the small mitochondrial rRNA. Mitochondrial rRNA synthesis begins, or at least accelerates 8-fold, at gastrulation (stage 10). Accumulation then proceeds at a constant rate, and by stage 45 the content of both mitochondrial rRNAs per embryo has doubled.

Mitochondrial rRNA synthesized during embryogenesis is relatively stable, having a half-life of 50 hr. Mitochondrial rRNA is synthesized normally in anucleolate mutant embryos, indicating that the synthesis of cytoplasmic and mitochondrial rRNA is not coupled obligatorily. Mitochondrial 4 S RNA synthesis is absent or very low throughout early embryogenesis and is therefore not coordinated with the synthesis of rRNA.

We conclude that the mitochondria synthesized during oogenesis and present in the egg are used during embryogenesis and are thus a storage product of eggs. Since the synthesis of different mitochondrial components initiates at different, characteristic stages of development we conclude that these components are under separate metabolic control.

rRNA, ribosomal RNA; tRNA, transfer RNA; cRNA, complementary RNA; A, adenylic acid; C, cytidylic acid; G, guanylic acid; U, uridylic acid; SDS, sodium dodecyl sulfate; SSC, 0.15M sodium chloride, 0.015M sodium citrate

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