

**Department of Biology, Consortium for Evolutionary Studies &
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Step-by-Step Evolution of Vertebrate Blood Coagulation

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Abstract

The availability of whole genome sequences for a variety of vertebrates is making it possible to reconstruct the step-by-step evolution of complex phenomena like blood coagulation, an event that in mammals involves the interplay of more than two dozen genetically encoded factors. Gene inventories for different organisms are revealing when during vertebrate evolution certain factors first made their appearance or, on occasion, disappeared from some lineages. The whole genome sequence databases of two protochordates and seven non-mammalian vertebrates were examined in search of some 20 genes known to be associated with blood clotting in mammals. No genuine orthologs were found in the protochordate genomes (sea squirt and amphioxus). As for vertebrates, although the jawless fish have genes for generating the thrombin-catalyzed conversion of fibrinogen to fibrin, they lack several clotting factors, including two thought to be essential for the activation of thrombin in mammals. Fish in general lack genes for the “contact factor” proteases, the predecessor forms of which make their first appearance in tetrapods. The full complement of factors known to be operating in humans doesn’t occur until pouched marsupials (opossum), at least one key factor still being absent in egg-laying mammals like platypus.

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