

Serine Proteases, The Basis of Immunity Through Evolution

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The evolutionary appearance of serine proteases over hundreds of millions of years gave struggling organisms a chance to interact and utilize their environment in new ways. Serine proteases are a gigantic family of enzymatic proteins that are named after the amino acid most responsible for their activity. Since the beginning of time these proteases have developed increasingly specific roles due to compounding complexities of the organisms where these enzymes are conserved. Serine proteases are found throughout our bodies, from digestion of food to blood clotting, fertilization and have a major role in our immune systems. Since the early 60s and with the use of x-ray visualization techniques, some of the most common serine proteases have been studied, also providing some information on their functions. Following the historical importance of these enzymes and with access to better methods it is possible to use databases to trace the lineage of our own enzymes through evolution in other species. These databases are comprised of sequences of genetic code that give clues to how closely related our enzymes are with some of our evolutionary ancestors. This correspondence is an attempt to connect the dots between evolutionary bottlenecks and the development of these enzymes through function and specificity.

In an attempt to connect chicken and alligator proteases with mammals we selected similar enzymes that represent these bottlenecks and have at least, partially sequenced genomes. The next step is to experimentally compare the bio-informatic libraries with results acquired in the lab. This is done using techniques that confirm cleavage specificity (activity based on structure) of each enzyme, potentially giving hints about how these extremely widespread and important enzymes have developed from one organism to another. As we trace the development of our own immune system back through evolution, therapeutic avenues may become evident, relationships uncovered and a better understanding of how the molecular world works.