

Re: Article: On the Origins of Chemical Biodefense

Source: <http://sci.tech-archive.net/Archive/sci.bio.evolution/2005-10/msg00505.html>

- *From:* jimmenegay@xxxxxxxxxxxxxx
 - *Date:* Mon, 17 Oct 2005 00:32:01 -0400 (EDT)
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Larry Moran wrote:

- > On Sun, 16 Oct 2005 01:41:04 -0400 (EDT),
- > Robert Karl Stonjek <rstonjek@xxxxxxxxxxxxxx> wrote:
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- >> On the Origins of Chemical Biodefense
- >>
- >> The following points are made by R. Liddington and L. Bankston
- >> (Nature 2005 437:484):
- >
- > [snip]
- >
- >> Random mutations occurring over hundreds of millions of years mean
- >> that the component amino-acid sequences of individual domains no
- >> longer share any similarity; nevertheless, their evolutionary origin
- >> is preserved in their three-dimensional structure.
- >
- > The other possibiity is that the motifs/domains in different
- > proteins do not share a common ancestor. Their structural similarity
- > is due to convergence on a common structural motif. In that case,
- > the absence of any sequence similarity is evidence that they are not
- > evolutionarily related.
- >
- > There is a controversy in the field of molecular evolution. Some
- > people, like me, believe that convergence explains many common
- > sequence motifs. We believe it's very unlikely that all traces
- > of sequence similarity could be lost in regions that must preserve
- > structural integrity while randomly changing all the amino acids
- > in order to wipe out sequence similarity. That just doesn't make
- > a lot of sense.
- >
- > Others believe that structural similarity trumps sequence similarity
- > when it comes to making decisions about homology. Those people
- > believe that all similar structures have evolved from a common
- > ancestor. In extreme cases they'll even argue that all zinc
- > fingers and all leucine zippers are homologous.
- >

Interesting. Could you recommend a review article that discusses this controversy? Most of the things I have read say that

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structure is more strongly conserved than sequence and hence that structural alignment should guide sequence alignment. I had never really considered the possibility of structural convergence.

But ISTM that 'convergence' is not really a good word for the hypothesis. There is no 'gradualism' in the structural evolution, is there? The two polymers may evolve to the same structure, but they don't really 'converge' upon that structure. You almost have to assume that the final structure arises almost as a 'saltation'.

Which is not to say that it is impossible for two non-homologous sequences to have the same structure. When you get right down to it, there j