

Re: Article: On the Origins of Chemical Biodefense

Source: <http://sci.tech-archive.net/Archive/sci.bio.evolution/2005-10/msg00492.html>

- *From:* lamoran@xxxxxxxxxxxxxxxxxxxxxxxxxxxx (Larry Moran)
 - *Date:* Sun, 16 Oct 2005 15:14:06 -0400 (EDT)
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On Sun, 16 Oct 2005 01:41:04 -0400 (EDT),
Robert Karl Stonjek <rstonjek@xxxxxxxxxxxxxxxx> wrote:

- > 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 possibility 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.

It doesn't really matter to which camp you belong. Both views have strong evidence to support them and neither one can explain all of the data. It's very likely that there are some cases of descent from a common ancestor where structural similarity has been

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preserved while sequence similarity has been lost. On the other hand, there are some very well-known "models" of this that are certainly wrong. They are really examples of convergence.

The sad thing is that many of the "structural" group are completely unaware of the controversy. They tend to come from the structural biologists and not from those who study molecular evolution. They publish papers as if their viewpoint was the only possible interpretation and they don't even bother paying lip service to any other explanation. The authors should have, at the very least, mentioned that their similar motifs may not be related by evolution and that's the real reason why they don't show any sequence similarity.

(The ironic thing about this paper is that the structure of C3 may actually be a good example of exactly what the authors claim. In that case, if the authors were aware of the controversy, they would have put a more thorough discussion in their paper – except that it's a Nature paper and such discussions are forbidden.)

Larry Moran

• *Follow-Ups:*

◆ ***Re: Article: On the Origins of Chemical Biodefense***

◇ *From:* William Morse

• *References:*

◆ ***Article: On the Origins of Chemical Biodefense***

◇ *From:* Robert Karl Stonjek

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