Origin of life: the polymerization problem

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A well-publicised paper by Claudia Huber and Günter Wächterhäuser in *Science* proposed a scenario for a materialistic origin of life from non-living matter.[1] They correctly state:

> *The activation of amino acids and the formation of peptides under primordial conditions is one of the great riddles of the origin of life.*

Indeed it is. The reaction to form a peptide bond between two amino acids to form a dipeptide is:

Amino acid 1 + amino acid 2 ➔ dipeptide + water

$$H_2NCHRCOOH + H_2NCHR'COOH \rightarrow H_2NCHRCONHCHR'COOH + H_2O \quad (1)$$

The free energy change (ΔG_1) is about 20-33 kJ/mol, depending on the amino acids. The equilibrium constant for any reaction (K) is the equilibrium ratio of the concentration of products to reactants. The relationship between these quantities at any Kelvin temperature (T) is given by the standard equation:

$$K = \exp(-\Delta G/RT)$$

where R is the universal gas constant (= Avogadro's number x Boltzmann's constant k) = 8.314 J/K.mol

For reaction (1),

$$K_1 = \frac{[H_2NCHRCONHCHR'COOH][H_2O]}{[H_2NCHRCOOH][H_2NCHR'COOH]}$$

$$= 0.007 \text{ at } 298 \text{ K}$$

where a compound in square brackets symbolises the concentration of that compound.

This means that if we start with a concentrated solution of 1 M (mol/1) of each amino acid, the equilibrium dipeptide concentration would be only 0.007 M. Since tripeptides have two peptide bonds, the equilibrium tripeptide concentration would be 0.007^2 M or 5×10^{-5} M. For a non-specific polypeptide with 100 peptide bonds (101 amino acids), the equilibrium concentration would be 3.2×10^{-216} M. NB: the problem for evolutionists is even worse, because life requires not just any polymers, but highly specified ones.

Since the equilibrium concentration of polymers is so low, their thermodynamic tendency is to **break down** in water, not to be built up. The long ages postulated by evolutionists simply make the problem worse, because there is more time for water's destructive effects to occur. High temperatures, as many researchers advocate, would accelerate the breakdown. The famous pioneer of evolutionary origin-of-life experiments, Stanley Miller, points out that polymers are 'too unstable to exist in a hot prebiotic environment'.[2,3] A recent article in *New Scientist* also described the instability of polymers in water as a 'headache' for researchers working on evolutionary ideas on the origin of life.[4] It also showed its materialistic bias by saying this was not 'good news'. But the real bad news is the faith in evolution which overrides objective science.

Some evolutionary scenarios

The analysis above doesn't mean it's impossible to make polypeptides. Consider the expression for the equilibrium constant K: if [H_20] is lowered, then [polypeptide] must increase. One approach is to drive off the water with heat, as proposed by Sydney Fox.[5] However, his experiments required a large excess of the *trifunctional* amino acids (i.e. they can combine with three other molecules), but these are produced very sparingly in typical simulation experiments.[6] The heat also destroys some vital amino acids and results in highly randomized polymers. Another problem is that all the chiral amino acids are racemized, that is, a 50/50 mixture of left and right handed molecules is produced, which is unsuitable for life.[7] The large excess of trifunctional amino acids results in extensive branching, unlike biological polymers. The required heating and cooling conditions are geologically unrealistic — there is no known place on earth where amino acids could be dumped and polypeptides would result. Finally, Fox's experiments required very concentrated and pure amino acids, while any hypothetical primordial soup would be impure and grossly contaminated with other organic chemicals that would destroy them.[8]

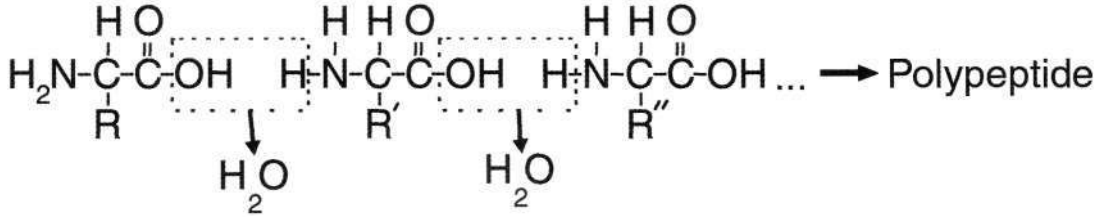
Another way to remove water is with certain high-energy chemicals that absorb water, called **condensing agents.** If the reaction between condensing agent C and water is:

$$C + H_2O \rightarrow D \quad (2)$$

and if ΔG_2 of reaction (2) is negative and large enough, it can couple with reaction (1):

$$H_2NCHRCOOH + H_2NCHR'COOH + C \rightarrow H_2NCHRCONHCHR'COOH + D \quad (3)$$

$\Delta G_3 = \Delta G_1 + \Delta G_2$. If AG_3 is large and negative, the equilibrium constant for reaction 3, K_3, will be large, and this could conceivably produce reasonable quantities of



polymers.

Some researchers used the condensing agent dicyanamide (N≡CNHC≡N) to produce some peptides from glycine, even claiming, *'dicyanamide mediated polypeptide synthesis may have been a key process by which polypeptides were produced in the primitive hydrosphere.* '[9]

However, the biggest problem is that condensing agents would readily react with any water available. Therefore it is a chemical impossibility for the primordial soup to accumulate large quantities of condensing agents, especially if there were millions of years for water to react with them. Yet the above experiment used a 30-fold excess of dicyanamide. And even with these unrealistic conditions, 95 % of the glycine remained unreacted, and the highest polymer formed was a tetrapeptide.[10]

Organic chemists can certainly make polypeptides, using intelligent planning of a complex multi-stage synthesis, designed to prevent wrong reactions occurring.[11] Living cells also use an elegant process to make polypeptides. This involves the use of enzymes to activate amino acids (and nucleotides) by combining them with the high-energy compound ATP (adenosine triphosphate), to overcome the energy barrier. Such high-energy compounds are not formed in prebiotic simulation experiments, and are very unstable.

Chain termination

To form a chain, it is necessary to react *bifunctional* monomers, that is, molecules with two functional groups so they combine with two others. If a *unifunctional* monomer (with only one functional group) reacts with the end of the chain, the chain can grow no further at this end.[12] If only a small fraction of unifunctional molecules were present, long polymers could not form. But all 'prebiotic simulation' experiments produce **at least three times more** unifunctional molecules than bifunctional molecules.[13] Formic acid (HCOOH) is by far the commonest organic product of Miller-type simulations. Indeed, if it weren't for evolutionary bias, the abstracts of the experimental reports would probably state nothing more than: 'An inefficient method for production of formic acid is here described...' Formic acid has little biological significance except that it is a major component of ant (Latin *formica)* stings.

A realistic prebiotic polymerisation simulation experiment should begin with the organic compounds produced by Miller-type experiments, but the reported ones always exclude unifunctional contaminants.

Wächterhäuser's theory

Günter Wächterhäuser is a German patent attorney with a doctorate in organic chemistry. He is highly critical of the usual primordial soup ideas of the origin of life. As the quote at the beginning of this article shows, he recognises that polymerization is a big problem. However, not willing to abandon his evolutionary faith, he proposes that life began as a cyclic chemical reaction on the surface of pyrite (FeS_2). The energy to drive this cycle is said to come from the continued production of pyrite from iron and sulfur. However, he admits that this proposal is is for the most part, 'pure speculation'.[14] Fellow origin-of-life researcher Gerald Joyce claims that the acceptance of Wachterhauser's theory owes more to his legal skills than to its merit.[14] Stanley Miller calls it 'paper chemistry'.[15]

In their latest well-publicised experiment, Huber and Wächterhäuser activated amino acids with carbon monoxide (CO) and reacted them in an aqueous slurry of co-precipitated (Ni,Fe)S using either hydrogen sulfide (H_2S) or methanethiol (CH_3SH) at 100 °C at a pH of 7-10.

We should also note that Huber and Wächterhäuser started off with very favourable conditions for chemical evolution. Although 'the researchers have not yet shown that this recipe can produce amino acids',[16] they used a strong solution (0.05 mol/1) of left-handed amino acids (or the achiral glycine), with no other organic material. Of course, any 'primordial soup' would have been dilute, impure and racemic. It would have contained many unifunctional molecules and other organic compounds that would have destroyed amino acids. Stanley Miller also points out that Huber and Wächterhäuser used concentrations of CO far higher than are realistic in nature.[16]

Even under their favourable conditions (due to intelligent design!), all they produced was a small percentage of dipeptides (0.4-12.4 %) and an even tinier amount of tripeptides (0.003 %) — calculated from reported quantities. Huber and Wächterhäuser also reported that 'under these same conditions dipeptides hydrolysed rapidly'!

The exclusive 'left-handedness' required for life[7] was destroyed in the process. They excuse this by pointing out

that some cell wall peptides have right-handed amino acids. But this misses the point — enzymes that break down cell walls are designed for exclusively left-handed amino acids, so an occasional right-handed amino acid is the perfect defence in a left-handed world.

A final irony is that one of their previous experiments converted CO into acetic acid (CH_3COOH) under similar conditions with CH_3SH and a (Ni,Fe)S slurry.[17] Since acetic acid is unifunctional, this would **prevent** long polymers from forming under the conditions Huber and Wächterhäuser propose!

Did scientists create life, or did the media create hype?

Newspapers around the world reported this experiment. Some went as far as claiming: 'German chemists have produced living cells from a combination of amino acids'[18]

If true, then this would be remarkable. Even the simplest decoded free-living organism, *Mycoplasma genitalium,* has 482 genes coding for all the necessary proteins, including enzymes. These proteins are composed of about 400 amino acids each on average, in precise sequences, and all in the 'left-handed' form.[19] Of course, these genes are only functional with pre-existing translational and replicating machinery, a cell membrane, etc. But *Mycoplasma* can only survive by parasitizing more complex organisms, which provide many of the nutrients it cannot manufacture for itself. So evolutionists must postulate an even more complex first living organism with even more genes.

However, as shown above, all Huber and Wächterhäuser produced were a few dipeptides and even fewer tripeptides. While they didn't make the deceitful claim quoted above, their evolutionary faith means that they see far more significance in their experiment than it deserves.

The next day, the same newspaper wrote '*WA Museum evolutionary biologist Ken McNamara said if life could be created artificially, it could emerge naturally given the right conditions.*'[20] How absurd — does this mean that because we can create cars artificially (with loads of intelligent input), it proves they could emerge naturally (without intelligence!)?

People should not be surprised by such biased reporting. We should compare the hype about 'Martian life' with the near silence about the fact that this claim has been thoroughly discredited, even according to most secular scientists.[21-24]

The cynical media disdain for truth was well illustrated at a symposium sponsored by the Smithsonian Institution. Ben Bradlee, editor of *The Washington Post,* said:

> To *hell with the news! I'm no longer interested in news. I'm interested in causes. We don't print the truth. We don't pretend to print the truth. We print what people tell us. It's up to the public to decide what's true.*'[25]

A detailed survey of the political and social beliefs of producers, editors, writers, and staff in the television industry[26] shows that they are biased against Christian morality. Two-thirds of them believe the structure of American society is faulty and must be changed. 97 % say women should have the right to decide whether they want to have an abortion, 80 % believe there's nothing wrong with homosexual relations, and 51 % see nothing wrong with adultery. And they openly admit that they push their ideas into the programs they create for their audiences. The media's willingness to push evolutionary hype is consistent with their anti-Christian stance.

Conclusion

Despite over-optimistic science reports and very biased and hyped-up media reports, scientists have not even come close to 'creating life in the test-tube'. Even if they do manage this feat, it will be the result of intelligent design. Ordinary undirected chemistry moves in the wrong direction — for example, as shown in this article, biological polymers tend to break apart, not form.

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Quotes

Evolution eroded faith

'I was once a member of a small graduate seminar in geology. At the time I was in my late forties whereas the rest of the group were young men in their early twenties. One afternoon, I was participating in an impromptu rap session on the subject of Christian beliefs. In the course of the discussion I was greatly disturbed to discover that the whole group were apostate Christians of various mainline denominations. As the discussion progressed, it developed that for each of them, their Christian faith had been eroded over a period of time as their acceptance of the theory of macroevolution grew.'

Wilbert H. Rusch Snr, Professor Emeritus, Biology and Geology, Concordia College, Ann Arbor, Michigan, USA, in his book *Origins: What is at Stake?* p. 52, Creation Research Society, USA, 1991.