DANIEL E. LEVY, Ph.D.

MIT Ph.D., CHEMIST, DISEASE-CURING SCIENTIST

Dr. Levy is an experienced organic/medicinal chemist who contributed to the design of novel therapeutic agents targeting cardiovascular disease, cancer, and inflammatory and CNS disorders. Over his 30 years of contributing to the biopharmaceutical industry, Dr. Levy led interdisciplinary teams focused on kinase inhibitors, GPCR antagonists, matrix metalloproteinase inhibitors, and cell adhesion molecules. His work is documented in almost 30 peer-reviewed publications and has generated over 26 issued/published United States patents.

After holding positions at Glycomed, COR Therapeutics, Scios, and Intradigm Corporation, Dr. Levy's most recent role was Vice President of CMC at Mind Medicine, developing novel synthetic pathways, formulations, and new IP supporting key clinical assets. He has broad experience in the chemistry of amino acids/peptides, sugars/carbohydrates, heterocycles, steroids, polyethylene glycols, and lipids. As a consultant, Dr. Levy provides strategic guidance and program implementation services to companies interested in small molecule drug discovery/development, diagnostics, and drug delivery/formulations. Additionally, he provides technical due diligence services, facilitates intellectual property development, and supports the filing of grant applications.

As a consultant, Dr. Levy is currently assisting companies in areas including:

- Small molecule therapeutics targeting cancer, concussion, arrhythmia, congestive heart failure, and CNS disorders
- Novel formulations for steroid-based therapeutics
- Use of nanoparticles and transfection polymers for gene therapy
- Novel strategies for antibody-drug conjugation
- Medicinal chemistry, 14C radiolabeling, and multi-kg GMP manufacturing

Dr. Levy received his Ph.D. in Organic Chemistry from the Massachusetts Institute of Technology and his B.S. in Chemistry from the University of California - Berkeley. He is the author/editor of three books addressing aspects of carbohydrate chemistry and mechanistic organic chemistry.

Life, Asymmetry, and the Existence of God – a Chemistry Discussion

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Science and religion are complementary. Where science is unable to explain, religion provides answers. Among the greatest questions at the interface of science and religion is how life came to be.

All living beings are made of cells composed of a membrane, nucleus, DNA, proteins, and enzymes, without which they would die. To ensure function, survival, and proliferation, these components must both exist and work together. While the odds of such systems evolving spontaneously are too great to calculate, an examination of enzymes and their component amino acids provides some insight from which one can extrapolate the sheer magnitude of unique factors required to enable the formation of life.

Nature provides 20 amino acids – each exhibiting unique structural variations.[1] Enzymes are comprised of linear strings of amino acids that contain any number of individual and/or multiple selections from the 20. As arbitrary words out of order don't create sentences, amino acids randomly assembled don't form functional enzymes. Enzymes generally range from 60 to 35,000 amino acids in length,[2,3] and a random assembly of only 60 amino acids results in 8.83×10^{17} possible combinations.

Aside from having different structural features, amino acids are asymmetric and exist in two chemically identical forms that are mirror images of each other. We designate these forms "D" and "L."[4] Enzymes essential for life are made up exclusively of "L" amino acids.[5] A specific 60 amino acid enzyme made from mixtures of "D" and "L" amino acids has 1.15×10^{18} possible combinations – an unfathomable number of variations from which all "L" forms of that specific sequence must emerge.

Building perspective, a single enzyme does not define life. There are more than 1,000 distinct enzymes present in bacterial life forms,[6] each having well over 1.15×10^{18} possible "D" and "L" combinations.[7] The odds of this happening randomly or by chance are lower than the odds of picking a single designated water molecule out of all the oceans on earth.

When the earth was forming, before life existed, the fundamental chemicals in the atmosphere were methane and ammonia.[8] Without energy input, there's no possible way that these chemicals can combine to form an amino acid. Even if that input occurred with lightning, any formation of amino acids would be a random event resulting in formation of an equal mixture of "D" and "L" amino acids. To favor "D" or "L", an influence (catalyst) must be present to "direct" the chemistry.

Chemists selectively create "D" or "L" amino acids using catalysts favoring formation of one form. These asymmetric catalysts are generally derived from chemicals provided by nature – "L" amino acids for example. Because these catalysts are derived from molecules that didn't exist in primordial earth, how could nature have produced the initial supply of "L" amino acids required for life? The answer must reside with an outside influence – a supreme intelligence consistent with the religious belief in God.

Footnotes:

1.https://www.britannica.com/science/amino-acid

2. Chen, Lorenzo H.; Kenyon, George L., Curtin, Francois, Harayama, Shigeaki, Bembenek, Michael E., Hajipour, Gholamhossein, Whitman, Christian P., *Journal of Biological Chemistry*, 1992, 267(25), 17716-21

3. https://www.ncbi.nlm.nih.gov/Web/Newsltr/FallWinter02/longest.html

4. "D" stands for Dextrorotatory and reflects the property of a molecule to rotate the plane of polarized light clockwise or to the right. "L" stands for Levorotatory and reflects the property of a molecule to rotate the plane of polarized light counterclockwise or to the left.

5. "D" amino acids exist naturally in small amounts and are produced by microbes (Soda, Kenji; Kagaku (Kyoto, Japan); 1977, 32(7), 517-26).

6. https://www.sciencedirect.com/topics/medicine-and-dentistry/microbial-enzyme

7. Depending on the number of "D,L" amino acids in the sequence.

8. https://www.britannica.com/topic/evolution-of-the-atmosphere-1703862