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Is the Sodium Chloride Level in the Oceans Evidence for Abiogenesis?

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Abstract

The percentage of salt in human body fluids and seawater is often used to provide evidence that life originated abiogenetically in the sea. This paper examines this assumption and finds the evidence shows that the levels of salinity in seawater and human blood are markedly different. The data and the evidence do not provide support for the theory of the chemical origin of life in the sea.

Keywords: abiogenesis, myths of evolution, origin of life, chemistry of life

Introduction

What is known as common table salt is a mineral required for life. Salt is a chemical compound called "halite," consisting of two elements, sodium (Na) and chlorine (Cl). Sodium is an alkali earth metal, and chlorine is a halogen gas. All alkali earth metal-halogen compounds are known as salts, but what we know as table salt will be discussed here.

Halite is a colorless brittle mineral commonly found on land and dissolved in many bodies of water (Fenton 1953; Pellant 1992). The sodium in salt in its ionized form is a positively charged cation. The ionized chloride forms a larger, negatively charged anion. The size difference between Na+ and Cl- facilitates achieving a well-packed salt crystal. Due to both the chemical properties of salt and the chemical properties of water, salt dissolves rapidly in water, breaking down into separate sodium and chloride ions. If the chemical properties of salt were different, NaCl would not be capable of carrying out its functions in the body that are necessary for life.

Salt and Evolution

Since Anaximander and Empedocles, most evolutionists have held that all animals (including *Homo sapiens*) evolved from life forms that originated by chemical evolution in water and later moved out of the water onto dry land (Spetner 1997). To support this view, evolutionists note that the tissues in our bodies are constantly moistened by a briny solution that they claim is similar to the salt and mineral level (salinity) found in oceans and many salt lakes of the past. Evolutionists often claim that this observation is evidence of our ancient evolutionary ancestry. The common Darwinian teaching is when a

> wriggling worm had evolved into backboned fish, blood had many of the functions it has in our own bodies today. In fact it is doubtful whether many genuinely new molecular features have appeared in earth's living matter since that time; it has been more a matter of the exploitation of capabilities which were already present in primitive form in the first vertebrates. The animals of the sea adapted themselves to its temperature, to its currents, its tides, and to the substances dissolved in it. In their own private internal circulations the range of salts remains somewhat the same as in the primitive sea-water in which their basic cellular natures evolved. Prick your finger and suck the flowing blood. It's faintly of the sea, with a richer underlying taste (Hackett 1973, p. 40).

Note that Hackett did not provide evidence that the range of salts remained somewhat the same as the level in the oceans as life evolved. More directly, Glasser states that the

> fluids in our bodies mimic the primeval seas in which life began. The concentrations of sodium, potassium, and chloride in our bloodstreams, the calcium, magnesium, and zinc in our cells are precisely the same as those that existed in earliest seas. We retained those ancient seas within us, and the chemical battles fought at the beginnings of life are in reality the same battles being fought today. The battlefields may have shrunk from tidewater inlets to a few cubic centimeters of blood, from ocean fronts and shallow bays (Glasser 1997, pp. 22–23).

Nor does Glasser provide information on the sources of his conclusions or cite any empirical research. Another good example of this line of reasoning, found in a human evolution text, is as follows:

> One human characteristic, a chemical one, harks back to our ancestry in the ocean. If all organic material and water is removed from a sample of human blood plasma, leaving only the mineral salts, the remaining material will be found to be closely similar to the salt produced by the evaporation of sea water. That

is, the percentages of sodium, potassium, calcium, magnesium, iodine, chlorine, and other minerals in human blood salt coincide with those of sea water. Our ocean-living ancestors developed cells adapted to the chemical environment of sea water. When they left the ocean, they took a part of the environment with them in the form of a fluid that bathes the cells; later it was incorporated into a blood stream (Lehrman 1961, p. 138).

Lehrman also does not provide documentation for his conclusion.

Berg (1959, pp. 169–170) notes, "The most important arguments in favor of the hypothesis that life originated exclusively in the ocean" are, first, "the similarity between the salt composition of the body fluids of land animals and that of the waters of the ocean." He then adds that the "similarity in the salt composition of the waters of the ocean and that of the body fluids of land animals could be accounted for" only by evolution (Berg 1959, p. 170).

The salt evidence idea has even been repeated by a former U.S. President as well as a Presidential candidate. John F. Kennedy stated that humans may have a love of the sea "because we all came from it," and, he claimed, it is a "biological fact that all of us have, in our veins the exact same percentage of salt in our blood that exists in the ocean." He also concluded that, for the same reason, we have salt not only in our blood but also in our sweat and tears (Kennedy 1963, p. 684). Former Presidential candidate Al Gore, although more careful in his wording, advocated the same erroneous idea when he stated that "our blood even contains roughly the same percentage of salt as the ocean, where the first life forms evolved" (Gore 1992, pp. 99–100).

John Morris relates another example of this idea being taught as fact by evolutionists:

> Evolutionists have a bank full of stories used to support evolution which sound good on the surface. … I first heard this one in a junior high school assembly during a "Mr. Wizard" film. The wise and believable professor in the film convinced his young assistant that evolution had to be true by showing how similar human blood is to seawater. The fact that the same chemicals (such as salt) are in each "proves" man's relation to all of life, which originated in the sea. But as with many of the evolutionary tales, this one doesn't stand up to scrutiny (Morris 2004, p. 4).

Although I have found numerous references in the popular scientific literature, using the BIOSIS data base's 15,889,702 records, accessed March 12, 2010 through OhioLink, I could not find a single empirical study in scientific journals that supported the ocean salt/human blood connection. This common assumption is an icon of evolution that lacks scientific support. As Morris notes, although the sea water-blood salt "argument for evolution seldom appears in modern textbooks" its former "prominence in textbooks from 1940–1970" ensures "its continuance by those who learned it then. It's indelibly imprinted in evolutionary folklore" (Morris 2004, p. 4). Reasons for dropping the idea from textbooks include the popularity of non-ocean abiogenesis theories, such as the clay theory of Cairns-Smith (1985, pp. 74–76) and the latest theory, the hydrothermal vent abiogenesis idea of Nick Lane (2009) and others.

The Origins of Sea Salt

Salt is an important component of many rocks found in the earth's crust. As rain dissolves the salt, it is carried into brooks and streams—and eventually into the oceans. This process is a major source of the ocean's high salinity level. In addition various forces in the earth slowly push the salt crystal rock up toward the earth's surface, allowing water to dissolve it to produce brine (a water mixture of about 35% salinity). Some lakes, such as the Great Salt Lake in Utah and the Dead Sea, located between modern-day Israel and Jordan, are as much as 25% to 27% saline (Hopkinson 1968, p. 55).

When the fountains of the deep (Genesis 7:11) subterranean sources of water were released at the time of the Flood, they likely carried to the earth's surface many tons of pulverized crustal material containing large amount of salts and other minerals. Hydrothermal vents also no doubt have carried many minerals, including sodium chloride, into the ocean water from below the earth's crust. Volcanic gases and rock decompositions are also major sources of sea salt. These sources are still supplying salt to the oceans today, and the amount of NaCl added annually is enormous: "Streams carry 2.5 billion tons of dissolved substances to the sea. These are soluble substances leached from rock during chemical weathering" (Skinner and Porter 1987, p. 371).

The salts dissolved in water are used by aquatic animals to form structures such as their skeletons, which are constructed out of seawater elements including silicon, calcium, and phosphorous. Some salt settles to the sea floor, but much is carried away in the form of salt spray in the air, causing the top part of many automobiles located near the oceans to rust.

Comparisons of Blood Salt Levels and Sea Salt Levels

Although similarities between human blood and seawater are often used as evidence that life first began in the sea, Tables 1 and 3 show the salinity and other mineral levels in human blood are *markedly different* from those of sea water today. Table 2 shows the reference range, and levels outside of those ranges creates health problems. Levels below the range produces a deficiency and levels above the range causes toxicity concerns. Another problem is, although both blood and seawater

> contain many of the same salts, [the] concentration of dissolved particles in blood is *very* different from that in seawater. The primary constituents of both are sodium and chlorine (which together make up common salt, NaCl), but seawater has three times as much sodium and five times as much chlorine per unit weight [as blood] (Morris 2004, p. 4).

Furthermore, seawater contains about eight times as much calcium and fifty times as much magnesium as blood, and blood has about two hundred times more zinc, two hundred and fifty times more iron, and one thousand times more copper. All of these (and many other elements) are common minerals found everywhere in both organic systems and inorganic rocks. Although found in both blood and seawater as well as inorganic clay, the fact that the suite of these minerals is so different in blood compared to seawater argues against the claim that enough similarity exists to support abiogenesis (Morris 2004, p. 4).

In addition, the amount of dissolved salts and minerals in seawater today depends on the water source because it is likely that the salt and mineral content of past seas varied significantly from area to area. In general, a ton of water from the Pacific Ocean today will yield about 79 pounds of salt, and a ton from the Atlantic Ocean yields about 81 pounds. When one compares these values to the Dead Sea yield—about 500 pounds of salt per ton of water—it is apparent that the levels are very different, depending on the location. Nor is the saltiness of a single body of water uniform, but varies according to where the sample is taken.

Table 1. The element composition of blood and sea water (in mg per liter) (after Batten 1997, p. 24).

Element	Blood	Seawater
Sodium	3220	10800
Chlorine	3650	19400
Potassium	200	392
Calcium	50	411
Magnesium	27	1290
Phosphorus	36	0.09
Iron	1	0.004
Copper	1	0.001
Zinc	1.1	0.005
Chromium	1.1	0.0002
Bromine	4	67
Fluorine	0.1	1.3
Boron	1	5
Selenium	0.9	0.0001

Table 2. The standard reference ranges of sodium and chloride for humans (after Segen and Stauffer 1998, pp. 70–71, 284–285).

1. Normal Values	
Sodium in serum	135–145 mEq/L
Sodium in urine	40–220 mEq/24 hours
Chloride in serum/plasma	95–110 mmol/L
Chloride in urine	110–250 mmol/24 hours
Chloride in sweat	5–40 mmol/L
2. Abnormal Values	
Serum/Plasma	Less than 90 mmol/L and greater than 115 mmol/L
Urine/Sweat	Less than 20 mmol/L and greater than 60 mmol/L

Mineral Variations in Life Forms

To produce a valid result, human blood cannot be compared to *modern-day* seawater salt content but should be compared to ancient seawater salt levels at the time when life supposedly arose and the precursors of blood first evolved. The reason is

> the ocean's salinity increases each day, as rivers dump their dissolved solids into it. Evolutionists propose (without evidence) a steady state for the ocean, but wouldn't the concentrations have changed throughout its over (supposedly) three-billion-year history? Maybe the *differing* concentrations between blood and seawater better prove evolution. (Morris 2004, p. 4).

To determine if the salt concentrations in our cells were "precisely" the same as those that existed in the earliest seas, science must be able to determine what the concentrations once were, a very difficult task. Furthermore, all animals including birds and insects would be expected to have somewhat similar concentrations of these chemicals.

Another problem that needs to be dealt with by the evolutionists making the claim that life originated in the sea is that sodium ion concentrations in red blood cells also varies widely in animal species, even within different breeds in the same species (Albritton 1952). The fact is the salt content of many internal fluids of various living things can vary enormously. Thus, to argue for the validity of the salt-life similarity theory one can simply select the animals that fit the sea origins theory and ignore others animals, including humans, that do not fit the salt-life similarity theory. The correct comparison is to evaluate a wide variety of animals and attempt to draw conclusions for a large set of data.

Nor is there a relationship between the presumed level of evolution from one-celled life forms to humans of any land animal and the amount of salt ions in its body tissue. Some seawater animals have salt and mineral levels that are very similar to their environment, others do not. Table 3 shows that, in general, only marine invertebrates have concentrations of sodium, potassium, calcium, magnesium, and chloride that are similar to seawater. With the exception of marine invertebrates, the NaCl ion concentration of most life forms is quite different from that of either salt or fresh water.

Table 3. Ion concentrations in sea water, fresh water, and body fluids of animals representative of different habitats (after Harris 1996, p. 276).

	Na (mM)	K (mM)	Ca (mM)	Mg (mM)	Cl (mM)
"Average" Sea Water	470	10	10	54	548
Marine Invertebrate Starfish *Asterias*	428	10	12	49	487
Marine Vertebrate Sculpin *Myoxocephalus*	194	4	3	2	177
Terrestrial Invertebrate Cockroach *Periplaneta*	161	8	4	6	144
Freshwater Invertebrate Crayfish *Cambarus*	146	4	8	4	139
Freshwater Vertebrate Salmon *Oncorhynchus*	147	9	3	1	117
Terrestrial Vertebrate Human *Homo*	142	4	5	2	104
Fresh Water average, North America	0.39	0.04	0.52	0.21	0.23

A further problem for the life originated in the sea theory is the ion content of sea water, rather than supporting life, is extremely toxic to most life forms (see table 1 for the element composition of sea water compared to blood). The fact is, the "salt concentrations of today's oceans would literally destroy any living creature if it were not for the sophisticated membrane pumps that keep the salts from entering the organism's cells" (Glasser 1997, pp. 45–46). Thus, any "warm pond" origin of life theory—aside from the other problems it has—must deal with the fact that, because salt is so toxic to life, the salt concentrations in the ancient seas must have been significantly *less* than that existing today for life to evolve.

Some scientists deal with the toxicity problem by concluding that when life was formed the ion content of seawater was markedly less than today. This belief, though, is pure conjecture—even estimates of salt levels in seawater from only a century ago are often highly speculative. Nevertheless, note the confidence of the following declaration:

> This is no mere speculation … the sodium and potassium in our bloodstreams, the concentrations of dissolved salts and the cobalt, magnesium, and calcium that are maintained in our cells are precisely the same as the concentration of those dissolved salts in the waters of the oceans existing over 3.5 billion years ago. The acids in our tissues are maintained at the pH of seawater during the Precambrian era (Glasser 1997, pp. 45–46).

Many scientists conclude that little evidence exists for the conclusion that the worldwide ocean salinity level has recently significantly increased. In fact, in some local areas evidence indicates that salinity has increased (Stott et al. 2004).

However, Austin and Humphreys (1990) conclude from an inventory of the known and conjectured processes that add and remove sodium ions to and from the oceans that only 27% of the present sodium ions delivered to the oceans can be accounted for by known removal processes. Conversely, some evidence indicates that the oceans' sodium concentration is not being maintained today in a steady state as supposed by many Darwinists but, instead, seems to be increasing with time. The present rate of increase estimated by Austin and Humphreys is about 3×10^{11} kg/yr. Austin and Humphreys (1990) conclude that use of different equations containing minimum input rates and maximum output rates allows for the ocean's maximum age of far less than 62 million years.

Conversely, some evidence exists that, as a whole, many minerals are now being reabsorbed at about the same rate that they are added. Excess amounts of many minerals often result in activation of mineral sinks. The best-known example is carbon dioxide. Another example is excess potassium and sodium are absorbed by clay particles, and large amounts of these minerals are used by animals for biological metabolism, especially as biological ions. If the seawater content of these minerals increases, biological organisms that use the minerals may increase.

Thus, a paradox emerges: theories regarding the sea origin of life require less salinity than currently exists, yet the only evidence for this conclusion is the assumption that the sea was far less salty in the distant past. Creationists who have investigated this found that there is no firm reason to assume a steady state, but that the opposite may be true: the data indicate the oceans are gaining in salinity rather than losing. This imbalance of salinity input to output is important in both sides of the debate.

The finding that salinity is increasing may lend some support to the abiogenesis theory, but it causes problems with the old-earth view. The imbalance indicates that the sea should contain much more salt than it does today if the 4.6 billion evolutionary model were true. Others argue that this problem is one more reason why it is difficult to extend current influx and removal rates backward (see Wheeler 1999). Consequently, for the evolutionary argument to be viable, evolutionists must compare modern blood to the salt concentration of the ancient sea, a very difficult problem.

Summary

It is commonly claimed in the popular evolutionary literature that the sea salinity level today is similar to that in cells and, therefore, this is evidence of abiogenesis and evolution. However, in a specialized computer search of over 15 million scientific articles, using the BIOSIS data base accessed through OhioLink on March 15, 2010, I was unable to find a single article that scientifically supported this claim. The literature simply does not provide evidence for the supposition that the salinity level in the oceans gives credence to the abiogenesis theory of life's origin in the sea. As Batten concludes:

> The mineral concentrations in human blood plasma and/or serum and seawater are quite different. They are not at all similar (see table). The chlorine and sodium contents of blood are only about 20% to 30% of seawater whereas the iron content is 250 times greater. Compared to seawater, blood has little magnesium but 9,000 times as much selenium. The data … contradict the evolution-from-seawater idea. Lehrman and others are quite wrong in saying that the percentages of minerals in human blood salt coincide with those in seawater. There is little similarity. Even the blood of sea creatures such as crabs is quite different [compared] to seawater (Batten 1997, pp. 24–25).

Darwinists claim the fact that salt is necessary for life is a result of our having evolved in a sea environment. Creationists usually conclude that salt is common in the earth's crust and in seawater because salt is required for our health. In the first case, the level of salt in life and the sea is similar because we are a product of nature. In the second case we live in a world created for us to meet our needs, thus nature was created to fit our requirements.

Given the evidence, the reason that sodium chloride is abundant is for the benefit of life as a result of design by the Creator has more credence than the claim that the putative similarity of the salinity of human blood and seawater is evidence that life originated in the sea by abiogenesis.

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