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Review Article

POTENTIAL ROLE OF RUKN NĀR (HEAT) IN CONTINUATION OF LIFE: A LITERARY SURVEY STUDY

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ABSTRACT

The classical concept of Rukn Nār (Heat) in Unani System of Medicine is recognized as the primordial constituent for life and is compatible with biological nature of living organisms. The present study was done to explore the potential role of Rukn Nār in contexts of the biological and medical analogy. Literature related to Rukn Nār was surveyed from various classical Unani books, journals, proceedings and internet. An attempt was made to compile the views regarding Rukn Nār and to explain the concept in context of biological and medical paradigms, and how Rukn Nār became the integral part of the Unani System of Medicine. After surveying and interpreting the literature, it infers that Rukn Nār has substantial role in continuation of life, and it should be interpreted as a form of energy.

Keywords: Nār; Heat; Energy; Life, Unani

INTRODUCTION

Nār is an essential part of Arkān Arba and the theory of Arkān i.e. Fire, Air, Water, and Earth with four proximate qualities i.e. hot, cold, dry and wet was described by Pythagoras¹⁻⁷. Arkān are simply indivisible matters, which provide the primary components for the body occupying position above the air (Fig.1). Further, they cannot be divided into simpler entities having different forms and functions. Each Rukn has two sets of basic qualities i.e. hot or cold and wet or dry; the constituent having hot and dry qualities is fire⁸⁻¹¹. The Unani System of Medicine regards Arkān as graded modalities of the touch and as such, these can be generalized in term of heat, cold, dryness and moisture, which are fundamental modalities of touch. Thus, presence of these qualities heat, cold, dryness and moisture can be perceived by touch either in simple or in compound form¹². According to Aristotle active qualities, i.e. heat and cold are two opposite movements / directions of energy¹⁰.

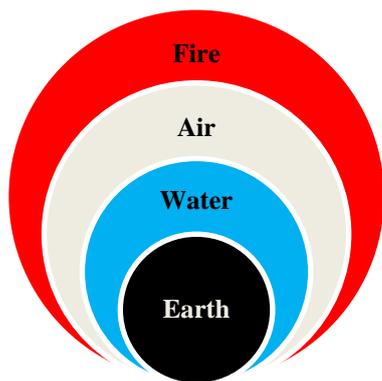


Fig.1: Spatial order of Arkān Arba in relation to their Qualities

According to Ibn Sina, two qualities i.e. hot and cold are active and other two qualities i.e. dry and moist are passive. In every condition, hot and cold ought to integrate and alter the things identical or non-identical, and render them moist, dry, hard, and soft. Hot and cold qualities are active because integration is a type of action while moist and dry are passive since they are acted upon^{6,10}.

Modern science differentiates the mass into chemical components and the energy into photons and measurable waveforms. The Unani System of Medicine recognizes energy in terms of heat and cold, while mass in terms of dryness and moisture. Of the four qualities, heat causes warmth, dispersion, dissolution, melting, disintegration, and evaporation. Cold makes the thing cool, causes integration, freezing, and extinguishing of heat. Moisture makes the object soft, humid, smooth, thin, and fluidity; while dryness makes the object dense, hard, stable, and restraint^{10,13-15}. Inferentially, heat and cold are two opposite emergent directions of energy in space; while dryness and moisture are two temporal and contrary reactions of the mass.

The same notion is substantiated by Einstein that neither isolated energy nor isolated mass exists. Everything comes into existence by the combination of both mass and energy¹⁰. Thus, the qualities of both mass and energy will be present simultaneously. Similarly, simultaneous presence of properties of motion and rest cannot be explained on the basis of materialistic element of chemistry, nor can time be measured in term of measurable movement. The Unani System of Medicine adopts earth, water, air, and fire as symbolic element to explanation of such constitutional structure with potential importance in continuation of life and the pure energy exists till its extreme limit, but primordial proportions of time and movement are present to their negligible limit¹⁰.

The real meaning of Arkān as mentioned by ancient philosophers is quite different from the connotation of elements of modern chemistry. It was something beyond the elements in their mind¹⁶. Modern scientists criticized that concept of Arkān is unscientific as they considered ‘Arkān’ as elements and blamed that ancient were aware about only four elements while science has discovered more than hundred elements. Here, it should be clearly understood that Arkān are not elements as conceived by present day scholars. The real fact is that Arkān generalizes the various qualities by which all the objects and phenomena are recognized in the world^{10,16}. Thus, Arkān Arba’a play the pivotal role in continuation and sustenance of body and thereby life. The hypothesis generated was to highlight the role of Nār (Heat) in continuation of life with comparative analysis on scientific arguments.

The methodology framework used in the present research work was through ‘input-processing-output’ approach. All the literature related to the theory of Arkān Arba was thoroughly surveyed. The related matter was also surveyed on PubMed, EMBASE, National AYUSH Portal, Scopus, CINHALL, and HINARI. Majority of data was extracted from offline sources, like books, and other literary sources.

DISCUSSION

Fire is a form of heat or energy. Its Mizāj (temperament) is Hārr (heat) and Yābis (dry). It is required in the compound to make the things light and to provide a stable shape. Its existence within organism brings about ripeness and unity. It occupies a position above the Air. The Quwat (power) of fire causes the penetration of air everywhere in all bodies and ameliorates the extremeness of Mā’ (water) and Arḍ (earth)^{1,8-9,17-19}. Ibn Harwi has classified the *Ḥarārat* (energy) into four types (Fig.2).

1. Heat of fire
2. Heat of sun
3. Heat yielded during motion
4. Heat found in the living organism i.e. innate heat²⁰

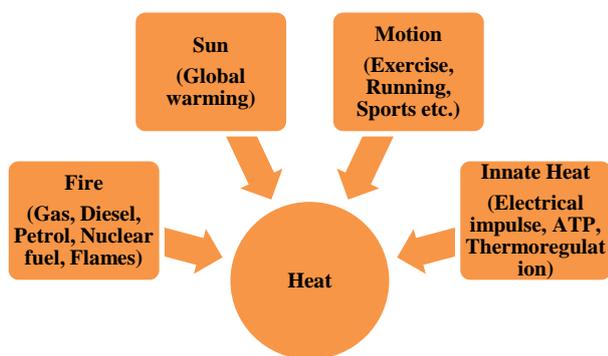


Fig.2: Main Sources of Heat affecting Plants and Animals

In primitive atmosphere, there were plenty of inorganic molecules in their free form. At that time, temperature of Earth was extremely high and was not favorable for chemical interaction. Hence, all inorganic atoms were in unstable form. As the temperature cooled down and suitable condition for chemical interaction developed, carbon, hydrogen, nitrogen, sulphur, phosphorus and water vapor started interacting with each other to form simple molecules like methane, ammonia, carbon dioxide and urea. On further interaction, amino acids came into existence. This chemical interaction was continuously going on; on further interaction between simple organic and inorganic molecules, more complex organic molecules were formed. These more complex organic molecules combined within oxygen molecules

and formed sugar and other allies. The assembly of these biomolecules gave rise to first prokaryotic life²¹⁻²⁴. These early forms of life i.e. prokaryotic organisms were formed around thermal vents. Hot water provided them suitable environment for the biochemical reaction. Heat was the catalyst that supplied energy of activation to propel the components into compounds through formation of chemical bonds. The free energy produced large quantities of macromolecules and became the basis for a more complex form of organization. Hence, Rukn Nār in the form of heat or energy essentially involved not only in the evolution but also in the continuation of early life²⁵. After millions of years, the prokaryotic organism gave rise to eukaryotic organisms that differ from prokaryotic organisms in having some specific functions. For example, the eukaryotic organisms have a nucleus and mitochondria in its cell. In the nucleus, genetic material is located; while mitochondrion-the powerhouse of the cell-supplied the free energy for its functions. Because of its own powerhouse, the eukaryotic organisms did not need to remain around the thermal vents of the ocean to stay alive or replicate. Its own powerhouse gave the eukaryotic organisms an advantage that allowed life to expand into all possible niches^{22-24,26}.

Ibn Rushd has mentioned that primary arrangement of Arkān occurs in plants and second order of arrangement is in animals⁴³. From this view, it is clear that first animates are the plants that thrive on earth, water, air and heat. When they get water and minerals from earth, obtain gases from air and essential energy from sun, only then their life sustains and continues^{12,27}. If any one of them like heat or air is lost or absent, life becomes difficult and can't continue. Therefore, we can say for the evolution and continuation of life like other Rukn, Rukn Nār is compulsory.

All the organisms attaining perfection proceed towards decline, and ultimately death occurs. To prevent extinction of species, its substitution is necessary. For this purpose, reproductive faculty is present in organisms to continue its species; plants produce offsprings via fruits seeds etc. and for ripening of the fruit sun light is necessary. Plants do not bear fruit if they are not exposed to sun light. In dark shaded area, plants do not grow; if grow, these are very weak. Moreover, foods in the form of plants can't develop without water and rain. Rain does not come without clouds produced in the sea or river with the help of sunlight (*Ḥarārat*)^{21,28-30}. It highlights the importance of Rukn Nār (energy) derived from sun in the sustenance of plants.

The secondary arrangement of Arkān is found in animals. All animals depend on plants directly or indirectly and can't live without food. Animals produce their offsprings through fertilization of ovum and sperm, and semen is necessary for the birth of offsprings. Semen is made from blood and blood is produced from Akhlāt (humours) again made from transformation of food. *Ḥarārat* (heat) is necessary for the digestion and transformation of food. Thus, *Ḥarārat* is necessarily involved directly or indirectly in the production of semen^{21,28-30}.

The human body is basically created from union of seminal fluid of male and female; while seminal fluid of male is considered as active while that of female as passive and both are moist in nature. *Ajzā' Arḍiyya* (earthy matter) and *Ajzā' Mā'iyya* (water) are comparatively more in seminal fluid of female, while that of male has more contents of *Ajzā' Nāriyya* (heat) and *Ajzā' Hawā'iyya* (gaseous matter/air). Hence, after the interaction of seminal fluid of male and female, moist zygote is formed. However, moist components are easily molded, there is need of *Ajzā' Arḍiyya* and *Ajzā' Nāriyya* to provide a stable shape to prevent it from molding. As the *Ajzā' Arḍiyya* provides hardness and *Ajzā' Nāriyya* lends stability, zygote becomes naturally very viscous,

hard, and more stable but this hardness is not like stone. Being more viscous, hard and stable, the zygote does not disperse²⁹.

According to Galen, innate heat is a type of Rukn Nār exerting fundamental influence on all aspects of biological functions, such as the expression of genes, the rate and force of contraction of muscles, the activity of enzymes, and the firing of neurons³¹⁻³³. Every cell in our body has the same DNA packed within its nucleus, yet each of this cell type is vastly different. Then why and how the different organs are formed. Obviously, genes do not determine the fate of a cell, but some other factors beyond genes are also responsible for it. Genes are activated and suppressed during the development of a fetus depending on the local environment in which the cell is embedded, resulting in expression of cell that will eventually perform a specific function within a specific organ. This process is highly dynamic and interdependent on a variety of environmental factors implicated in gene expression throughout the organisms¹⁶.

The external environment is changeable which warrants for constant internal environment of the body for the proper functioning and coordination between the cells and organs. This consistency of internal environment is called homeostasis^{34,35}. Lack of Ḥarārat (heat) disrupts homeostasis as dehydration does. The cells require a constant supply of energy to maintain their proper functions and co-ordinations. A decrease in the supply of energy whether free heat or ATP will bring down specialized function of the cell, tissue and body. In severe cases, the damage will be irreversible and ultimately death can occur. According to law of energy, energy is neither created nor destroyed but it is changed from one form to another one. When energy is produced, it really means that it is being transformed. Living organism has a system of energy which is part of total energy system existing

on earth; hence, energy (Ḥarārat) system supports life: one within living organism and another one that surrounds us³⁴.

1. **External energy cycle:** - In external environment, the ultimate source of energy is the sun. Growing plants use water and carbon dioxide as raw materials and transform the sun energy into stored chemical energy. The animals depend on the plants for their and transform the plant energy into animal food energy.

2. **Internal energy cycle:** - As we eat the plant and animal foods, we change the stored energy into body fuels; glucose and fatty acids transform them into various other forms of energy to serve the body needs, such as electrical energy in the brain and nerve tissue; mechanical energy in the muscle contraction, and thermal energy to maintain the body warmth. Overall, this energy cycle repeats it constantly to sustain our lives³⁴.

The dietary sources of metabolic energy are carbohydrate, proteins, and fat (Fig.3). The metabolism of these fuels results in the production of carbon dioxide and water. Although the process of metabolism in the body is more complex, it is a fundamental law of chemistry that if the starting material and end products are same, the energy yielded is also same. Therefore, the energy yielded from foodstuffs can be determined by measuring the heat produced when they are burnt in air. During the cellular metabolic processes, also called cellular respiration or cellular metabolism, molecules of ATP are made within the cell during stepwise decomposition (catabolism) of organic molecules (carbohydrates, fats, and proteins). The energy contained in food is measured as calories, and this decomposition releases the chemical energy (calories) stored in these organic foodstuffs that is used in synthesis of ATP (another form of chemical energy) from ADP (adenosine diphosphate) and PO₄ (inorganic phosphate). Thus, chemical reactions use ATP as an energy source to maintain cellular structure and function³⁶⁻³⁷.

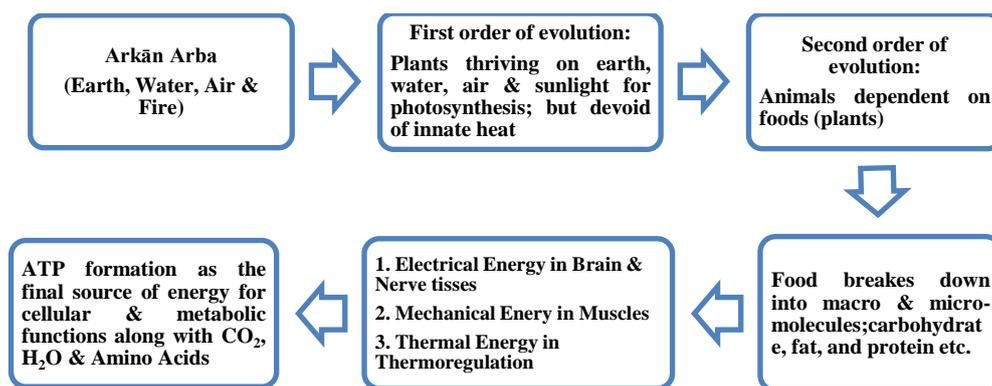


Fig.3: Sequential depiction of Arkān Arba and Rukn Nār (heat/energy) in evolution and cellular functions

The cellular process by which ATP is formed during the breakdown of organic molecules requires molecular oxygen (O₂). This process is called cellular or biochemical respiration or cellular metabolism. Respiration, therefore, requires an exchange of gases between the cell and its surroundings to allow the inflow of O₂ to the cell and the outflow of CO₂. Biochemical respiration is an aerobic process of ATP production. This biochemical meaning of respiration should not be confused with the everyday meaning of breathing. The most common substance decomposed aerobically in cells to produce ATP is glucose³⁸. The breakdown of a glucose molecule into carbon dioxide and water is a continuous process occurring in three steps.

The first step is called glycolysis; because it does not require oxygen, it is also called anaerobic (without oxygen) respiration. This step occurs in the cytoplasm of the cell. The next two steps

are called the Krebs's citric acid cycle and the electron transfer or transport system. These two steps require oxygen and they occur in the matrix and on the folds or cristae of the mitochondria of the cell^{37,39}.

Second step of biochemical respiration is Krebs's citric acid cycle which takes place in the mitochondria. This cycle utilizes only one of the two pyruvic acid molecules produced in glycolysis, and for every pyruvic acid that enters in the Krebs's citric acid cycle, three CO₂, four NADH₂, one FADH₂, and one ATP (GTP) are produced^{22,35}. Here, the generation of ATP in the form of metabolic energy is must for sustenance of cells.

Thirdly, oxygen is the ultimate electron acceptor for the molecules captured by the co-factors during glucose decomposition. Electron transport is a part of glycolysis when

oxygen is available, and this electron transport accounts for most of the ATP production in the Krebs's citric acid cycle³⁷.

Glucose is a simple carbohydrate; other carbohydrates such as starch (plant carbohydrate) and glycogen (animal starch) as well as other types of sugars such as monosaccharides and disaccharides fit into the cellular furnace at the level where glucose enters the glycolytic sequence. If not needed immediately, these molecules are stored in the body (in food vacuoles or the liver or converted to fat cells) until needed later to produce more ATP^{35,40}. Here, the important point to highlight is that our body conserves energy (Ḥarārat) to support the biological functions without interruption.

Physiologically, when muscles are overworked, extra energy is produced in the form of ATP. Initially, aerobic respiration produces much of this energy; later on, if the muscle worked more rapidly than oxygen (O₂) is supplied to it from the bloodstream, the muscle cells begin to produce ATP anaerobically and lactic acid starts accumulating resulting in fatigue. Once oxygen gets to the muscle, the fatigue diminishes as lactic acid is broken down.

Similarly, over-exercise causes not only sore and fatigue, but also heartbeat and breathing rates are accelerated. On sitting position, fast breathing is done to get more O₂ into our bodies, and fatigue slowly diminishes. When O₂ again becomes available, the lactic acid is converted back to pyruvic acid and aerobic respiration proceeds as normal. It should be noted that anaerobic formation of ATP by muscles is much less efficient than aerobic respiration as only two molecules of ATP are produced per glucose molecule^{34,37,39}. It infers that combination of energy (Ḥarārat) with oxygen (Hawa) potentially contributes to life, and energy without oxygen does not support life durably.

In summary, glycolysis occurs in the cytoplasm of the cell and produces pyruvic acid. If oxygen is available, the pyruvic acid is eventually converted to Acetyl-CoA, which then enters the citric acid cycle, and is eventually converted to CO₂, H₂O, and 38 ATP. If oxygen is not available, the pyruvic acid is converted to lactic acid and only two ATP molecules are produced³⁷. Hence, theory of Rukn Nār in the various forms of energy i.e. photosynthesis, electrical, chemical, and metabolic energy addresses the existence and continuation of life substantiated with conventional medicine and natural sciences, and no one can deny the essential involvement of Nār (heat) along with earth, water, air and in continuation of life.

CONCLUSION

Matters or substances that are found in the universe are also found in the living organisms, and there is no qualitative difference between universe and living organisms except in their degree of whether it formed from primary, secondary or tertiary order of organization. The physicians and philosophers of Unani System of Medicine were aware about physical and chemical elements like Iron, Arsenic, Gold, Silver, Copper, Zinc etc., still they used the concept of Arkān because of its relevance in explaining the biological phenomenon, and continuation of life. Arkān Arba'ā is a quite different system of classification of matter as compared to present periodic table of elements which is based on the physical state (solid, liquid, gas & energy).

The concept of Rukn Nār is not the exact fire but it is an abstract quality that connotes the sense of heat and energy that has been extensively studied and scientifically proven in various forms of energies found in the universe, plants, and the human body. Thus, Rukn Nār is a comprehensive but indicative concept which can't be subjected to the rejection merely in view of physical state of

fire synonymously, as the Unani philosophers were quite aware of fire, flames, and burning process.

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