



Research Article

Does DNA Represent Kidney Essence in Traditional Chinese Medicine?

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Abstract

In Traditional Chinese Medicine (TCM), kidney is more a functional term, only loosely connected to the anatomic entity of Western medicine, and is considered to be the foundation of the innateness. Kidney essence, comprising of both the congenital essence and the acquired essence, is the core element for the function of kidney. We introduce, in this discussion, one molecular connotation of the TCM kidney theory by analyzing the feature of DNA and its components genes. DNA is genetic material, naturally belonging to the congenital essence. Genes are made up of DNA sequences and mandate the production of RNAs and proteins, hence dominate the life process, including the assimilation of daily diets, i.e., the procurement of the acquired essence. Meanwhile, the acquired essence supplies materials for DNA replication, gene expression. The interaction of DNA and the acquired essence influences the life process in a profound way. In other words, DNA, a major component of the congenital essence, works in collaboration with the acquired essence. Based on these facts, the kidney's contributions to reproduction and development/growth are able to be accomplished through the partnership of DNA and the acquired essence. In addition, the double helix is the structure of DNA and also the foundation of DNA semi-conservative replication, where the yin yang co-dependence between the two strands is an outstanding feature, further connecting DNA to kidney that is considered the core of yin yang throughout the body. In conclusion, DNA is introduced as a representative of TCM kidney, which might shed the light to decipher the TCM ancient theory with the modern biology.

Keywords: Acquired essence; Congenital essence; DNA; Kidney; Yin yang

In Traditional Chinese Medicine (TCM), kidney is one of the five zang organs and is considered more a functional concept, but does not closely refer to the modern anatomic organ. TCM kidney's function is originally described in *Yellow Thearch's Inner Canon*, an ancient TCM book, as in "the so-called essence is the fundamental substance of life" and "the kidney, mandating concealing, is the base of keeping and the place of essence" [1]. *Yellow Thearch's Inner Canon Plain*

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questions discourse on primitive vitality specified kidney's functions and pointed out: "kidney masters water, collects the essence from both five zang-organs and six fu-organs for concealing" [1]. The essence kept in kidney is the substance vital to life activities. Kidney essence consists of both the congenital essence and the acquired essence. The congenital essence is inherited from parents, as *Yellow Thearch's Inner Canon Spiritual Pivot self-consciousness* pronounced: "Along with birth comes, the essence", while the acquired essence is processed from foodstuff [1]. In order to carry out the function of kidney and therefore take on the life activity, the congenital essence and the acquired essence collaborate intimately. In Ming dynasty, the understanding to kidney's function was upgraded to kidney is the resource of the innateness. Not only these decrees about kidney have been being upheld by TCM doctors during clinic practices with successes, but also, with the modern sciences, the new insights are on their way, which are going to introduce more comprehensive understanding and propel the development of kidney function study in a broader spectrum.

DNA is genetic material that contains all the information to build up the human body. The double helix is the structure of DNA and the foundation of DNA replication, where co-dependence between the two strands is an outstanding feature. Genes, the functional units of heredity, are embedded in DNA. In the attempt to explain the concept of TCM kidney in the modern biology, by analyzing the structure, the semi-conservative replication of DNA, as well as genetic functions of DNA through gene expression, we are able to place DNA in the realm of the congenital essence, understand the partnership between DNA and the acquired essence and thereby interpret the kidney function of controlling reproduction, development and growth, and introduce the yin yang feature of DNA to correspond to the yin yang original of the body resided in kidney.

DNA Represents the Congenital Essence

TCM kidney is known to store the congenital essence. Lining up with this concept, DNA is inborn and maintains the consistent sequences carrying the genetic information. Apparently, the congenital essence and DNA shall be bounded. The congenital essence must be inherited from the parents, evidently DNA comes this way and thereby is a form of the congenital essence. A sperm from the father and an oocyte from the mother join together and give rise to a fertilized egg, initiating the journey of a new life. With fertilization, fertilized eggs possess a set of chromosomes from farther and another set of chromosomes from mother. In this way, the genetic material DNA was delivered and re-organized in offspring, which concurs with TCM theory that the congenital essence is gathered from the parents and kept in kidney. To this concern, *Yellow Thearch's Inner Canon Spiritual Pivot qi classification* emphasizes on kidney essence and said: "Two spirituals tangle up, come into shape, so essence ensues, and then the life rises" [1].

The maternal and paternal chromosomes are mixed, conferring the offspring the unique genetic trait, in the pattern characterized by Mendelian inheritance law. Plus, with meiosis, exchange may occur between the homologous chromosomes, causing the mixture of maternal and paternal genetic traits more complex. From this angle, we

might be able to understand more comprehensively of what *Yellow Thearch's Inner Canon Spiritual Pivot course of life* portrays the origin of life: "Taking mother as the foundation, father the standard" [1].

DNA Plays a Key Role in Reproduction, Differentiation and Growth

As discussed above, TCM kidney stores kidney essence which consists of both the congenital essence and the acquired essence. TCM Kidney essence rules over reproduction, development/growth.

DNA is akin to the congenital essence. The congenital essence is inherited from the parents, and this essence combines with the acquired essence generated after birth to constitute kidney essence. DNA plays a key role not only because it belongs to the congenital essence but also because it can behave as the congenital essence to collaborate with the acquired essence.

DNA replication and gene expression are the basic means

DNA replication is required in reproduction and growth. Reproduction starts with germ cells. In meiosis, the germ-line cell DNA replicates once, and the cell divides twice, forming the haploid sperm cell and the haploid oocyte. Growth commences from the fertilized egg that is diploid and carries on through mitosis, where DNA replicates once and the cell divides once.

Heredity information is concealed in genes and genes are imbedded in DNA. The sequences and expression of genes are the determining factors to the life process. Genes determine the human phenotypes, including those that concern reproduction development/growth [2-7]. By this arrangement, DNA wields its power through gene expression and consequently serve the task of determining reproduction, development/growth.

The expression is the way of genes to show their functions, and the functional products are the front-line participants to life process. Started with the fertilized egg, the whole body maintains the same genome in life, but the expression of genes varies all the time and has to follow the right orders. In the process of development and growth, the cell proliferation and differentiation are highly regulated, as both spatial specificity and temporal specificity are in play. In this way, the development and growth are able to follow the right path.

DNA partners up with the acquired essence

DNA, in the form of the congenital essence, attends to the reproduction, development/growth, but cannot play solo; DNA needs partner up with the acquired essence to make life flourish. The congenital essence and the acquired essence collaborate intimately, serving the whole journey of life from the cradle to the grave. The acquired essence contains the nutrients from daily diets and is vital to the assimilation for the body building. Although DNA and the acquired essence are of different origins, they have sophisticated interaction and form a partnership. DNA and genes mandate the processing of foodstuff to refine into the acquired essence, and the acquired essence supplies for the functions of DNA and genes.

As the component of the congenital essence, genes express functional products, which can assist to acquire the essence from foodstuff. In the processes that nutrition obtained from the daily diet is assimilated to build up body tissues or supplies energy for life activities, kinds of enzymes and hormones are required to fulfill the

procedure. Enzymes and hormones come from gene expressions. Behind the expression of these enzymes and hormones, many others genes play their parts to interfere, through signal transductions, for instance. In another words, DNA lay the foundation for the acquired essence to develop and function.

DNA replication and gene function are dependent on the acquired essence as well. DNA is built up on nucleotides whose own synthesis material and co-factors, such as vitamin B12 and folic acid, come from the acquired essence. Gene expression produces functional RNAs and proteins, in which the acquired essence is the resource of the raw materials.

As of the expressed proteins, many need bind the specific prosthetic groups, including ions, molecules, or vitamins, to carry on their biological functions and these prosthetic groups are often the components of the acquired essence. Moreover, in terms of gene expression which is highly regulated and organized, some substances from daily diets can indeed cast a significant influence. As much as a substance involved in the synthesis of phosphatidylcholine, acetylcholine and S-adenosylmethionine, for example, choline can also influence the expression of cortical and hippocampal genes [8]. Often, the situations are more complicated. Obesity is a growing healthy problem cross the globe, and genetic risk interacting with more fried food consumption is found to be likely a major cause in three US cohort studies [9].

DNA Accommodates Trait of Yin Yang Original Resided in Kidney

Yin and yang are considered as the most fundamental elements in TCM, as described in *Yellow Thearch's Inner Canon plain questions discourse of yin yang by parallelism*: "Yin and yang are the law of nature, the statutes of universe, and the place of the almighty" [1]. Since kidney is in charge of the congenital essence and DNA is a representative of the congenital essence, we looked into DNA molecule to search if yin yang trait shows itself there, and found out that DNA is clearly the molecule of yin yang.

DNA is inherited with a yin yang manner

Each parent contributes a set of DNA chromosome to the offspring, and father is yang and mother is yin, so two sets of DNA chromosomes gathered in the offspring bears yin and yang trait at the start of life. Yin yang harmony is the prerequisite of the creation in nature. Two parental DNAs come into harmony, forming the congenital essence of the offspring.

DNA structure and DNA replication have yin yang trait

The double helix, in which two DNA single strands wind around each other, looks much like the Taiji yin yang diagram. It is not clear whether this similarity insinuate any significant connection between DNA and yin yang, but DNA double-strand structure and semi-conservative replication demonstrate DNA's nature of yin yang.

The anti-parallel direction and the co-dependence of the two strands demonstrate the feature of yin yang, and this is the way that the genetic information exists. Abiding by complementary base pairing rules, two DNA single strands, running anti-parallel, are confined by each other at every base pair position. The polarity of two DNA strands orienting exhibits the opposite of yin and yang. Meanwhile, the complementary base-pairing confines the nucleotides sequence of one DNA strand is exactly complementary to that in the other strand, an arrangement reflecting the co-dependence of yin and yang.

The DNA semi-conservative replication also relies on yin yang, through which genetic information passes on to the next generation. Two strands of DNA separate to serve as templates, and then, following complementary base pairing rules again, a new DNA strand is generated on the template, producing new DNA double strands in the same yin yang co-dependent model. The old double-stranded DNA has one yin strand and one yang strand, and so a new yang strand is generated on the old yin strand, a new yin strand on the old yang strand. In this way, the DNA semi-conservative replication represents “yin and yang give birth to each other”.

Because DNA can represent the congenital essence kept in kidney and demonstrate the inborn yin yang feature, we dare to make the presumption that DNA might be associated with the yin yang original resided in kidney. On this account, in the light of DNA structure and replication, the TCM old sayings, “kidney yin and kidney yang can never separate” and “merely yang or merely yin cannot reproduce”, can be deciphered in the eye of the modern biology [10].

Perspective

TCM development has experienced a long journey and is ever-growing. However, the modern biology seems to overgrow TCM. To address this matter, bridges are needed to be built to refresh TCM theory, which basically is macro-scale, with modern biological knowledge at molecular level; in the meantime, the modern biology, which largely focuses on micro-structure of life, can benefit from the philosophy rooted in TCM. In this discussion, we portray DNA, through its structure, replication and gene expression, as a part of the whole picture of TCM kidney theory. The connection of DNA to both the congenital essence and the acquired essence kept in kidney was established, and the role of DNA in kidney mastering reproduction and development/growth was outlined as well. Besides, the yin yang feature of DNA was brought up to reflect the yin yang original resided in kidney. Clearly, TCM kidney theory is a compound functional concept far beyond the explanation in terms of DNA presented in this

discussion. What is presented in here is merely a corner of the iceberg. The comprehensive understanding to TCM kidney theory demands far more undertakings. We look forward to exchanging views with our peers and hence to explore more molecular mechanisms.

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