

LETTER TO EDITOR

Early Description of Heredity Traits by *Ali ibn Rabban al-Tabari*

Dear Editor,

Research on the history of science shows how scientists have acquired knowledge and explored the reality of the world of being throughout history (Broumand, 2006, pp. 288-290). Various medical theories, such as Darwin's evolutionary theory and Mendelian genetics, are not excluded from this issue, and the influence of past scientific experiences in their development is undeniable.

The modern science of genetics, building upon Gregor Mendel's foundational research (Weiling, 1991, pp. 1-25), has its roots in ancient civilizations. The first attention to the issue of inheritance can be found in the works of ancient Greek philosophers such as Hippocrates (Mayr, 1982, pp. 635-637). Muslim scientists, particularly those in Persia, gathered medical knowledge from various ancient civilizations (Zargaran, and Arezaei, 2016, p. 3494; Broumand, 2006, pp. 288-290). In doing so, they presented new knowledge in the era of Islamic civilization by adding their knowledge to those concepts. These scholars have

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provided many medical innovations and discoveries, many of which still hold true today. The discovery of pulmonary blood circulation by *Ibn al-Nafis* is one of the most important examples (Zargaran, and Arezaei, 2016, p. 3494).

Islamic civilization was the dominant medical school in Europe until around the 17th century AD. Masterpieces of physicians and scientists of this school, such as *The Canon of Medicine (al-Qānūn fī al-Ṭibb)* by *Avicenna* or *al-Hawi (Kitāb al-Ḥawī fī al-ṭibb)* by *Abu Bakr al-Razi (Rhazes)* became standard medical texts in Europe as medical reference books, exhibiting the leading of this medical school in the world (Zarei, Noroozi, and Khadem, 2019, pp. 28-36). *Abul Hasan Ali Ibn Sahl Rabban al-Tabari*, also known as *Ibn Rabban Tabari*, was an Iranian Christian physician and one of the notable medical figures during the Islamic civilization. He left enduring marks on the field through his comprehensive medical treatise, *Firdows al-Hikmah* (lit. Paradise of Wisdom). This book is one of the earliest medical texts written in Arabic and is considered the first encyclopedia of medicine (Sezgin, 2001, pp. 310-314; Ardalan, Khodadoust, and Mostafidi, 2015, pp. 1-6; Tabari, 2002, p. 33).

There are discrepancies regarding Tabari's birth year. While some sources indicate it to be 158 AH (775 AD) (Ardalan, Khodadoust, and Mostafidi, 2015), Sezgin suggests that it could be either 180 AH or 185 AH, citing Meyerhoff's evidence in the History of Arabic writings (Sezgin, 2001, pp. 310-314). Nevertheless, based on various narrations that confirm the presence of Tabari in the court of Maziyar Ibn Qaran at around 214 AH (830 AD), we can be sure that he was alive during the 9th century AD (Ardalan, Khodadoust, and Mostafidi, 2015).

Tabari wrote his book in seven parts, including 30 articles in 360 chapters. *Firdows al-Hikmah* contains a lot of information in the fields of natural wisdom, astronomy, zoology, botany, embryology, and other branches of medicine (Ardalan, Khodadoust, and Mostafidi, 2015, pp. 1-6; Tabari, 2002, p. 33).

In the fourth chapter of the second part of *Firdows al-Hikmah*, Tabari dedicated a chapter to the birth of children. At the end of this chapter, he mentions the story of a baby with black skin born to white parents. Interestingly, the child's maternal grandfather also had black skin:

“وأن امرأة ولدت بنتا بيضا من رجل حبشي وأدركت ابنتها تلك وتزوج بها رجل أبيض فولدت ولدا أسود لأن الولد نزع إلى لون الجد أعني أبا الأم” (Tabari, 2002, p. 33).

“And that a woman gave birth to a daughter with the blood of an Abyssinian man, and a white man married her, and she bore a black son because the boy turned to the color of his grandfather, I mean the father of the mother.”

The existence of a hidden trait in parents, its transmission to children, and its appearance in the second generation is a concept that can be considered one of the simple examples of Mendel's theory of dominant and recessive traits.

According to Mendel, there are some hereditary traits (we show them with A) that show themselves in the first generation (F1) if they are combined with similar traits or not. (Aa or AA will show A anyway in the first generation). Mendel considered these traits to be dominant hereditary traits. On the other hand, recessive traits (we show them with a) include some hereditary traits that need to be combined with a similar to appearing in the first generation (F1) offspring (a must be paired with a to appear in the first generation) and if not combined with a similar trait, they will not appear in the first generation (F1)



(Aa will not show in the first generation). But the next generation will show the trait of a in a ratio of 3 to 1 (Elston, Satagopan, and Sun, 2012, pp. 1-9; Mendel, 1865, pp. 3-47).

Regardless of whether skin color is recessive or dominant as a hereditary trait, the fact that in Tabari's view, a trait can be passed from parents to children without appearing in the child and remains hidden until its emergence in the next generation (F₂), is a new-found and thought-provoking subject.

On the other hand, in the narration mentioned in *Ferdows al-Hikmah*, there is a point worth pondering that validates Tabari's point of view: it is Tabari's direct reference to the skin color of the paternal parent of the F₂ generation (who is white and married to a girl from the F₁ generation). He was also white, and therefore, he could not have been the direct cause of the transfer of skin color to his child. By giving direct reference to the skin color of the F₂ generation's father, Tabari eliminates potential ambiguities regarding his hypothesis on inheritance. This observation shows Tabari's awareness of the complexities of inheritance and the potential for specific traits to be influenced by factors beyond the apparent features of the parents.

Tabari's storytelling and analytical approach toward this genetic event, later formalized by Gregor Mendel, exemplifies the insightful and admirable perspective of *Ali ibn Rabban al-Tabari* and the intellectuals of the Islamic Golden Age. These individuals lived ahead of their time and were on par with thinkers who lived centuries after them. Undoubtedly, the existence of such a narrative in the book of *Ibn Rabban Tabari* can indicate the attention of scientists of that time to this concept. More thorough research of these works could lead to more intriguing discoveries about the history of medicine.

Authors' Contribution

In this article, Sobhan Ghezloo wrote the initial draft and collected data and wrote part of the article. Babak Daneshfard has done scientific review and editing and writing other parts of the articles. Ebrahim Khadem supervised the entire project and analyzed the text. Also, the final text of the article is reviewed and approved by all authors.

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Conflict of Interest

None.

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