

# EMBRYOLOGY IN THE QUR'AN

A Scientific-Linguistic Analysis of Chapter 23

*With responses to academic and popular contentions*

Includes the essay *Did the Prophet Muhammad Plagiarise Ancient Greek Embryology?*

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# ABSTRACT

This paper is an analysis of chapter 23 verses 12 to 14 of the Qur'an in light of modern embryology. This study will provide a linguistic breakdown of the relevant verses and correlate these linguistic items to established facts in the field of embryology.

To ensure a comprehensive understanding of this study, an overview of quranic exegesis will be provided to appreciate how the Qur'an is made accessible and intelligible to the reader. This study will also address various contentions which attempt to challenge the credibility of the quranic discourse and its concurrence with modern embryology. Among these responses will be a refutation of the ancient Greek (Hellenic) plagiarism thesis. This thesis maintains that Hellenic embryology was the source of the Qur'an's, and by extension, the Prophet Muhammad's ﷺ, medical knowledge.

In chapter 23 verses 12 to 14 the Qur'an provides eight meaningful points describing the process of the developing human embryo:

We created man from an essence of clay, then We placed him as a drop of fluid in a safe place. Then We made that drop of fluid into a clinging form, and then We made that form into a lump of flesh, and We made that lump into bones, and We clothed those bones with flesh, and later We made him into other forms. Glory be to God the best of creators.<sup>1</sup>

At first glance, the English translation of the Qur'an's embryonic description seems uninvolved and simplistic. However, as this study will show through linguistic analysis of the Arabic Qur'an, each word conveys a depth of meaning that, upon closer look, correlates staggeringly to established reality.

# WHAT IS THE QUR'AN?

Linguistically the word Qur'an means 'reading' and came to be referred to as 'the text which is read'. The Qur'an also calls itself *al-kitab* which lexically implies a written book. Thus, the significance of writing, reading and reflecting upon the Qur'an has been emphasised from the very beginning of Islam.

The quranic material is divided into *surwar*,<sup>2</sup> meaning 'chapters' in Arabic. According to the historian Phillip Hitti, the collected written text of the Qur'an is one of the youngest epoch-making books and the most widely read book ever written.<sup>3</sup>

The Qur'an is the supreme authority in Islam as it is the fundamental and essential source of the Islamic creed, ethics, laws, and guidance. For Muslims, the Qur'an is of Divine origin. It is the speech of the Creator and not the word of the Prophet Muhammad ﷺ.<sup>4</sup> Rather, it was revealed to him, and through him to mankind, in word and meaning. Az-Zarqani, a 9<sup>th</sup> century scholar of the Qur'an, summarises the description of the book. He writes:

The Qur'an is the Arabic speech of God, which He revealed to Muhammad in wording and meaning, and which has been preserved in the compiled written pages of the Qur'an, and has reached us by recurrent reporting.<sup>5</sup>

# THE SCIENCE OF QURANIC EXEGESIS

The Qur'an, like any other legislative and spiritual book, requires exegesis. Quranic exegesis, known as *tafsir* in Arabic, is essentially the knowledge through which one increases an understanding of the Qur'an and a comprehension of its commandments and wisdom.<sup>6</sup>

Quranic exegesis is a branch of knowledge dealing with "the method of the delivery of the words of the Qur'an, their interpretation, their individual and composite forms and expediencies."<sup>7</sup> It is this science by which the Qur'an is understood, its meanings explained and its rulings derived. Thus, the Qur'an is made accessible and intelligible to the reader.

What follows are the main sources of quranic exegesis used by exegetes to interpret the Qur'an:

## 1. THE QUR'AN

The first source of exegesis is the Qur'an itself. Many verses in the Qur'an complement and clarify the meaning of other verses.<sup>8</sup> This use of intertextuality is considered significant in the study of linguistics.<sup>9</sup> The following is an example of the Qur'an explaining itself through relevant verses:

- a. "The path of those you have favoured" is here unexplained but then elaborated upon in a verse elsewhere in the Qur'an.<sup>10</sup> [*See below*]
- b. "Those whom God has favoured, such as the Prophets, loyal persons, martyrs and honourable men. How fine are such companions."<sup>11</sup>

## 2. THE PROPHETIC TRADITIONS

The second source is the traditions of the Prophet Muhammad ﷺ.<sup>12</sup> The Qur'an often mentions the Prophet's ﷺ role of expounding upon the Qur'an in word and deed.<sup>13</sup>

## 3. THE STATEMENTS OF THE COMPANIONS

The third source is the explanations of the companions of the Prophet ﷺ, who learnt the Qur'an directly from him. Many of them devoted their entire lives to studying the Qur'an, its exegesis and related knowledge.<sup>14</sup>

## 4. THE ARABIC LANGUAGE

Another source of exegesis is the Arabic language in which the Qur'an was revealed. The Arabic language is used as a tool to analyse verses if the other sources do not offer an interpretation.

# SCIENCE IN THE QUR'AN

The Qur'an's relationship with science has been discussed for centuries, with scholars debating whether to use science as an exegetical tool to elucidate its meanings. The 14<sup>th</sup> century scholar Al-Shatibi disputes the claim that the Qur'an includes knowledge of the natural sciences.

He argues that the Qur'an is a religious book which is mainly focused on the manifestation of the Divine will in the human sphere of existence. Al-Shatibi writes:

Many people have overstepped all bounds and made undue claims about the Qur'an when they assigned to it all types of knowledge of the past and the present such as the natural sciences, mathematics and logic.<sup>15</sup>

Conversely, the 11<sup>th</sup> century theologian and philosopher, Al-Ghazali, asserts that although the Qur'an doesn't present scientific details, it does provide the metaphysical framework to understand science. Al-Ghazali views the Qur'an as providing the foundations to all types of knowledge. For example, he states that all knowledge is implied "in the signs and indications in the Qur'an"<sup>16</sup> and in his book *The Jewels of the Qur'an* he argues that the principles of various sciences "are not outside" the Divine book.<sup>17</sup>

Al-Ghazali's views are substantiated by the mainstream scholarly perspective that the Qur'an is an intrusive text that seeks to engage with the inner dimensions of man. Communicative strategies employed by the Qur'an to achieve this include the technique of asking questions and referring to sign-posts to God. These sign-posts include the innumerable wonders that can be seen in the natural world, such as the planets orbiting the sun, the stars, the alternation of the night and day, the various animals and insects, and the intricacies of our own psychological and physiological development. In this context, there are an estimated 750 verses concerning science and natural phenomena.<sup>18</sup>

Science, as defined by the philosopher Bertrand Russell, is "the attempt to discover, by means of observation and reasoning based upon it, ...particular facts about the world, and the laws connecting facts with one another...".<sup>19</sup> Although there is no consensus over the definition of science, it seems that Russell's definition, when applied to the Qur'an, offers an array of verses pointing to scientific study. Some examples include:

And who created all things and made them to an exact measure.<sup>20</sup>

We shall show them Our signs in every region of the earth and in themselves, until it becomes clear to them that this is the Truth.<sup>21</sup>

There truly are signs in the creation of the heavens and the earth, and in the alternation of the night and day, for those with understanding.<sup>22</sup>

In the creation of the heavens and earth; in the alternation of the night and day; in the ships that sail the seas with goods for people; in the water which God sends down from the sky to give life to the earth when it has been barren, scattering all kinds of creatures over it; in the changing of the winds and clouds that run their appointed courses between the sky and earth: there are signs in all of these for those who use their minds.<sup>23</sup>

This, however, does not imply the Qur'an is a book of science; rather, it is a book of *ayaat* which is commonly interpreted as 'verses' and linguistically conveys various meanings, such as: sign, proof, evidence and miracle.<sup>24</sup> Thus, the quranic verses pertaining to the natural world are not intended to provide detailed descriptions of nature. Rather, they are meant to encourage thinking and reflection. Commenting on this, Professor of Philosophy Shabbir Akhtar in his book *The Qur'an and the Secular Mind: A Philosophy of Islam* writes:

Nature's flawless harmonies and the delights and liabilities of our human environment, with its diverse and delicate relationships, are invested with religious significance. Created nature is a cryptogram of a reality which transcends it: nature is a text to be deciphered. Evidences accumulating in the material and social worlds and in the horizons jointly point to a hidden immaterial order.<sup>25</sup>

It is important to note that Islamic scholarship does not adhere to the view that science is the only method to discover truths about man, life and the universe. In fact, Islamic

scholarship views science as a useful method of study which has a limited scope and should not be solely relied upon when assessing the truth of our existence. This philosophical position is based on various arguments. For example:

- science, or more specifically scientism, which is the view that we should believe only what can be proven scientifically, is self-defeating. Scientism claims that a proposition is not true if it cannot be scientifically proven. However, the above claim itself cannot be scientifically proven. Therefore, according to this claim, the claim itself is not true. Hence, scientism is self-defeating.
- scientism cannot prove necessary truths like mathematics and logic. For example, “if  $p$  implies  $q$ , and  $p$ , then  $q$ ” and “ $3 + 3 = 6$ ” are necessary truths and not merely empirical generalisations. In fact, scientism requires these necessary truths but it cannot prove them, and any attempt to do so would be tantamount to arguing in a circle.
- scientism has a limited scope as it cannot provide a basis for moral truths. For instance, biology or evolution cannot provide rational explanations for the meaningfulness of good and bad. This is because evolution implies that we are just by-products of a lengthy biological process; our morals have developed like our ears or teeth. Since evolutionary changes are inevitable, moral truths will also change. From this perspective morality has no meaning, as the philosopher of science Michael Ruse aptly states:

The position of the modern evolutionist . . . is that humans have an awareness of morality . . . because such an awareness is of biological worth. Morality is a biological adaptation no less than are hands and feet and teeth ... Considered as a rationally justifiable set of claims about an objective something, ethics is illusory. I appreciate that when somebody says ‘Love thy neighbor as thyself,’ they think they are referring above and beyond ... Nevertheless, ... such reference is truly without foundation. Morality is just an aid to survival and reproduction, ... and any deeper meaning is illusory . . .<sup>26</sup>

In considering the above discussion, the Islamic creedal position maintains that the Qur’an does not negate established realities or facts, and there is a scholarly consensus that its statements pertaining to the natural world are not confined to a 7<sup>th</sup> century understanding

of nature. This is explained by the scholar Mohar Ali in his book *The Qur'an and the Orientalists*:

Far from reproducing or reflecting the erroneous world-view prevailing in the seventh century Arabia, the Qur'an indeed goes far beyond the scientific knowledge of the time and speaks of scientific facts and truths that have only recently been discovered by man.<sup>27</sup>

To conclude this section, the fact that a 7<sup>th</sup> century document contains statements rejecting the established scientific assertions of its time, and complying with what is considered as established reality, makes evident the nature of the Qur'an as a sign-post to the transcendent. This encourages contemplation, and facilitates the arrival at the conclusion that God is One and the quranic discourse is Divine.

This paper will take one of these signs found in chapter 23 verses 12 to 14, and provide a linguistic breakdown correlating each key word with modern embryology.

## ANALYSIS OF CHAPTER 23

The Qur'an provides a concise and eloquent account of the developing human embryo.

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ مِنْ سُلَالَةٍ مِّنْ طِينٍ  
ثُمَّ جَعَلْنَاهُ نُطْفَةً فِي قَرَارٍ مَّكِينٍ  
ثُمَّ خَلَقْنَا النُّطْفَةَ عَلَقَةً فَخَلَقْنَا الْعَلَقَةَ مُضْغَةً فَخَلَقْنَا  
الْمُضْغَةَ عِظَامًا فَكَسَوْنَا الْعِظَامَ لَحْمًا ثُمَّ أَنْشَأْنَاهُ خَلْقًا آخَرَ  
فَتَبَارَكَ اللَّهُ أَحْسَنُ الْخَالِقِينَ

We created man from an essence of clay, then We placed him as a drop of fluid in a safe place. Then We made that drop of fluid into a clinging form, and then We made that form into a lump of flesh, and We made that lump into bones, and We clothed those bones with flesh, and later We made him into other forms. Glory be to God the best of creators.<sup>28</sup>

# 1. ESSENCE/EXTRACT OF CLAY

وَلَقَدْ خَلَقْنَا الْإِنْسَانَ مِنْ سُلَالَةٍ مِّنْ طِينٍ

We created man from an essence (*sulaalah*) of (*min*) clay (*tin*)

This verse mentions that the first stage of the development of the human being is that man is formed from a *sulaalah* of clay. The word *sulaalah* means an extract<sup>29</sup>, something drawn out<sup>30</sup> or the most subtle, purest and essential constituent.<sup>31</sup>

The classical exegetes of the Qur'an understood the words *sulaalatin min tin* (an essence of clay) to specifically refer to the miraculous creation of Adam. These exegetes include the famous 13<sup>th</sup> century scholar from Cordoba, al-Qurtubi;<sup>32</sup> the 9<sup>th</sup> Century Persian historian and scholar, al-Tabari;<sup>33</sup> and the 12<sup>th</sup> century Iraqi physician and historian al-Baghdadi.<sup>34</sup> Significantly, other exegetes suggest these words also refer to the essential elements of the human body, which consist of various chemical components found in clay. Both meanings are intelligible and therefore either can be adopted.

## SCIENTIFIC INTERPRETATION

By applying a scientific analysis to this verse, it becomes clear that this stage appertains to certain essential chemical components. It is significant that these chemical components are found in clay. They include: Oxygen, Carbon, Hydrogen, Nitrogen, Calcium, Phosphorus, Potassium, Sulfur, Chlorine, Sodium, Magnesium and Silicon; all of which are required for human functioning and development.<sup>35</sup> This is explained by the jurist and exegete Shafi Usmani in his eight volume exegesis of the Qur'an. He writes:

The words *sulaalah* means 'extract' and *tin* means 'wet earth' or 'clay' and the verse means that man was created from some special elements extracted from earth.<sup>36</sup>

This perspective highlights the Qur'an's alignment with modern science, as these elements are essential for human life. It also serves to convey the way the Qur'an uses perfectly accurate terms that convey the intended meaning using the briefest of speech.

## THE HUMAN BODY IS NOT MADE OF CLAY?

Contemporary critics state that the Qur'an is inaccurate concerning the development of the human being as the human body is not made from clay. This argument stems from a misunderstanding of the Arabic language, as the key word allowing for the above interpretation is *sulaalah* (extract, something drawn out etc.). This clearly indicates that it is not clay from which the human is created, but an *extract* of clay which alludes to the necessary chemical components required for human life. If this contention refers to the creation of Adam, then it can be addressed by referring to the Islamic theological understanding of miracles. The creation of Adam was not a natural event. Rather, it was a supernatural event that cannot be explained naturalistically. In summary, the creation of Adam from clay was a miracle.

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### SUMMARY BOX

The *sulaalatin min tin* stage: the essential elements required for human life and functioning, found in clay.

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## 2. DROP OF FLUID

ثُمَّ جَعَلْنَاهُ نُطْفَةً

then We placed him as a drop of fluid (*nutfah*)

The next stage of the development of the human embryo is *nutfah*. This word has various meanings:

- By looking at the Arabic language, it can mean a dribble, a trickle, a drop or semen.<sup>37</sup> *Nutfah* can also mean a singular entity which is a part of a bigger group of its kind. This is suggested by the classical dictionary *Lisan Al-Arab* which explains *nyftah* as “a single drop of water remaining in an emptied bucket”.<sup>38</sup>

- According to Prophetic tradition, which can be found in *Sahih Muslim* in the *Book of Menstruation*, the Prophet Muhammad ﷺ explained the male and female reproductive substances mix.<sup>39</sup>
- The Qur'an further clarifies that the *nutfah* is a single entity or a drop from a larger group of its kind by stating that the *nutfah* comes from semen, *maniyyin* in Arabic:

Had he not been a sperm (*nutfah*) from a semen (*maniyyin*) emitted?<sup>40</sup>

- This perspective on the *nutfah* highlights how the intended use of this word is not to portray the meaning of semen but rather that it is a substance *from* semen. This supports the view that it is a single substance from a larger group of its kind. The classical exegete Ibn Kathir comments on this verse and clarifies that the *nutfah* is a substance from semen. He states:

meaning, was not man a weak drop of *nutfah* from a despised fluid known as semen.<sup>41</sup>

- Explaining its view on the word *nutfah*, the Qur'an in another verse elucidates how the human being is made from an extract of a 'liquid disdained' (semen):

Then He made his posterity out of the extract (*sulaalah*) of a liquid disdained.<sup>42</sup>

As previously discussed, the word *sulaalah* means an extract, something drawn out or the most subtle, purest and essential constituent. The above meanings and explications bring to light that the intended use of the word *nutfah* is a drop of a single extract, containing a specific substance like an egg or sperm, from the male semen and the female equivalent. Therefore, the word *nutfah* is not just another synonym for semen.

- The above view is supported by the Islamic scholarly tradition - which includes as Sa'id ibn Mansur, Ibn Abi Hatim and others - that maintain that there is something within the drop (*nutfah*) that is responsible for fertilisation and the genetic makeup of the embryo.<sup>43</sup>

- The companion of the Prophet Muhammad ﷺ, and the quranic exegete, Ibn Abbas, mentions that the *nutfah* is:

from a weak drop of the water/fluid of man and woman.<sup>44</sup>

Ibn Kathir, while commenting on the 2<sup>nd</sup> verse in chapter 76 of the Qur'an, cites Ibn Abbas as describing the *nutfah* stage as the mixing of two fluids, therefore confirming the statement above:

This means the fluid of the man and the fluid of the woman when they meet and mix.<sup>45</sup>

Ibn Abbas' above explanations seem to allude to the fact that the *nutfah* is just a fluid. Therefore, some commentators assert that this illustrates that the word *nutfah* is a synonym for the word semen. This assertion lacks a holistic understanding and it fails to take into account the other quranic verses and the Prophetic traditions referring to the *nutfah*. In the Prophetic traditions, when describing semen in context of its appearance and form, the words *mani* and *maniyyan* are used. This is consistent throughout various Prophetic traditions that can be found in the collections of Muslim, Nisai, Ibn Majah, Abu Dawud and Bukhari. For example, in the book of *Taharah* (purification) in the collection of Sunan at-Tirmidhi, Aisha (the wife of the Prophet ﷺ) narrates that she washed *maniyyan* from the Prophet's ﷺ garments.<sup>46</sup> If the whole corpus of exegetical material is used to form an accurate perspective on the word *nutfah*, Ibn Abbas' statement should be taken in the context of the *nutfah* being a specific drop of fluid from the semen and not the semen itself. This is because the Prophetic traditions use the words *mani* and *nutfah* in different contexts, and therefore clearly differentiate between the two terms, further highlighting that they are not synonyms. Additionally, the quranic verses pertaining to the word *nutfah* clearly mention that the *nutfah* is an extract from semen, and not semen itself.

- In addition to the above, the Qur'an mentions another meaning for the word *nutfah* by describing it as a combination of mingled (*al-amshaj*) substances: "We created man from a drop (*nutfah*) of mingled fluid."<sup>47</sup>

This verse, from a grammatical perspective, portrays an image of the *nutfah* as an entity made up of a combination of substances. The word *al-amshaj* (mingled) is a plural adjective and it is used here with the singular noun *nutfah*. Grammatically, this highlights the verse's concept of the *nutfah* as being a single entity or drop produced by a combination of substances coming from the mother and the father.

In light of this analysis, the word *nutfah* can mean a drop of fluid from the male and female that are extracts from a larger volume or group of its kind. It can also mean a single entity produce by a combination of drops from the semen and the female equivalent, which contain essential extracts or substances like a sperm (spermatozoon) or an egg (oocyte).

## **SCIENTIFIC INTERPRETATION**

The principles put forward by both the Qur'an and the Prophetic traditions coincide with what is known today of modern embryology. The *nutfah* stage specifically implies the process of fertilisation, which requires the 'mingling' of components from the father's semen and the mother's equivalent. These components form a single cell known as the zygote. In regard to this, embryologists John Allan and Beverley Kramer state:

The human individual arises from the conjugation of two minute structures called cells, one from the mother (oocyte) and one from the father (spermatozoon). These are called gametes. Together, these gametes form a single cell, the zygote, from which the entire embryo, including its surrounding membranes, grows.<sup>48</sup>

From a physiological perspective, each one of the two cell structures from both the mother and the father need to be contained in fluids necessary for fertilization. The spermatozoon is contained in fluid called semen,<sup>49</sup> and the oocyte is surrounded by follicular fluid which contains sex steroids, glycoprotein hormones, plasma proteins, mucopolysaccharides, and enzymes.<sup>50</sup> Interestingly, advancements in physiology concluded that the oocyte is coated in oviductal secretions required for its viability and fertilizability. Physiologists Bruce Koeppen and Bruce Stanton explain:

Oviductal secretions coat and infuse the cumulus-oocyte complex and may be required for viability and fertilizability.<sup>51</sup>

Thus, the analysis of the word *nutfah* as 'a single entity formed as a result of a combination of essential extracted substances that are contained in fluids necessary for fertilization (semen and follicular fluid)' corresponds with the description of the zygote's formation.

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## SUMMARY BOX

The *nuftah* stage: the formation of the zygote, via the mingling of two fluids from the mother and the father, which contains two small cell structures (the oocyte and the spermatozoon).

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## 3. IN A SAFE PLACE

فِي قَرَارٍ مَّكِينٍ

In a safe (*qaraarin*) place (*makeen*)

The next stage in the process of human development is *qaraarin makeen*. The word *qaraarin* means to make sedentary, to establish, to assign, to schedule, to determine, to stipulate, to regulate and to decide; and it carries the further meanings of to confirm, to establish and to affirm.<sup>52</sup> The word *makeen* has meanings that include to place, to put or set down firmly and to put in position.<sup>53</sup> The combination of these two words provide connotations of: in a safe place, in a place firmly fixed, in a safe lodging and in a firm resting place.

## SCIENTIFIC INTERPRETATION

The terms used by the Qur'an at this stage coincide with modern embryology. The zygote divides into a ball of cells with an outer shell to form the blastocyst. Studies in embryology assert that around the 6<sup>th</sup> day after fertilization, the blastocyst implants itself securely into the uterine wall. John Allan and Beverley Kramer explain the process of implantation:

Implantation begins at about the 6<sup>th</sup> to 7<sup>th</sup> day after fertilization. The part of the blastocyst projecting into the uterine cavity remains relatively thin. The syntrophoblast contains a proteolytic enzyme which causes destruction of the endometrial cells so that that the blastocyst sinks deeper and deeper into the uterine mucosa...The

final deficiency in the endometrium is sealed off by a blood or fibrin clot, overlying the blastocyst. This cover is called the operculum. By about 10 to 12 days after fertilization, the blastocyst is completely encased in the endometrium and thus, implantation is complete.<sup>54</sup>

The analysis of the words *qaraarin makeen*, reflect modern developments in embryology. The meanings offered by the combination of the words *qaraarin makeen* depict the blastocyst sinking 'deeper and deeper' and the sealing off of the endometrium with a 'fibrin clot' ensuring that the blastocyst is 'completely encased'.

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## SUMMARY BOX

The *qaraarin makeen* stage: the blastocyst sinking in the endometrium, being completely encased i.e. the process of implantation.

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## 4. A CLINGING FORM

ثُمَّ خَلَقْنَا النُّطْفَةَ عَلَقَةً

Then We made that drop of fluid into a clinging form (*‘alaqah*)

The Qur'an describes the next stage of the developing human embryo with the word *‘alaqah*. This word carries various meanings including: to hang, to be suspended, to be dangled, to stick, to cling, to cleave and to adhere. It can also mean to catch, to get caught, to be affixed or subjoined.<sup>55</sup> Other connotations of the word *‘alaqah* include a leech-like substance<sup>56</sup>, having the resemblance of a worm; or being of a 'creeping' disposition inclined to the sucking of blood. Finally, its meaning includes clay that clings to the hand, blood in a general sense and thick, clotted blood - because of its clinging together.<sup>57</sup> This view (that *‘alaqah* means clotted blood - because of its clinging together) is supported by Ibn Kathir, as he explains the word to mean a "dangling clot".<sup>58</sup>

## SCIENTIFIC INTERPRETATION

As defined by modern embryology, the myriad of meanings for the word *‘alaqah* correspond to various stages of the embryo’s development. Comparisons can be drawn between quranic and scientific depictions of the embryo’s appearance and its relationship with the womb. According to modern embryology, from day 15, the embryo is hanging or suspended via the ‘connecting stalk’ [see **Figure 1**] and it obtains nutrients through contact with the maternal blood vessels. This description bears a striking resemblance to the picture painted by the word *‘alaqah* – a ‘hanging’ or ‘suspended’ substance, obtaining nutrients from its host’s blood. Following this, during the 4<sup>th</sup> week, two processes occur: when the cranial and caudal ends of the neural tube close, known as neurulation; and the initial stages of the folding of the embryo. It is upon the culmination of these two processes that the embryo resembles a leech-like form suggested by the word *‘alaqah* – a creeping, leech or worm-like substance [see **Figure 2, 3 and 4**]. Another perspective on the embryo’s external features is that it resembles that of a blood-clot. Although the word *‘alaqah* means clotted blood in the sense that it clings, some classical linguists indicate that it can also refer to a blood-clot in its exact meaning. This perspective correlates with the development of the primary cardiovascular system and the fact that blood does not circulate until the end of third week [see **Figure 5**].

Below is a correlation of the following meanings of the word *‘alaqah* and modern embryology:

- Hanging/suspended
- Suckling blood
- Leech/worm like substance
- Blood-clot

## HANGING/SUSPENDED

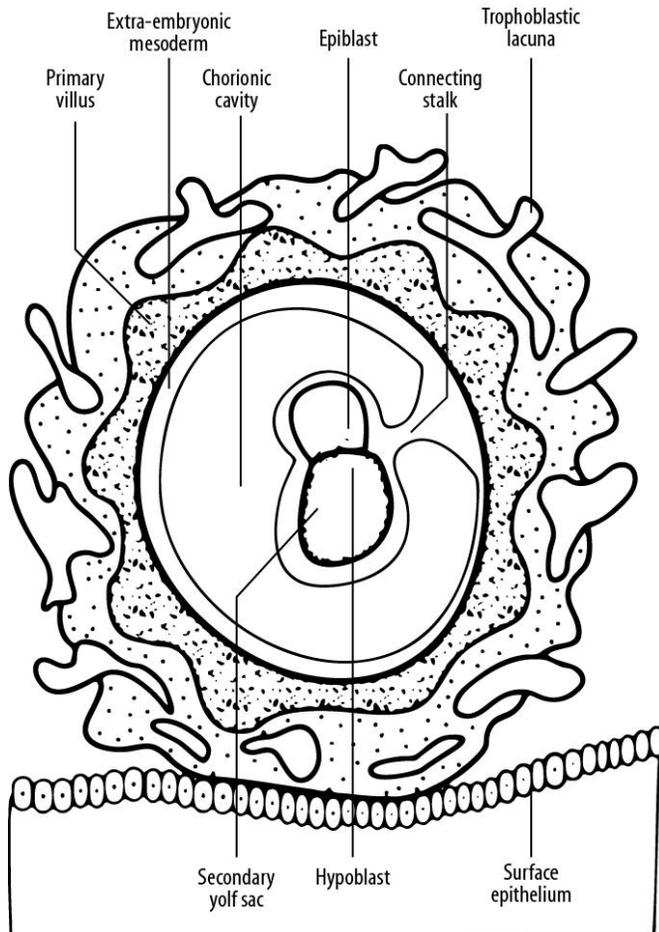
### THE CONNECTING STALK SUSPENDING THE EMBRYO

Embryologists Barry Mitchell and Ram Sharma explain the ‘hanging’ or ‘suspended’ aspects of the *‘alaqah* stage. They describe the embryo as being:

connected to the cytotrophoblast by a connecting stalk of extra-embryonic mesoderm (primitive connective tissue). The stalk is the forerunner of the umbilical cord.<sup>59</sup>

Interestingly John Allan and Beverley Kramer use the word “suspend” to describe the role of the connecting stalk:

Cavitation of the extra-embryonic mesoderm does not occur at the connecting stalk which remains intact to suspend the developing embryo in the extra-embryonic coelom.<sup>60</sup>



*Figure 1 shows the embryo connected to the cytotrophoblast via a connecting stalk, as if it were hanging or suspended.*

## **SUCKLING BLOOD**

### **OBTAINING NUTRIENTS VIA BLOOD VESSELS**

With regard to the way the embryo obtains its nutrients through contact with the maternal blood vessels, Barry Mitchell and Ram Sharma write:

Due to the rapid growth of the embryo during the second week, there is a need for a more efficient means of nutritional and gaseous exchange. This is achieved when the embryonic blood vessels of the chorion come into contact with the maternal blood vessels of the decidua.<sup>61</sup>

... [by the third week]... The exchange of nutrients, respiratory gases and waste products between the maternal and fetal blood takes place across the placental membrane within intervillous spaces. Maternal blood enters these spaces from the spiral arteries, branches of the uterine artery, bringing nutrients and oxygen for the embryo and fetus.<sup>62</sup>

This reinforces the validity of the meanings of *‘alaqah*, and its evoking images of an entity obtaining its nutrients via blood.

## **LEECH/WORM-LIKE SUBSTANCE**

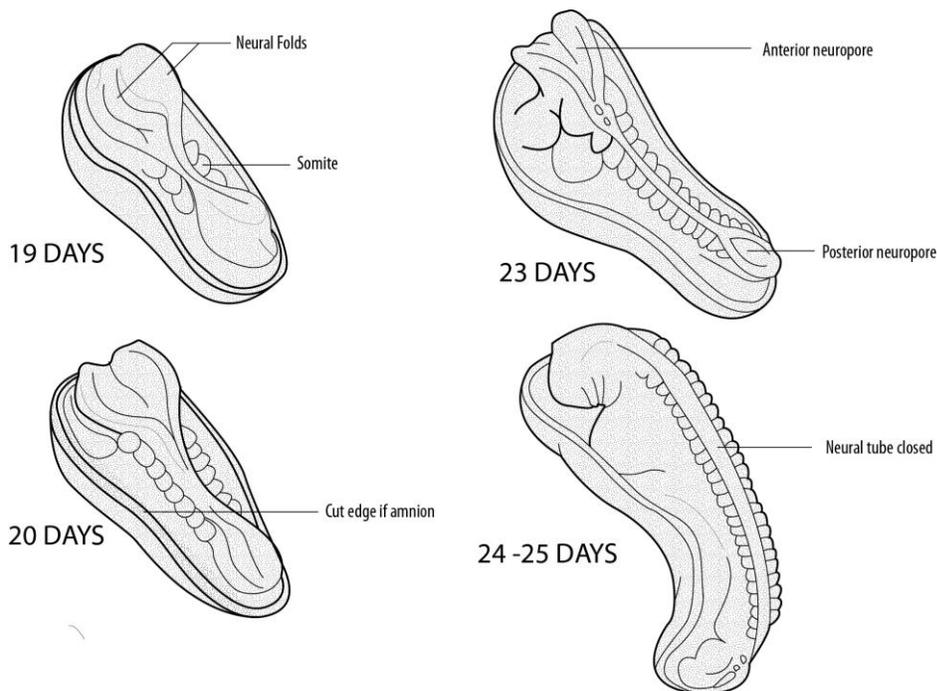
### **NEURULATION & THE FOLDING OF THE EMBRYO**

The *‘alaqah* stage suggests the process of neurulation and the initial stages of the folding of the embryo. Neurulation describes the process when the cranial and caudal ends of the neural tube close from days 19 to 25 (approx.); and the folding of the embryo involves the head and the tail being brought closer together. The combination of these two physiological changes causes the embryo to resemble a leech or worm-like substance.

## NEURULATION

At the end of neurulation the cranial and caudal ends of the neural tube close. The embryo at this point becomes leech or worm-like in appearance<sup>63</sup> [see **Figure 2**]. Barry Mitchell and Ram Sharma explain the process of neurulation:

At about 19 days, at the cranial end of the primitive streak, the underlying mesoderm and notochord induce the ectoderm to form the neural plate, which rounds up to form the neural folds. The neural plate enlarges initially at the cranial end. At 20 days, the neural plate in the mid-region of the embryo remains narrowed, but it expands at the caudal end. The plate deepens to form the neural groove from which the neural tube forms. The cranial and caudal ends of the tube are open and are known as the anterior and posterior neuropores; these eventually close.<sup>64</sup>

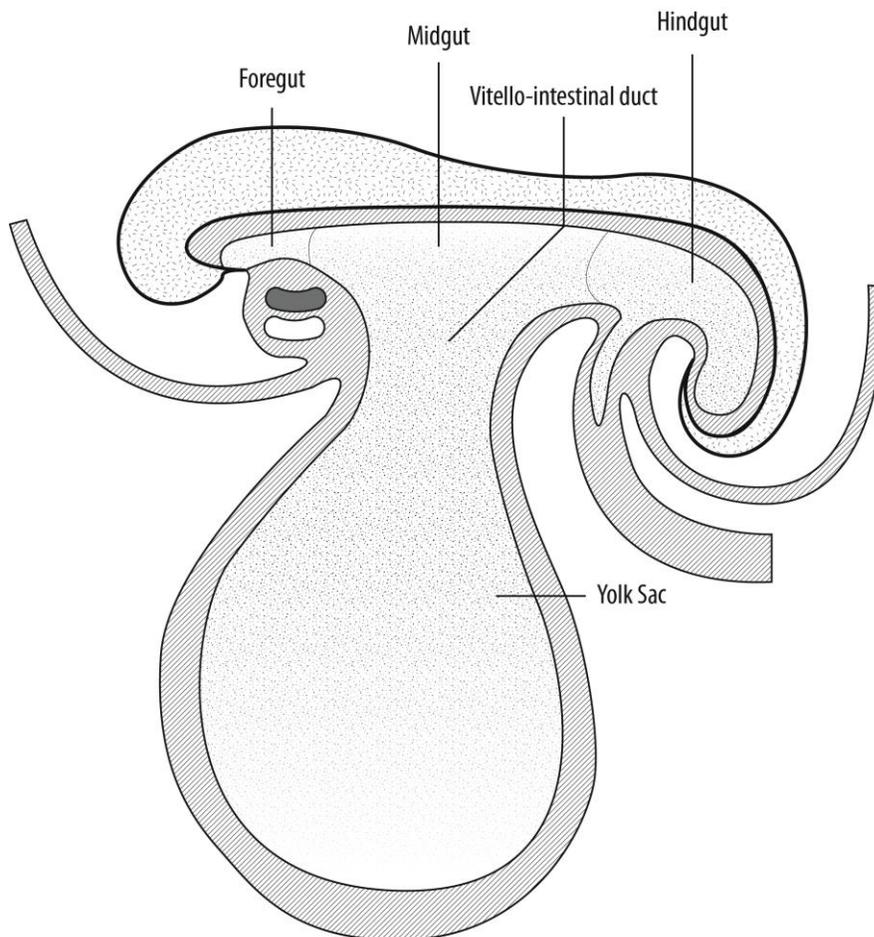


**Figure 2** shows the process of neurulation. At the end of neurulation (24-25 days) the cranial and caudal ends of the neural tube close. The embryo, at this point, becomes leech-like or worm-like in appearance.

## FOLDING OF THE EMBRYO

The folding of the embryo is also responsible for forming a leech or worm-like shape [see *Figure 3*], or as embryologists have described; a cylindrical or tube-like structure. Embryologists Keith Moore and T. V. N. Persaud suggest that a:

significant event in the establishment of body form is the folding of the flat trilaminar embryonic disc into a somewhat cylindrical embryo. Folding results from the rapid growth of the embryo, particularly the brain and the spinal cord.<sup>65</sup>



*Figure 3* shows the folding of the embryo where the head and tail are brought closer together. This process is also responsible for forming the leech-like or worm-like appearance of the embryo.

The tube-like or leech-like structure [see **Figure 4**], as explained by Barry Mitchell and Ram Sharma, is due to:

longitudinal folding, which occurs between days 21 and 24, result[ing] in ... the embryo [bending] so that the head and tail are brought closer together...[to] form a tube-like structure.<sup>66</sup>



A. Embryo at 24-25 days



B. Leech or bloodsucker



C. Embryo at 26-30 days

**Figure 4** various visual representations of the human embryo at 24 - 30 days: [A] shows a lateral view of an embryo (size 2.5-3.0mm) at days 24 to 25. (Modified from Moore & Persaud: *The Developing Human 8th Edition*) [B] *Hirudo medicinalis*, medicinal leech (modified from *The Human Body. The Incredible Journey from Birth to Death*, © BBC Worldwide Ltd, 1998) [C] Scanning electronmicrograph of an embryo at week 4, 26 - 30 days. (Professor Kathy Sulik, The University of North Carolina). Note how the human embryo looks like a leech or worm at this stage.

## **CONFIRMATION FROM SCIENTISTS AND EMBRYOLOGISTS**

Supporting the above view that the embryo resembles a worm or leech-like substance, scientists and embryologists have confirmed this depiction of the embryo by describing it as a “leech” and a “worm”. For instance, Dale Layman in *Anatomy Demystified* describes the embryo as worm-like in appearance:

Another membrane becomes the yolk sac, which provides nourishment for the early embryo. By 24 days, a connecting stalk appears in the middle of the now worm-like body.<sup>67</sup>

Keith Moore concludes:

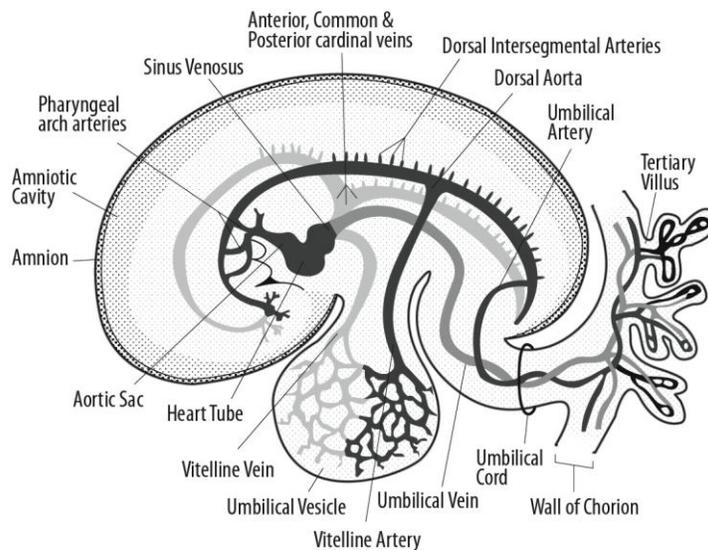
The human embryo is truly leech like.<sup>68</sup>

## **BLOOD-CLOT**

### **THE DEVELOPMENT OF THE PRIMARY CARDIOVASCULAR SYSTEM AND THE LACK OF BLOOD CIRCULATION UNTIL THE END OF THE THIRD WEEK**

The development of the primary cardiovascular system is responsible for the blood-clot like external features of the embryo. By the end of the third week, the heart of the embryo connects with its blood vessels, the connecting stalk, the chorion and the yolk sac. It is during this period that the blood starts to circulate. Before this time the blood is fluid but does not move around the embryo. This resembles the physical description of a blood-clot. Keith Moore and P. V. N. Persuad explain:

The heart and great vessels form from mesenchymal cells in the heart primordium-cardiogenic area. Paired, endothelium-lined channels-endocardial heart tubes-develop during the third week and fuse to form a primordial heart tube. The tubular heart joins with blood vessels in the embryo, connecting stalk, chorion, and umbilical vesicle [yolk sac] to form a primordial cardiovascular system. By the end of the third week, the blood is circulating, and the heart begins to beat on day 21 or 22.<sup>69</sup>



**Figure 5** the development of the primary cardiovascular system. Notice how the embryo looks like a blood-clot.

## SUMMARY BOX

The *‘alaqah* stage:

- The embryo is connected to the cytotrophoblast via a connecting stalk, as if it were hanging or suspended.
- It is upon the culmination of two processes - neurulation and the folding of the embryo - that the embryo appears worm or leech-like.
- The embryo obtains its nutrients via contact with the maternal blood vessels. This mirrors the action of an entity obtaining its nutrients via blood.
- The external features of the embryo resembles a blood-clot, this is due to the formation of the primary cardiovascular system and the lack of blood circulation until the end of the third week.

## MISREPRESENTING THE EMBRYO'S APPEARANCE?

Contemporary commentators argue the embryo only looks leech-like when the yolk sac is removed, therefore the *‘alaqah*'s description is a misrepresentation of the embryo's appearance at this stage. This contention is misplaced as embryologists consider the yolk sac (also known as the umbilical vesicle) to be an extra-embryonic feature and explain that the yolk sac is formed by extra-embryonic endodermal cells.<sup>70 71</sup> This fact disproves claims of misrepresentation as the yolk sac is not an internal feature of the embryo even though the yolk sac plays a significant role in the transfer of nutrients and the development of the primordial gut.<sup>72</sup> When the relationship between the embryo and the yolk sac has been described by embryologists, terminology has been used indicating it is an external embryonic feature. For instance, embryologist Bruce Carlson in his book *Human Embryology and Developmental Biology* includes the yolk sac under the chapter "Placenta and Extra-embryonic membranes"<sup>73</sup>, therefore implying that it is external to the embryo's main body form. E. Jauniaux, D. Jurkovic, Y. Henriot, F. Rodesch and J. Hustin in their article *Development of the Secondary Human Yolk Sac: Correlation of Sonographic and Anatomical Features* refer to the yolk sac and embryo as having a "dependence" and a "relationship" highlighting the view that the yolk sac is an extra-embryonic feature:

Because of the close dependence between the embryo and the secondary yolk sac, it has been suggested that impairment of this relationship could affect normal embryonic development.<sup>74</sup>

Another example to highlight how some embryologists describe the yolk sac as an external embryonic feature is the yolk sac's role in developing the primordial gut. Embryologists Keith Moore and T. V. N. Persaud write:

During the fourth week, the dorsal part of the umbilical vesicle [yolk sac] is incorporated into the embryo as a primordial gut.<sup>75</sup>

The incorporation of the yolk sac into the embryo indicates that the yolk sac is not an internal embryonic feature. A final example to illustrate that the yolk sac is considered as an extra-embryonic feature is how embryologists consider the yolk sac as being attached to the embryo. Bruce Carlson writes:

By 12 to 13 days, the primary yolk sac collapses leaving a smaller secondary yolk sac attached to the embryo.<sup>76</sup>

On a final note, even if the yolk sac is considered as part of the embryo, it doesn't undermine what the Qur'an intends to portray. This is because even with the yolk sac, the embryo still looks worm or leech-like but with the appearance of it sucking or being attached to an external substance [see *figure 3*].

## 5. A LUMP OF FLESH

فَخَلَقْنَا الْعَلَقَةَ مُضْغَةً

*and then We made that form into a lump of flesh (mudghah)*

The next stage of human development defined in the Qur'an is *mudghah*. This term means to chew, mastication, chewing, to be chewed, and a small piece of meat.<sup>77 78</sup> It also describes the embryo after it passes to another stage and becomes flesh.<sup>79</sup> Other meanings include something that teeth have chewed and left visible marks on; and marks that change in the process of chewing due to the repetitive act.<sup>80</sup> The *mudghah* stage is elaborated on further, elsewhere in the Qur'an:

then from a fleshy lump (*mudghah*), formed and unformed.<sup>81</sup>

The Arabic word used here for 'formed' is *mukhallqah* which can also mean 'shaped' or 'moulded'.<sup>82</sup>

## SCIENTIFIC INTERPRETATION

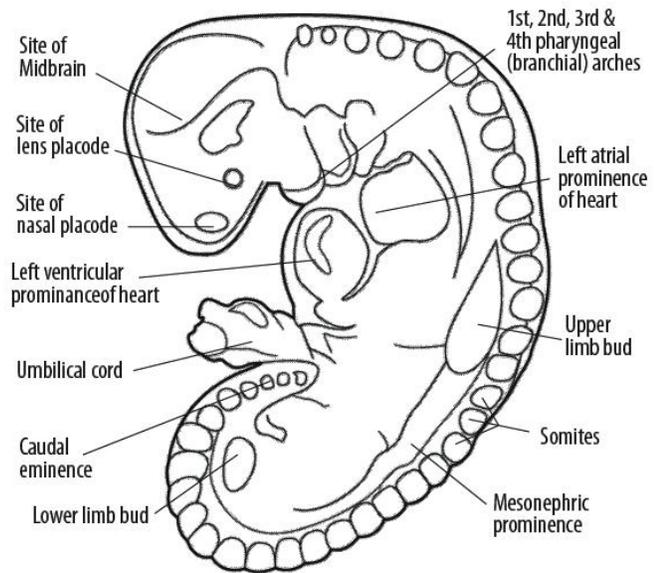
Taking a lexical approach to the interpretation of the word, this stage deals with the 4<sup>th</sup> week, when somites begin to develop and shift their position to surround the neural tube and notochord. The appearance of the embryo at this stage corresponds with the meaning: 'to be chewed' and 'something that teeth have chewed and left visible marks on' [see *Figures 6 and 7*]. Concerning somite development, embryologist T. W. Sadler writes:

When somites first form from presomitic mesoderm, they exist as a ball of mesoderm (fibroblast-like) cells. These cells then undergo a process of epithelization and arrange themselves in a donut shape around a small lumen. By the beginning of the fourth week, cells in the ventral and medial walls of the somite lose their epithelial characteristics, become mesenchymal (fibroblast-like) again, and shift their position to surround the neural tube and the notochord. Collectively, these cells form the sclerotome that will differentiate into the vertebrae and ribs.<sup>83</sup>

Another meaning for the word *mudghah* includes something looking like a morsel of flesh. This too is an accurate description of the embryo's appearance at this stage. Interestingly, the quranic explanation of *mudghah* as being "formed and unformed", can refer to the organogenetic period, during which all the main organs have begun to develop but are not yet fully formed.<sup>84</sup> This period also occurs at around the 4<sup>th</sup> week.

## **A CHEWED SUBSTANCE?**

An argument raised by critics concerning the *mudghah* stage is that a chewed piece of meat or a lump of flesh does not resemble the embryo at any stage described by modern embryology. In responding to this, it is necessary to clarify what constitutes a 'chewed piece of flesh'. It includes, not just mastication, but also something being chewed just once. This maintains the meaning of the word *mudghah* as the *bite marks* do resemble a piece of meat chewed once. This is highlighted by its other meaning: 'something that teeth have chewed and left visible marks on'.



**Figure 6** somites begin to develop and shift their position to surround the neural tube and notochord. Notice how with this lateral image and diagram of the embryo resembles something that has been chewed or a substance that teeth have left visible marks.



**Figure 7** a lateral view of the embryo at 26 - 30 days (4<sup>th</sup> week). Notice how the image above has teeth like marks on the notochord.

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## SUMMARY BOX

The *mudghah* stage:

- The development of somites giving the embryo the appearance of a chewed substance.
  - What looks like a morsel of flesh - an accurate description of embryo's appearance at this stage.
  - It also describes the organogenetic period (the development of organs, not yet fully formed).
- 

## 6. BONES

فَخَلَقْنَا الْمُضْغَةَ عِظَامًا

and *We made that lump into bones* (*‘idhaam*)

The next stage in embryonic development (according to the Qur’an) is the creation of *‘idhaam* from the *mudghah* stage. The word *‘idhaam* in the Arabic language means bone, and is specifically applied to the bones of the hands and feet, or of the arms and legs of an animal, “upon which is the flesh”.<sup>85</sup>

## SCIENTIFIC INTERPRETATION

The *‘idhaam* stage pertains to the development of the axial and limb skeleton, occurring around the 5<sup>th</sup> week. Barry Mitchell and Ram Sharma explain:

The origin of mesenchymal cells forming the skeletal tissues varies in different regions of the body. Mesenchymal cells forming the axial skeleton arise from the mesodermal somites, whereas the bones of the appendicular skeleton are derived from the somatopleuric

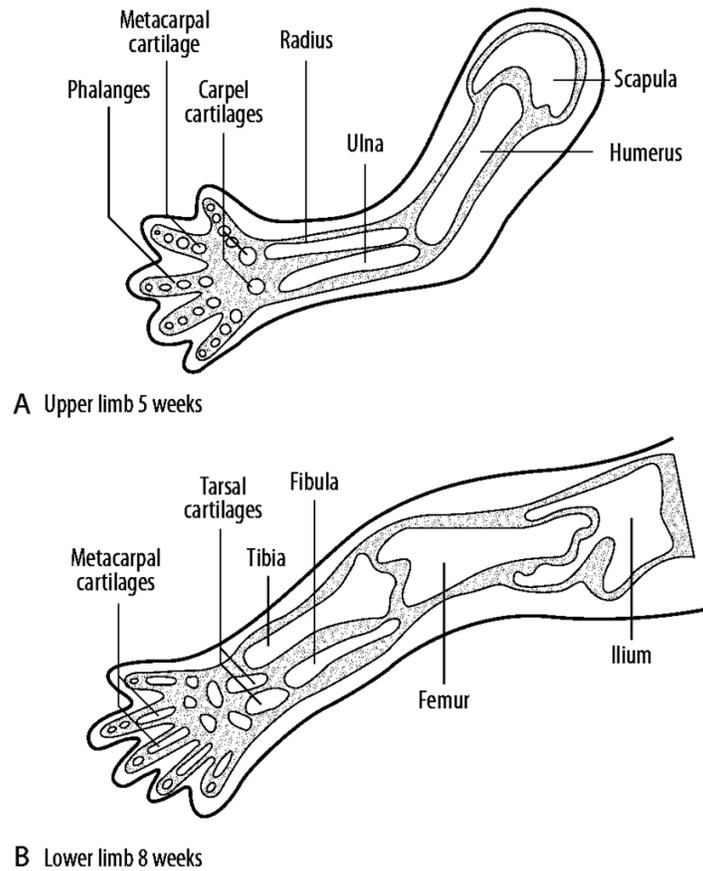
mesenchyme of the lateral plate mesoderm. After reaching their destination the mesenchymal cells condense and form models of bones. The subsequent differentiation of mesenchymal cells into chondroblasts or osteoblasts is genetically controlled.<sup>86</sup>

'Limb bones' is the specified meaning of the word *cidhaam*, and therefore can refer to the development of the limb buds which give rise to the development of the limbs and the appendicular skeleton. Barry Mitchell and Ram Sharma elaborate on the formation of the limb and appendicular skeleton:

The appendicular skeleton consists of limb girdles and the bones of the limbs. The bones of the appendicular skeleton develop from mesenchymal condensations which become cartilaginous models.<sup>87</sup>  
[See **Figure 8**]

John Allan and Beverley Kramer also comment on limb bone formation:

The limb mesenchyme is at first a homogenous mass but soon condensations occur in it and these chondrify to form cartilaginous models of the various bones. Each cartilage model is surrounded by perichondrium which is a condensation of mesenchyme. An ossific centre (primary ossification centre) is formed upon each cartilage model by the ingrowth of osteoblasts (bone-forming cells) from the surrounding mesenchyme. The surrounding mesenchyme is now termed periosteum (surrounding the bone). Osteoblasts now produce bone which give rise to the skeletal elements of the limbs.<sup>88</sup>



**Figure 8** the development of limb bone.

There are clear parallels between the quranic *‘idhaam* stage and the view modern embryology takes i.e. the development of the axial, limb and appendicular skeleton.

## SUMMARY BOX

The *‘idhaam* stage: the formation of the axial, limb and appendicular skeleton.

## FROM A LUMP TO BONES?

A common misconception, usually made by those unfamiliar with Arabic, is that this verse can be literally translated as “and We made that lump into bones”. From this, they conclude that this verse is unscientific because a lump of flesh cannot turn into a mass of bones. However, this is based upon a crude understanding of Arabic grammar and the Qur’an’s eloquence. This verse, from a grammatical perspective, has the meanings of: “and We made *of/from/out of* the lump, bones”.

This is why the Indian Islamic scholar Yusuf Ali translates this verse as “then we made out of that lump bones”; M. H. Shakir translates it as “then We made (in) the lump of flesh bones”;<sup>89</sup> and the British scholar of Arabic and Islamic studies A. J. Arberry, in his translation of the Qur’an which is still used by academics today, translates this verse as “then We created of the tissue bones”.<sup>90</sup>

## NOT REAL BONES?

Another contention from commentators is that at this stage there are no real bones. It is argued that the apparent bones are mere cartilage as ossification is incomplete and, therefore, the Qur’an is inaccurate. They further assert that the Arabic term for cartilage, *ghurdoof*<sup>91</sup> should have been used instead of *‘idhaam*. Although a valid contention, it is misplaced. The Arabic word for cartilage refers to a type of cartilage that is not a precursor to bones, but rather remains as flexible connective tissue. It is, according to *Lane’s Arabic-English Lexicon*:

any soft bone, such as is, or may be eaten and [i.e. the soft or cartilaginous, part,] the firm part that is harder than flesh and softer than bone, of the nose.<sup>92</sup>

Conversely, the word *‘idhaam* encompasses the cartilaginous form of the bones as the skeletal framework is put in place. Furthermore, the use of the word *‘idhaam* is more accurate because it also carries the meaning of “bone, but properly applied to the bones of the hands and feet, or of the arms and legs, of an animal, upon which is the flesh.”<sup>93</sup> Since flesh - in other words muscles and tendons - is subsequently formed around the limb bones of the developing human, the use of the word *‘idhaam* is more apt as it encompasses the description of limb bones that have flesh upon them (see next stage).

Additionally, the process of ossification begins by the 8<sup>th</sup> week,<sup>94</sup> and continues on after birth. The ossification process completes around puberty. Barry Mitchell and Ram Sharma explain:

The centres of ossification first appear in the limb bones during the eighth week. By the twelfth week, the shafts of the limb bones are ossified, though the carpal bones of the wrist remain cartilaginous until after birth. The ossification of the three largest tarsal bones of the ankle begins about 16 weeks, but some of the smaller tarsal bones do not ossify until 3 years after birth.<sup>95</sup>

From this perspective, it would be a medical absurdity to assume newborns or young teenagers do not have bones simply because they require ossification, especially since ossification completes at the end of the growth-spurt of puberty. Nevertheless, if this were the case, and we were to consider this stage as being 'boneless', the connotations of the word *'idhaam* allow for an all-encompassing interpretation because the "cartilaginous models of the various bones"<sup>96</sup> are included in its meaning.

## 7. WE CLOTHED THOSE BONES WITH FLESH

فَكَسَوْنَا الْعِظْمَ لَحْمًا

*We clothed (kawsana) the bones with flesh (lahm)*

The next stage in the quranic description of the development of the human embryo is clothing the bones with flesh. The word *kasauna* means: to clothe, to dress, to garb and to attire. It also carries the meanings of: to hang, to drape, to face, to line and to case. Further interpretations of the word include: to encase, to cover, to put, to slip and to give the appearance of and make look like.<sup>97</sup> The word *lahm* means flesh, meat, or a piece of flesh or meat.<sup>98 99</sup>

## SCIENTIFIC INTERPRETATION

The words used in the Qur'an to describe this stage are remarkably consistent with modern embryology. The word *kasauna* denotes the migration and aggregation of the myoblasts

which organise into dorsal and ventral muscles muscle masses surrounding the developing skeleton. These physiological developments are illustrated by the meanings that *kasauna* carries, such as: to clothe, to dress, to encase and to cover. The word *lahm* is not just limited to the limb muscles but also applies to the muscles masses surrounding the axial skeleton.

Barry Mitchell and Ram Sharma elucidate the process of muscle formation over the developing limb skeleton:

The limb muscles differentiate from myoblasts in the proximal part of the limb bud, and soon receive their innervations from the ventral rami of the spinal nerves. The myoblasts then migrate distally and soon become organized into a dorsal and ventral muscles mass surrounding the developing skeleton, carrying their innervations with them.<sup>100</sup>

John Allan and Beverley Kramer confirm how limb muscles are formed:

Soon after the cartilaginous models of the bones have been established, the myogenic cells, which have now become myoblasts, aggregate to form muscle masses on the ventral and dorsal aspects of the limbs. These muscle masses, the relevant compartments, form the flexors and extensors of the joints. Rotator muscles are also formed so that flexors and pronators are related and extensors and supinators are related.<sup>101</sup>

The process of muscular formation is not just limited to the limbs. Once the skeletal framework is in place, muscles start to form around the developing skeleton. For example, Bruce Carlson highlights how the facial musculature forms once the basic facial skeletal structure takes place.<sup>102</sup>

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## SUMMARY BOX

The *kasana* and *lahm* (the key words in this stage): the migration and aggregation of the muscles cells around the developing limb and axial skeleton, to form muscles, tendons and connective tissue.

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## WHY USE FLESH AND NOT MUSCLE?

Critics of the quranic description of the developing human embryo maintain that the word *lahm* (flesh) is not the most accurate word to use and the word *adlat* (muscle) is more appropriate. This contention is insubstantial because the word *lahm* is far more comprehensive as it includes muscle and other aspects of flesh such as tendons and connective tissue in its meaning, all of which are involved at this stage. John Allan and Beverley Kramer explain:

Ultimately, the muscles and tendons become attached to the bony structures so that they can produce their actions across the joints.<sup>103</sup>

This statement proves that using *adlat* (muscle) in reference to this stage is imprecise. It is only the word *lahm* (flesh), used by the Qur'an, that carries sufficient comprehensiveness in its meaning to describe what occurs in this stage.

## WHAT WAS CREATED FIRST, BONES OR FLESH?

Commentators on the quranic description of the developing human embryo claim the Qur'an portrays an inaccurate succession of events with regards to the bones and the clothing of the flesh. They declare that bone and muscle formations occur simultaneously, and that the Qur'an uses the connective particle *fā*, which in the context of the verse, indicates a quick succession of one thing happening after the other. For instance the Qur'an says "We made that lump into bones, and (*fā*) We clothed those bones with flesh".

This view represents a misunderstanding of the linguistic context of the verse. The Qur'an's use of the particle *fā* is not in the context of creating; rather, it is in the context of clothing

the bones with flesh. The Qur'an does not specify when the flesh (or muscles) were formed; it only specifies when the clothing of the limb bones with flesh happens. This, as John Allan and Beverley Kramer explain, is straight after:

Soon after the cartilaginous models of the bones have been established, the myogenic cells, which have now become myoblasts, aggregate to form muscle masses on the ventral and dorsal aspects of the limbs.<sup>104</sup>

A significant clarification to make is that this contention, incorrect as it is, is also not based on a consensus amongst embryologists. According to many embryologists limb bone and muscle formation are not simultaneous. For example embryologist Bruce Carlson confirms that the limb bones are formed before the limb muscles:

The skeleton is the first major tissue of the limb to show overt signs of differentiation.<sup>105</sup>

## 8. WE MADE HIM INTO OTHER FORMS

ثُمَّ أَنشَأْنَاهُ خَلْقًا آخَرَ

*Then we made him into other (akhara) forms (khalqan)*

The word *khalqan* means to shape, to form and to mold. It also means to make, to create and to originate.<sup>106</sup> The word *akhara* means another or one more.<sup>107</sup> Al-Razi quotes the companion of the Prophet ﷺ, and quranic exegete, Ibn Abbas that “other forms” signifies all various types of growth including foetal, infancy, and childhood.<sup>108</sup>

## SCIENTIFIC INTERPRETATION

The terms used in the Qur'an to describe the final process correspond to modern embryology. From the 8<sup>th</sup> week to the end of pregnancy the period of growth and enlargement occurs, during which the baby begins to form human-specific aesthetic features. This is usually called the fetal stage. The baby's 'shape' develops from indistinguishable to

being 'molded' and 'made to look like' the human 'form'. Barry Mitchell and Ram Sharma convey this stage of growth:

The period of time from the end of week 8 to full term (38 weeks) is a phase of growth and enlargement (the fetal period).<sup>109</sup>

T. W. Sadler confirms that this stage is where the embryo becomes more human looking and is characterised by rapid growth:

The period from the beginning of the ninth week to birth is known as the fetal period. It is characterized by maturation of tissues and organs and rapid growth of the body...During the third month, the face becomes more human-looking.<sup>110</sup>

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## SUMMARY BOX

The *khalqan akhara* stage: the end of the embryonic stage, and the beginning of a new phase of growth where the embryo is characterised as more human-looking.

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## DID THE PROPHET PLAGIARISE ANCIENT GREEK EMBRYOLOGY?

Commentators assert that the quranic view on human development was plagiarised from Hellenic embryology. They specifically claim that the Prophet Muhammad ﷺ plagiarised the works of the ancient Greek philosopher and polymath Aristotle, and the 2<sup>nd</sup> century physician and philosopher Galen. To respond to this accusation, this section will articulate the mainstream Islamic scholarly position that the Prophet ﷺ did not plagiarise or borrow ideas from Hellenic medicine.

## DOES SIMILARITY IMPLY PLAGIARISM?

To address the contention that the Prophet Muhammad ﷺ borrowed or plagiarised Hellenic views on embryology, the philosophical implications of inferring plagiarism from similarity must be discussed. If there is a similarity between two things X and Y, to make the inference that X copied Y, or Y copied X would require some form of evidence. Otherwise, the argument will be fallacious as it will commit the fallacy of *argumentum ad ignorantiam*, in other words, arguing from ignorance. Take the following example into consideration: there are two patent applications that have arrived at the patent office in the UK. The patent officer examines both applications and they appear to have a similar design for a particular product. Can the patent officer claim plagiarism? No. To justify this claim the patent officer would require a practical link establishing a connection between both authors of the patents in question. In absence of a practical link, the assertion that they copied each other is speculative and untenable. This also applies to the assertion that the Prophet ﷺ plagiarised Hellenic embryology.

In light of the above, practical links establishing a valid connection between the Qur'an and Hellenic embryology must be specific and direct. Non-direct evidence, such as an assumed popularised culture of Hellenic embryology, is not enough to prove borrowing or plagiarism. An inference made from such an assumption is weak unless all other possible explanations have been shown to be wrong or explained as improbable. For example, historians claim that there was some cultural exchange between the Greeks, Romans and Arabs. Evidence to support such a claim includes trade routes, the practice of cupping and cauterisation. However, from this evidence, can the inference that the Prophet ﷺ borrowed Hellenic views on embryology be made? The structure of the argument can be presented in the following way:

1. There were some cultural exchanges between Arabs and Greeks
2. The Prophet ﷺ was an Arab
3. Therefore the Prophet ﷺ plagiarised Hellenic views on embryology

Based on the above, how does the conclusion (point 3) logically follow? For the commentators to claim that the Prophet ﷺ plagiarised Hellenic embryology based on the above argument is unwarranted. This is due to the fact they have assumed some hidden premises. These premises include:

- a. The Prophet ﷺ learned Hellenic embryology from someone who studied Greek medicine.
- b. Hellenic medicine was known, adopted and utilised by Arabian (or Arabic speaking) society in the early 7<sup>th</sup> century.

- c. The Prophet ﷺ was a liar, as he claimed the Qur'an to be the word of God and not the borrowed knowledge of Hellenic embryology.
- d. Hellenic and quranic views on embryology are similar.

These premises will be addressed below to provide a strong case against the plagiarism thesis.

## **DID THE PROPHET LEARN HELLENIC MEDICINE FROM SOMEONE WHO STUDIED GREEK MEDICINE?**

According to the various biographies of the Prophet Muhammad ﷺ, the only person who may have studied Greek medicine and came into direct contact with the Prophet ﷺ was the physician al-Harith bin Kalada. Bin Kalada was born in the middle of the 6<sup>th</sup> century in the tribe of Banu Tha'if in Ta'if. Some historians maintain that he received his medical education at the Jundishapur medical school where he learnt the teachings of Aristotle and Galen.<sup>111</sup> According to these historians:

The major link between Islamic and Greek medicine must be sought in late Sasanian medicine, especially in the School of Jundishapur rather than that of Alexandria. At the time of the rise of Islam, Jundishapur was at its prime. It was the most important medical centre of its time, combining the Greek, Indian and Iranian medical traditions in a cosmopolitan atmosphere which prepared the ground for Islamic medicine.<sup>112</sup>

Following this narrative, some historians and commentators believe the Prophet ﷺ plagiarised Aristotelian and Galenic accounts of the developing human embryo via bin Kalada, and sought medical advice from him.<sup>113</sup> This is unfounded for various reasons:

1. Claiming the Prophet ﷺ sought medical advice from bin Kalada neither implies nor stipulates the fact that he copied bin Kalada's apparent knowledge of Hellenic embryology. The onus of proof is on the one who is making the claim. From a historical perspective, there is no direct and explicit evidence that indicates the Prophet ﷺ manufactured his views on embryology via bin Kalada.
2. It is generally believed that bin Kalada graduated from the Persian medical school at Jundishapur. However, the existence of such a school has recently been questioned by a

number of leading historians. For instance, the historian David C. Lindberg in his book, *The Beginnings of Western Science*, highlights the legendary status of the school:

An influential mythology has developed around Nestorian activity in the city of Gondeshapur [Jundishapur] in south-western Persia. According to the often-repeated legend, the Nestorians turned Gondeshapur into a major intellectual center by the sixth century, establishing what some enthusiasts have chosen to call a university, where instruction in all of the Greek disciplines could be obtained. It is alleged that Gondeshapur had a medical school, with a curriculum based on Alexandrian textbooks, and a hospital modeled on Byzantine hospitals, which kept the realm supplied with physicians trained in Greek medicine. Of greatest importance, Gondeshapur is held to have played a critical role in the translation of Greek scholarship into Near Eastern languages and, indeed, to have been the single most important channel by which Greek science passed to the Arabs. Recent research has revealed a considerably less dramatic reality. We have no persuasive evidence for the existence of a medical school or a hospital at Gondeshapur, although, there seems to have been a theological school and perhaps an attached infirmary. No doubt Gondeshapur was the scene of serious intellectual endeavour and a certain amount of medical practice—it supplied a string of physicians for the Abbasid court at Baghdad beginning in the eighth century—but it is doubtful that it ever became a major center of medical education or of translating activity. If the story of Gondeshapur is unreliable in its details, the lesson it was meant to teach is nonetheless valid.<sup>114</sup>

Roy Porter, a social historian of medicine, raises the contention about whether a medical school actually existed there. Porter in his book, *The Greatest Benefit to Mankind: A Medical History of Humanity*, writes:

Jundishapur was certainly a meeting place for Arab, Greek, Syriac and Jewish intellectuals, but there is no evidence that any medical academy existed there. Only in the early ninth century did Arab-Islamic learned medicine take shape.<sup>115</sup>

According to the academic medic and historian Plinio Prioreschi, there appears to be no evidence of a major medical school in either the 6<sup>th</sup> or 7<sup>th</sup> century. In his book, *A History of Medicine*, he brings to light that there are no Persian sources that substantiate the claim that Jundishapur played a significant role in the history of medicine.<sup>116</sup> It is also interesting to note, that from the 5<sup>th</sup> to the 7<sup>th</sup> century, Jundishapur does not seem to have any other students that can be authenticated historically. This raises an important question: how is it that such a noted and reputable ancient academic institution has no known students?

3. Historians such as Manfred Ullman and Franz Rosenthal are skeptical about the material referring to bin Kalada. They refer to him as a legendary figure,<sup>117</sup> which has literary allusions to characters of fictitious creation. Professor Gerald Hawting, in his essay, *The Development of the Biography of al-Harith ibn Kalada and the Relationship between Medicine and Islam*, writes:

In these latter sources, the information about al-Harith is fragmentary, references to his profession as a doctor are not consistent and, where they occur, tend to be incidental, and there seems to be little information about the nature of his medicine or detail about his life.<sup>118</sup>

From this perspective, using unreliable or inconclusive historical narratives concerning bin Kalada's "profession as a doctor", serve to weaken the argument that the Prophet ﷺ copied the 7<sup>th</sup> century physician.

4. There are historical reports stating that bin Kalada converted to Islam and was considered a companion of the Prophet ﷺ. Ethnographer and linguist, William Brice in his book *An Historical Atlas of Islam*, writes:

He was converted to Islam and had acquired the status of one of the Prophet's Companions.<sup>119</sup>

Lecturer and novelist, Abubakr Asadullah expresses a similar position:

According to nearly all traditional sources, the first known Arab physician was al-Harith ibn Kalada, a graduate of Jundishapur and a Jewish convert to Islam, a contemporary of Prophet Mohammad.<sup>120</sup>

In light of this, the Prophet ﷺ copying bin Kalada is highly improbable as it is irrational to assert that an educated physician would convert to Islam, and follow the Prophet's ﷺ message, had he known or suspected the Prophet ﷺ of copying his work on embryology. However, it must be noted that there is uncertainty as to whether bin Kalada embraced Islam and reports relating to his conversion are not authentic.<sup>121</sup>

5. The traditional sources that elaborate on bin Kalada also convey information relating to the Prophet ﷺ, including his miracles and the supernatural eloquence of the quranic discourse. One of these sources is *Ta'rikh al-Rusul wa'l-Muluk*.<sup>122</sup> It underlines various aspects of the life and character of the Prophet ﷺ including his truthfulness. Since this source is used for sound historical information, insight, and as a point of reference on bin Kalada, reason necessitates that it also be viewed as reliable with regard to its discussion on the unquestionable integrity of the Prophet ﷺ. Therefore, to accept the historical sources that elaborate on bin Kalada would be tantamount to agreeing that Prophet ﷺ was truthful, thereby undermining any claim of copying and plagiarism. Instead, contentions of this nature raise questions about the impartiality and objectivity of the contender.

6. Bin Kalada was from al-Ta'if, a town which came into contact with Islam only in the 8<sup>th</sup> year of the Islamic calendar, and it was during this period that Islamic historical sources first mention the physician. Therefore, it would be absurd to suggest the Prophet Muhammad ﷺ copied bin Kalada's views on the developing human, because chapter 23 of the Qur'an and its verses referring to embryology had already been revealed by the time bin Kalada met the Prophet ﷺ.<sup>123</sup>

7. The link between bin Kalada and the Hellenic tradition is doubted by historians. Gerald Hawting explains that due to the scientific tradition in the Golden Age, historians and biographers of the time sought links to established institutions such as Jundishapur, to associate Islam with the science of the day:

In this context... [Hawting sees]... a motive for the elaboration of the links of al-Harith ibn Kalada with Persia and its Hellenistic tradition.<sup>124</sup>

8. Even if the historical reports concerning bin Kalada's role as a physician are assumed to be accurate and valid, his medical practice raises serious doubt as to whether he learned or adopted Hellenic medicine. Historians and relevant reports concerning bin Kalada clearly describe his approach and practice of medicine as folkloric and of the Bedouin type. For instance, in one report when bin Kalada treated Sa'ad ibn Abi Waqqas, the treatment that bin Kalada prescribed was a drink mixture made up of dates, grain and fat. This treatment is reflective of the medical ideas and treatments of the Prophet ﷺ and not of Hellenic medicine.<sup>125</sup>

In view of the above discussion, whether bin Kalada had any formal link to Galenic and Aristotelian views on the development of the human embryo remains inconclusive, and so adopting the plagiarism thesis via bin Kalada does not carry much weight. Additionally, the historical narratives concerning bin Kalada are conflicting, speculative, doubtful and untenable. Therefore, to use bin Kalada as a valid link connecting the Prophet ﷺ and Hellenic medicine is baseless. For a lengthy discussion on this topic, please refer to Khalid al-Khazaraji's and Elias Kareem's essay, *Was al-Harith bin Kaladah the Source of the Prophet's Medical Knowledge*.<sup>126</sup>

## **HELLENIC MEDICINE WAS KNOWN, ADOPTED AND UTILISED BY ARABIAN (OR ARABIC SPEAKING) SOCIETY IN THE EARLY 7<sup>TH</sup> CENTURY**

Commentators assert that Hellenic embryology was common in early 7<sup>th</sup> century Arabic speaking society. This view is based on the assertion that there were cultural exchanges between the Greeks, Romans and Arabs. Cultural exchanges did occur, and its beginnings predate the advent of Islam. However, it doesn't logically follow that it included Hellenic views on embryology, or that Hellenic medicine was popularised and disseminated throughout the region. To maintain such a claim is untenable, as it would imply that there is historical evidence to show that Hellenic embryology was transferred or learned via these cultural exchanges. The following points comprehensively highlight that Hellenic embryology was not transferred or learned via Greco-Arab cultural exchanges:

### **1. THE PROPHET MUHAMMAD COULD NOT HAVE ACQUIRED KNOWLEDGE OF HELLENIC EMBRYOLOGY VIA WRITTEN WORKS**

The first major translations of Hellenic embryology into Arabic began at least 150 years after the death of the Prophet Muhammad ﷺ. As Roy Porter in his book, *The Greatest Benefit to Mankind: A Medical History of Humanity from Antiquity to the Present*, writes:

Only in the early ninth century did Arab-Islamic learned medicine take shape. The first phase of this revival lay in a major translation movement, arising during the reign of Harun al-Rashid (r. 786-809) and gaining impetus in the caliphate of his son, al-Ma'mun r.813-33). It was stimulated by a socioeconomic atmosphere favourable to the pursuit of scholarship, a perceived need among both Muslims and Christians for access in Arabic to ancient medicine, and the ready availability for the relevant arts.<sup>127</sup>

Crucial in this 'age of translations' was the establishment in Baghdad, capital of the Islamic empire under the Abbasid caliphs, of the Bayt al-Hikma (832), a centre where scholars assembled texts and translated into Arabic a broad range of non-Islamic works. The initial translation work was dominated by Christians, thanks to their skills in Greek and Syriac. The main figure was Hunayn ibn Ishaq (d. 873), later known in the West as Johannitius, a Nestorian Christian from the southern Iraqi town of al-Hira...With his pupils, he translated 129 works of Galen into Arabic (and others into Syriac), providing the Arabic world with more Galenic texts than survive today in Greek.<sup>128</sup>

According to the historian of medicine Donald Campbell, the earliest possible translation of Greek medicine was done at least 50 years after the death of the Prophet ﷺ by the Syrian Jew Maserjawaihi:

John the Grammarian and Aaron the Presbyter, who was also an Alexandrian, lived at the time of Mohamet (c. 622). Aaron compiled thirty books in Syriac, the material for which was derived chiefly from the Greek; these books were called the Pandects of Aaron and were said to have been translated into Arabic c. 683 by the Syrian Jew Masrjawaihi; this is of interest as it is the first definite attempt at

the transmutation of the medicine of the Greeks into that of the Arabians.<sup>129</sup>

### **A NOTE ON THE 6<sup>TH</sup> CENTURY SYRIAC AND LATIN TRANSLATIONS**

Other possible means of knowledge transfer would include non-Arabic texts, such as the Syriac and Latin translations of Galen's books. However, the Prophet Muhammad ﷺ did not know Syriac or Latin. Therefore, this idea is implausible. Also, the Prophet ﷺ could not have been taught Hellenic embryology via someone who had learned via these translations, as there is no evidence that he came into direct contact with anyone who had studied Greek medicine, as highlighted in the above discussion on al-Harith bin Kalada.

Significantly, historians maintain that there is no evidence of any acquisition of Hellenic medical knowledge before the beginning of the eighth century, and that it was only through double-translation, from Greek into Syriac, and from Syriac into Arabic, that the Arabs first became acquainted with the works of the Greeks. The historian John Meyendorff, in his paper *Byzantine Views of Islam*, highlights the points raised above:

Until the end of the Umayyad period, these Syrian or Coptic Christians were the chief, and practically the only, spokesmen for the Christian faith in the Caliphate. And it was through the intermediary of these communities - and often by means of a double translation, from Greek into Syriac, and from Syriac into Arabic - that the Arabs first became acquainted with the works of Aristotle, Plato, Galien, Hippocrates, and Plotinus.<sup>130</sup>

Since the first Arabic translations of Hellenic medicine appeared at least 50 years after the death of the Prophet Muhammad ﷺ, the view that he somehow had access to the Syriac translations is unfounded, because it was through these double translations that the Arabs first became acquainted with Hellenic medicine.

Further separating the Prophet ﷺ and the Syriac and Latin translations is the lack of any positive or cogent answers to the following questions:

- If the knowledge contained in these translations informed common knowledge then why are there no oral or written reports concerning knowledge of Hellenic

embryology? (See **The Prophet Muhammad ﷺ could not have acquired Hellenic embryology from 7<sup>th</sup> century Arabian common knowledge.**)

- Why are the quranic verses that elaborate on the developing human dissimilar to Hellenic embryology? (see **Are Hellenic and quranic views on embryology similar?**)
- The historical evidence strongly suggests that Hellenic embryology was not known in early 7<sup>th</sup> century Arabic speaking society. In this context, the contention assumes the Prophet ﷺ was the only person who came into contact with the Syriac or Latin translations. This inevitable conclusion is irrational and conspiratorial, especially in a 7<sup>th</sup> century Arabian context, because many people would travel to regions where Syriac and Latin were spoken. Therefore, to claim the Prophet ﷺ was the only one who somehow gained knowledge via these translations, even though Hellenic embryology was not common knowledge (see point 3 below **The Prophet Muhammad ﷺ could not have acquired Hellenic embryology from 7<sup>th</sup> century Arabian common knowledge** below), raises far more problems than it solves.

## **2. THE PROPHET MUHAMMAD COULD NOT HAVE BEEN INFLUENCED BY POPULAR MEDICAL PRACTICE WITH A SUPPOSEDLY HELLENIC FLAVOUR**

There is no direct historical evidence indicating that Hellenic medical practices were utilised or known in early 7<sup>th</sup> century Arabic speaking society, as Roy Porter highlights, “only in the early ninth century did Arab-Islamic learned medicine take shape.” Supporting this view, Donald Campbell explains that Arab physicians were brought into high repute by the early part of the 8th century as a result of studying Greek medicine.<sup>131</sup>

Further distancing Hellenic medical practice from early 7<sup>th</sup> century Arabic speaking society, Ibn Khaldun classifies popularised medicine during the 7<sup>th</sup> century as Arab folk medicine:

Civilized Bedouins have a kind of medicine which is mainly based upon individual experience. They inherit its use from the shaykhs and old women of the tribe. Some of it may occasionally be correct. However, that kind of medicine is not based upon any natural norm or upon any conformity (of the treatment) to temper the humors. Much of this sort of medicine existed among the Arabs. They had

well-known physicians, such as al-Harith b. Kaladah and others. The medicine mentioned in religious tradition is of the (Bedouin) type.<sup>132</sup>

Supporting Ibn Khaldun's views, the historian of medicine, Plinio Prioreschi, confirms that 7<sup>th</sup> century Arabian popularised medicine did not reflect Hellenic medicine:

From the pre-Islamic to the early Islamic period, there were no significant changes in the practice of medicine...In these documents we find that such medicine continued to be practiced for some time, Camel urine and milk were common remedies, various vegetable products (e.g. henna, olive oil) and other animal products (e.g. sheep fat, honey) were also considered effective.<sup>133</sup>

The historian Vivian Nutton in her essay, *The Rise of Medicine*, explains how the Arabs had their own distinct medicine which further supports the claim that the Arabs did not utilise or adopt Hellenic medicine until after the death of the Prophet Muhammad ﷺ:

The Arab conquests of the seventh century crafted a new political order onto a basically Christian, Syriac-speaking society. Although the Arabs had their own medicine, based on herbs and chants, they were not numerous enough to impose it on their new subjects.<sup>134</sup>

A contention against this position maintains that early 7<sup>th</sup> century Arabs had practices of cupping, which was a Hellenic practice, and therefore Hellenic medical practices were transferred from the Greeks to the Arabs. There is no direct evidence to justify this claim, just because some medical practices were similar, it doesn't imply that they exchanged this practice. One can argue that it could have been the Chinese, as they also practiced cupping. Even if some of these practices were as a result of direct cultural exchanges, it doesn't logically follow that Hellenic views on embryology were also transferred. Knowledge of Hellenic embryology and emulating medical practice are not the same. Where medical practices may be adopted, as they are not complicated, details about the development of a human embryo would require education, usually at an academic institution. This is proved by the fact that by 531 CE, in Alexandria, Hellenic texts "formed the basis for the Alexandrian medical curriculum".<sup>135</sup> In light of this, there is no substantial historical evidence that the Prophet Muhammad ﷺ interacted with anyone who learned Hellenic embryology from a medical academic institution.

### **3. THE PROPHET MUHAMMAD COULD NOT HAVE ACQUIRED HELLENIC EMBRYOLOGY FROM 7<sup>TH</sup> CENTURY ARABIAN COMMON KNOWLEDGE**

An interesting view adopted by various commentators includes highlighting the difference between practice and knowledge. For instance, a culture X may have knowledge of medical practices Y yet continue to practice their own medicine. Modern African cultures are good examples to substantiate this view. For instance, there are some cultures in Africa that are aware of germ theory and the use of anti-biotics, but still persist on the practice of witchcraft and magic.<sup>136</sup> In similar light, society in early 7<sup>th</sup> century Arabia could have had knowledge of Hellenic embryology but practiced its own distinct Bedouin medicine. However, there is a striking difference between the two situations. There is evidence to show that African cultures have knowledge of germ theory and western medicine, but there is no evidence to show that early 7<sup>th</sup> century Arabian society had knowledge of Hellenic embryology. To assert such a view would be to argue from ignorance. Even if the assertion is taken seriously, more questions arise that undermine the argument. For example, why is there no evidence to show that there was knowledge of Hellenic embryology, and why are there no pre-Islamic traditions that indicate an early 7<sup>th</sup> century knowledge of the science?

Continuing with the above questions, an understanding of the Arab's well developed oral traditions serve as a means to dismantle the assertion that Hellenic medicine was known, popularised, adopted and utilised during the life of the Prophet Muhammad ﷺ. The Arabs had made poetry and the transmissions of oral traditions as the means to transfer knowledge, such as stories of the famous pre-Islamic wars, ethics and current affairs. In light of this, there is no evidence of any oral tradition elaborating or even briefly mentioning Hellenic views on embryology, Muhammad Salim Khan in his book, *Islamic Medicine*, explains this significant point:

The pre-Islamic Arabs were familiar with the working of the major internal organs, although only in general. Surgical knowledge and practices were limited to cauterisation, branding and cupping. The care of the sick was the responsibility of the women. There is no evidence of any oral or written treatise on any aspect of medicine. There was use of folk medicine, which has interesting connections with magic. It is also interesting to note that pre-Islamic Arabia had contacts with ancient Egypt, Greece, Persia and India, where medicine was highly developed, but there is no material to suggest that it was adopted or utilised by ancient Arabs. This is particularly

surprising in view of the fact that the ancient Arabs were well developed in their poetry.<sup>137</sup>

## **WAS THE PROPHET MUHAMMAD A LIAR?**

Early historical sources on the Prophet Muhammad's ﷺ life illustrate and emphasise the integrity of his character. He was not a liar and to assert as much is indefensible. The presumption that he plagiarised Hellenic embryology, while maintaining the Qur'an to be the word of God, is inconceivable. There are various reasons for this. For instance he was known even by the enemies to his message as the "Trustworthy".<sup>138</sup>

Further proof of the Prophet's ﷺ reliability and credibility is enforced and substantiated by the fact that a liar usually lies for some worldly gain, but the Prophet ﷺ rejected all worldly aspirations and suffered tremendously for his message.<sup>139</sup> He rejected the riches and power he was offered to stop promulgating his message. Significantly, he was persecuted for his beliefs; boycotted and exiled from his beloved city - Makkah; starved of food; and stoned by children to the point where his blood drenched his legs. His wife passed away and his beloved companions were tortured and persecuted.<sup>140</sup> The psychological profile of the Prophet ﷺ is obviously incongruent with a liar, and to maintain that he was dishonest is tantamount to making bold claims without any evidence. The late Emeritus Professor in Arabic and Islamic Studies W. Montgomery Watt in, *Muhammad at Mecca*, explores this:

His readiness to undergo persecution for his beliefs, the high moral character of the men who believed in him and looked up to him as a leader, and the greatness of his ultimate achievement - all argue his fundamental integrity. To suppose Muhammad an impostor raises more problems than it solves.<sup>141</sup>

It was the Prophet's ﷺ truthfulness that was a key cause of his success on both political and religious levels. Without his trustworthiness, which was an integral part of his moral behaviour, he could not have achieved so much in a relatively short space of time. This view is addressed by the historians Edward Gibbon and Simon Oakley in, *History of the Saracen Empire*.

The greatest success of Mohammad's life was effected by sheer moral force.<sup>142</sup>

## **ABSENCE OF EVIDENCE IS NOT EVIDENCE OF ABSENCE**

Critics argue that the discussion thus far points towards an absence of evidence, and an absence of evidence is not evidence of absence. This claim asserts that even if there is lack of evidence that Hellenic embryology was common knowledge it still does not prove that knowledge of the subject was absent from early 7<sup>th</sup> century Arabic speaking society. As ever, this understanding of the above discussion is flawed. The discussion so far has presented a strong case showing that Hellenic embryology did not form part of early 7<sup>th</sup> century Arabian society's common knowledge. If it was common, it would most likely to have been recorded in the oral traditions, the written treatises, the medical practices and the historical narratives of the time. For these reasons, the claim that Hellenic embryology was common knowledge is highly unlikely. Therefore, to prolong this claim is irrational and conspiratorial.

## **ARE HELLENIC AND QURANIC VIEWS ON EMBRYOLOGY SIMILAR?**

### **1. ARISTOTLE AND THE QUR'AN**

The accusation that the Qur'an is similar to Aristotelian views on human embryology is untenable for various reasons:

Firstly, Aristotle believed only the male produces fluid responsible for the development of the embryo (the genetic material). In his book *On The Generation of Animals* he supposes the male semen to be the active form and the female ovum as providing only the passive element for fertilization; an idea contradictory to modern embryology. In fact, Aristotle was of the opinion that semen mixed with women's menstrual blood, coagulating to form the embryo. Aristotelian accounts of human development are evidently incongruous with both the Qur'an and modern embryology, as illustrated in his own writings:

...the female, though it does not contribute any semen to generation... contributes something, viz., the substance constituting the menstrual fluid... [I]f the male is the active partner, the one which originates the movement, and the female qua female is the passive one, surely what the female contributes to

the semen of the male will be not semen but material. And this is in fact what we find happening; for the natural substance of the menstrual fluid is to be classed as prime matter.<sup>143</sup>

Classical exegetes of the Qur'an convey the disagreement between Aristotelian accounts of human development and the quranic narrative. The Qur'an describes the *nutfah* as a mingled substance from *both* the male and the female, not just the male. It also stresses *both* the male and female as being responsible for the child's genetic makeup. Ibn al-Qayyim, the 14<sup>th</sup> century jurist and commentator of the Qur'an, uses various Prophetic traditions to emphasise the fact that male semen alone is not responsible for generating a child.<sup>144</sup> Ibn al-Qayyim theorizes that if women do not have a type of semen, then their children would not look like them. The male semen alone does not generate a child because conception only occurs upon the mixture of male sperm with another equivalent (ovum) from the female.<sup>145</sup> Furthermore, assertions of plagiarism are futile as the words used in the Qur'an are unlike Aristotle's choice of words; the Qur'an is scientifically accurate and Aristotle is not. Aristotle's discredited supposition (of menstrual blood being involved in the process of fertilisation) is further contrasted with the Qur'an and its use of the word *nutfah*, which is not the word for menstrual blood in Arabic. The word for menstrual blood in Arabic is *hayd*.<sup>146</sup>

Secondly, Aristotelian views on human development include that male embryos are generated on the left side of the womb, and female embryos on the right side of the womb.<sup>147</sup> This is a concept that the Qur'an does not mention.

Thirdly, Aristotle held the belief that the upper body is formed before the lower body:

Now the upper portion of the body is the first to be marked off in the course of the embryo's formation; the lower portion receives its growth as time goes on.<sup>148</sup>

Again, this idea does not exist in the Qur'an.

A contention to the above response includes the assertion that the Prophet Muhammad ﷺ plagiarised the following passage from the Aristotle:

Round about the bones, and attached to them by thin fibrous brands, grow fleshy parts, for the sake of which the bones exist.<sup>149</sup>

This seems to correlate with the quranic statement, "then we clothed the bones with flesh".

In response to this, an interesting and significant deduction can be made upon considering the similarities between both statements. Rather than negate the authenticity of the Qur'an, the similarities serve to dismantle the claim that the Prophet ﷺ copied Aristotle. For example, how could the Prophet ﷺ take the correct information from Aristotle and, at the same time, reject the incorrect information? Also, how could the Prophet ﷺ include other aspects of the developing human embryo, which are not mentioned in Aristotelian literature, but yet correspond with modern embryology? The only rational deduction to these observations is to assert that the Qur'an did not borrow or copy from Aristotelian embryology. To oppose this would be tantamount to claiming that the Prophet ﷺ knew what was correct, understood what was incorrect and had knowledge that transcended the early 7<sup>th</sup> century understanding of human development.

## 2. GALEN AND THE QUR'AN

To substantiate the view that the quranic accounts of the developing human are similar to Hellenic embryology, commentators have attempted to compare the quranic stages of human development with Galenic views on the subject. However, upon analysing Galen's writings, and contrasting it with the various and extensive meanings of the *nuftah*, *'alaqah* and *mudghah* stages, there are considerable differences to be found:

### 1<sup>ST</sup> STAGE

In his book, *On Semen*, Galen states:

But let us take the account back again to the first conformation of the animal, and in order to make our account orderly and clear, let us divide the creation of the foetus overall into four periods of time. The first is that in which, as is seen both in abortions and in dissection, the form of the semen prevails. At this time, Hippocrates too, the all-marvelous, does not yet call the conformation of the animal a foetus; as we heard just now in the case of semen voided in the sixth day, he still calls it semen.<sup>150</sup>

Galen clearly states that his views are as a result of dissections and abortions, and then goes on to explain that the first stage of human development is in the "form of σπέρματος". The word σπέρματος (*sper-ma-tos*) in the Greek language means sperm<sup>151</sup>. However this understanding of the word was only realised in the 17<sup>th</sup> century<sup>152</sup>. In the 2<sup>nd</sup> century, which was the period of Galen's writings, the word σπέρματος meant semen. So from a Galenic

perspective this stage is merely describing what can be seen with the naked eye, which is a semen like substance.

This raises a significant contention; if the Qur'an was a summary of Galenic views on embryology then the Arabic word that should have been used to represent this understanding is *mani* or *maniyyan*. As previously discussed, the reason for this is that in the Prophetic traditions, when describing semen in context of its appearance and form, the words *mani* and *maniyyan* are used. These words are consistently used throughout the Prophetic traditions.

Further widening the gap between Galenic and quranic terminology is the use of the word *maniyyan* elsewhere in the Qur'an. The Qur'an mentions the word *maniyyin* (the genitive case of *maniyyan*) in the context of the physical form and appearance of an emitted substance. This word is also used in conjunction with the word *nutfah* which clearly shows how the two words are not referring to the same thing, because the *nutfah*, according to the Qur'an, comes from the *maniyyin* (semen):

Had he not been a sperm (*nutfah*) from a semen (*maniyyin*) emitted?<sup>153</sup>

As previously explored (see ***Drop of Fluid***), this perspective on *nutfah* highlights how the intended use of this word is not to portray the meaning of semen. Rather, it is a drop or a substance from semen. In another verse the Qur'an explains how the human being is made from an extract (*sulaalah*) of a liquid disdained (semen).<sup>154</sup> The word *sulaalah* means an extract, something drawn out or the most subtle, purest and essential constituent. This shows that the intended use of the word *nutfah* is not as a synonym for semen. Rather, it is a drop containing an extract from the semen (and the female equivalent), containing essential substances like a sperm or egg.

Even if the view that *nutfah* is just a drop of semen, the context of the Prophetic traditions and the Qur'an clearly show that *nutfah* is used for the process of fertilization and the development of the human being, and *mani* or *maniyyan* is used in the context of the physical form of the emitted substance. Nevertheless, the quranic view still highlights that the *nutfah* is different from *mani*, because the Qur'an mentions that it is a drop of semen of which is an extract. This indicates that the *nutfah* is a pure, subtle or essential part of the semen, and not the whole semen itself.

It is worth noting that Galen adopted the view that the semen came from blood. Galen writes:

An artery and a vein are observed to go to each of the testicles, not in a straight path, as they do all other parts, but twisting first in many shapes, like grape tendrils or ivy... And in these many twists that they make before reaching the testicles you can see the blood gradually growing white. And finally, when the vessel has now reached the testicle, the substance of the semen is clearly visible in it...but they generated it from blood, which spent a great deal of time in them; for this is the use of the twisting. And as they altered the quality of the blood they changed it to semen.<sup>155</sup>

Galen also asserts that semen from both the male and female mix with menstrual blood. In his book *On Semen*, he dedicates a whole section on disagreeing with the Aristotelian position that the male semen mixes with menstrual blood, and articulates a case for the mother contributing semen as well as menstrual blood to form the fetus.<sup>156</sup> Galen concludes that the formation of the fetus arises from the two semens mixing with the subsequent involvement of the menstrual blood.<sup>157</sup>

The above ideas and processes are not mentioned in the Qur'an. The quranic narrative explicitly states that the *nutfah* and *‘alaqah* stages are distinct and separate, and at no point does the Qur'an mention that the *nutfah* comes from the *‘alaqah*, and then subsequently mixes with the *‘alaqah* (again!?) to form the human fetus. This clearly undercuts any claim that the Qur'an is similar to Galenic embryology.

However, some commentators assert that the *nutfah* and *‘alaqah* stages are a summary of Galen's above inaccuracies. Their main point is that the Qur'an mentions *fa khalaqna nutfata ‘alaqan*, which means "And then we created the drop into a clinging form". They propose that the words *fa khalaqna* can mean to mix or to combine, and therefore are a representation of the Galenic idea of the semen subsequently mixing with blood. They further stipulate that this assertion is supported by the fact that *nutfah* can mean semen and *‘alaqah* can mean blood in a general sense.

This assertion displays a clear misunderstanding of the Arabic language for the following reasons:

1. As previously discussed, the quranic use of the word *nutfah* does not mean semen, especially in the Galenic context.
2. The Qur'an mentions that the *nutfah* and *‘alaqah* stages are distinct, and that the stages of the developing human embryo are discrete and separate, inasmuch as they

do not mix or combine. This is understood by the use of the key word: *khalaqna*, which means “we made it become”<sup>158</sup>, indicating that each stage is different and separate from one another.

3. The key word *khalaqna* does not carry the additional meanings of “to mix” and “to combine”, so the assertion that the Qur’an borrowed this knowledge is false, because the Divine book clearly mentions each stage as distinct and separate as opposed to the Galenic understanding of semen and blood mixing.

In light of the above, if chapter 23 of the Qur’an was just a summary of Galenic embryology why did it not use the Arabic word for semen (*maniyyan*) to refer to σπέρματος, since this Greek word was also used in the context of the physical form and appearance of the fluid? Significantly, why does the Qur’an refer to the *nutfah* as being a special part or extract of semen (*maniyyan*), which clearly indicates that they are not referring to the same thing? The use of the two words clearly shows that there are two different meanings being portrayed. The different choice of words to describe sexual emissions, fluids and cells in varying contexts further highlights that the Qur’an, and by extension the Prophet Muhammad ﷺ, did not plagiarise Galenic embryology, because if they did, then *maniyyan* and *nutfah* would be referring to the same substance. Also, why did the Qur’an not mention that the *nutfah* comes from blood, like the Galenic view? Why did the Qur’an not mention that the *nutfah* combined with menstrual blood to create the human fetus? These questions clearly distance the Qur’an and the Prophet ﷺ from the accusation that they borrowed Galenic views on embryology. Therefore, once the original context and language of the source-texts in question are analysed, it can be concluded that they are not identical or even suspiciously similar.

## 2<sup>ND</sup> STAGE

But when it has been filled with blood, and heart, brain and liver are still unarticulated and unshaped yet have by now a certain solidarity and considerable size, this is the second period; the substance of the fetus has the form of flesh and no longer the form of semen. Accordingly you would find that Hippocrates too no longer calls such a form semen but, as was said, fetus...<sup>159</sup>

Another significant contention concerns Galen’s second stage that refers to the embryo as being filled with blood. The key Greek words used are πληρωθη (*plee-ro-thee*) which means filled<sup>160</sup> and αίματος (*eh-ma-tos*) meaning blood<sup>161</sup>. If the Qur’an borrowed Galenic views on the developing human embryo, the words that should have been used are ملأت (*mal-at*) which means the manner in which something is filled<sup>162</sup>, and دم (*dam*) which means blood<sup>163</sup>.

However, the word *‘alaqah* is used in the Qur’an. This word in the context of blood can mean blood in a general sense, and a clot of blood due to its sticking together.<sup>164</sup> Conversely, the word *‘alaqah* alone would not represent the Galenic stage here, because its meanings do not encapsulate the word “filled” and its use to mean blood-clot would be misplaced as the word for blood-clot in Greek is not αίματος rather it is θρόμβος (*throm-vos*), which is a word Galen does not use.<sup>165</sup> Even if commentators assert that the use of the word *‘alaqah* as a blood-clot in this context is satisfactory, an explanation is required to reconcile the fact that it only means blood-clot in the sense that it clings. This is made clear in *Lane’s Arabic-English Lexicon* and in Ibn Kathir’s quranic exegesis. Ibn Kathir explains the word *‘alaqah* to mean a “dangling clot”<sup>166</sup> and *Lane’s Arabic-Lexicon* clarifies that it means a blood-clot “because of its clinging together”<sup>167</sup>, rather than its physical appearance. Therefore, using the Arabic words ملأت and دم would have been more appropriate, because Galen specifically refers to “filled with blood” and not just blood. This whole discussion has to be understood in the context of the primary meaning for the word *‘alaqah*, which is not blood or blood-clot but rather to hang or to be suspended. For that reason, the claim that the Qur’an reflects Galenic embryology is weak and unsubstantiated.

Even though there are opinions of classical linguists that indicate that the word *‘alaqah* can mean a blood-clot in its true sense, the plagiarism thesis breaks down when a more contextual understanding of Galenic embryology is taken into consideration. At this second stage, Galen uses the word σαρκοειδής (*sar-ko-ee-this*), meaning fleshy,<sup>168</sup> to refer to the appearance of the embryo. This undermines the claim that the quranic stages are similar to Galen, because words that can mean fleshy in Arabic, such as *mudhgah* and *lahm*, are used to describe later stages. However, Galen mentions this stage as a fleshy substance filled with blood. The word in the Qur’an used to describe this stage doesn’t encompass such a meaning, because *‘alaqah*, if we assume it to mean blood or blood-clot, does not encompass a fleshy substance filled with blood. To illustrate this further, imagine someone had to summarise the following statement into Arabic: a blood filled substance that is fleshy - what words must they use to best represent the meaning of the statement? An array of words from the classical Arabic would be used like the words mentioned above, but *‘alaqah* would not be one of them.

### **3<sup>RD</sup> STAGE**

The third period follows on this, when, as was said, it is possible to see the three ruling parts clearly and a kind of outline, a silhouette, as it were, of all the other parts. You will see the conformation of the three ruling parts more clearly, that of the parts of the stomach more dimly, and much more still, that of the limbs. Later on they form

‘twigs’, as Hippocrates expressed it, indicating by the term their similarity to branches.<sup>169</sup>

As explored, the Qur’an mentions *mudghah* as a chewed-like substance and a small piece of flesh. In contrast, Galen discusses the “conformation” of “the three ruling parts”, “silhouettes” and “twigs”, which is most likely in reference to limb bone formation. He details these three ruling parts as being more visible than the stomach and the limbs. However, the Qur’an makes no mention of this, and its mention of limb formation comes at the next stage. It is both implausible and impractical, therefore, to suggest that the Qur’an copied the works of Galen as it does not include any of the descriptions provided by Galen at this stage. Also, the word *mudghah* would have been appropriately used as a summary of the ancient Greek word ἐμβρύειον (*em-vree-on*)<sup>170</sup>, which means the flesh of an embryo, however Galen did not use this word. The following hypothetical scenario highlights the absurdity of asserting similarity between the quranic and Galenic descriptions of this stage: if someone had become acquainted with Galenic embryology and had to summarise his third stage, would the word *mudghah* accurately encompass the meaning of “the three ruling parts”, “silhouettes” and “limbs”? The answer is no. This conclusion is also supported by the fact that there is no mention of flesh, a small piece of meat or something that has been bitten in the original Greek of Galen’s writings describing this stage. A conservative approach to the above question would at least conclude that there was a serious misreading or misunderstanding of the text. Even if that were the case, it would still highlight that Galenic and quranic terms are dissimilar, and it would raise the need for evidence to establish a misreading or misunderstanding. In light of the evidence provided in this section, it is extremely unlikely that there was any common knowledge of Hellenic embryology, written or oral, in early 7<sup>th</sup> century Arabia.

## EARLY GREEK TRANSLATIONS OF THE QUR’AN

9<sup>th</sup> century Greek translations of the Qur’an undermine the view that Galenic and quranic embryology are similar. Early Greek translations of the Qur’an clearly show how the quranic terms used to describe the development of the human embryo are not the same as Galenic terms. For instance, Niketas of Byzantium, who was one of the most influential Byzantine theologians who wrote against Islam, comments on 9<sup>th</sup> century translations of the Qur’an.<sup>171</sup> Concerning the word *‘alaqah*, Niketas maintains that the quranic usage of the word implies that man was created from a leech:

He says that man was created from a leech [βδέλλης].<sup>172</sup>

The key word that Niketas refers to in the Greek translation is βδέλλης (*vdel-lis*), which means leech.<sup>173</sup> In view of the fact that the early Greek translation of the Qur’an does not

use Galenic terminology to understand the text, and that the early Greek understanding of *‘alaqah* meant leech, strengthens the argument against the contention that Galenic and quranic views on embryology are similar. This is further supported by the fact that Niketas’ writings and commentary on the Qur’an are polemic in nature.<sup>174</sup> Niketas wanted to undermine Islam, and attempted to do so by refuting the quranic discourse.<sup>175</sup> This brings to light a question that weakens the plagiarism thesis. If quranic and Galenic views on embryology were similar, why did not Niketas expose the similarity to show that the Prophet Muhammad ﷺ borrowed Hellenic views on embryology? The absence of Niketas’ attempt to link quranic views on embryology with Hellenic medicine, clearly shows how an early Greek understanding of the Qur’an was not perceived to be the result of borrowed Hellenic medical knowledge. It is also interesting to note that Niketas’ work on the Qur’an was used as a reference for anti-Islamic polemics for over 500 years,<sup>176</sup> which highlights that the plagiarism thesis is a relatively modern innovation in the field of anti-Islamic polemics, and brings to light the fact its allegations are based on misunderstandings of the culture of the time, including a superficial understanding of the Greek and Arabic language.

Other historical documents that can be traced back to the Byzantine period are anathemas recorded during Muslim conversions to Christianity. For example, the following ritual was used during conversions to Christianity:

I anathematize Muhammad’s teaching about the creation of man, where he says that man was created from dust and a drop of fluid [σταγόνοϛ] and leeches [βδέλλων] and chewed-like substance [μασήματος].<sup>177</sup>

The key words used here are σταγόνοϛ (*sta-go-nos*) which means a drop<sup>178</sup>, βδέλλων (*vdellon*) which means leech<sup>179</sup>, and μασήματος (*ma-see-ma-tos*) which means something that has been chewed<sup>180</sup>. This clearly indicates that an early Greek understanding of the Qur’an does not correspond to Galenic views on embryology. This is due to the fact that Galen never used the Greek words mentioned above.

A key disagreement to the above argument involves commentators asserting that the 9<sup>th</sup> century Greek translation is inaccurate. Although a legitimate contention, it is incorrect. The 9<sup>th</sup> century translation seems to be a high quality translation, as the historian Christian Hogel writes:

Whoever produced the translation (and more than one person may well have been involved in the process), it should be stressed that, despite the mentioned linguistic features that may seem to point to a

humble origin, it is actually of high quality. The person (or persons) completing the task knew Arabic and Greek well, and a high degree of precision and consistency was aimed at and normally achieved.<sup>181</sup>

This view is also supported by the academic historian Christos Simelidis, he writes:

The ninth-century Greek translation of the Qur'an, although not without mistakes, is generally accurate, and evidently the translator consulted both lexicographical and exegetical material.<sup>182</sup>

### **THE SIMILARITIES BETWEEN GALENIC EMBRYOLOGY AND THE QUR'AN**

A contention to the above analysis, is the fact that there are still some similarities between Galenic embryology and the quranic narrative. These similarities include the fact that both the Qur'an and Galenic views understood that semen came from both the mother and the father. In response to this, it must be noted that in light of the above evidence, this contention is irrational. To assert that the Qur'an borrowed Galenic embryology in light of the striking differences discussed above, is tantamount to claiming that evolution and creationism are similar because they address the same field of science. Many questions are raised that belittle this contention, such as: how could the Qur'an, and by extension the Prophet Muhammad ﷺ, have known what was right, dismissed what was wrong and ensured that the whole quranic narrative on the development of the human embryo was congruent with reality?

### **MEDIEVAL ARABIC MEDICAL TEXTS AND GALENIC STAGES**

In light of the above discussion, critics argue that medieval Arabic medical texts appreciated the agreement between the Qur'an and Galen, and these texts adopted some quranic terms to describe Galenic stages. These texts include Ibn Sina's *Kitab al-Qanun fi al-Tibb* and ibn Abbas' *Kamil al-Sina'a al-Tibbiyya*. In response to this criticism there are a few points to consider. Firstly, Galenic medicine was perceived to be the science of the time, therefore it is obvious that a believing Scientist would want to marry scientific "truths" with Divine truths. Secondly, claiming an agreement between the Qur'an and Galen does not mean that they do agree. This is merely an opinion of a Muslim scientist or medic who is driven by the desire to reconcile the science of the day with his belief in the Qur'an. If these medics and scientists were alive today, they would have probably dissociated the Qur'an from inaccurate Galenic embryology. Thirdly, the analysis above has provided a strong case against the claim that the Qur'an's and Galen's views on the developing human embryo are similar. Fourthly, if quranic and Galenic embryology are in agreement, then how did the Qur'an, and by extension the Prophet Muhammad ﷺ, not include the inaccurate descriptions and ideas

provided by Galen? How did the Prophet ﷺ know that Galen's view of the formation of semen from blood was inaccurate? How did he know that Galen's view that semen does not mix with blood to form the embryo was wrong? And, why do many of the Arabic terms used in the Qur'an not capture the meaning of the Greek terms used by Galen? In light of these questions, the argument that medieval Arabic medical texts declare an agreement between Galen and the Qur'an, as a means to highlight similarity and plagiarism of Galenic embryology, is baseless and unfounded.

## DID THE PROPHET DISSECT HUMAN AND ANIMAL EMBRYOS?

Critics allege that the Prophet Muhammad ﷺ dissected or examined human and animal embryos, and therefore this serves as an explanation of the scientific knowledge contained in the Qur'an. An immediate refutation of this allegation is that many of the stages described in the Qur'an cannot be seen with the naked eye but require optical aids, examples of which include the *nutfah* stage and the *ʿalaqah* stage. Yet another poignant reason invalidating this is the impracticalness and counter-productivity of the Prophet ﷺ spending his time examining embryos, when his proclaimed mission was to spread the message of Islam. These particular verses (that is; the verses detailing the development of the embryo) did not, and would have been unlikely to, affect the essence or propagation of Islam, especially in a 7<sup>th</sup> century Arabian context where such deep understandings of embryology was improbable. Finally, why aren't there any records of the Prophet ﷺ dissecting animal or human embryos? Such a claim does not tally with the life and mission of the Prophet Muhammad

ﷺ.

## IS THE QUR'AN INACCURATE CONCERNING WHERE SPERM COMES FROM?

So let man observe from what he was created. He was created from a fluid, ejected, emerging from between the backbone and the ribs.<sup>183</sup>

The above verses have been condemned by various critics and commentators as being scientifically inaccurate, and any attempt to salvage an accurate meaning from them has been suggested to be tantamount to textual acrobatics. This evaluation arises from an

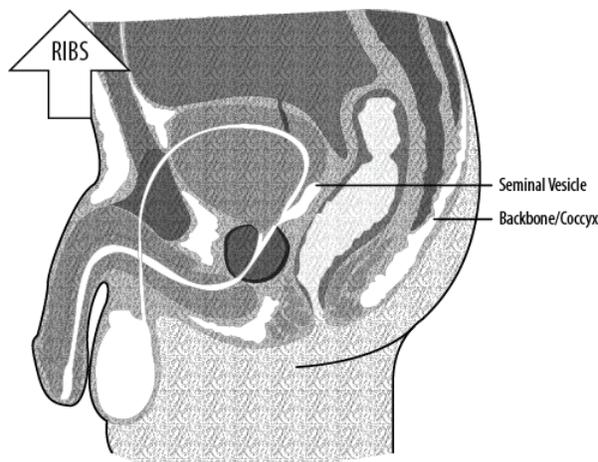
analysis of the words **الصُّلْبِ** (*sub*) and **التَّرَائِبِ** (*tara'ib*) which have been translated to

mean 'backbone' and 'ribs'. Those who maintain the scientific inaccuracy of the Qur'an claim the above translation for the words *sulb* and *tara'ib* cannot be reconciled with modern developments in physiology. However, after a lexical analysis of these words it will be seen that these words do in fact concur with modern physiology.

The word **الصُّلْبِ** (*sulb*) carries various meanings including hard, firm, solid, stiff and rigid. It also means any portion of the backbone, particularly the lumbar portion and the loins. It is specific to males.<sup>184 185</sup> The word **التَّرَائِبِ** (*tara'ib*) means breastbone, the ribs<sup>186</sup> or the pelvic arch,<sup>187</sup> and this word according to most authors refers specifically to women.

With such examinations of the interpretations offered by the Arabic language, it can be inferred that the Qur'an complies with modern physiology as it is well known that the sperm and semen come from an area referred to as the loins, and the ovum comes from the pelvic arch area. Both of which are required for the creation of man, that is to say, the human being.

Even if the above analysis is dismissed, the verse in question would still be scientifically accurate. Modern physiology states that semen is made up various fluids. For instance, semen is made up of sperm which comes from the testes and makes up 2-5% its content. Fluid from the seminal vesicles make up 65-75% of semen, and fluid from the prostate makes up 25-30% of the male sexual fluid. Also, semen is made up of fluid from the bulbourethral glands which makes up less than 1% of the semen. According to modern physiology the main source of the semen is the fluid from the seminal vesicles and these vesicles are situated between the lower backbone and the ribs [see **figure 9**]:



**Figure 9** notice how the seminal vesicle is between the backbone and the ribs.

# DO THE PROPHETIC TRADITIONS UNDERMINE THE SCIENTIFIC ACCURACY OF THE QUR'AN?

Prophetic traditions that clarify and elucidate the quranic view on the developing human embryo correspond with modern embryology. There are a myriad of traditions that substantiate this claim.

## GENDER DETERMINATION

The following tradition on gender determination highlights how the Prophetic traditions are in line with scientific developments:

The angel is sent to the *nutfah* after it has settled in the uterus for 40 or 45 nights and says, “Lord! Is it to be wretched or happy?” Then this is inscribed. Then he says, “Lord! Is it to be male or female?”<sup>188</sup>

During the 6<sup>th</sup> week of the developing embryo the primary sex cords are finger like projections. At this time both the male and female gonads appear identical. However, just after the 6<sup>th</sup> week a significant event occurs that determines the physical expression of the embryo’s genetic makeup. This event is the activation of genes that stimulates the production of male and female hormones:

If the Y chromosome is present in the embryo’s cell, a gene within the short arm of the chromosome called SRY will turn on, initiating a chemical chain reaction that will turn on other genes and stimulate the production of male hormones. If the X chromosome is present, or if the SRY gene is missing from the Y chromosome, the embryo will develop into a female via mechanisms that are not fully understood.<sup>189</sup>

This clearly shows a strong correspondence between embryology and the above tradition.

## DO THE QURANIC STAGES LAST 40 DAYS EACH?

However, there is a particular tradition that critics have claimed to be scientifically inaccurate. The following tradition has been interpreted to mean that the *nutfah*, *‘alaqah* and *mudghah* stages occur in three 40 day sequences, making it a period of 120 days. This interpretation does not concur with the appearance of the embryo during this time:

The Messenger of Allah, the true and truly inspired said, “(The matter of the Creation of) a human being is put together in the womb of the mother in forty days, and then he becomes a clot of thick blood for a similar period, and then a piece of flesh for a similar period.”<sup>190</sup>

To clarify this seemingly inaccurate tradition, a correct interpretation would be that the 40 days are parallel, meaning that the stages occur within a 40 day period. This is supported by another Prophetic tradition which mentions that the creation of specific differentiated organs start after the first 42 days:

When 42 nights have passed...God sends an angel to it, who shapes it.<sup>191</sup>

This tradition clearly indicates that the *nutfah*, *‘alaqah* and *mudghah* stages occur before 42 days.

Additionally, the tradition in question uses the phrase ‘like that’ which can be understood as a repetition of the time period. The phrase is *mujmal*, which in the classical sciences means general, whereas the aforementioned tradition is *mubayyan*, meaning explicit. The rule according to the classical sciences is that the general is specified by the explicit to give an accurate portrayal of the meaning and intention of the speaker. Many scholars such as Imam Malik and the 7<sup>th</sup> century scholar Ibn Azzamlakani reached the conclusion that the *nutfah*, *‘alaqah* and *mudghah* stages occur during the first 40 days.

## THE PROPHETIC AND JEWISH TRADITIONS

As ever, popular commentators persist in their attempts to show that the Prophet Muhammad ﷺ copied or borrowed knowledge from other sources. One such claim maintains that the Prophet ﷺ borrowed knowledge from the Talmud, which is one of the main texts of the Jewish tradition.

The following Prophetic tradition from *Musnad Ahmad* has been used by commentators to substantiate the claim that the Prophet ﷺ borrowed inaccurate ideas from the Jewish tradition:

He is created of both, the semen of the man and the semen of the woman. The man's semen is thick and forms the bones and the tendons. The woman's semen is fine and forms the flesh and blood.<sup>192</sup>

The Talmud mentions something similar:

Our Rabbis taught: There are three partners in man, the Holy One, blessed be He, his father and his mother. His father supplies the semen of the white substance out of which are formed the child's bones, sinews, nails, the brain in his head and the white in his eye; his mother supplies the semen of the red substance out of which is formed his skin, flesh, hair, blood and the black of his eye.<sup>193</sup>

In response to this claim, the above Prophetic tradition has a weak (*da'if*) chain of narration (*isnad*).<sup>194</sup> A weak tradition is considered *da'if* due to a gap, or discontinuity, in the chain of narrators, or due to some criticism of a narrator in the chain, such as being untrustworthy or having a bad memory.<sup>195</sup> In the Islamic sciences a weak Prophetic tradition is not used as a reference or taken into account when attempting to establish what the Prophet Muhammad ﷺ said. Therefore, using the above tradition to claim that the Prophet ﷺ was wrong, or that he borrowed from the Talmud, is unfounded.

The following is another tradition that commentators use to support the claim that the Prophet Muhammad ﷺ copied or borrowed medical knowledge from the Talmud:

Not from all the sperm a fetus is created and if God wills to create anything, nothing can debar him.<sup>196</sup>

The Talmud refers to a similar concept:

man is not fashioned from all the drop but only from its purest part.<sup>197</sup>

To use the above Talmudic excerpt to claim that the Prophet Muhammad ﷺ borrowed knowledge from the Jewish tradition fails to take into account the entire corpus of material concerning this topic. For instance, the Prophet ﷺ himself implied that the Jewish tradition had some sound knowledge of embryology, therefore it is highly unlikely that the Prophet ﷺ deliberately sought to plagiarise or borrow from the Jewish tradition.

The Prophetic tradition narrated by Tauban, which can be found in *Sahih Muslim*<sup>198</sup>, states that one of the Rabbis of the Jews came to the Prophet Muhammad ﷺ to test him on his knowledge about the development of a child. The Prophet ﷺ answered correctly and the Rabbi became a Muslim. This clearly undermines the fact that the Prophet ﷺ deliberately borrowed knowledge from the Jewish tradition, as it was clear that the Prophet ﷺ knew the Jews has some knowledge on the subject.

It is significant to note that the Jewish tradition has some grave errors concerning the stages of embryonic development. If the Prophet ﷺ borrowed from the Jewish tradition, why did he reject what was wrong and take only what was accurate? This implies that the Prophet ﷺ had an accurate understanding of the development of the human embryo.

The inaccuracies in the Talmud clearly undermine the assertion that the Prophet Muhammad ﷺ plagiarised knowledge from the Jewish tradition. The Talmud contains various references to the development of the human embryo:

- *golem* : formless, rolled-up thing
- *shefir meruqqam*: embroidered foetus
- *ubbar*: something carried
- *walad*: child
- *walad shel qayama*: viable child
- *ben she-kallu khadasharw*: child whose months have been completed.<sup>199</sup>

The above summary of the Talmudic understanding of the development of the human embryo is obviously dissimilar - as well as being scientifically inaccurate - to the quranic stages explained in this study. Therefore, to claim that the Prophet Muhammad ﷺ rejected the inaccuracies of the Jewish tradition and adopted the correct views on human development raises far more problems than it solves.

## A NOTE ON USING TRANSLATIONS

Various critics who argue the verses on embryonic development and the origins of sperm are not in line with scientific facts, tend to use the available quranic translations to express and highlight how certain words in the Qur'an cannot be reconciled with scientific truths. This approach is flawed. Translation studies conclude that there can never be equivalence between languages,<sup>200</sup> and to assert this would wrongfully presume cultural and linguistic symmetry between two different languages, which is linguistically unattainable. This clarification is applicable more so to Arabic and European languages than any other as they are both "linguistically and culturally incongruous".<sup>201</sup> Therefore, a translation will never be a representation of the original text and anyone who seeks total equivalence "is chasing a mirage".<sup>202</sup> Hence, a lexical analysis, coupled with an understanding of quranic exegesis and up-to-date knowledge of modern science, is required to form sound conclusions concerning science and the Qur'an.

In attempts to close the gap between languages a detailed exploration is required of the derivations and connotations of each and every word. As a result of this, translators produce varying translations of a single verse. Additionally, translations are heavily dependent on exegetical works and the wide range of interpretations offered by them. Citing one particular translation or restricting the evidence for points of an argument to a single interpretation does not allow for, and cannot provide, adequate grounds for reaching a proposed conclusion. With regard to verses concerning natural phenomena, interpretations will vary based upon the background information a particular exegete has on the topic. Evidently, basing conclusions on inaccurate interpretations and translations is an insubstantial and ineffectual means of inferring the Qur'an to be wrong. If all possible meanings of a particular verse were reconciled with established facts, and the results showed them to be incongruous and incompatible, then the conclusion that the Qur'an is inaccurate would be taken seriously. As yet, this has not been the case as illuminated, established and reaffirmed with the analysis provided in this paper.

On a more general note, the linguistic features of quranic Arabic give the Qur'an depth. Its use of words with multi-layered meanings facilitates oceans of interpretations, providing the foundations and impetus for one of the world's greatest and most influential civilizations. As the academic linguist Hussein Abdul-Raof writes:

The richness of quranic language and its receptivity towards different interpretations help explain how this single book could have given shape to one of the world's great civilizations.<sup>203</sup>

# CONCLUSION

This paper proposed a scientific-linguistic analysis of chapter 23 verses 12 to 14 of the Qur'an. Modern medical references were used to correlate between significant linguistic details and contemporary science. The results clearly illustrate the Qur'an as being concurrent with modern embryology. Additionally, contentions to the quranic view on the development of the human embryo were responded to with particular emphasis on the plagiarism thesis, which puts forward the charge that the Prophet Muhammad ﷺ plagiarised Hellenic embryology. The responses provided expose the plagiarism thesis as untenable, and lacking in explanatory power and scope.

It is hoped that this paper will open the door for sincere, nuanced and frank discussions concerning the quranic discourse. It must be understood that in order to comprehend the Qur'an, a deep study is required rather than a superficial reading of its verses. Take the analogy of a vast sea. Swimming on the surface will never give scientists knowledge of its secrets.

Similarly, concerning the depth of the Qur'an, God makes this clear:

And if whatever trees upon the earth were pens and the sea [was ink], replenished by thereafter seven more seas, the words of God would not be exhausted. Indeed, God is Exalted in Might and Wise.<sup>204</sup>

# GLOSSARY

**Amnioblast:** a cell derived from the ectoderm which forms the wall of the amniotic cavity, i.e. the amnion.

**Amniotic cavity:** the cavity surrounded by the amnion, filled with amniotic fluid, surrounding the fetus.

**Blastocyst:** the hollow sphere of cells derived from the morula consisting of the inner cell mass and outer trophoblast.

**Cartiliginous plate:** the growth plate in a developing long bone.

**Chorion:** the membrane that surrounds the fetus, consisting of trophoblast and extra-embryonic mesoderm.

**Chorionic villi:** the finger like protrusions of chorion and trophoblast which contain blood vessels, and are surrounded by maternal blood in the intervillous spaces.

**Cytotrophoblast:** the cellular part of the trophoblast, as distinguished from the syncytiotrophoblast.

**Ectoderm:** the outer germ cell layer that gives rise to the epidermis of the skin, the nervous system and sense organs.

**Endoderm:** the inner germ cell layer from which the lining of the gut tube and its associated glandular structures are derived.

**Endometrium:** the inner lining of the uterus in which implantation occurs.

**Extra-embryonic coelom:** the space between the layers of the extra-embryonic mesoderm; also known as the chorionic cavity; and separates the amnion and yolk sac from the embryo.

**Fetal period:** the period of growth in size of the fetus from week 8 to term.

**Mesenchyme:** loose embryonic connective tissue derived from mesoderm or neural crest.

**Myoblast:** precursors cells of muscles, derived from intra-embryonic mesoderm.

**Neurulation:** the process of neural tube formation.

**Notochord:** the midline structure that forms a midline axis for the embryo, and from which the intervertebral discs are formed.

**Scelerotome:** derived from the somite and giving rise to connective tissue surrounding the neural tube and notochord to form the vertebrae.

**Somites:** most medial segmented components differentiated from the paraxial mesoderm and giving rise to muscle of the trunk and limbs, most of the axial skeleton and part of the dermis.

**Syncytiotrophoblast:** the outer part of the trophoblast that invades the endometrium and which contributes to the formation of the placenta.

**Trophoblast:** cells that form the outer layer of a blastocyst which provide nutrients to the embryo and develop into a large portion of the placenta.

**Zygote:** is the initial cell formed when two gamete cells are joined by means of sexual reproduction. These cells are an ovum from the female and a sperm cell from the male.

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- <sup>187</sup> Taj Al Arus Min Jawahir Al Qamus, or refer to Muhammad Asad's footnote in his translation of the Qur'an, which can be found here <http://arthursclassiconovels.com/koran/koran-asad10.html>, retrieved 5 September 2011, 15:31.
- <sup>188</sup> Al-Bukhari and Muslim, narrated by Hudhayfa.
- <sup>189</sup> <http://www.pbs.org/wgbh/nova/assets/swf/1/how-sex-determined/how-sex-determined.swf> retrieved 3 October 2011, 09:10.
- <sup>190</sup> Al-Bukhari and Muslim, narrated by Ibn Mas'ud.
- <sup>191</sup> Narrated by Muslim, Kitab al-Qadar.
- <sup>192</sup> Musnad Ahmed, Vol. 1, page 465.
- <sup>193</sup> Babylonian Talmud, Nidda 31a. Accessed online [http://www.come-and-hear.com/niddah/niddah\\_31.html](http://www.come-and-hear.com/niddah/niddah_31.html), retrieved 6 April 2012, 15:14.
- <sup>194</sup> See <http://tinyurl.com/6rqx5py> (a shortened URL from the dorar.net hadith search database that also provides a classification the hadith). Retrieved 6 April 2012, 15:02.
- <sup>195</sup> See *The Science of Hadith*, which can be accessed here <http://www.islamic-awareness.org/Hadith/Ulum/hadsciences.html>. Retrieved 6 April 2012, 15:07.
- <sup>196</sup> Sahih Muslim, Book of Marriage.
- <sup>197</sup> Babylonian Talmud, Nidda 31a. Accessed online [http://www.come-and-hear.com/niddah/niddah\\_31.html](http://www.come-and-hear.com/niddah/niddah_31.html), retrieved 6 April 2012, 15:14.
- <sup>198</sup> This tradition can be found in the book of menstruation.
- <sup>199</sup> Joseph Needham. *A History of Embryology*. Cambridge University Press. 1934, page 59.
- <sup>200</sup> Qur'an Translation: Discourse, Texture and Exegesis. Curzon Press. 2001, page 9.
- <sup>201</sup> Ibid, page 5.
- <sup>202</sup> Ibid, page 7.
- <sup>203</sup> Ibid, page 65.
- <sup>204</sup> The Qur'an: with Surah Introductions and Appendices. The Qur'an Project. Saheeh International Translation. 2011, page 345. Qur'an chapter 31 verse 27. [www.quranproject.org](http://www.quranproject.org).

