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Research Article

Unravelling The Mysteries Of Microorganisms In The Qur'an

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Abstract. Over centuries, microorganisms have puzzled microbiologists due to their wonders. This descriptive qualitative study adopted Thematic Approach and Synoptic Approach to unravel how Qur'an allude to these wonders. Tafsir Ibn Kathir was used for preliminary interpretation of identified verses. Data concerning wonders of microorganisms were screened from online databases. The preposition *من* (part of) used in the phrase *لَا يَعْزُبُ عَنْهُ مِثْقَالُ ذَرَّةٍ فِي السَّمَاوَاتِ وَلَا فِي الْأَرْضِ وَلَا أَصْغَرُ مِنْ ذَلِكَ وَلَا أَكْبَرُ إِلَّا فِي كِتَابٍ مُبِينٍ* (not even the weight of a speck of dust or less than that or greater escapes His knowledge in the heavens or in the earth but it is in a Clear Book) of Qur'an, 61:10, as used in Qur'an, 34:3, allude that, even microorganisms and their tiniest particles that makes them, are within Allah's knowledge. This modest contribution may help people to ponder on presence, greatness, and glory of Allah (S.W.T).

Keywords: Qur'an, Microorganisms, Microbes, Infectious Diseases.

INTRODUCTION

In the Qur'an, 16:89 Allah (S.W.T) says: And we have sent down to you the book (the Qur'an) as an exposition of everything, guidance, mercy, and glad tidings for those who have submitted themselves [to Allah (S.W.T), as Muslims]. In his tafsir (Tafsir Al Qur'an Al 'Adhwim), Ibn Kathir has reported that, Ibn Mas'ud (R.A) said: Allah (S.W.T) made it clear that, in the Qur'an there is complete knowledge of about everything. This means that, Qur'an is the exposition or clarification of everything; including the signs in the field of Microbiology.

Furthermore, in the Qur'an, 41:53 Allah (S.W.T) says: We shall show them our signs in the universe, and in their own selves, until it become manifest to them that this (the Qur'an) is the truth. It is not sufficient in regard to your Lord that He is a witness over all things? In his tafsir [Tafsir Al Qur'an Al 'Adhwim], Al Imam ibn Kathir has reported that, here, Allah (S.W.T) is promising humans that, He will show us the signs in the universes and in our own bodies. He also reported that, this verse is similar to another verse of Qur'an, 27:93 where Allah (S.W.T) says: And say [O Muhammad (S.A.W) to these polytheists and pagans.]: All praise and thanks are Allah's; He will show you His *ayats* (signs, in yourselves, and in the universe or punishments), and you shall recognize them. And your Lord is not unaware of what you do. Furthermore, in various verses of the Qur'an; such as Qur'an, 41:53, 27:93, and 51:21, Allah (S.W.T) has promised humans to show them His signs of the presence, greatness and glory. These are the signs of the things, phenomenon, and various matters; including the matter related to Islamic Shari'ah, what He has prohibited and what He has permitted. Among these signs are those related to the microscopic worlds; including the world of microorganisms and their wonders.

Microorganisms or microbes are living organisms that are too small to be seen by our naked eyes, i.e., organisms with microscopic dimension, that can only be seen by the help of the microscopes. Because it is not possible to see what is inside our bodies without using specialized tools, it means that this is the promise of giving us the ability to construct the tools and designing the techniques that will enable us to accomplish this purpose. Among these tools and techniques are techniques and tools for investigating microorganisms. Hence, the establishment of methodologies and tools; such as microscopes, for the investigations of microbial world is also a sign for the presence, greatness and glory of Allah (S.W.T).

Following this promise, the proper identification of the microorganisms; such as their sizes, shapes, structures, morphologies, life cycles, and all their wonders; in terms of benefits and detrimental effects, remained elusive until 17th century (1674) when Allah (S.W.T) enabled Antony van Leeuwenhoek (1632-1723), a curious Dutch drapery merchant, to peer at a drop of lake through a glass lens that He had carefully constructed, and observed the first ever signatures of microorganisms. In one of his writings, he said:

“Very many little animalcules, whereof some were roundish, while others a bit bigger consisted of an oval. On these last, I so two little legs near the head, and two little fins at the hind most end of the body. Others were somewhat longer than an

oval, and these were very slow a-moving, and few in number. These animalcules had diverse colors, some being whitish and transparent; others with green and very glittering little scales, others again were green in the middle, and before and behind while; others yet were ashes grey. And the motion of most of these animalcules in the water was so swift, and so various, upwards, downwards, and round about, that 'twas wonderful to see." (Nester et al., 2007)

In subsequent investigations, Allah (S.W.T) enabled other microbiologists and microscopists to broaden the scope of the microbial world through the three major historical eras: discovery era, transition era, golden era, and molecular biology era. Through these eras, different microbial lives have been discovered. The word microbe was first invented by Charles Sedillot in 1878. Any living organism having a diameter of 1 mm or below is called microorganisms, and fall under the extensive domain of Microbiology. The word Microbiology was coined by Louis Pasteur; a French Chemist who lived from 1822-1895, and implies the study that deals with the investigation and describing the nature, characteristic features, and application of microorganisms (Cavaillon & Legout, 2022). Currently, there is general consensus among microbiologists to include five (5) major groups as microorganisms: protozoans, fungi, archaea, bacteria, and viruses.

It is generally considered that, microorganisms existed on earth for about 3.5 billion years, and over this time, animals and plants have evolved from these microscopic forms (Nester et al., 2007:1). With this regard, microorganisms are believed to be the foundation for all other life forms. Microorganisms exist on earth; in/on every place where physical conditions for their survival permit: in/on humans, plants, animals, and other living organisms, in water, soil, and atmosphere. Microorganisms can reproduce in all three habitats except in the atmosphere. Generally, the number of microorganisms far exceeds all other living organisms on the planet. Although lake water may appear transparent to the eye, a liter of water can harbor a billion bacteria. A gram of soil can also contain over a billion bacteria. The microorganisms that reside in/on the human body plays a significant role in the health and diseases of the humans. These microbes are called normal human microbiota. And now, the ratio of human cells to bacterial cells has been updated from 10:1 or 100:1 to closer to 1:1 (i.e., $3.0 \cdot 10^{13}$ human cells: $3.8 \cdot 10^{13}$ bacterial cells) (Sender et al., 2016). Many microorganisms have special dispersal cells that can be carried by winds across and between continents. In addition, birds and insects transport microorganisms as they fly.

Thus, we live in a world teeming with microbial life; but for the decree of Allah (S.W.T), most of them are beneficial to the humans. However, the small percentage of the microbes that causes diseases [about 1%] have brought a greater burden of morbidity and mortality to the humans throughout the history of the human civilization; through the normal infections and the outbreak of pandemic infections.

The profound assertion given to us by Allah (S.W.T) invites deeper exploration into the modalities by which Allah (S.W.T) conveys knowledge in the Qur'an. Survey of the verses of the Qur'an indicates that, in the Qur'an, there are two main modalities in which Allah (S.W.T) describe things: directly [by mentioning their names or characteristics], or indirectly [by alluding to them]. The specific focus of this study

was to uncover how the Qur'an has alluded to all these forms of microbial lives and their wonders. This may help people to ponder on the presence, greatness and glory of Allah (S.W.T). It may also generate the interest of other scholars to mount further research in this subject.

METHODOLOGY

This was descriptive qualitative study that adopted Thematic Approach [*Uslub Tafsir Al-Maudhu'i*]¹ and Synoptic Approach [*Uslub Tafsir Ijmali*]² (adopted from Alawi & Jakarta, 2018) to uncover how Qur'an has alluded to the sizes, shapes, structures, morphologies, and all the wonders of microorganisms; including their potential benefits and harm to the humans. Tafsir Al-Qur'an Al-'Adhwim of Al-Imam Ibn Kathir; which is regarded as the second after Tafsir Al-Tabari of Al-Imam Ibn Jarir At-Tabari and Al-Jaami'ul Ahkaam al-Qur'an of Al-Imam Al-Qurtubi, was used as the principle tafsir to get the preliminary interpretation of the identified verses. Modern tafsirs such as Saheeh International Translation by Qur'an Project, The Message of Qur'an by Muhammad Asad, In the Shade of Qur'an by Said Qutb, and Tafsir Jalaalayn by Jalali Ad-Din As-Suyuti and Jalali Ad-Din Al-Mahali were consulted to supplement this purpose. Further meanings of interested words from the identified verses were collected from The Hans Wehr Dictionary of Modern Written Arabic. Data concerning sizes, structures, morphologies, and all wonders of the viruses were screened from PubMed, Medline, ScienceDirect, Scirus, Google Scholar online database and search engine.

FINDINGS AND DISCUSSION

Sizes, Shapes, Structures, Morphologies, And All Their Wonders

The comprehensive survey in the Qur'an revealed two verses that allude to the sizes, shapes, structures, morphologies, and all the wonders of microorganisms; including their potential benefits and detrimental effects to the humans. These verses are:

وَمَا تَكُونُ فِي شَأْنٍ وَمَا تَتْلُو مِنْهُ مِنْ قُرْآنٍ وَلَا تَعْمَلُونَ مِنْ عَمَلٍ إِلَّا كُنَّا عَلَيْكُمْ شُهُودًا إِذْ تُفِيضُونَ فِيهِ ۗ وَمَا يَعْزُبُ عَنْ رَبِّكَ مِنْ مِثْقَالِ ذَرَّةٍ فِي الْأَرْضِ وَلَا فِي السَّمَاءِ وَلَا أَصْغَرَ مِنْ ذَلِكَ وَلَا أَكْبَرَ إِلَّا فِي كِتَابٍ مُبِينٍ

Neither you do any deed nor recite any portion of the Qur'an, nor you do any deed, but We are Witness thereof when you are doing it. And nothing is hidden from your Lord (so much as) the weight of a speck of dust on the earth or in the heaven.

¹ Is the systematic writing of the interpretations applied by commentators by not adopting the order of verses in the glorious *Qur'an*, but by collecting all the verses that address the same theme and then drawing logical conclusions.

² In this methodology, the commentators interpret the verse in conformity with the grouped verses, then describe the meaning of the whole verse and draw conclusions.

Not what is less than that or what is greater than that but is (written) in a Clear Record. (Qur'an, 10:61)

وَقَالَ الَّذِينَ كَفَرُوا لَا تَأْتِينَا السَّاعَةُ ۗ قُلْ بَلَىٰ وَرَبِّي لَتَأْتِيَنَّكُمْ عَالِمِ الْغَيْبِ ۗ لَا يَعْزُبُ عَنْهُ مِثْقَالُ ذَرَّةٍ فِي السَّمَاوَاتِ وَلَا فِي الْأَرْضِ وَلَا أَصْغَرُ مِنْ ذَلِكَ وَلَا أَكْبَرُ إِلَّا فِي كِتَابٍ مُّبِينٍ

Those who disbelieve say: The Hour will not come to us. Say: Yes, by my Lord, the All-Knower of the Unseen, it will come to you; not even the weight of a speck of dust or less than that or greater escapes His knowledge in the heavens or in the earth but it is in a Clear Book. (Qur'an, 34:3)

In these two verses, two similar phrases can be extracted:

وَمَا يَعْزُبُ عَنْ رَبِّكَ مِنْ مِثْقَالِ ذَرَّةٍ فِي الْأَرْضِ وَلَا فِي السَّمَاءِ وَلَا أَصْغَرَ مِنْ ذَلِكَ وَلَا أَكْبَرَ إِلَّا فِي كِتَابٍ مُّبِينٍ

And nothing is hidden from your Lord (so much as) the weight of a speck of dust [dharra/ ذَرَّةٌ] on the earth or in the heaven. Not what is less than that or what is greater than that but is (written) in a Clear Record. (Qur'an, 10:61)

لَا يَعْزُبُ عَنْهُ مِثْقَالُ ذَرَّةٍ فِي السَّمَاوَاتِ وَلَا فِي الْأَرْضِ وَلَا أَصْغَرَ مِنْ ذَلِكَ وَلَا أَكْبَرَ إِلَّا فِي كِتَابٍ مُّبِينٍ

Not even the weight of a speck of dust [dharra/ ذَرَّةٌ] or less than that or greater escapes His knowledge in the heavens or in the earth but it is in a Clear Book. (Qur'an, 34:3)

The word *dharra/ ذَرَّةٌ* contained in the phrase *laa ya'azubu 'anhu mithqaalu dharratin fii samaawaati wala fil ardhi walaa aswkar min dhaalika walaa akbaru ilaa fii kitaabin mubin*; which has been used in Qur'an, 61:10, which is similar to the one used in Qur'an, 34:3, and in the Tafsir Al Qur'an Al 'Adhwim by Al Imam ibn Kathir, has been translated as “not even the weight of a speck of dust or less than that or greater escapes His knowledge in the heavens or in the earth but it is in a Clear Book”, indicate that, even the microorganisms such as protozoa, fungus, archaea, bacteria, and viruses, as well as particles, are within Allah's knowledge, and have been recorded in the *Lawhil Mahfudh* (the preserved tablet). With their sizes, these groups are: protozoans (1µm to several millimeters, or more), fungus (2-10 µm to 46 cm), archaea (0.1 µm to over 15 µm), bacteria (0.1 µm - 3 µm), and viruses (20 nm – 1000 nm) (Nakai, 2020; Ryu, 2017; Levin & Esther, 2015; Herris, 2008; Mahy & Brian, 2003; Barns, 1997; Fenner et al., 1987).

Furthermore, it has also been translated as atom's weight in other tafsirs such as Saheeh International Translation, Muhammad Asad, and Jalaalayn. Similarly, it has been also translated as **"the weight of a small ant"** in the Saheeh International Translation. All these tafsirs allude that, any microorganism and particle; in the heavens or earth, is not hidden to Allah (S.W.T); by His knowledge as well as His control.

Further analysis alludes that, the preposition *min/ من* which has been used in the small phrase *wala aswkhara min dhaalika/ وَلَا أَصْغَرَ مِنْ ذَلِكَ* in all these two verses; and which has been translated as **"less than that"**, has also been translated as **part of, from among, to belong to, some of them, and belonging to** in the Hans Wehr Dictionary of Modern Written Arabic. This dictionary also has brought the phrase *thawbu min hariir* and translated it as **garment made from [of] silk**. These tafsirs alludes that, even a tiny particle that constitute any microorganism or particle are within Allah's knowledge.

This also alludes that, like particles of atoms; that have been identified in particle physics to be composed of other smaller particles such as electrons, neutrons, protons, quarks, leptons etc (Brewer et al., 2020; Garcia, 2007; Weinberg, Fisaletti & Sorli, 2006; 2003; Mann & Moris, 1993), the microorganisms also are composed of other smaller or tiny particles.

History of Microbiology

The whole history of Microbiology was overwhelmed by the controversy among microbiologists from two blocks: those who believed that microorganisms arise from dead decayed matter (spontaneous generation theory), and those who believed that they arise from living matters (biogenesis theory). It has been claimed that, in 1861, Louis Pasteur finally settled the controversy of spontaneous generation versus biogenesis by proving experimentally that microorganisms are not spontaneously generated from dead decayed matter but arises from the living matters (Cavaillon & Legout., 2022; Lavine and Evers, 1999). Despite of the strong opposition against spontaneous generation theory, it continued to persist until recently, 19th century. This shows that, there is a reality in it.

Qur'an, 30:19 says: **He brings out the living from the dead, and brings out the dead from the living. And revive the earth after its death. And thus, shall you be brought out (resurrected)**. This is a clear indication that, Allah (S.W.T) create in both directions: from dead to the living, and from the living to the dead. And therefore, microorganisms might be either created from living or non-living materials; or both directions have been involved in their creation [this fact is known only to Allah (S.W.T) who created them]. That's why in the Qur'an, 42:49 He has stated: **And Allah belongs the kingdom of the heavens and earth. He creates what He wills. He bestows female (offsprings) upon whom He wills, and bestows male (offsprings) upon whom He wills**. And in many other verses, He says: **Certainly, Allah has power over all things**.

Germ Theory Of Diseases

Louis Pasteur was also involved for saving a principal industry of France i.e., manufacturing of wine and beer. He found that fermentation of grains and fruits; resulting in alcohol, was brought about by microorganisms, and also determined that bacteria were involved in the spoilage of wine during fermentation process. In 1897, He proposed that, mild heating at 62.8°C (145°F) for 30 minutes rather than boiling was enough to destroy the undesirable organisms without destroying the taste of the product, the process was called Pasteurization. Later on, in 1892, pasteurization was introduced in USA on a commercial basis. His findings led to the development of the Germ Theory of Disease, which states that, many diseases; in both humans and animals, are caused by the growth and replication of microorganisms such as protozoans, fungus, archaea, bacteria, and viruses (Nester et al., 2007).

However, according to Qur'an, this is not a theory, rather it is a fact. Qur'an has pointed to the two vectors of medical importance to the humans, these vectors are mosquitoes [in Qur'an, 2:26], and flies [in the Qur'an, 22:73].

Mosquitoes

In the Qur'an, 2:26 Allah (S.W.T) says:

إِنَّ اللَّهَ لَا يَسْتَحْيِي أَنْ يَضْرِبَ مَثَلًا مَّا بَعُوضَةً فَمَا فَوْقَهَا ۚ فَأَمَّا الَّذِينَ آمَنُوا فَيَعْلَمُونَ أَنَّهُ الْحَقُّ مِنْ رَبِّهِمْ ۗ وَأَمَّا الَّذِينَ كَفَرُوا فَيَقُولُونَ مَاذَا أَرَادَ اللَّهُ بِهَذَا مَثَلًا ۗ يُضِلُّ بِهِ كَثِيرًا وَيَهْدِي بِهِ كَثِيرًا ۗ وَمَا يُضِلُّ بِهِ إِلَّا الْفَاسِقِينَ

Indeed, God is not timid to present an example - that of a mosquito or what is smaller¹⁵ than it. And those who have believed know that it is the truth from their Lord. But as for those who disbelieve, they say, “What did God intend by this as an example?” He misleads many thereby and guides many thereby. And He misleads not except the defiantly disobedient.

In this verse, Allah (S.W.T) is debunking the contempt and ridicule of polytheists when they laughed on the previous similitudes [in the previous verses], by telling them that, He is not timid to give an example even of a mosquito and what is on its body (Kitota, 2023). This is due to the fact that, all of His creations; being larger or smaller in sizes, are overwhelmed with wonders. This verse point to the two important aspects about mosquitoes in relation to the infectious diseases: (1) the mosquito itself [see the phrase *بَعُوضَةً فَمَا فَوْقَهَا* (Indeed, God is not timid to present an example - that of a mosquito)]. (2) What is on its body [see the phrase *فَوْقَهَا* ('on' or 'on top of it')] (Kitota, 2023).

With regards to the aspect number 1, the Arabic word *بَعُوضَةً* used in this verse

[*Surat Al-Baqarah*, 2:26] implies a female mosquito.³ This means that, the mosquito which is referred to in this verse is a female mosquito. With regard to the aspect number 2, studies show that the insects; including mosquitoes, harbor microbes and parasites, and their diversity varies depending on the sex of the mosquito, the developmental stage, and ecological/environmental factors (Minard et al., 2013). The microbes include microbes such as pathogens [e.g., bacteria, virus, fungus and protozoa] and normal microbiota [e.g., *Wolbachia*]. The parasites include water mites (Dennison et al., 2014). Most mosquitoes inhabit the aquatic environment rich in organic matter, vegetation, animal cadavers, and dejections, insect's breeding water and nectar sources. These environments favor the growth of microorganisms and parasites (Girard et al., 2021; Dennison et al., 2014; Hochberg and Ives 2000).

The mosquitoes are exposed to the microbes and parasites during their interactions with the above ecosystems (Alphey, 2009). Some of these microbes and parasites are found 'within' the bodies of the mosquitoes in various organs such as the midgut, reproductive organs [e.g., ovaries], malpighian tubules, and hemocoel. These include viruses [e.g., arboviruses], bacteria (e.g., *Wolbachia*), and protozoa (e.g., plasmodium). Some are found on the various parts of their bodies such as on head, thorax, abdomen, and appendages. These include parasitic water mites and *Wolbachia* (Huang et al., 2020; Ata et al., 2017; Dennison et al., 2014; Minard et al., 2013). The phrase *فَمَا فَوْقَهَا* is preliminary referring to this sign.

Joining the two points, mosquitoes are the vectors of a broad range of causative agents of harmful viral, bacterial, and parasitic diseases, infecting both humans and animals, via either contaminating various fomites or through bites (Olagunju, 2020; Huang et al., 2020; Sarwar, 2015; Alphey, 2009). They carry a broad range of pathogens [bacteria, parasites, and viruses] that cause diseases such as Malaria, Zika, Lymphatic filariasis, Dengue, Yellow fever, Chikungunya, Japanese encephalitis, and West Nile fever (WHO, 2020).

However, as it has been revealed in this verse, it has been identified that, its only female mosquitoes that can bite and transmit diseases (Mponzi et al., 2020), and it is unknown exactly how many people are affected by mosquito bites annually as most go unreported. What is known is that mosquito-borne diseases cause a tremendous disease burden, infecting 700 million and causing a million deaths every year (Caraballo & King, 2014).

Flies

In the Qur'an, 22:73 Allah (S.W.T) says:

يَا أَيُّهَا النَّاسُ ضُرِبَ مَثَلٌ فَاستَمِعُوا لَهُ ۖ إِنَّ الَّذِينَ تَدْعُونَ مِنْ دُونِ اللَّهِ لَنْ يَخْلُقُوا ذُبَابًا وَلَوْ
اجْتَمَعُوا لَهُ ۗ وَإِنْ يَسْلُبْهُمْ الذُّبَابُ شَيْئًا لَّا يَسْتَنْقِذُوهُ مِنْهُ ۗ ضَعُفَ الطَّالِبُ وَالْمَطْلُوبُ

³ [https://corpus.quran.com/wordmorphology.jsp?location=\(2:26:9\)](https://corpus.quran.com/wordmorphology.jsp?location=(2:26:9)). Last accessed on March 13, 2022.

O people, an example is presented, so listen to it. Indeed, those you invoke besides God will never create [as much as] a fly, even if they gathered together for it [i.e., that purpose]. And if the fly should steal from them a [tiny] thing, they could not recover it from him. Weak are the pursuer and pursued.

In this verse, Allah (S.W.T) is telling the polytheists; and all of us, that, we can never create even a fly, even if we gather together; in attempt to create it. He continues to challenge them; and all of us, that, even if it steals from us anything, we can never recover it [from it]. According to the signs in the Biology and Microbiology, the only thing that a fly can steal from us is food and health.

Firstly, a fly undergoes extracellular digestion; releasing digestive enzymes outside [to the food] that will readily digest it, and then it absorbs the digestive liquids. By this sign, even if you grab it and try to retrieve the food, you can never get it. Secondly, among all insects; that are preliminary regarded to be the vectors of various infectious diseases, houseflies (*Musca domestica*) have been reported to be the most prevalent vector all over the world, harboring more than 100 pathogens, such as helminths, fecal bacteria, protozoans, and viruses, and leading to the spread of more than 65 diseases. These diseases include: Cholera, Anthrax, Shigella, ORF Virus, Typhoid, Dysentery, and Ascariasis, and they cause a great burden of morbidity and mortality (Olagunju, 2022; Sarwar, 2015). By this sign, Allah (S.W.T) has uncovered to us that, another thing that a fly can steal from us are good health and living, by causing diseases and disabilities, and even be the reason behind our deaths. The second observation is in line with the view of Said Qutb in his tafsir [In the Shade of Qur'an] who said that: **Flies can rob people of that which is precious indeed. At the same time, a fly carries agents of some very serious diseases, such as tuberculosis, typhoid, dysentery and conjunctivitis. It can deprive a person of his eyes or other organs, or indeed deprive him of his life. A weak and contemptible fly can rob a human being of what he can never retrieve.**

However, according to the Hadith narrated by Abu Huraira (R.A) reported by Al Imam Al Bukhari in his Sahih, the Prophet Muhammad (S.A.W) said: no infectious diseases can be transmitted from animal or human to another without the permission from Allah (S.W.T).

1. Microbial division

Bacteria and archaea reproduce asexually only, while eukaryotic organisms can engage in either sexual or asexual reproduction. Bacteria and archaea most commonly reproduce by the process known as binary fission, where a single cell divides into two equally sized new daughter cells. This is another baseline of creation. In the Qur'an, 51:49, Allah (S.W.T) has stated that, **and of everything We have created pairs, that you may remember [the grace of Allah (S.W.T)].** Other less common reproductive techniques can include budding, multiple fission, and spore production.

2. The mortality of the microorganisms

The existence of the microbial world; and their motilities, were hinted in the Qur'an, 42:29 when Allah (S.W.T) stated that, **and among his signs (proof, evidence, lessons, signs, etc.) is the creation of the heavens and the earth,**

and whatever moving (living) creatures He has dispersed in them both. And He is All-potent over their assembling (i.e. resurrecting them on the day of resurrection after their death, and dispersion of their bodies) whenever He wills. Studies shows that, an impressive diversity of motility mechanisms has evolved in prokaryotes. They move through liquids or over moist surfaces by swarming, swimming, twitching, gliding, and floating. Movement can involve surface appendages; such as flagella that spin, pili; that pull, as well as Mycoplasma 'legs'; that walk. Internal structures; such as the cytoskeleton and gas vesicles, have been reported in some types of motility. However, the mechanisms of some other types of movement remain to be mysterious (Amils, 2014; Jarrell and McBride, 2008; Bardy et al., 2003).

3. Control of microbial growth

In the Qur'an, 5:6, Allah (S.W.T) has command the believers to take ablution before each prayer; whether optional (*sunnah*) or compulsory (*fardh*) prayer. He says:

الْيَوْمَ أُحِلَّ لَكُمْ الطَّيِّبَاتُ ۖ وَطَعَامُ الَّذِينَ أُوتُوا الْكِتَابَ حِلٌّ لَكُمْ وَطَعَامُكُمْ حِلٌّ لَهُمْ ۖ وَالْمُحْصَنَاتُ مِنَ الْمُؤْمِنَاتِ وَالْمُحْصَنَاتُ مِنَ الَّذِينَ أُوتُوا الْكِتَابَ مِنْ قَبْلِكُمْ إِذَا آتَيْتُمُوهُنَّ أَجُورَهُنَّ مُحْصِنِينَ غَيْرَ مُسَافِحِينَ وَلَا مُتَّخِذِي أَخْدَانٍ ۗ وَمَنْ يَكْفُرْ بِالْإِيمَانِ فَقَدْ حَبِطَ عَمَلُهُ وَهُوَ فِي الْآخِرَةِ مِنَ الْخَاسِرِينَ

O you who have believed, when you rise to [perform] prayer, wash your faces and your forearms to the elbows and wipe over your heads and wash your feet to the ankles. And if you are in a state of *janābah*, then purify yourselves. But if you are ill or on a journey or one of you comes from the place of relieving himself or you have contacted women and do not find water, then seek clean earth and wipe over your faces and hands with it. God does not intend to make difficulty for you, but He intends to purify you and complete His favor upon you that you may be grateful. (Qur'an, 5:6) And in the hadith/sunnah, Prophet Muhammad (S.A.W) said:

مَنْ تَوَضَّأَ فَلْيَسْتَنْثِرْ، وَمَنْ اسْتَجَمَرَ فَلْيُوتِرْ

Whoever performs ablution should clean his nose with water by putting the water in it and then blowing it out, and whoever cleans his private parts with stones should do it with odd number of stones.⁴

⁴ Ismail, A. (1997). Sahih Al-Bukhari (M. Khan, Trans). Riyadh. Saudi Arabia: Darussalam Publishers and Distributers. Volume 1. Hadith number 161.

With regards to these directives, Muslims take ablution 5 times or more per day. In each ablution they wash their hands 3 times, they take water into their mouth and blowing it out 3 times, they take water into their nose and blowing it out 3 times, they wash their faces 3 times, they wash their hands up to the ankle 3 times, they rub their wet hand on their heads and ears 1 time, and they wash their legs [up to the ankle].

In Microbiology, all these parts of the body that Muslims washes and rub during ablution; such as mouth, nose, ear and skin, are among of the body parts called portal of entries, where pathogens reside and use them to invade the body cells. For example, among of the methods of transmission of some infectious diseases; respiratory infections, including the COVID-19 pandemic, is through aerosols [the mixture of air, water, and dusts].⁵ But by the decree of Allah (S.W.T), usually these aerosols are trapped by the nasal hairs and mucus present in the nose. Zou *et al.*, 2020 have analyzed the viral load in nasal and throat swabs obtained from 17 symptomatic patients in relation to the days of onset of any symptoms. Higher viral loads were detected soon after symptoms onset, with higher viral loads detected in the noses than in the throats.⁶ Hence, as stated in the above hadith, if a person is performing ablution 5 times a day or more; by taking water in the nose and blowing it out 3 times, the viral load will be reduced or expelled out all. Therefore, this maxim has laid the foundation and showed direction of controlling and preventing the transmission of the infectious diseases that are transmitted through inhaling aerosols. However, this method was not mentioned in the modern medicine as the method of controlling and preventing the spread of the COVID-19 pandemic.

Tools And Techniques For Investigating Microorganisms

As said earlier, Qur'an is the description of everything; including the signs in the field of Microbiology. In the Qur'an, 41:53 and 27:93, Allah (S.W.T) has promised humans that He will be showing us the signs of his presence, greatness, and glory in our bodies, and affirm that we shall recognize them. Because it is not possible to see what is inside our bodies without using specialized tools and techniques [methodologies], it means that, this is the promise of giving us the ability to construct the tools and designing the techniques that will enable us to accomplish this purpose. Therefore, it is clear that, among these tools and techniques, are different kinds of microscopes and microbiological techniques we are using nowadays.

Decomposition Of Organic Matter

Microbiological studies show that, this role of decomposing the dead bodies is done preliminary by both bacteria and fungi. The prohibition of eating dead animals (in Arabic: *al maitatu*) in the Qur'an, 2:173, 5:3, 6:145 and 16:115; that has been identified to harbor a number of microorganisms, that are at work, decomposing

⁵ Nester, W.E., Anderson, G. D., Robert, E. C & Nester, T. M. (2007). *Microbiology. A Human perspective*. New York: McGraw-Hill.

⁶ Zou, L. Z., Ruan, F., Huang, M., Liang, L., Huang, H., Hong, Z., *et al.*, (2020). SARS-CoV-2 viral load in upper respiratory specimens of infected patients. *The New English Journal of Medicine*, 382:12.

them, implies the reason behind their prohibition. Most of these microbes pose a serious threat to the life of humans, and one of the objectives of Islamic Shari'ah is to protect the health and lives of the humans.

Similarly, in the Qur'an, 20:55, Allah (S.W.T) has stated that, **thereof (the earth) We created you, and into it We shall return you, and from it we shall bring you out once again (Qur'an, 20:55)**. The phrase **and into it We shall return you** is an indication of the decomposition process; which as stated, it is done primarily by both bacteria and fungi. Soon after the death of humans, the normal microbiota changes and start to decompose the body, prior to the next decomposition process that will be done by the soil decomposers after being buried, that include bacteria, fungus, as well as arthropods like ticks, mites etc. Hence, the prohibition given in these verses encompasses even the microorganisms and their decomposition activities, and it meant to preserve the health and life of humans due to the diseases that could arise from ingesting the pathogenic microorganisms.

A survey from various databases reveals that, this study might be the first comprehensive study to specifically describe how Qur'an has alluded to the microorganisms and all their wonders: their sizes, shapes, structures, morphologies, their true nature, their life cycle; including their benefits and detrimental effects. The previous identified studies have described this subject by analyzing other verses, particularly Qur'an, 2:26 (Kitota, 2013, Kusumaningrum et al., 2022, Abdul Majid, 2021, Masri, 2021, Mursyid, 2020, Lalu et al., 2020, Al-Osail & Al-Wazzah, 2017 & Al-Jawi, 2006). However, this particular verse alludes to the sizes, structures, morphologies, and other wonders of all small creatures found in the bodies of the mosquitoes such as saliva, and on the bodies of the mosquitoes; such as ectoparasites [namely water mites], bacteria, and viruses, but it does not allude directly to all categories of microorganisms and their constituent particles. The word *dharra*/ ذَرَّةٌ and preposition *min*/ مِنْ used in the Qur'an, 10:61 and 34:3 described in this study account for the great difference between this study and the verse described in the previous identified studies. Furthermore, the present study has reported additional other verses that allude directly to the presence of microorganisms, their growth, their motilities, their control measures, as well as the tools and techniques of investigating them. All these features are not reported by the previous studies.

These findings highlight an area of Qur'anic and biological and medical science integration; specifically, the field of Virology, that has received limited attention. This study paves the way to other researchers, encouraging them to explore more deeply on how the verses of the Qur'an have traversed the subject of Virology.

CONCLUSION

This descriptive qualitative study highlights the miraculous aspects of the Qur'an by uncovering the subject that, under normal circumstance, people might not imagine has been traversed in its verses. The qualitative descriptive analysis provided in this study highlight this miracle. Like particles of atoms and other particles, the microorganisms and their constituents' particles; and their wonders, such as their sizes, shapes, structures, morphologies, their true nature, their life cycles, their

growth, their motilities, their control measures, the tools and techniques of investigating them, as well as their benefits and detrimental effects in terms of morbidity and mortality, have been alluded in the Qur'an. As science and technology continue to advance, it is imperative for people from various fields of study worldwide to turn towards the Qur'an and integrate their specialized knowledge with its diverse verses. Doing so may help to reveal the miraculous aspects of the Qur'an, thereby strengthening our faith in Allah (S.W.T) and His final Messenger, Muhammad (S.A.W). The comprehensiveness of its verses and their profound insights are inconceivable to have been taught by anyone not receiving divine revelation. It is indeed Allah (S.W.T), the all-knowing, who revealed the Qur'an, rich with miraculous aspects, to His final Messenger, Muhammad (S.A.W).

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