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Contents

ANTIMICROBIAL PEPTIDES: BASIC FACTS AND PROSPECTIVE AS AN ALTERNATIVE TO ANTIBIOTICS

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A B S T R A C T

The availability of complete genome sequences and development of information technology have provided a greater opportunity for peptide based drug designing. The field of structure based drug designing is a rapidly growing area and the exposition of genomic, proteomic and structural information has provided new targets and opportunities for drug lead discovery. In the meat industry, the use of antibiotics as growth enhancers is a common practice and is reported that out of total , globally 50% of the antibiotic is used to promote growth. Wide spread and some time indiscriminate use of antibiotics has been accompanied by the emergence of microorganism that are resistant to these agents. Antibiotic resistance has been posing increasingly serious concern to the public, health specialist and animal food producers. To overcome antibiotics resistance and to retain consumer confidence in a safe food supply, health specialist and food animal producers are searching for alternative, yet effective means of preventing and treating emerging and re-emerging diseases. Thus, new approaches to the problem of antimicrobial resistance and development of novel classes of antimicrobial agents with less likelihood to gain resistance are needed. Antimicrobial peptide also known as host defense peptides are prevalent throughout the nature as a part of the intrinsic defenses of most organisms and have been proposed as a blueprint for the design of novel antimicrobial agents.

Keywords - Antimicrobial Peptides, Antibiotic resistance, Novel antimicrobial agents, host Defense Peptides

1. INTRODUCTION

Different drugs use in livestock production, particularly in intensive management has created a build-up of chemicals in the food chain and the environment. There are a very few numbers of laboratories assessing the potentials impact of different drugs to the environment. Among different drugs, antibiotics are commonly used in animal industry across the world for treatment, prevention and control of diseases. Besides these, in meat industry the antibiotics are used at low concentration as growth enhancers. Low dose antibiotics are given as feed and water additives which improve daily weight gain and feed efficiency through alterations in digestion and disease suppression. It is stated that low dose of antibiotics in swine results in healthier animals and reduces the "microbial load" on meat resulting in an assumed decrease in potential food borne illness risk. While the benefits of sub therapeutic antibiotic administration are welldocumented, there is much concern and debate regarding the antibiotic residue in meat and development of antibiotic resistance microbes associated with their use. Antibiotics residue may deposit/accumulate or otherwise be stored within the cells, tissues, organs

or edible products of animals. The over drug residues are public health and economically related. The palatability, aroma and quality of meat could be affected by antibiotic residues and also threaten human health as these are allergenic, organotoxic, mutagenic, teratogenic or carcinogenic. Residues of penicillin, tetracyclines, sulphonamides and aminoglycosides are the most frequently cited causes of allergic penicillin, tetracyclines, sulphonamides and aminoglycosides are the most frequently cited causes of allergic reaction , aminoglycosides (e.g. streptomycin) can cause varying degree of nephrotoxicity and ototoxicity .

The availability of complete genome sequences and development of information technology have provided a greater opportunity for peptide based drug designing. The field of structure based drug designing is a rapidly growing area and the exposition of genomic, proteomic and structural information has provided new targets and opportunities for drug lead discovery. The use of antibiotics as growth enhancers is a common practice and extensive use of antibiotic in meat industry causes an alarming increase of antibiotic resistance microbes across the world [1]. Antibiotic resistance has been posing increasingly serious concern to the public, health specialist and animal food producers.Therefore, there is a need of alternative group of drugs which are active in vivo and are able to act fast and has broad-spectrum activity, do not induce bacterial resistance and have limited or no side effects.Antimicrobial peptides are prevalent throughout the nature as part of the intrinsic defenses of most organisms. These peptides represent ancient host defense molecules and act as key elements in non-specific immunity [1]. Their wide spread distribution throughout the animal and plant kingdoms suggest that antimicrobial peptides have served a fundamental role in the successful evolution of complex multicellular organisms [2]. New strategies are required for synthesis of novel antimicrobial agents to deal with the threat of bacterial resistance [3]. Antimicrobial peptides hold promise as broad-spectrum alternatives to conventional antibiotics [4].

The rapidly responsive and phylogenetically ancient innate immune system of host defense is generating increasing interest due to its broad spectrum of effectiveness. Epithelial physical and chemical barrier system represents an important part of the innate immune system preventing primary infection as these surfaces are equipped with various antimicrobial substances [5]. The most common sites of initial encounter with microbes are the epithelial lining of the different organ as well as different physiological system. The epithelial layer of the vertebrates provide the first line of defense against pathogens and hostile environment [6]. If this barrier is breached, microorganism invades and an acute inflammatory response occurs .The activation and deployment of pathogen specific immune responses occurs slowly relative to the potential kinetics of microbial proliferation and restricted to higher eukaryotes which contain immune cells capable of recognizing antigens and responding with effectors cells. The acquired immune system is primarily cellular in composition, relying on the actions of B and T cells which are not triggered rapidly enough to protect against exposure to any pathogen or infection.

But the non-specific innate immune response is more immediate which depends upon the activity of phagocytic cells such as macrophages and neutrophils and in the expression of a number proteins and peptides. The rapidity of the innate immune system provides effective host defense against a vast array of microbes in a manner that is independent of previous exposure to any pathogen [7].

Specific antigens recognition by lymphocytes plays a limited role during initial encounter by microbes. Epithelial physical and chemical barrier system represents an important part of the innate immune system preventing primary infection as these surfaces are equipped with various antimicrobial substances [8]. These epithelial derived molecules can restrain microbes by causing structural disruption or metabolic injury. The absence of functionally important immune system in lower vertebrates, invertebrates and plants indicates that innate immune system plays vital role to defend them in survival. Peptide based host defense can be considered as a pervasive and evolutionary ancient mechanism of immunity. The innate immunity is very fast and multifunctional in nature [9] and is mediated, at least in part by the potent antimicrobial action of cationic peptides against gram positive and gram negative bacteria, fungi, parasites and even some viruses [10] and [11].

Antimicrobial peptides with broad spectrum activity are widely distributed in nature and have been characterized from plants, insect, amphibian as well as mammals, including human [12, 13 and 14].

Multicellular organisms live by and large, harmoniously with microbes. Antimicrobial peptides are distributed ubiquitously in plant, bacteria, insects, amphibian and mammals and by virtue of their broad spectrum antimicrobial activity use to fend off a wide range of microbes including bacteria, fungi and protozoa [15]. Bombinins, magainins and dermaseptins are best characterized group of antimicrobial peptide and has been isolated from amphibians [16]. Antimicrobial peptides are expressed from those parts of animals that are most likely to come into contact with pathogens from the environment. Thus they are found in skin, epithelial surfaces of tongue, gut, trachea and lungs [17].

Antimicrobial Peptides have considerable therapeutic potential as these peptides prevents from colonizing and growing to a point where they can cause life threatening infection. As antimicrobial peptides are effective components of host defense, that can be explored as possible alternative to conventional antibiotics. Traditional antibiotics usually have single or limited types of target molecules, which can be mutated easily by bacteria to gain resistance. The action of antimicrobial peptide involve the direct electrostatic interaction with negatively charged microbial cell membrane, followed by physical disruption and capable of killing broad range of microorganism due to lack of involvement of specific receptors [18]. These peptide kill micro-organism rapidly compared to conventional antibiotics and appear to be refractory to the development of resistance. All these attributes make them attractive candidates as next generation therapeutic agents for treating multi-drug resistant bacterial infections.

Antimicrobial peptides cover a wide spectrum of gene encoded and ribosomally synthesized molecules

from bio-synthetic precursors that display a considerable diversity in size and structure. The primary translation product is generally pre-protein which is processed by definite pathway to pro-protein and processed further to mature active peptides by specific pathways [19]. Antimicrobial peptides of various families differ in size, amino acid sequence and certain structural motif. Families of antimicrobial peptides genes are located in clustered, in close proximity on the same chromosome, which suggests that they may have evolved from a common ancestral defense gene by duplication [20]. These antimicrobial peptides represent a unique and quite complex host defense tool [21]. Mammalian defensins and cathelicidins are the two broad classes of antimicrobial peptides constitute a large family of endogenous peptide antibiotics with broad-spectrum activity against various bacteria, fungi and viruses. All defensins are polycationic 3.5-4.5 kDa, relatively arginine rich nonglycosylated peptides and are characterized by the presence of six conserved cysteine residues forming three intermolecular disulfide bonds with a compact triple stranded   -sheet structure [22]. Based on the positions of six cysteine residues and linkages of the disulfide bonds and overall molecular structure, defensins are divided further into three classes: -defensin,   -defensin and   defensin.   -defensin are 29-35 residues in length containing three disulfide bridges in 1-6, 2-4 and 3-5 alignment and reveal a triple stranded   -sheet structure with   -hairpin loop that contains cationic amino acids [23]..   -defensin are 36-42 residues in length and possesses disulfide alignment at 1-5, 2-4 and 3-6 position [24]. A novel class of defensins also has been isolated and named   -defensin for its circular structure in which cysteine residues linking at 1-6, 2-5 and 3-4 [25]. Many   -defensin are expressed by epithelial cells and other cells of body [26]. Their expression in nonmyeloid cells may occur constitutively or in response to signal that are generated during infection, inflammation or and tissue repair.

Cathelicidins are mostly synthesized from the bone marrow progenitor cells of mammalian species. Precursors of the cathelicidin family possesses a Nterminal signal peptide of 29-30 amino acids, a pro sequence of approximately 99-114 amino acids which is highly conserved both intra and inter species and the C-terminal region there is substantial heterogenesity which encode mature peptide, containing 12 to 100 amino acids. Expression of human cathelicidin namely hCAP-18 and LL-37 is reported respectively in the reproductive tract and skin epithelial cell [27]. Several β-defensin namely, human β-defensin-4 from testis [28]. ,cryptidin from mouse sertoli cells [29]. Bin1b from rat epididymis [30]. (has been isolated. Antimicrobial peptide gene in the uterine tract has been characterized from Bubalus bubalis and the potency of the individual amino acids has been analyzed [31]. On the basis of amino acid sequence of natural antimicrobial peptides various analogues can be prepared by replacing with desired amino acid. Antimicrobial peptide gene from buffalo tongue has been sequenced and characterized [32 and 33].

II. CONCLUSION

Synthesis of different length of natural analogue of buffalo lingual antimicrobial peptide and functional study revealed its potency against both gram positive and negative bacteria. Designed and synthesized antimicrobial peptides qualifies as prototypes of innovative drugs that can be widely explored as novel antimicrobial drugs to reduce the adverse affect of antibiotic.

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ON THE CHARACTERISTICS OF APHARISMS RELATING TO THE CONCEPT OF "TONGUE" IN ENGLISH

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A B S T R A C T

The article studies paremiological units in modern linguistics and their specific features which investigates aphorisms related to the concept of "tongue" in English. The use of paremiological units related to the concept of "Tongue" is not only dependent on events, situational changes, even a specific context has the ability to choose the appropriate option. In order to use the aesthetic function of the language, the creator chooses one of the inexhaustible expressive possibilities of the language according to his purpose - the one he wants. The variants of proverbs and proverbs do not mean the same thing, there is a very subtle difference in meaning between them. The author or speaker chooses only one of them to express his opinion more sharply and clearly, according to the speech situation and purpose. These peculiarities of the topic are investigated which are given in conclusions and suggestions on the topic.

Keywords - Aphorism, Paremiological Unit, Proverb, Saying, Phraseological Unit.

I. INTRODUCTION

In modern linguistics, paremiological units are units that have a great potential in terms of informativeness in the language, were prepared by ancestors, have the quality of stability as the main features, and exist as the integrity of communicative content and grammatical form. They are traditional sentences, formed on the basis of certain patterns. Paremiological units have all the characteristics of speech derivatives (devices) in the form of a text, the signs of sociality and non-repeatability in them are similar to such signs of speech sounds, words, affixes. A unique approach is required in the modeling of paremiological units related to the concept of "tongue" in English. In determining their attitude to language and speech, an exceptional approach to other speech phenomena is appropriate. Paremiological unit in all languages is different from phraseologism. Phraseological unit, first of all, has the status of a word (lexeme), while proverbs and proverbs are of speech nature, that is, they are formed grammatically; the speaker does not feel the need to give a grammatical tone in the

process of using it. It can be called internal stability that words in stable compounds cannot be replaced by synonyms and variants, and that sentences in proverbs are grammatically formed and become stable. Even when proverbs and proverbs take place in another sentence as a ready-made syntactic device, their sentence status remains intact[4].

II. LITERATURE REVIEW

The use of paremiological units related to the concept of "Tongue" is not only dependent on events, situational changes, even a specific context has the ability to choose the appropriate option. In order to use the aesthetic function of the language, the creator chooses one of the inexhaustible expressive possibilities of the language according to his purpose - the one he wants. The variants of proverbs and proverbs do not mean the same thing, there is a very subtle difference in meaning between them. The author or speaker chooses only one of them to express his opinion more sharply and clearly, according to the speech situation and purpose. In the aphorisms related to the concept of "tongue" in English, language is considered as the heart, pride, symbol of independence, future of the nation. In contrast, in a number of the most powerful and significant works of art, the language first of all touches the heartstrings. Then it is mentioned as a means of conveying the words to the listener.

III. METHODOLOGY

In English, paremies, aphorisms and texts form the symbolic, objective, imaginative and evaluative layers of the "tongue" concept and allow to fill in the cognitotype of the lower terminals of the mentalinguistic model of the language. Aphorisms, along with proverbs, are artistic summaries of folk wisdom and express various aspects of folk thinking. Aphorisms occur as an independent genre, but they can also be "inserted" into a nonaphoristic context. The main features of aphorisms, i.e. philosophical, definitiveness, generalized character of semantic categories, are naturally reflected in the compositional construction of the word. Such a microtext, compared to other gnomic units, is also called a "product of life experience" by great personalities. In this, the author abandons the subjective worldview of the statement and brings the ready-made formula to the reader's simple honest thinking: Euch is the residue of design: Bi Rickey Library is thought in cold storage: Lord Samueh The compositional features of aphorisms, together with artistic and stylistic means, provide words in the gnomic sense of the language with an obligatory feature for them - unconventionality. In the process of scientific research, we witnessed a lot of use of the following stylistic devices in aphorisms related to the concept of "tongue" in the English language.

I. Antithesis - Methodological use of contrasting ideas, concepts, etc. Ex: 1. Talking should be an exercise of the brain not of the tongue (Gapirishtilningemas, balkimiyaningmashqlaribo'lishikerak) (Anonymous)

2. Queen. Hamlet, thou hast thy father much offended. Ham. Mother, you have my father much offended. Queen. Come, come, you answer with an idle tongue (William Shakespeare). As can be seen from the above examples, "brain and language or thought and language" are opposed to each other and antithesis is created in these aphorisms.

II. Comparisons - is an artistic image tool based on bright and exaggerated depiction of the object of the image by simulating it with another thing phenomenon, which relies on common signs and characteristics for the things-phenomena that are being compared. Ex: 1. ―English is the most beautiful language, but not rhymed tongue‖ (John Lennon). (Ingliztilichiroylibo'lishimumkin, lekinqofiyalitilemas) 2. ―Silence is foolish if we are wise, but wise if we are foolish‖. As you can see from the examples, although English is a very beautiful and popular language today, it is difficult to arrange the rhymes when writing poems and ghazals in this language.[5] A lot of poetic works of English poets reach people in a way that is not in accordance with the norms of worldly works.

III. Irony (Greek: eίgopeía - literally, to make a fool of oneself) in contemporary linguistics, it comes in the meaning of sarcasm, irony, sarcasm. Ex: 1. A woman's tongue is sharp enough to pierce the toughest flesh [1] (Ayolningtiliengqattiqgo'shtni ham teshishiuchunyetarlichao'tkir). 2. Woman's tongue is he weapon, her sword, which she never permits to rest or rust (Ayolningtili – u qurol, uningqilichi, u hechqachon dam olishgayokizanglashgaruxsatbermaydi). The given examples are a set of concepts that indicate the style of irony to the respective interlocutor during the conversation. Such aphorisms are dialogic and are a case of irony applied to some opinions of the second person.

IV. Parallelism (юн. parallelos–yonma-yon yokiboruvchi) - due to the similarity or contradiction between what is described, it allows validating of emotion and feelings of emotion. ―That curry is heaven on the tongue but hell in the tummy.‖ plays on the oppositional dichotomy of the concepts of heaven and hell. [1]. In the aphorism given above, it is said about the actions of heaven and hell that are contradictory to each other, pointing out that language is the road that leads to heaven and hell, and parallelism characterizes the stylistic device.

V. Chiasmus (Greek: chiasmus - from the letter X of the Greek alphabet, i.e. located in the form of this letter) - syntactic parallelism in the reverse order, a stylistic figure based on the repetition of words (fragments) in the verse in the reverse order. Ex: 1. But as for prophecies, they will come to an end; as for tongues, they will cease; as for knowledge, it will come to an end [2] (Afsonalarkeladiketadi, tillargakelsak u o'ladi, shuningdek, bilim ham tugaydi.) 2. Gifts of prophecy, tongues and knowledge will cease/faith, hope and love will abide [2] (Bashorattilvabilimsovg'alariiymon, sevgivaumidbilandavometadi). In the above aphorisms, the repetition of words in the reverse order of legend, linguistics, and words constitutes a stylistic figure of chiasm. This stylistic device, or chiasm, is a form of people's experiences, expressed in a lot of oral speech and decorates communication.

VI. Ellipsis (Greek: elleírsís - dropping, dropping) is one of the stylistic figures, deliberately omitting a

word (part) of a sentence in speech. Ellipsis is carried out with a specific artistic and aesthetic goal in mind. If there is a question about a quote, either don't use it or ask the speaker (language specialist)to clarify." (Agar iqtiboshaqidasavolbo'lsa, uniishlatmangyokima'ruzachi (tilegasi)dananiqlikkiritishiniso'rang). There are such aphorisms that always come to the mind of a person and when they are conveyed to the listeners, they feel that some word is needed or missing, and even if the word is added and changed, the meaning remains the same. in the aphorism given above, if the word "speaker" is replaced by the word "language owner", it can be understood in the same sense.

VII. Rhetoric (Greek: rhetorike - oratory) is the science of the art of speaking. The subject of rhetoric is speech, and all related issues (choice of material, placement, sentence construction, proof and disproof of an idea, choice of words, style, use of stylistic figures, reading a speech and h.) learns. Ex: 1. My home tongues are the languages I speak with my sisters and brothers, with my friends. [3] (tilimmeni aka-uka, opasingilvado'stlarimbilanmuloqotqiluvchivositadir). In the above aphorism, the word order is correctly set, organized, fluent and expressive. As a result, rhetoric is embodied in this aphorism. In many aphorisms, we find the expression of speech in a chaotic form. But it is precisely in rhetoric that the sequence of words requires its superiority.

VIII. Gradation: (lat. gradatío - to strengthen consistently) is a stylistic figure based on consistently strengthening the content. One of the speech fragments "the meaning of the second. Ex: 1. O, I could prophesy, But that the earthy and cold hand of death Lies on my tongue. No, Percy, thou art dust, And food for – [4].

Kelibketdinechadunyolar

Keldihayotyig'ladio'lim

Sen deb jafochekdibobolar

Ularketdisenqoldingtilim

2. ―I do not regret, I do not call, I do not cry‖(Afsuslanmayman, achinmayman, yig'lamayman ham). It can be seen from this quote that the words "world, death" strengthen the meaning of the word "language" and create a gradation in the poem.

IX. Anaphora (юн. апaphora — yuqorigachiqarish). The use of a style consisting of the repetition of exactly one element at the beginning of parallel structured speech fragments (eg, verses)Long tongue of cat looks beautiful, Like fire Lord cat's tongue powerful. Looking red colored tongue of cat, Life gets lesson that creation is best. In this aphorism, an anaphoric stylistic device appears in the repeated repetition of the English word "tongue" and the comparison of the semantics of "tongue" to the language of various creatures. Our scientific research has shown that among the above stylistic tools, antithesis and simile are the leading tools for aphorisms. The use of such aphorisms in many materials seems natural to us and has become a habit.[7]

Aphorisms perform a certain aesthetic function in the epic narrative, the author, characters' speech or

other parts of the plot, sometimes as they are, sometimes partially changed or created completely anew. Universal aphorisms are irrefutable summative expressions and consist of one or two parts such as "Tongue is the mirror of the nation", "Tongue is the pride of the nation". In the individual aphorism, they are found expanded. For example, "A poet is, before anything else, a person who is passionately in love with language" (The tongue may hide the truth but the eyes—never) can hide the truth, but the eyes never can). "The best time for you to hold your tongue is the time you feel you must say something or bust" we see the following four-part version of the aphorism: Language - enjoyment "Language - nation, language - pride, language - disaster." Taking into account the above, we have selected examples of aphorisms expressing the concept of "tongue" in English. After seeing some of them, we divided into the above groups. Language is a feeling of perversion: in aphorisms involving the word "tongue" in English, it is given to a human child and appears as a measure of a person's ability to enjoy life. The following aphorisms express such meanings as the enjoyment of language and act as a bridge to understand the events that make it happy in the process of communication.[6]

And this, our life, exempt from public haunt, finds tongues in trees, books in the running brooks, sermons in stones, and good in everything; 1. ―In the English language there are orphans and widows, but there is no word for the parents who lose a child.‖; 2. A bitter man needs to place his troubles on the front of his tongue so that they; 3. Like a child who saves their favorite food on the plate for last, I try to save all thoughts of you for the end of the day so I can dream with the taste of you on my tongue.‖; 5. The language we use creates the reality we experience. (Michael Hyatt); 6. Just remember, when someone has an accent, it means that he knows one more language than you do.‖; 7. We feel free because we lack the very language to articulate our unfreedom.‖; Language is a nation: language is the heart, pride, symbol of independence, future of every nation. No nation can be a complete nation without language. Without him, the Motherland has no will. In the aphorisms about the concept of "tongue" in the English language that we are studying, it is a means of communication that contributes to the world recognition of the nation. [3]

As proof of our word, we analyzed the following aphorisms. 1. There are many things which cannot be expressed by words. There are many words which cannot be spelled by human tongue. There are many tongues which utter one single truth; 2. Language is my nation, my village, my wife, my pen-friend, my check-out girl. Language is a complimentary moist lemon-scented cleansing square or handy freshen-up whippet; 3. The limits of my language means the limits of my world; 4. silence is the language of god, all else is poor translation; 5. Political language... is designed to make lies sound truthful and murder respectable, and to give an appearance of solidity to pure wind.

Language is pride: language is a person's pride, a mirror of the soul. It is not only the heart and pride of a person, but also the language is the clothing of a person. How to wear this dress is up to each individual. Language is the translator of the soul. Because in the process of communication, each word is the first to

be clicked on the strings of the heart. Then it is polished in sentences and conveyed to the listener. We also analyzed the aphorisms that express the semantics of the language in English, and those that mean pride, pride, and heart. 1. ―Nothing complements a fast mind better than a slow tongue. And nothing aggravates a slow mind better than a fast tongue; 2. I go silent so I can write. When my tongue is wagging my fingers are silent; 3.A woman's weapon is her tongue 4. Her beauty was enough to get her into most any situation she desired and her tongue—sharp and venomous—was enough to get her out again; 5. If you talk to a man in a language he understands, that goes to his head. If you talk to him in his language, that goes to his heart‖; 6. ―But if thought corrupts language, language can also corrupt thought‖; 7. ―For last year's words belong to lastyear's language And next year's words await another voice.‖

Language is a disaster: a disaster is talking about trivial things. We studied and analyzed all the disasters in the language: the appearance of enmity and mutual enmity between people, gossip, backbiting, lies, arguments, making fun of each other, discrediting each other by revealing secrets, and expressing them. 1. Thieves and liars kill indirectly, unintentionally, and with no other weapon than their tongues and malice; 2. Remember that it is quicker to destroy than build, so be careful of what you do even with your own tongue.‖ 3. The tongue is the soft weapon that kills subtly 4. Ignorance is no reason with a fool for holding his tongue; 5. Words can be medicines; they can also be poisons. Words can heal; they can also kill... It all depends on how, when and where they are use and against whom! Let us not abuse our words. It's a misuse of the tongue; 6. I see a tongue! Some asshole is licking my peephole; 7. ―It's not all bad. Heightened self-consciousness, apartness, an inability to join in, physical shame and self loathing—they are not all bad. Those devils have been my angels. Without them I would never have disappeared into language, literature, the mind, laughter and all the mad intensities that made and unmade me‖; 8. We have a natural right to make use of our pens as of our tongue, at our peril, risk and hazard.[7]

Literary aphorisms as an element of literary language, the role of aphoristic expressions in the artistic language of stories is studied. Aphorisms aimed at artistic reflection of a wise, instructive thought in a concise form are a means of creating imagery in the work, expressing the thought clearly and effectively, giving depth to the content and advancing the mind. When elucidating the nature of language phenomena, including the development of any literary language, the formation of metalanguage norms, interaction with other languages, and other issues, it is necessary to work and draw conclusions based on the laws of language development. Otherwise, it will not be possible to come to correct and accurate conclusions.

IV. CONCLUSION

Thus, in English language aphorisms, the concept of "tongue" appears as a standard by which

nationality, communication, and the possibility of enjoying life are evaluated. Completing the subject layer of the "Tongue" concept, the authors of the aphorism call to use the language in the right ways, to live in life and do good deeds. It is important to use language correctly - to direct it to the welfare of society and not to allow ignorance to dominate. All these aphorisms mainly lead to the positive aspects of the language, to the rules of etiquette, and serve to illuminate its spiritual side.

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DETECTION OF E. COLI O157:H7 IN SEVERAL FOOD IN DIFFERENT AREAS OF BAGHDAD

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A B S T R A C T

This study was conducted to detect E. coli O157:H7 in some food(minced beef , beef burger , white soft cheese and salads) from different areas in Baghdad from September 2019 until November 2019 , (SMAC) Medium was used to detect the bacteria and to differentiated it from other Entero bacteriaceae .The number of obtained isolates reached 283 ,231,219 isolation respectively for September , October and November , the results showed rise in the total number of the isolations that were obtained from September comparison with October and November. The sorbitol fermentative isolates percentage reached 85% ,88% and 94% while non sorbitol fermentative isolates reached 11%, 5% and 4% .Isolates were non sorbitol fermentative subjected to cultural and morphological examinations, the isolates appeared in a pale golden color, with a rod shape, G-, moving ,and 42 isolates were non-sorbitol fermentative identified using VITEK-2, one isolate was E.coli O157:H7 that was obtained from the burger with a probability percent of 97% ,and was also identified genetically with PCR using the Escherichia coli O157:H7C1-057,Escherichia coli O157:H7 FRIK944 ,Escherichia coli O157:H7 FRIK2455, Escherichia coli O157:H7 FRIK2069,Escherichia coli O157:H7 FRIK2533, (accuracy of 100%) and with Escherichia coli O157:H7 AR-0427(accuracy of 99%), which was matched with the sequence of O157:H7 strain FS94 also were subjected to latex test a specific test to the strain E. coli O157:H7.

Keywords - E. Coli O157:H7, PCR ,Latex Test

I. INTRODUCTION

Escherichia coli is a bacteria that belong to Enterobacteriaceae witch has a rod shape, gram negative , aerobic and facultative aerobic, it is optimum temperature is 37c but it can grow in a wide range in between 15-45 c ,Capable of fermenting sorbitol, lactose and glucose fermentative , gas and acid forming and can produce β-glouconidase (1) (2) (3)(4).E.coli is considered a huge contributor in human pathogen but at the same time it is conceded to have a huge impact on the health of human instance (5) .E.coli bacteria is divided into 6comon types depending on its characteristics and to its virulent factor to :Enter invasive E. coli (EIEC) , Enterotoxigenic E. coli (ETEC), Enteropathogenic E. coli (EPEC), Enteroaggregative E. coli (EAEC) , Diffusely Adherent E. coli (DAEC) and Enterohaemorrhagic E. coli (EHEC) this group is a It is a subgroup of Escherichia coli producing shiga toxins(STEC)It causes bloody diarrhea and acute hemorrhagic colitis in children and infantsEHEC, which causes epidemic diseases, and was diagnosed as an epidemiological cause for the first time in the United States of America in 1982.(2)(6) Bacteria is transmitted through contaminated food, such as

consuming contaminated foods including mined meat, dairy products, salads, and burgers. It is also transmitted through the feces of infected people and through drinking water and direct contact with infected animals and humans. (7)

E.coliO157: H7 is found in all seasons, and most likely to be found more in the summer, especially when the temperatures are high, which facilitates their spread and survival(8) .Hemorrhagic coliform bacteriaare characterized by being sorbitol nonfermentative, not producing the enzyme Glocuonidase-, and unable to grow in the presence of potassium cyanide KCN (9).The shiga toxin produced from type STEA, Toxin is characterized by its resistance to heat, as the production of shiga toxin is necessary for the virulence of Escherichia coli O157: H7, but it is not the only one responsible for pathogenicity, as the bacteria must colonize the intestinal mucosa and the possession of pO157 is also associated with the ability to cause disease (10).Stx1 toxins are identical to those produced by Shigella dysenteriae, with one difference in amino acids. Stx2 is known to be more toxic, and its production is more associated with hemorrhagic colitis or hemolytic uremic compared to group A toxins.(11),(12) Type II toxins, STx2, lead to kidney injury and severe weight loss. The O157: H7 pattern is due to the fact that it contains two antigens. The first is the autosomal O antigen, which binds to the lipopolysaccharide being a thermally stable antigen and may be common in the gut. The O antigens are commonly used in the serotyping of many gram negative intestinal flora, and the second antigen is the flagellar antigen related to the H flagellum that is not related to bacterial pathogenesis. Thus only motile colonies such as Escherichia coli have these antigens(13).II. MATERIALS AND METHODSCollecting samples: 300 samples of food (minced meat , burger , white soft cheese and salads)were collected from various places of Baghdad included al baya'a , tobji , abo gahareeb and bab- alsharji (eastern gate) for 3 months (september , October ,November) 75 specimen , samples were kept in a disposable boxes in the fridge at 4 C. Initial activation of samples was made using Trypticase Soya Broth (TSB) by adding 1 gm of the sample to 9 ml of the TSB broth and incubation on 41.5c for 24 hours (14).

Bacterial isolation: culture was made using pour plate method for the initial samples after incubation period is over using peptone water decimal up to 106 using MacConkey Sorbitol Agar that was prepared according to(10) (15) plates were incubated at 37c for 24 hours , non-sorbitol colonies were chosen usingstreaking method on Cefixime -Tellurite – Sorbitol MacConkey Agar (CT-SMAC) according to (16) (17)(18) clarification processes were conducted on the last medium until having clear colonies

Morphological and cultural identification test: Cultural identification: isolated and growing colonies on selective media (SMA)by inoculating the medium by streaking method and incubation at 37c for 24 hours and colonies characteristics were noted including colonies shape, surface, ledges ad colonies height.

Microscopical identification: bacterial cells were gram stained and then seen by the microscope at

magnifying power X1000, cell's response for gram stain, shape of cell and cells assembly were observed.

Motility Test: test was conducted in to methods by using in the hanging drop method and using the large objective lens of microscope, second method were stabbing the motility test medium, growing outside the stabbing line was observed.

Vitek-2 identification: 64 biochemical test were conducted automatically.

PCR molecular identification: Isolate was cultivated on nutrient agar using 1ml for 24 hours at 37c then centrifuged at 13000 rpm then assembling the biomass to be used for PCR 16s rRNA amplification using the following primers

Primers	Nitrogen base sequins
27 Forward	5⁻AGAGTTTGATCCTGGCTCAG3⁻
1492 Rivers	5⁻TACGGTTACCTTGTTACGACTT3⁻

Table1: primers used for16s rRNA amplification

Component	Size (micro liter)
Master mix	12.5
DNA extract	2
Forward primer10 bicomoll	1
Reverse primer10 bicomoll	1
Free Water Nuclease	8.5
Total size	25

Table2:Master mix amplification compounds

Number of cycles	Time in minutes	Temperature	Steps
1	05:00	95	Initial Denaturation
30	00:30	95	Denaturation
	00:30	60	Annealing
	01:00	72	Extension
	07:00	72	Final Extension
1	10:00	10	Cooling

Table3: Additives of the reaction tube to amplify16S rRNA by PCR

The Electrophoresis Of DNA Amplification Products On Agarose Gel: Agarose gel was prepared by dissolving 1.1 gm agarose in 100mlof XTAE solution and heated by microwave ,1 microliter of ethidium bromide was added then mixed well and left to cool at 50c then. The sample was subjected to electrophoresis assay for 1 hour, 100v/m Amp for 1 hour .in order to initiate the movement from negative poles toward positive poles. The DNA bands were detected by using UV light Tran's illuminator device

Latex agglutination test identification: Colonies of bacterial suspension were placed on a latex strep provided by oxiod company and them mixed with a drop of sterilized water and a drop of the O157 latex test reagent (13)

III. RESULTS AND DISCUSSION

The detection of E. coli O157: H7 in several foods:42 sorbitol non fermentive isolates were obtained

from a total 300 isolates using Sorbitol MacConkey Agar a selective Media for E.coli O157:H7 and as shown in table (6) (19) and (1) total number of isolates obtained 283 ,231, 219 isolates for September October and november respectively and the percent of sorbitol fermentative isolates 85% ,88% and 94% while sorbitol non fermentative isolates were 14% , 11% and 5% respectively that might contain E.coli O157:H7because E.coli is sorbitol non fermentative and it can be seen in golden pale while fermented isolates of sorbitol appeared purple , number of the solates obtained in September was rising in conformation for the temperature is optimum in September rather than colder months .

Number of sorbitol non fermentative isolates	Number of sorbitol fermentative isolates	Total number of isolates	Isolation source
12	58	70	Soft cheese
9	66	75	Burger
7	58	65	Salads
12	61	73	Mined beef
40	243	283	Total

Table4: September isolation results using sorbitol MacConkey Agar and CT- sorbitol MacConkey Agar

Number of sorbitol non fermentative isolates	Number of sorbitol fermentative isolates	Total number of isolates	Isolation source
8	42	50	Soft chees
5	43	48	Burger
4	61	65	Salads
9	59	68	Mined beef
26	205	231	Total

Table5:October isolation results using sorbitol MacConkey Agar and CT- sorbitol MacConkey Agar

Number of sorbitol non fermentative isolates	Number of sorbitol fermentative isolates	Total number of isolates	Isolation source
5	41	46	Soft chees
2	49	51	Burger
1	61	62	Salads
4	56	60	Mined beef
12	207	219	Total

Table 6: November isolation results using sorbitol MacConkey Agar and CT- sorbitol MacConkey Agar

Isolates identification:

Cultural and Morphological for isolates:

Initial identification of sorbitol non fermentative isolates was conducted based on the isolate's characteristics on CT-SMA medium incubation for 24hours at 37C, colonies were seen in a pale gold color thus being sorbitol non fermentative smooth and concaved surface and perfect edges table 7 (20). All results of morphological test shown that sorbitol non fermentative isolates were all rod-shaped gram negative with pink reddish color (figure1) (21).

Culturing Properties	Notes
Colonies' Pigment	Pale gold or colorless
Colonies Shape	Round
Colonies Height	Convexed
Colony's Outer Perimeter shape	Perfect
Colonies surface	Smooth(slimy)
Morphological Properties	**Notes**
Reactivity of Cells to Gram Stain	Negative
Shape of Cells	Short rod
Cells' Group	Shows as individuals, pairs or chains of cells

Table7: Cultural and Morphological for isolates

Fig. 1: Non fermented bacterial isolates under an optical microscope

VITEK 2 apparatus identification:

42 sorbitol non- fermentation isolates were subjected to VITEK, results showed that only 1 sorbitol non fermentative isolate was E.coli O157 with a probability 97% . the use of VITEK 2 technology is a good and fast way to identify the O157 serotype, (22).

Molecular Identification:

DNA extraction:

The DNA was extracted from isolate based on VITEK that the isolate was E.coli O157 and the purity of DNA was examined by Nano Drop with a purity of 1.9 which is adequate for Polymerase Chain Reaction (PCR) process. (23) reported that the PCR did not need a large quantity of DNA which may instead produce unlimited amplifying products. On other hand, an adequate quantity of DNA may reduce the accuracy.

Polymerase Chain Reaction (PCR):

A PCR for the isolate was conducted depending on 16S rRNA gene was carried out. The electrophoresis on 1% agarose show (by using U.V detector), that there was a clear band represents the genes amplifications (Fig.2). The molecular size of gene amplification band was over 100 bp comparing with ladder size at the same conditions, which refers to the prime binding to the complete sequence inDNA pattern.(14).
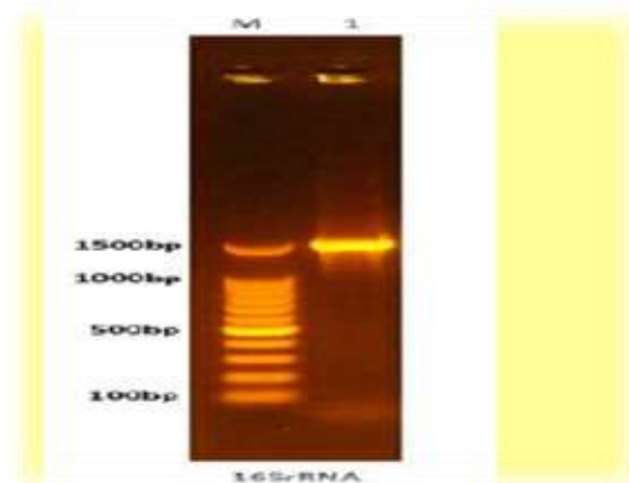
Fig. 2:Electrophoresis of the amplification products of the 16S rRNA gene by PCR technique on a 1% acarose gel using a 100-1500 base pair of DNA volume index

Sequence analysis of amplification products

The sequence of nitrogen bases, of the16S-rRNA gene, for the local bacterial isolatewas studied by sending the amplification products to the Korean company Macrogen.

The nitrogen bases sequencewere (1356base-pair) which was taken from the local isolate sequence The BLAST program has been used to find out the similarity of gene with the bank information (NCBI). The results showed that there is a match between isolation and100% with global isolation sequences globalRegistered on the NCBI website and registered in the United States of America Which included Escherichia coli O157:H7C1-057100%, Escherichia coli O157:H7 FRIK944 100% ,Escherichia coli O157:H7 FRIK2455,100% , Escherichia coli O157:H7 FRIK2069100%,Escherichia coli O157:H7 FRIK2533,100%matching 99% strain Escherichia coli O157:H7 AR-0427as shown in table 8 .sequence ID: Mn824766

| Strain	Identity	ID
Escherichia coli O157:H7 C1-057	100%	CP035366.1
Escherichia coli O157:H7 FRIK2455	100%	CP015843.2
Escherichia coli O157:H7 FRIK944	100%	CP016625.1
Escherichia coli O157:H7 FRIK2069	100%	CP015846.1
Escherichia coli O157:H7 FRIK2533	100%	CP015842.1
Escherichia coli O157:H7 AR-0427	99%	CP043942.1

Table8: Shows the ratio of match of the nitrogen base sequences of E.coli O157: H7 Strain FS94 isolated from the burger with 6 strains of E.coli O157: H7 bacteria recorded in

Latex agglutination test E.coli O157: H7

Latex is considered a conclusive and easy test designed for the presumptive identification of Escherichia coli serogroup O157:H, for this purpose latex kit was used Control negative , Control positive , O157 test latex , O157control latex prepared by oxoid , result showed an observable agglutination while using drops of the O157 Test Latex reagent (figA 3) compared to (fig B 3) which represent the comparing treatment thus shows that the isolate contain the antigen O157 and belongs to serogroupE.coli O157:H7 (13).Latex test One of the most important rapid confirmatory tests for the serotype of E. coli O157: H7, which is easy to use due to the short time and the lack of effort.(24)
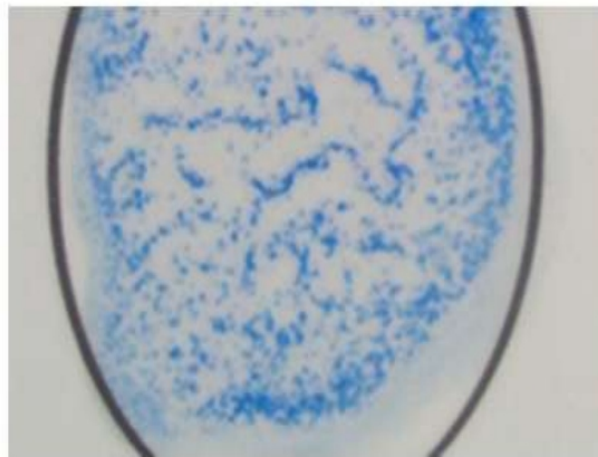
(A) Positive
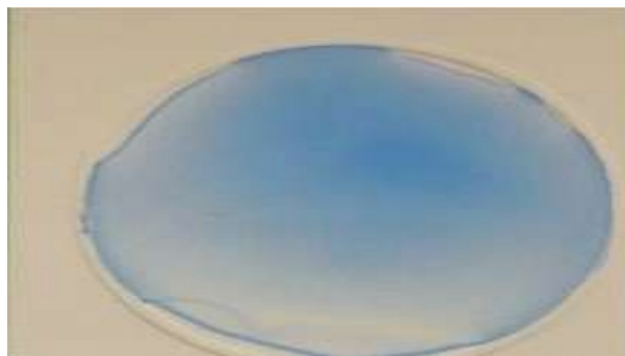
(B) Negative

Fig.3: Latex agglutination test E.coli O157 :H7

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ADVANCED AQUACULTURE MONITORING AND CONTROLLING SYSTEM

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A B S T R A C T

This work proposes aquaculture technology, which exhibits several innovations for monitoring and controlling the aqua species quality. Aquaculture is one of the fastest growing food industries in terms of farming with a short production cycle. It became popular when people began to eat a nutritious diet in order to avoid diabetes and nutritional deficiencies. To implement, we proposed the numerous embedded sensors and modules be controlled and monitored by the micro-controller. We deploy the Arduino IDE as a compiler, and applications such as Blynk and Thing Speak to test and monitor the IoT. When compared to previous estimations, our effort is more cost effective, efficient, and accurate.

Keywords - Aquaculture, Advanced Aqua-Farming, Iot, Internet of Things, Fisheries.

I. INTRODUCTION

Aquaculture involves cultivating, growing and collecting fish, shellfish and aquatic vegetation, it can be seen as farming in aquatic environment. In the US, aquaculture is seen as an eco-friendly source of food and goods, it also helps in maintaining healthy ecosystems and can be used to repopulate endangered species. [1].

Figure1: Aqua Farming

Figure 1 depicts aquaculture, which consists of producing a large number of aqua species in flora and fauna. This is the recreation of living beings, which aids in the extension of human life [2]. This consists various steps starting with farming to marketing of the product. These steps include seedling of roes or hatchling which needs to be provided care and monitored to observe the behaviour as well as health of the aqua creatures [3].

Figure 2: Node MCU

In Figure 2, it depicts the Node MCU board which is embedded with Wi-Fi module and consistingTensilica 32-bit RISC CPU Xtensa LX106 as micro-controller.It is built in Harvard architecture with 32-bit transfer rate. It consists 30 Pins which represents the Digital, CLK, Power Supplies etc. This micro-controller operates voltages between 6volts to 12 volts and consists 128kbps of memory and 4MB of ROM which enhances the process speed and data exchange rate [6].

Figure 3 : Analog pH Sensor

The pictorial representation of Analog pH(Potential of Hydrogen) Sensor is depicted in figure 3, this pH sensors measures the pH range of solution. These scales ranges from 0 to 14 , in which pH property of 0-6 is acidic, 7 is neutral and 8-14 is basic is defined [7]. These are measured by :

$$pH = -\log10[H+] \text{ Eq.1}$$

In which H+ denotes the Hydrogen ions concentration.

The DO (Dissolved Oxygen) sensor which calculates the amount of oxygen dissolved in solution. This is used to predict the oxygen levels in solutions to predict better life expectancy of aquatic creatures [8].

Dissolve oxygen = mg/lit = 8*100*N/V * v Eq.02

When determining the volume of a sample, V (in milliliters), the volume of the titrant used, v (in milliliters), and the normality of the titrant, N, are considered. Additionally, a constant, 8, is applied as 1 milliliter of 0.025 N Sodium Sulphate solution is equivalent to 0.2 milligrams of oxygen.
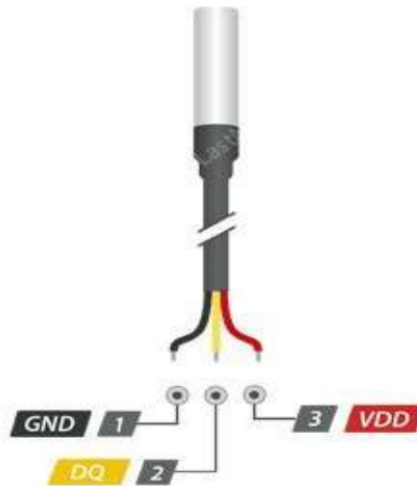
Figure 4 : Dallas Temperature Probe

The Temperature probe which measures the temperature of the solution is depicted in Figure 4, this can measure from a range --55Celsius to 125Celsius [9].

Turbidity sensor is measurement of dust particles upto visible light, Varying this parameters can effect the aquatic species life behaviour [10]. This module has to measure the quality in terms of ppm as shown in Figure 7 [11].

Figure 5 : Camera Module

Camera module is depicted in Figure 5, which captures the motion of species and detect with the help of image processing [12]. This camera has an resolution of 640 x 480 and with a frame rate of 30 fps [13]. The Water control valve will control the water flow by closing and opening the valve , this will act as the water level and flow control system with period to period to control and pump the fresh water to lake [14].

Figure : 6 Water level sensor

The water level sensor consists the water presence of maximum set by the operator in which the maximum water level may reflect to overflow of pond or lake we use control valve as depicted in Figure 6, so in order to prevent we use water level sensor as shown in Figure 10 [15].
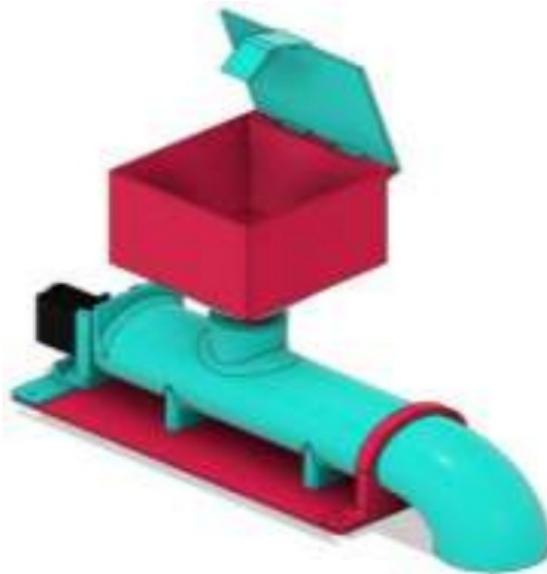

Figure:7 Food Dispenser

The custom built food dispenser using 3D- printer is used to dispense the food with time to time using RTC (Real Time Clock) and valve attached to servo motor [16]. This consists a valve which performs opening and closing when RTC has been active as depicted in Figure 7[17].
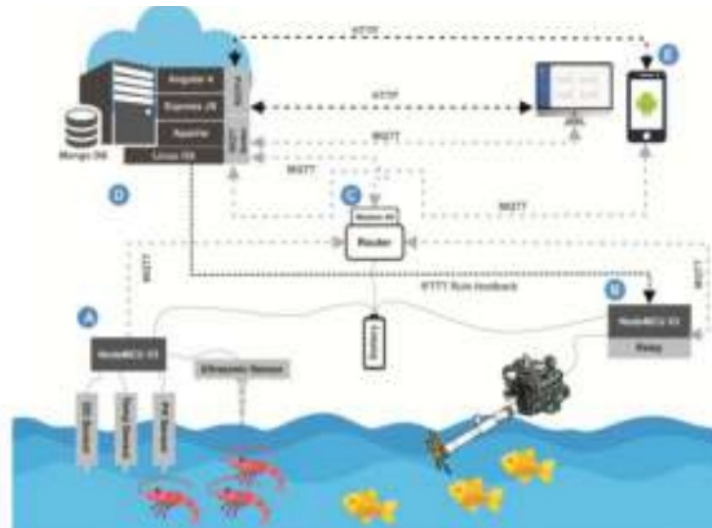
Figure 8: IoT network for Aquaculture

The Figure 8 depicts the IoT network of Aquaculture which consists various convolutions such as sensors, micro-controllers, wireless transmissions, servers and cloud data [4]. Firstly the sensors and micro-controller is configured in a way that exchanges the data. The data from sensors will be transferred to microcontroller further transferred to server using wired (Ethernet) or wireless (Wi-Fi) networks which will further stored in cloud and accessed through an secured application to monitor data remotely[5].

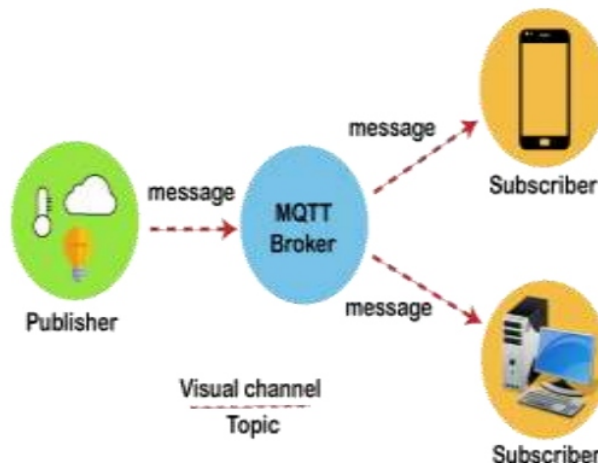## II. PROPOSED METHODOLOGY

Figure : 9 MQTT Architecture

MQTT is a messaging protocol that is based on a set of standards, which is utilized for communication between machines [17]. It is particularly useful for devices such as smart sensors, wearables and other IoT devices that need to transmit and receive datathrough networks with limited bandwidth and resources. Due to its simplicity and low-energy consumption, MQTT is suitable for use with a large number of devices. Additionally, it employs Quality of Service (QoS) levels to ensure the guaranteed

delivery of messages to recipients [18], even when there are connectivity issues with the devices as shown in Figure 9.

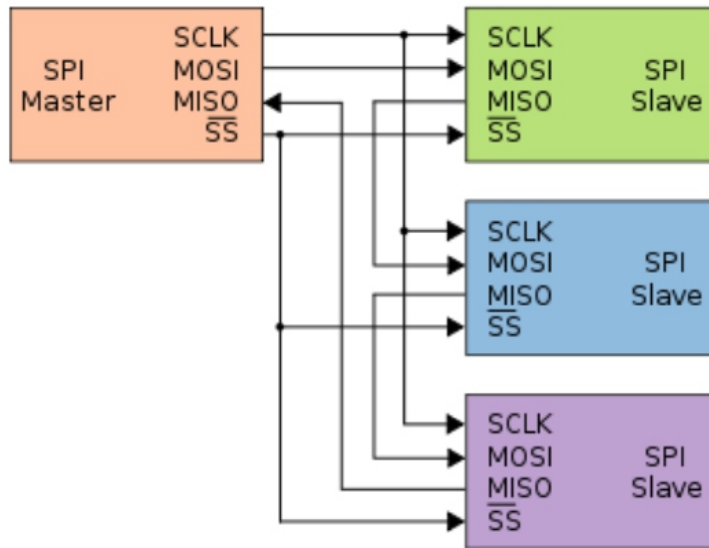**Figure : 10 SPI Protocol (Serial Peripheral Interface)**

The serial (bit-by-bit) flow of data between two devices, one designated a master and the other a slave. SPI has four modes that correspond to the four different clocking configurations (0, 1, 2, 3). On the falling edge of the clock cycle, bits sampled on the rising edge of the clock cycle are moved out, and vice versa [20] as depicted in Figure 10.
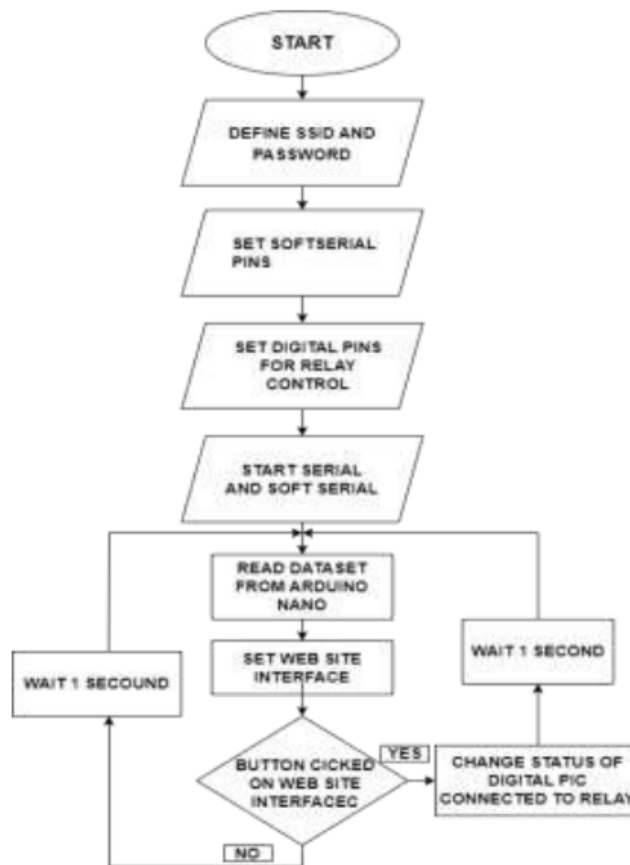
Figure : 11 Flow Chart for Node MCU to sensor communication

The flowchart depicts the various steps included for data transmission from end to end devices beginning from sensors to cloud monitoring. Firstly, the SSID and password of nearby WiFi must be connected to Node MCU. Secondly, The pins of sensors and modules need to be connected to peripherals of the Node MCU. The data received by the sensors and modules will be accumulated by the micro controller then further transmitted by various network protocols to server using wireless bands, these are accessed and monitored though a cloud based application as shown in Figure 11.
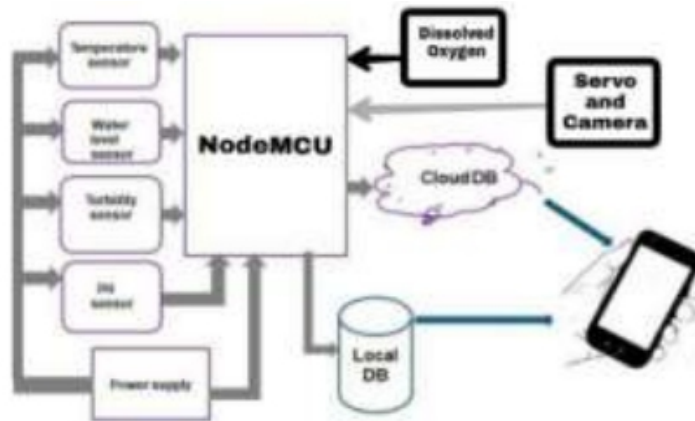

Figure : 12 Block Diagram for Data Transmission

The block diagram depicts the various storage access protocols and data acquisition techniques such as SPI, UART, I2C, MQTT protocols in order to accumulate and display to the users device remotely for monitoring and control using database and cloud storage.
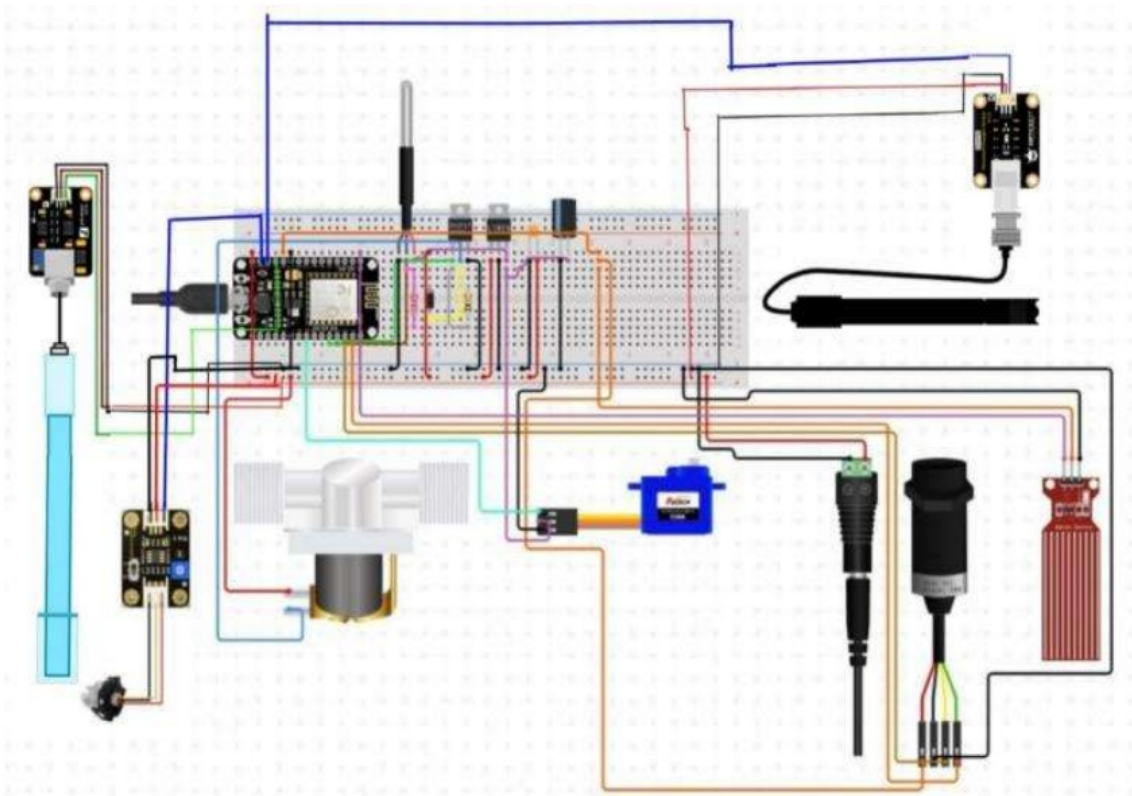

Figure : 13 Circuit Diagram

The Figure 13 depicts the various sensors and modules connected to a single micro controller, As micro controller represents the Digital pins and power supply terminals in order to get feedback from sensors and control modules such as temperature, dissolved oxygen, pH, turbidity, water level, camera and modules such as servo for food dispensing, water control valve to control and monitor the entire aquaculture system stable and reliable. This increases the growth in scalability and health state of aqua species.

III. SIMULATIONS AND EXPERIMENTAL RESULTS
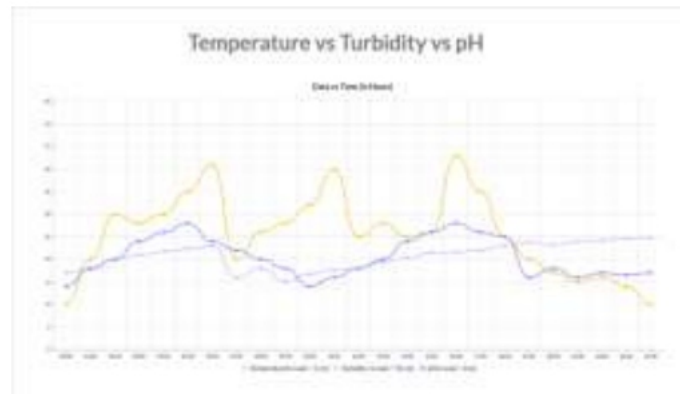
The Figure 14 represents the plots for 24 hour span for temperature, pH, Turbidity which represents the state of water or solution change drastically with in time to time. In order we need to control the peak values of the parameters to stable and balance the life conditions of aqua species.

The graph scale varies such that 1cm = 1 scale for temperature, 50cm = 1 scale for turbidity, 1cm = 2 scale for pH. When turbidity in the time interval 06 : 00 hr to 07 : 00 hr, 10 : 00 hr to 12:00 hr and 15 : 00 hr to 17: 00 hr drastically increased as plotted in the above graph. Coming to the pH in the time intervals of 06 : 00 to 07 : 00 and 14 : 00 to 19 : 00 it gains more basic nature, in order to control the diluted HCL is

Figure 15 : Graph Plots for Food Dispensing Machine

The Figure 15, consists the graph plots which depicts the „0" and „1" status for on - off state of food dispensing machine. In the above graph the time interval between on - off of food dispenser is 4 hours. The intervals 04:00 to 08:00, 12:00 to 16:00 and 20:00 to 00 : 00 hrs intervals supply food by releasing

the servo motor to control food flow through a valve.

Figure : 16 Output in Blynk Application

The Figure 16 depicts the values collected from sensors further transferred to applications which will be displayed with minimal latency. The output display consists temperature values, pH values, turbidity, food dispenser timing status, water valve status, water level status and camera with object detection.

IV. CONCLUSION

An Advanced IoT Based Aquaculture system has been presented with this experimental results. Different modules and sensors have been controlled and monitored using an external device wirelessly. Every electronic interface and hardware of a network have been tested and proper connection is established using I2C, SPI and MQTT protocols. Device-todevice communication allows aquaculture that are in close proximity to communicate using the I2C and SPI protocol. All the devices are operated and controlled through Wi-Fi. Blink Applications have been used as a server Interface through which a user can operate home appliances. Different parameters like temperature, pH, turbidity, and object detection through camera have been observed along with minimal latency.

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N-TERRAFORMING

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A B S T R A C T

In this paper, the goal is to explain how we plan on using neutrinos as heat producing particles that will heat up the core of cold planets, and that heat will diffuse or spread radially until it reaches the surface and hence atmosphere of the planet. We will do this by relying on the "ghost like" nature of neutrino particles to phase through the planet until they reach the core, where they will meet each other and repel due to the Pauli exclusion principle. The Pauli Exclusion principle will act as a back-and-forth force between incoming neutrinos from the mantle with repelled neutrinos from the core, making them all pile up at the core and increasing the probability of them interacting with the atoms of the core and thereby heating it up.

Keywords - Neutrinos, Terraforming, Hydrolysis, Lorentz Force, Repulsive Forces and Heat Transfer

I. INTRODUCTION

This research paper aims to show how we can use neutrinos to terraform a cold planet. The paper shall be divided in four parts:Firstly, a literature review regarding what is a neutrino, secondly, how will we produce them in this N-Terraforming process,thirdly,the Thermodynamics behind N-Terraforming, and finally, N-Terraforming.

II. NEUTRINOS

A neutrino is a subatomic particle that has no electrical charge and a very small mass, which might even be zero.They are known as "ghost particles" because they barely interact with any particle at all and essentially almost phase through everything.Since neutrinos don't interact very much with anything, creating a detector to prove their existence was a tedious, and at times, thought of as an almost impossible task, but many detectors exist now and days that proved that they exist.These detectors are basically large containers of molecules, like water molecules for example, and due to their sheer number, statistically speaking at least one out of the huge amount of incident neutrinos should interact with a water molecule.When the neutrino interacts with the molecule a specific sensor gives the reading that a temperature increase occurred and that tells us that the neutrino interacted with the water, hence neutrinos must exist.One might argue that another particle interacted with the water, but the container is usually placed inside an insulating material and beneath the earth's surface, very deep down, making any other particle besides a "ghost particle" that could phase through basically anything, including

earth's surface and the insulator, basically impossible It is the fact that these Neutrinos don't interact very much with matter that make them perfect for terraforming. So, they will easily phase through any planet and reach the core.

Since the core of the planet is denser, the chances of them stopping to interact with the core atoms are higher, and hence, the heat will be transferred into it.

III. NEUTRINO PRODUCTION IN NTERRAFORMING

Now that we have clarified what neutrinos are, we need to understand now how will we make the neutrinos we intend to send towards the planet.

We can create electron neutrinos via a positive beta decay of an energetic proton into a neutron, a positron and the intended electron neutrino. We can store and obtain the protons in a chamber inside the satellite in a plethora of ways, the way preferred in Nterraforming is storing water in the container in the satellite and later on perform electrolysis to extract the protons from the water. Considering that the minimum energy a proton would need to be moving to create a neutron and a positron both a rest, the minimum energy the proton would need to overcome to produce a neutrino would need to be greater than the sum of the rest energies of said neutron and positron and rest.

$$E_{neutrino} = E_{MovingProton} - (E_{Neutron} + E_{Positron})$$

Considering the modulated value of the minimum energy possible by the moving proton (Its rest energy), the minimum energy the proton would need to be added to at least produce the two particles by compensating their energy difference is given by:

$$E_{MovingProton} = E_{Protonatrest}$$

$$E_{Neutrinoproduction} \geq |(m_{movingProton} - (m_{Neutron} + m_{Positron})c^2|$$

Plugging in the rest masses of the particles and the speed of light we get that the minimum extra energy required from the proton for neutrino production is:

$$E_{Neutrinoproduction} \geq 2.889 \times 10^{-13} \text{ J}$$

$$E_{Movingproton} \geq E_{Protonatrest} + E_{Neutrinoproduction}$$

$$E_{Neutrinoproduction} = 2.889 \times 10^{-13} \text{ J}$$

So now that we know the minimum energy required to add to the proton to produce the neutrino, we need to know at what speed the proton must move to reach that energy level.

We can calculate that minimum speed by using special relativity.

$$V_{relativistic} \geq c \times \sqrt{1 - (\frac{E_{Protonatrest}}{E_{Movingproton}})^2}$$

After plugging in the data, we get that:

$$V_{relativistic} \geq 1.8559 \times 10^7 \text{ m/s}$$

So, now we need to devise of a principle to accelerate the proton towards this speed, one advantage of using the proton as the decaying particle and not the neutron is that a proton, being electrically charged, is accelerated by electromagnetic forces.

We send the proton in a constructed straight and narrow pathway inside the laser satellite that will aim towards the cold planet, the proton shall be accelerated on this pathway via the Lorentz force generated by a surrounding copper wire perpendicular to its flow of motion.Being familiarized with the Lorentz force, we can easily compute the minimum current required to generate the force required to accelerate the proton towards the minimum speed required inside the laser satellite.

$$I \geq \frac{Q \times V_{relativistic}}{\text{Length of laser satelite}}$$

The length of a Laser Satellites vary, some are 6 meter long, others can be 7 and so on, for this particular satellite let us assume we are building one that is 10 meters long, computing the data, we get that the minimum current required to accelerate one proton is:

$$I \geq 2.96944 \times 10^{-13} \text{ A}$$

This is a very low current output requirement which presents a very satisfactory result and feasible activity regarding economic matters, with just 1 A, we can accelerate approximately 3×10^{13} times faster, and hence fire neutrinos that are 3×10^{13} times more energetic towards the cold planet from just one satellite, making the production of the Neutrinos in the N-Terraforming method completely feasible with a high level of neutrino energy production from a very small amount of energy spent.

IV. THE THERMODYNAMICS BEHIND NTERRAFORMING

Here we aim to show the thermodynamic equations that arise when we are heating the planet,there are many types of thermodynamic equations that can arise for different types of planets considering that different planets can have different compositions and different phases throughout their structure.The diversity of planets does not impede us however of following a patterned or organized sequence that

will perfectly describe how the heating process works in N-Terraforming, there are many aspects to consider while terraforming a planet, but since we are only concerned with the temperature aspects of terraforming, the principle shall be the same for all.

The basic principle that will govern here is the Zeroth law of Thermodynamics, where basically the amount of heat transferred from a hotter body shall be equal to the amount of heat received by a colder body so they can both reach the equilibrium temperature.

Here the energy given will be the energy given by the neutrinos sent by the laser satellites, since all neutrinos will have the same energy each, the total amount of energy shall be the number of neutrinos sent times the energy of each traveling neutrino.

$$Q_H = n \times E_{neutrino}$$

The above formula is crucial because it will give us the specific number of neutrinos (and consequently the number of protons) that we will need to send to heat the cold planet and the number of neutrinos required will tell us the amount of current required inside of the laser satellite.

So, to get the number required all we need to do is toobtain the amount of heat required to transfer to the planet (QH), and divide it by the energy of each neutrino, that shall be determined by the relativistic speed the decaying proton was traveling at (something that is completely under our control, and the most optimal value possible by our current technology would be the logical standard

To obtain Q_H, we just need to use the formula:
$$Q_H = Q_C$$

Teq is the temperature of equilibrium that shall be reached by the planet's core after we heat it.

The equilibrium temperature is the temperature we want the cold planet's core to have, which is the temperature of our planet's core (currently the inner core is said to be 6150K), the temperature of the cold

planet varies from planet to planet but we can easily discover that by using many methods such as spectroscopy for example.

Let us know select a cold planet as an example of how we would approach thermodynamically the N Terraforming process.

The specific planet in question is the dwarf planet Pluto, which presents a core mostly made out of Rock and Ice, nothing impedes us from studying the mineralogical structure of the rock, extracting data such as their latent heat and heat specificity, and including the rock in the thermodynamic equations as well, but seeing as this is more about showing how the thermodynamic process of N-Terraforming would work we do not need to do so and will focus solely on the ice.

Pluto has a core temperature of 500K (so Tc =500K), and the core mas is estimated to be at the order of 1022, so let us say that m=1022 kgs, with all of this in mind, the following are the equations we build to

findQH:

$$Q_H = Q_C$$

$$Q_H = C_{H20}m(T_{eq} - 0°) + mC_{ice}(0 - Tc) + mL_{ice}$$

$$Q_H = 2.5 \times 10^{29}J$$

Now that we know the energy required to heat the core, we can do as discussed earlier and find out how many neutrinos would be needed, the average energy that a neutrino has after a typical beta decay such as these ranges from 0.5 to 1 Mevs, so let us say each neutrino has 0.7 Mevs, now let us perform the calculations:

$$Q_H = n \times E_{neutrino}$$

$$n = \frac{Q_H}{E_{neutrino}}$$

$$n = 2.2 \times 10^{39}$$

Now all we need to do is to obtain 2.2×10^{39} protons from the hydrolysis of the water stored inside a container of the satellite, to do this we just need to calculate how much energy we will need to give surpass the Gibbs free energy off all the water molecules of the container, all of the 2.2×10^{39} protons will flow inside the pathway perpendicular to the copper wire, each proton will be acted upon by the force generated by the copper wire that surrounds the entire pathway, all of them will be moved by the same magnetic force.

We can use uranium as the source of energy for the hydrolysis of water and the resulting protons will move all the same time through a cathode with sufficient surface area.

Let us calculate how much uranium we would need and how long the process would take considering that the Gibbs free energy of water is 237.13 kj per mol and a ton of uranium has a power of 4×10^{10} J per hour.

$$time = \frac{Energy\ required}{Power\ by\ one\ ton\ of\ uranium}$$

$$time = \frac{237130 \times \frac{2.2 \times 10^{39}}{6.02 \times 10^{23}}}{4 \times 10^{10}}$$

$$time = 2.16 \times 10^{10}\ hours$$

This time is not feasible so let us increase the number of tons to let's say a million tons, we will get that:

$$\text{time} = \frac{237130 \times \frac{2.2 \times 10^{39}}{6.02 \times 10^{23}}}{4 \times 10^{10} \times 10^6}$$

$$\text{time} = 21664.701 \text{ hours} \approx 903 \text{ days}$$

So, it would take two and a half years and a million tons of uranium to extract all of the protons from the water container and send them to the pathway with the copper wire, each kg of uranium cost 130 dollars so this would cost 130 billion dollars to achieve this step of N-terraforming in 2.5 years, but this is more of a corporate decision that those not devaluate the effectiveness of this method, we could easily increase the time span and reduce the amount of uranium being used for example or even simply increase the current responsible for the Lorentz Force to produce high energy neutrinos, something said possible in: "Ackermann, M., Bustamante, M., Lu, L., Otte, N., Reno, M. H., Wissel, S., ... &Yildizci, E. (2022). High-energy and ultra-high-energy neutrinos: A Snowmass white paper. Journal of High Energy Astrophysics, 36, 55-110.P".

So basically, we have a perfect way of knowing how much water we will need inside of the container, how much the process will cost and how long it will take to heat up the planet considering the hydrolysis time.

V. N-TERRAFORMING

So, to sum up, N-Terra forming is a project that intends to surround a cold planet with orbiting laser satellites that will emit neutrinos that will phase through the planet's crust and mantle until they collide at the core and cause a 180 degrees turn due to Pauli repulsion between two similar fermions.

The neutrinos will constantly bounce back and forth inside the nucleus of the planet due to the Pauli repulsions caused by the neutrinos incoming at the nucleus colliding with the ones trying to leave it, and the neutrinos that are colliding at the centre of the nucleus repelling each other away from the centre.

Due to the fact that the nucleus of a planet is always much denser than any other part of a planet, and usually extremely dense in comparison to the dense water molecules containers created by humans to prove the existence of said neutrinos, the probability of them interacting with the atoms of the nucleus will be much higher and thereby heating up the nucleus via energy transfer from the neutrinos.

To further demonstrate the other aspects that we account for in N-Terra forming, we would need to construct a time equation we would use to know how long will it take to terra form the planet.

$$\text{Time to load the neutrinos to the core} = \frac{Qh}{\text{Power of laser}}$$

$$v_{neutrino} \approx c$$

$$t_{neutrino} = \frac{\text{Radius of the planet nucleus}}{c} \times 2$$

$$\text{Neutrino Pulse Frequency} = \frac{n}{t_{neutrino}}$$

$$n = 1$$

$$\text{Neutrino Pulse Frequency} = \frac{C}{2 \times \text{Radius of the planet nucleus}}$$

So now we know how to calculate the time and neutrino emission frequency required for the neutrinos to stay inside of the core and to know how long it will take to terraform it.

To know the total time, we just need to add the time discussed earlier to time it takes for the hydrolysis of the water container. So, to get an idea of how it would look like this is a simulation made via python code:
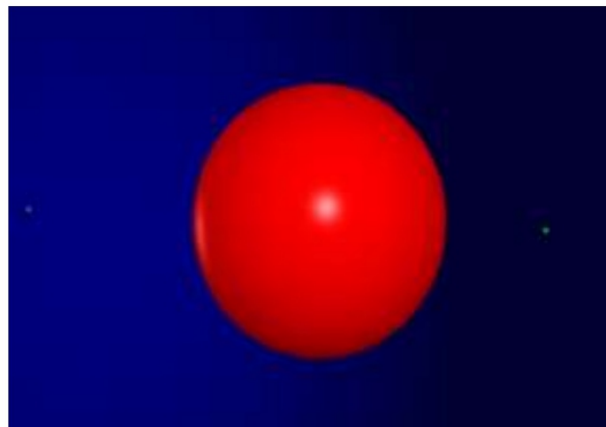
The image above displays the neutrinos (the little green spheres) traveling towards the core of the planet (The red sphere). The blue surroundings are supposed to represent the mantle of the planet.
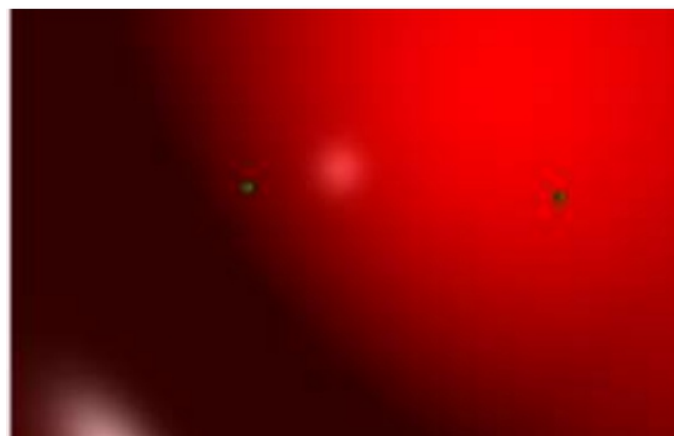
The above image shows the neutrinos traveling inside the core of the planet and towards each other.
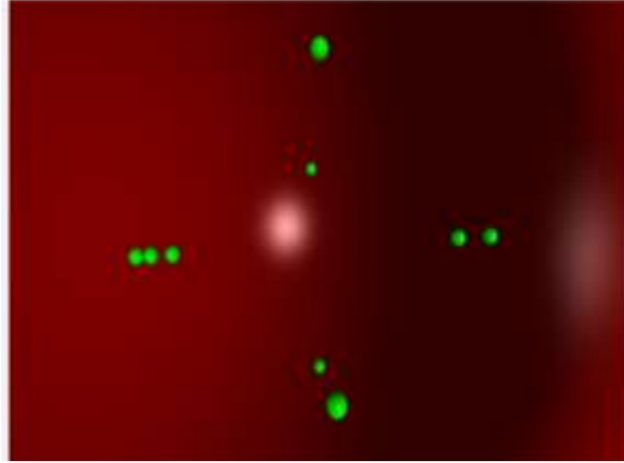
The previous image shows the piling up of neutrinos after the first neutrinos repelled each other at the center of the core and were repelled again by second wave neutrinos incoming from the mantle, so all of the neutrinos will meet at the center again and repel each other again and the same process will repeat till all the neutrinos we sent reach there.During this whole process the neutrinos will eventually interact with the core atoms and transfer energy to it so the more we pile them up like this the more we increase the probability of this happening.

VI. CONCLUSION

After running the simulation that followed the exact trajectories given by the derived equations, we were able to see that the neutrinos will in fact pile up and increase in number inside of the core and hence increase the probability of heating it. So, we can conclude that after applying all these principles, we can terraform a planet at low budget and at a more predictable fashion. And it is a more stable and definite terraforming method.Here are some advantages and disadvantages of using the NTerraforming method.

ADVANTAGES

It provides a more stable and easily predictable method of terraforming

The production of neutrinos are simple hydrolysis processes we are already familiar with

The use of particle emitting satellites has already been done by humans and so the emission of neutrinos towards a planet using satellites is not a far-fetched goal

We are able to terraform a planet from the inside so we are completely reducing the chances of directly damaging the planet's surface or atmosphere dramatically by heating them via indirect heat conduction

DISADVANTAGES

We are unfamiliarized with working with neutrinos for practical applications and never terraformed a planet so there might be a lot of unknowns that could put the project at risk. So, a trial-and-error approach shall be implemented

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