International Journal of Scientific Research in Multidisciplinary Studies
Vol.**10**, Issue.**1**, pp.**34-38**, January **2024**
E-ISSN: 2454-9312 P-ISSN: 2454-6143
Available online at: www.isroset.org

Research Article

Ageing and trem-2 Neuronal Signaling in Phyllanthus Emblicas

Wahul Umesh B.[1]

[1]Dept. of Immunology, Biotechnology, National Institute of Virology, Pune, India

Author's Mail Id: umeshwahul@yahoo.com

Received: 24/Nov/2023; **Accepted**: 28/Dec/2023; **Published**: 31/Jan/2024

Abstract— "Phyllanthus emblica" known to be amla has role in the skin aging influences the changes in skin, including skin dryness, wrinkle, and irregular pigmentation. Initially the 6 day observation has been taken for the ageing activity to be track to study the TREM2 pathway of "Phyllanthus emblica".
Cellular observation and pathway consideration: The environmental impact of pH, Temperature, Humidity and stability of amla fruits is important for the ageing of cells in neuronal cascade of TREM2 Pathway, while studying the fruits cell cycle. The melanin suppression through inhibition of tyrosinase and tyrosinase-related protein-2 activities, the strong antioxidant, and the potent matrix metalloproteinase-2 in cellular observation of tyrosinase pathway. The study aimed to evaluate the anti-skin aging efficacy of amla.

Keywords— Anti-Skin aging, Cellular observation, Neuronal junction, TREM2 etc.

1. Introduction

The majority of neurons belong to the central nervous system, but some reside in peripheral ganglia, and many sensory neurons are situated in sensory organs such as the retina and cochlea.

The cell body's main function is to **house the nucleus and other important organelles which manufacture proteins, such as neurotransmitters, for the rest of the neuron**. The cell body also processes incoming information from the dendrites.

Brain cells called neurons send information and instructions throughout the brain and body. The information is sent via electro-chemical signals known as action potentials that travel down the length of the neuron. These neurons are then triggered to release chemical messengers called neurotransmitters which help trigger action potentials in nearby cells, and so help spread the signal all over.

However, not all information is equally important or urgent. Especially when it comes to sensations such as touch and position sense, there are some signals that your body needs to tell your brain about right now, and some that can wait a little while to be processed. For example, pain from a shallow cut travels faster than pain originating in your liver.

While walking along and suddenly you trip and begin to fall. Luckily, your body senses that your limbs are in the wrong place and instead of falling to the ground, you just stumble a little. This sense of knowing where you are in space is known as proprioception, and the nerves that transmit this information are among the fastest in your body! This is because they have two special characteristics that allow them send information very quickly – a large diameter, and a myelin sheath.

A myelin sheath also decreases the capacitance of the neuron in the area it covers. Since the neuron is at a negative membrane potential, it's got a lot of agitated negative ions that don't have a positive ion nearby to balance them out. Like charges repel, so the negative ions spread out as far from each other as they can, to the very outer edges of the axon, near the membrane. This then attracts positive ions outside the cell to the membrane as well, and helps the ions in a way, calm down. We then end up with thin layers of negative ions inside of the cell membrane and positive ions outside the cell membrane.

Many investigators suspect that neurons originated from endothelial secretory cells that could secrete chemical substances, respond to stimulation, and conduct impulses. Specialization may then have brought about an outer receptor surface and an inner conducting fibre. In fact, neurosecretory cells can propagate action potentials, and many neurons secrete chemical substances, called neurohormones, that influence the growth and regeneration of cells at other sites of the body. Some researchers suggest that neurons may have first appeared as neurosecretory growth-regulating cells in which elongated processes were later adapted to rapid conduction and chemical transmission by release of

neurotransmitters at their endings.This investigation on myelin sheath has shown the cellular observation and pathway consideration for TREM2 signaling.in "*Phyllanthus emblica".*

1.1 Biochemistry:

1.1.1 Chemical signaling:

Prokaryotic organisms have sensors that detect nutrients and help them navigate toward food sources. In multicellular organisms, growth factors, hormones, neurotransmitters, and extracellular matrix components are some of the many types of chemical signals cells use. These substances can exert their effects locally, or they might travel over long distances. For instance, neurotransmitters are a class of short-range signaling molecules that travel across the tiny spaces between adjacent neurons or between neurons and muscle cells. Other signaling molecules must move much farther to reach their targets. One example is follicle-stimulating hormone, which travels from the mammalian brain to the ovary, where it triggers egg release.

Cells have proteins called **receptors** that bind to signaling molecules and initiate a physiological response[1]. Different receptors are specific for different molecules. Dopamine receptors bind dopamine, insulin receptors bind insulin, nerve growth factor receptors bind nerve growth factor, and so on. In fact, there are hundreds of receptor types found in cells, and varying cell types have different populations of receptors. Receptors can also respond directly to light or pressure, which makes cells sensitive to events in the atmosphere.

Receptors are generally transmembrane proteins, which bind to signaling molecules outside the cell and subsequently transmit the signal through a sequence of molecular switches to internal signaling pathways. Membrane receptors fall into three major classes: G-protein-coupled receptors, ion channel receptors, and enzyme-linked receptors[2].

The names of these receptor classes refer to the mechanism by which the receptors transform external signals into internal ones — via protein action, ion channel opening, or enzyme activation, respectively. Because membrane receptors interact with both extracellular signals and molecules within the cell, they permit signaling molecules to affect cell function without actually entering the cell.

1.1.2 Electrical Signaling:

Electrical signals are conveyed **along the cell membrane**. Second, for communication between cells, the electrical signals generally are converted into chemical signals conveyed by small messenger molecules called neurotransmitters.

Nerve cells generate electrical signals that transmit information. Although neurons are not intrinsically good conductors of electricity, they have evolved elaborate mechanisms for generating electrical signals based on the flow of ions across their plasma membranes. Ordinarily, neurons generate a negative potential, called the resting membrane potential, that can be measured by recording the voltage between the inside and outside of nerve cells.

Action potentials are propagated along the length of axons and are the fundamental signal that carries information from one place to another in the nervous system. Generation of both the resting potential and the action potential can be understood in terms of the nerve cell's selective permeability to different ions, and of the normal distribution of these ions across the cell membrane.

Activation of receptors can trigger the synthesis of small molecules called **second messengers**, which initiate and coordinate intracellular signaling pathways. For example, **cyclic AMP** (cAMP) is a common second messenger involved in signal transduction cascades. (In fact, it was the first second messenger ever discovered.) cAMP is synthesized from ATP by the enzyme **adenylyl cyclase**, which resides in the cell membrane[3]. The activation of adenylyl cyclase can result in the manufacture of hundreds or even thousands of cAMP molecules. These cAMP molecules activate the enzyme **protein kinase A** (PKA), which then **phosphorylates** multiple protein substrates by attaching phosphate groups to them.

1.1.3 **G-Coupled –complex receptors signaling to** *MAPK/ERK.*

G-protein coupled receptors are activated buy a wide variety of external stimuli Upon receptor activation, the G protein exchanges GDP, for GTP causing the disassociation of the GTP bound α/β and Y subunits and triggering diverse signaling cascades. Receptors coupled to different heterotrimeric G protein subtypes can utilize different scaffolds to activate the small G protein */MAPK* cascades, employing at least three different classes of Tyr kinases[4].

Src family kinases are recruited following activation of PI3K Y by β/Y subunits. They are also recruited by receptor internalization, cross activation of receptor Tyr kinases or by signaling through an integrin scaffold involving Puk2 and /or FAK.GPCRs can also employ PLCβ to mediate activation of PKC and CaMKII, which can be have either stimulatory or inhibitory consequences for the downstream MAPK Pathway[5,6,7].

2. Materials and Methods

1. Commercial sample of Amla - 5 Pieces (for physical observation)
2. Tissue paper/Silk Cloth
3. Steel needle- Pricking purpose)
4. ANOVA software for computational study-

Methodology-

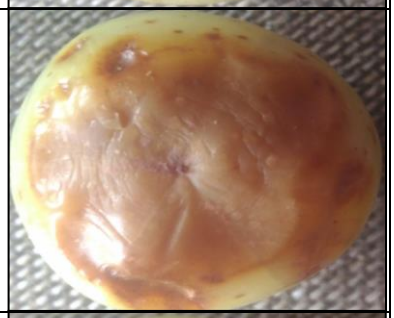
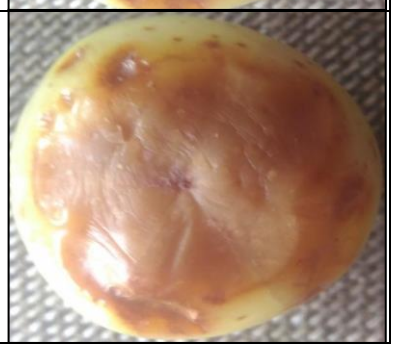
1. Commercial sample for market has been taken/purchased has been used for experiment purpose.
2. A few days market amla taken, washed thoroughly and cleaned/wiped with silk cloth.
3. A small pricked done on every amla -with stainless steel needle.

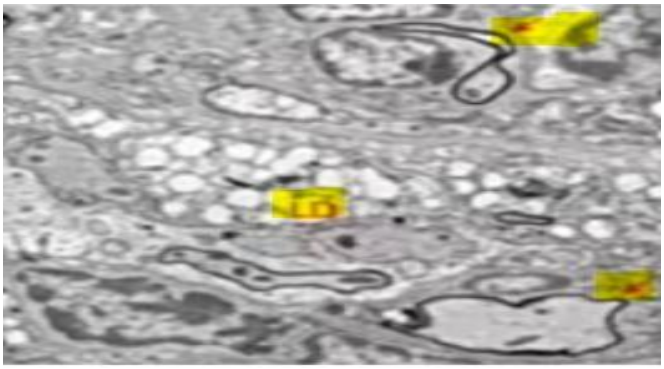
4. A small corrosion will be found after spending time, it will be increase accordingly day by day.
5. The day by day increasing corrosion shall be measured and observed.
6. The observation shall be write on paper for records.
7. The shall be collected and ANOVA was determined for each piece of amla.
8. The ANOVA data matched and compared with the reference data from Web searches.
9. The web searched data used for reference data in the past also the data with myelin growth in amla and mice accordingly ageing in mice was calculated and graphed
10. The ageing of Amla related with myelin and neuronal transfer is linked with myelin from neuronal observed with mice.
11. As the amla shows the ageing or destruction of neurons accordingly with age-of day today activity in comparison with TREM2 deficient mice.

3. Results and Discussion

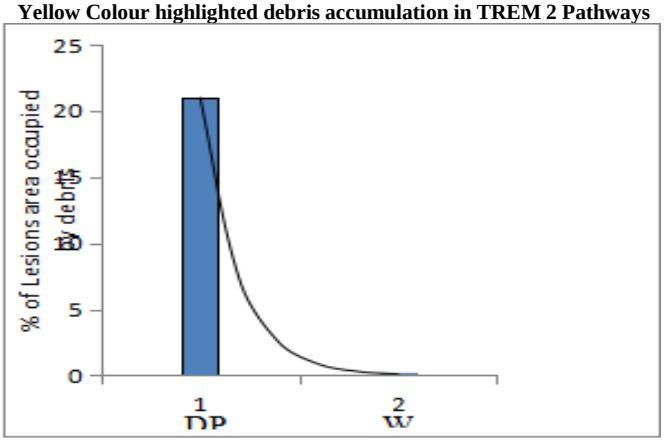
Ageing study and chemical neurons transfer in *Phyllanthus emblicas*"

Table 1-Day wise observation:

1st Day Observation Brownish dark patches arise due to the poor signaling or inhibition of neuronal junction and the enzymes inhibition. .	
2nd Day Observation With the Brownish dark patches the size changes according the effect of humidity and room temperature and pH in the environment.	
3rd Day Observation Change in fruit size also impact the colour of fruit ripening and damage to the cell membranes, the process of fruit ripening inhibited slowly due to the enzyme suppression and De-oxygenation leads due to the excess amount of ethanol production and damages to the cell membrane.	
4th Day Observation Same as 3rd day observation no fruits cell membranes survive protein renatuaration and leads to the inhibition of protein synthesis.	
5th Day Observation The synthesized proteins not able to translate properly and hence not able to produce the conformational change and hence the Enzyme and or Protein.	
6th Day Observation The improper synthesized protein will not be able to form the chain of polypeptide or the chain of amino acids and forms the different changes in color, size and taste even though.	

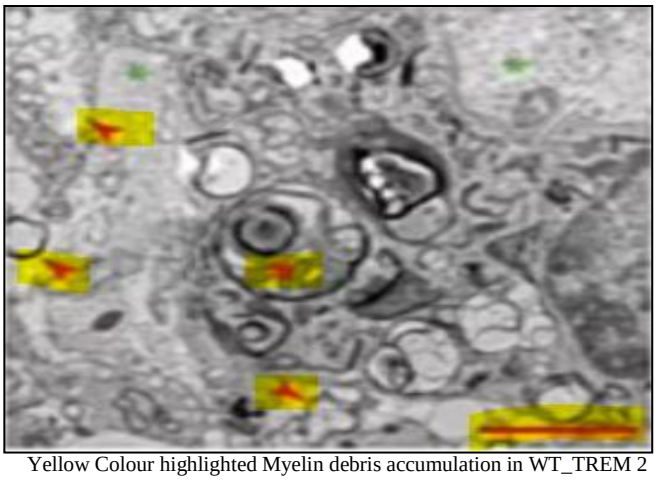


Yellow Colour highlighted debris accumulation in TREM 2 Pathways

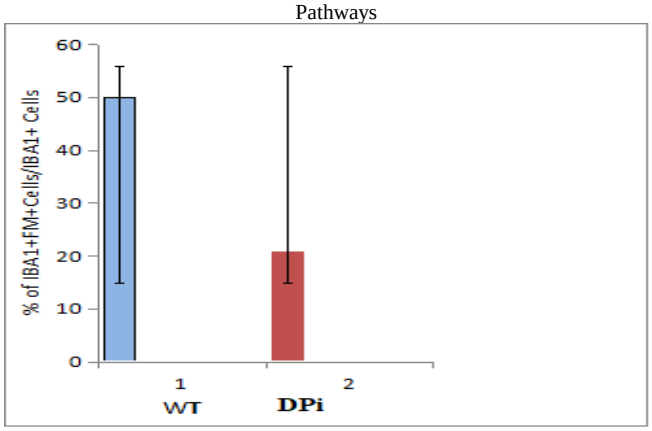


% of IBA1 _FM Cells shows 21% Dpi for Myelin debris accumulation in WT_TRME2 deficient Mice

Fig 1. Myelin debris accumulation in Amla fruits and TREM2 deficient mice



Yellow Colour highlighted Myelin debris accumulation in WT_TREM 2 Pathways



% of IBA1 _FM Cells shows 21% Dpi for Myelin debris accumulation in WT_TRME2 deficient Mice

Fig 2. Myelin debris accumulation in WT_TREM 2 deficient mice

Neuronal transfer in the Dendritic cells:

The transfer of messages from the neurons takes place into the different segment of axon; it carries the information in the form of assorted and distorted messages.

These assorted and distorted messages known to be the electrical and chemical signaling molecules for e.g hormones and cyclic AMP (cAMP) molecules respectively.

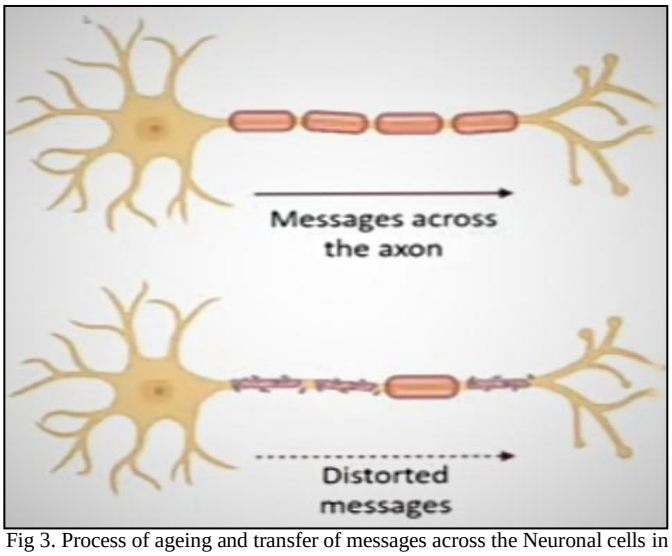


Fig 3. Process of ageing and transfer of messages across the Neuronal cells in *Phyllanthus emblicas*":

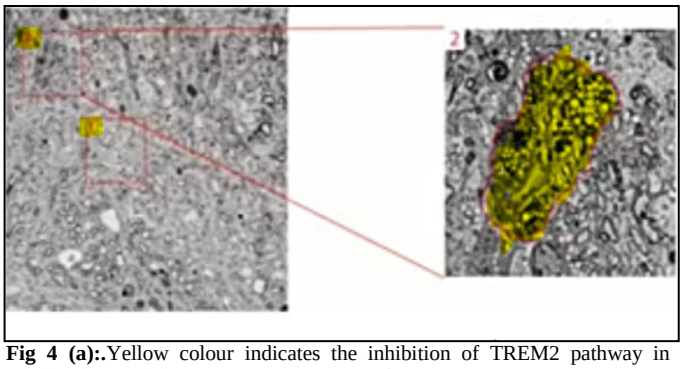


Fig 4 (a):. Yellow colour indicates the inhibition of TREM2 pathway in *Phyllanthus embilica's* and accumulation of myeloid debris which mediates the antigen presentation in the T cell immune response for immunological response of foreign particles, but the accumulation of myeloid cell debris leads to the Tamoxifen-induced conditional deletion of the CSF-1R in microglia from cuprizone-fed mice caused aberrant myelin debris accumulation and reduced microglial phagocytic responses.

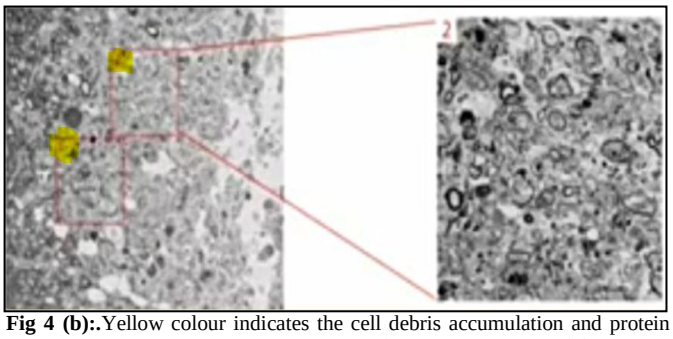
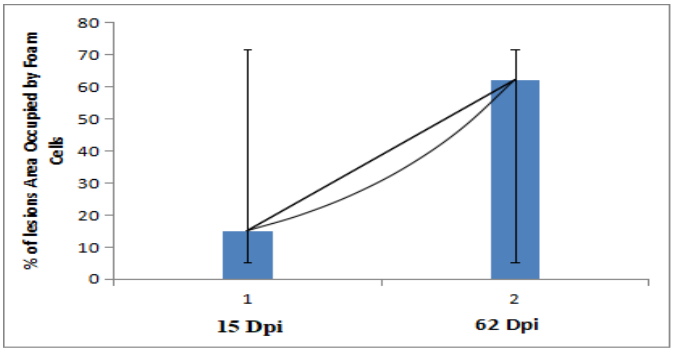


Fig 4 (b):. Yellow colour indicates the cell debris accumulation and protein translation in the ER lumen and nucleus of TREM2 pathway of foam cells initiated and inhibited at the different % of lesions area i.e. 15Dpi and 62Dpi.

Fig 4. TREM2 Signaling Pathway



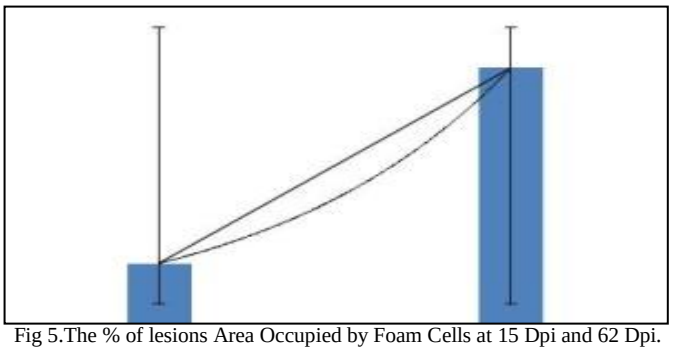


Fig 5.The % of lesions Area Occupied by Foam Cells at 15 Dpi and 62 Dpi.

The above lesions shows the activation of ER stress at different cell while in TREM2 signaling, it also shows the inhibition and of foam cells accumulation and myeloid debris accumulation or in protein translation in the ER and Nucleus.

4. Conclusion and Future Scope

The study of current article the thematic for comparison of plant with animals, however the lifespan for animals are more than the plants of herbarium.
Also the plants are rich with protein fibers, Fats and other Biomolecules, as they are the only living cells on earth who produce their own food.

So the plant food such as fruits and leaves e.g. Spinach , Fenugreek, safflower leaves, Dill leaves is very good source for human being to survive and have more nutrition from it.
Also the comparison of ageing data show the accumulation of myelin cells or destruction of myelin cells which prevent the ageing of animal or human being.

The study results, reveals and suggested that amla branch is a rich source of bioactive compounds and can be a potential ingredient for utilization in anti-skin aging products, so after ageing it is good to use the amla product and herbal remedies.

Data Availability
The data procurement has been done from the google scholar, and scientific websites.

Conflict of Interest-
No conflict of interest.

Funding Source-
Thanks to UGC New Delhi- for funding for PhD Research Work.

Authors' Contributions
Author has contributed for the writing, review and approval of article, also responsible for the copyright statement and application, however the corresponding author is first authors only.

Acknowledgement
Thanks for family and family member for their moral and ethical values for not to burden and impose on me.

References

[1] Purveys D, Augustine GJ, Fitzpatrick D, et al., editors. Neuroscience. 2nd edition. Sunderland (MA): auer Associates; 2001. Chapter 2, Electrical Signals of Nerve Cells. Chapter.2, **2001.**
[2] Aoki Y, Niihori T, Narumi Y, Kure S, MastubaraY; 'These RAS/MAPK syndromes: Novel roles of the RAS pathway in human genetic disorders, *Hum. Mutations;*Vol.**29,** Issue.**8**, pp.**992-1006, 2008.**
[3] Caunt CJ, Finch A.R, Sedgley KR, Mc Ardle CA, Seven – transmemberane receptor signaling and ERK compartmentalization *Trends Endocrnol. Metabolisms*, Vol.**17,** Issue.**7**, pp.**276-83, 2006.**
[4] Goldsmith ZG, Dhansekaran G protein regulation of MAPK networks; DN *Oncogene6*, Vol.**22,** pp.**3122-3142, 2007.**
[5] Kim EK, choi EJ, Pathological roles of MAPK signaling pathways in human diseases; *Bhochem.Biphys. Acta*, Vol.**1802,** Issue.**4,** pp.**396-405, 2010.**
[6] McKay, MM Morrison DK, integrating signals from RTKsto ERK/MAPK; *Oncogene*, Vol.**26,** Issue.**22,** pp.**3113-3121, 2007.**
[7] Ifergan I and Miller SD, Potential for Targeting Myeloid Cells in Controlling CNS Inflammation; *Front. Immunol.*Vol.**11,** pp.**5718-5790, 2020.**

AUTHORS PROFILE

Drs. Wahul Umesh B earned his M.Sc and Ph.D. in Biological Sciences, from Swami Ramanand Teerth Marathwada University Nanded under the financial assistance from UGC New Delhi. in 2012, and 2023, respectively. He is currently working as Associate Professor and Post Doctorate Research Scholar in National Institute of Virology, Pune in Department of Immunology from ICMR, New Delhi, 2023. He is a member of ISROSET since 2014, Life member of ISCA since 2016 and a life member of the Elsevier/Science Alert since 2020. He has published more than 11 research papers in reputed international journals including Thomson Reuters (SCI & Web of Science) and it's also available online. His main research work focuses on Protein chemistry, and Biochemistry. He has more than 03 years teaching and 7 years of research experience.

