

2022

- SCIENCE
- PHARMACY
- INNOVATION

EDITION - 2022

# APSE Bulletin

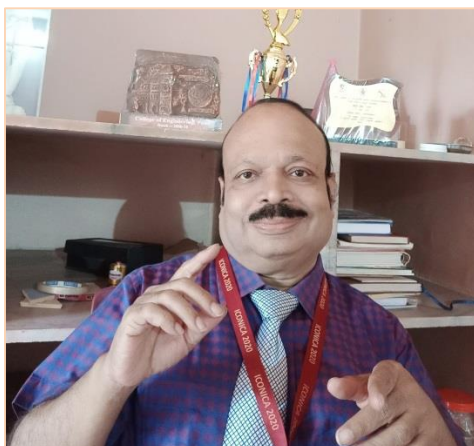
Association of Pharmaceutical Scientists and Educators

*Only Research Nothing Else*

Website : <http://www.svcop.org/acpiapse.php>

Email : [publish.apse@gmail.com](mailto:publish.apse@gmail.com)

## Message from the desk of the President, APSE



At last! Corona Era, Online Events, and Lockdowns are all over. An international organization of the Association of Pharmaceutical Scientists and Educationists (**APSE**) constituted during the peak Corona period with the mission of providing a competitive and interactive platform to budding pharmacists, researchers, and educationists catering to nurture their innovative potential, productivity and creativity is soon completing its three years. I am delighted to declare the organization of the first offline (physical) two-day international conference at Bhimtal (Uttarakhand) on Nov. 25-26, 2022 in collaboration with Graphic Era Hill University, Bhimtal after the successful organization of two dozen online Conferences and an equal number of professional meets during Corona period. Let me take this wonderful opportunity in the capacity of the President, APSE, and on my behalf to cordially welcome one and all to this beautiful hill station of Uttarakhand. It is heartening to note that the editorial board has successfully and meticulously completed the tedious job of compiling both the activities of APSE in the form of a Bulletin and research papers being presented during the conference in the form of a concise Abstract book (with ISBN). Furthermore, we as APSE would like to pause for a while, look back at what we have achieved so far, take stock of how far we have traveled professionally, identify what remains yet to be done, and make viable plans while keeping in mind the vision of APSE. I wish young graduates with hands-on training and a holistic approach to learning reach great heights in their research and professional career. I wish you enjoy the beautiful ambience, avail marvelous get-together opportunities, have meaningful professional discussions, and carry home pleasant memories of this event. We rarely get such a unique and wonderful opportunity in the vicinity of nature to interact physically, know each other well and meet personally. Let us all join hands in making India a Vishva-Guru (विश्वगुरु) showing the righteous path to the entire globe.

**Prof. Milind Parle**, President, Association of Pharmaceutical Scientists and Educators (APSE). Section Editor: Current Science (Bentham Science Publishers), Ex. Dean, Faculty of Medical Sciences, Guru Jambheshwar University of Science and Technology ('A' Grade NAAC Accredited University), HISAR (HARYANA). E-mail: [mparle@rediffmail.com](mailto:mparle@rediffmail.com), Mobile: + 91 9812161998.

## Message from the Secretary

### **Dr. Hanumanthachar Joshi**

Hon. Editor, APSE Bulletin  
Hon. Secretary, APSE  
Principal, Sarada Vilas College of Pharmacy  
Mysuru, Karnataka, India  
Email: amanjoshi17@yahoo.com



Dear Readers

Greetings from the Association of Pharmaceutical Scientists and Educators (APSE).

We are delighted to present to you the 1<sup>st</sup> edition of “APSE Bulletin” the Special bulletin published by the Association of Pharmaceutical Scientists and Educators (APSE).

The ASPE bulletin is not just a new bulletin; it’s an illuminating chronicle of our association that provides insight into the ethos of the global research activities and revels in capturing the exhilarating flashback of the previous year’s journey by the stakeholders and members of the association.

Through this bulletin, we are pleased and honored to share with you the wealth of contributions from the members in the form of useful and interesting write-ups. It is not just the text but the splendor of pictures and images within the pages that speak about the enriching events, activities, achievements, and articles.

The editorial board extends its heartfelt gratitude to the research scientists and eminent academicians for their guidance and support.

Special appreciation to the assiduous editorial board, who have endeavored to the hilt to the task at hand for days to ensure that the “APSE Bulletin” stays current and vibrant.

## Message from the Joint Secretary

**Prof. (Dr.) Shailendra Shivaji Gurav**

Hon. Editor, APSE Bulletin  
Joint Secretary (Goa), APSE  
Professor,  
Goa College of Pharmacy, Goa University, Goa, India  
Email: shailendra.gurav@nic.in



It is heartening to note that the APSE Editorial team has put in a great deal of effort in bringing out the first bulletin, "APSE- Bulletin- 2022," which opens a "portal of hope" for the scientific community and the academic community as a whole. Today is the day and age of cutting-edge technology. If we want to improve people's standard of living and make strides toward national progress and prosperity, we must embrace the idea that scientific research and innovation are indispensable. I highly recommend pharma students, and researchers take full advantage of ASPE as a superb forum for exploring scientific and educational knowledge. I have no doubt that, with its leadership, APSE will succeed in its future endeavours.

Best wishes!!!

## Message from the APSE Vice Presidents

It gives me immense pleasure that APSE is bringing its first edition of “APSE Bulletin- 2022”. I commend the efforts put forth by the editor of APSE under the able leadership of the President. Bulletin has a great educative value and encourages the readers to think and write. In fact, young readers find its first exposure through this medium. The APSE Bulletin also records the achievements and various activities of the association. My best wishes for the entire team and I wish the association to continue its journey of excellence.

Wish you all a happy reading!!!



**Dr. K. S. G. Arulkumaran M.Pharm., Ph.D., FAGE (Manipal)**

Vice-President of APSE (Kerala)

Principal, KTN College of Pharmacy,

Chalavara, Puliyanamkunnu P O, Ottapalam Taluk, Kerala 679505

## Message from the APSE Vice Presidents

“Science and technology is not formal logic, which cannot be taught but its growth can be encouraged in those who already possess it. The joy of discovery is a pleasure a man can ever feel, as no problem can stand the assault of sustained thinking”.

I am very happy to learn that Association of Pharmaceutical Scientists & Educators is coming up with an APSE Bulletin to cater the needs of the research community of the country. I am sure it will serve as a platform for exchanging views and experiences and a forum for sharing of knowledge of emerging trends in the field of research and development. I hope that the outcome of this newsletter will prove to be beneficial for the young researchers.

It is my pleasure to radiate about the surpassing team of editorial members whose assiduous work resulted in the publishing of this APSE Bulletin. The hectic task of making this inaugural APSE Bulletin in a huge way is an outcome of sincere and hard work extended by the editorial team. I congratulate the editorial team for their efforts in bringing this newsletter.

On behalf of APSE, Andhra Pradesh branch I extend my best wishes for the grand success of the APSE Bulletin to scale new heights than ever.



**Dr. BALAGANI PAVAN KUMAR**

**M.Pharm, Ph.D, FIC, FBSS, FICCP, FAGE, MISTE,**

Vice President of APSE (Andhra Pradesh),

Professor & Principal, Gokula Krishna College of Pharmacy

Sullurpeta, SPSR Nellore, AP.

## Editorial Message from the Chief Editor

**Dr. Arunachalam Muthuraman**

Associate Professor,

Department of Pharmacology,

Faculty of Pharmacy, AIMST University, Malaysia.



It is with profound pleasure, humility, and anticipation that we celebrate the first launch of the Association of Pharmaceutical Scientists & Educators (APSE) Bulletin with this inaugural issue. On behalf of the APSE Editorial Team, I would like to extend a very warm welcome to the readership of the APSE Bulletin. I take this opportunity to thank our authors, editors, anonymous reviewers, and APSE executive members all of whom have volunteered to contribute to the success of the APSE Bulletin.

APSE society is primarily focused on encouraging the building of connections between budding researchers, scientists, and educators to reach their career advancement and serve in the Pharmacy Profession & Society. This APSE society is recognized by various National and International Institutions and jointly conducts various events like conferences, webinars, seminars, and skill development programme.

APSE bulletin is a platform to share their message about innovation, novelty, vision, and opinion of current updates of pharmacy information to the public and pharmacy professionals. This APSE Bulletin has covered all aspects of health care professions. We would also like to include information on public awareness of basic to advanced translational medicines and research. We aim to develop the understanding and best management of public health care and the well-being of health care professionals. We welcome contributions by joining to APSE and submitting your research and opinions of health care information to APSE Bulletin.

APSE Bulletin provides the ideal forum for the exchange of information on health care profession & research advancement and more in various formats: commentary, short communication, novel findings, survey reports, and opinions reports on promising developments, and practices of pharmacy and health care system. The APSE Bulletin's editorial board has strongly convinced of this initiative and will provide science-driven information with strict international processes and editorial standards to the scientific community. APSE Bulletin is published two times a year. To ensure rapid dissemination of information, we aim at completing the peer review process of submission of articles within 2 months from the submission date.

APSE bulletin is committed to publishing all received manuscripts with higher and top priority based on the recommendation of peer reviewers. Further, we will periodically modernize and strengthen the standard & quality of the APSE Bulletin. I close this message by inviting everyone to submit their exciting research to the APSE bulletin. We are committed to publishing all information on the pharmacy health care system with significant benefits to the public health care system.

Once again, I welcome you to this APSE Bulletin, with your support as authors, reviewers, and APSE editors. Ultimately, we will see bright prospects for the APSE bulletin to serve science and the scientific community.

**Dr. Arunachalam Muthuraman**

**Editor in Chief**

APSE Vice-President (North Malaysia)

Associate Professor, Pharmacology Department, Faculty of Pharmacy, AIMST University, Semeling, 08100 Bedong, Kedah Darul Aman, Malaysia.

E-mail: [muthuraman8@gmail.com](mailto:muthuraman8@gmail.com) ; [arunachalammu@gmail.com](mailto:arunachalammu@gmail.com)

Phone No: +91-9988040886 (India); +60-1136293386 (Malaysia whatsapp).

## Office bearers of APSE

**President:**

Dr. Milind Parle

**Secretary:**

Dr. Hanumanthachar Joshi

**Treasurer:**

Dr. Kiran Kumar Hullatti

**Vice Presidents (India):**

Dr. Wakode, Dr. Nirmal Singh, Dr. Arul Kumaran, Dr. Bannappa, Dr. Anil Kumar, Dr. Nitin Bansal, Dr. Pavan Kumar Baglani, and Dr. Nitin Mahurkar.

**Vice Presidents (International):**

Dr. Palanisamy Sivanandy (Malaysia), Dr. Arunachalam Muthuraman (Malaysia), Prof. Mangestuti (Indonesia), Dr. Shanmugarajan (USA), Dr. Majed Mohammed Abdoalkanad (Yemen), Dr. Samir Dhingra (West Indies), Dr. Tippeswamy, (Saudi Arabia), and Dr. Mano Yasunari (Japan).

**Joint Secretaries:**

Dr. Shailendra Gurav (Goa), Dr. Simanchal Panda, Dr. Himanshu Joshi (UK), Dr. Vandanapatel (Gujarat), Dr. Manasadeepa (Karnataka), Dr. Mytreysi (Tamil Nadu), and Dr. Sudhakar (Andrapradesh).

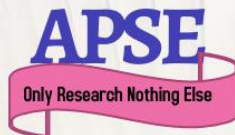
**Core committee Members:**

Dr. Kuntal Das, Dr. Veeresh Bantal (AP), Dr. Surendrayerasi, Dr. Sachin Lohe, Dr. Shachindra, Dr. Mehboob (Malaysia), Dr. R. Deshpande, and Dr. Varadarajan (Malaysia).

**Advisors / Special Invitees:**

Dr. Rajendra Kakade, Dr. Najwade, Dr. Sandip Aurora, Dr. Durai Swamy, Dr. A. Nagappa, and Dr. Dinesh Dhingra.





## International Webinar

19 Feb 2021

11 AM (IST)

### Retarded Child : A Social Concern

#### **Prof. Milind Parle**

President, APSE  
Former Dean, Professor & Head  
Dept. of Pharm. Sciences, Guru Jambheshwar University  
of Science & Technology, Hisar, INDIA

Link to Join  
<http://bit.ly/apsefeb2021>



Dr. Hanumanthachar Joshi  
Secretary, APSE



Dr. Sharad R. Wakode  
Vice President, APSE

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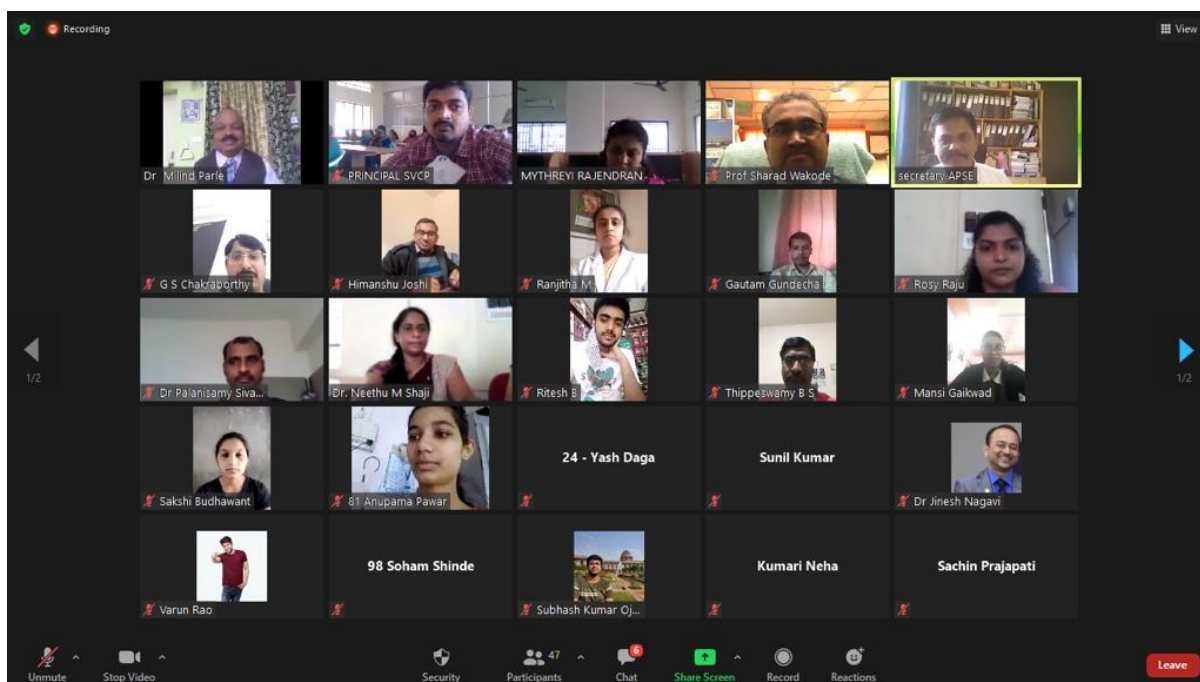


Dr. R. Mythreyi  
Jt. Secretary, APSE (Tamil Nadu, India)  
MODERATOR

*Outreaching budding Scientists and Young Minds*

MORE INFO:  
[founderapse@gmail.com](mailto:founderapse@gmail.com)  
Ph: +91-821-2489988, 9663373701

APSE organized an international webinar on “Retarded Child: A Social Concern”. The talk was delivered by **Prof. Milind Parle**, APSE President, Former dean, Professor & Head, Department of Pharm. Sciences, Guru Jambheshwar University of Science & Technology, Hisar, India on 19<sup>th</sup> February 2021; the session was chaired by Dr. Sharad R. Wakode, Vice President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; and it was moderated by Dr. R. Mythreyi, Joint Secretary of APSE (Tamilnadu).



Zoom Participants of APSE organized an international webinar on “Retard Child: A Social Concern”. The talk was delivered by **Prof. Milind Parle**, APSE President, Former dean, Professor & Head, Department of Pharm. Sciences, Guru Jambheshwar University of Science & Technology, Hisar, India on 19<sup>th</sup> February 2021; the session was chaired by Dr. Sharad R. Wakode, Vice President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; and it was moderated by Dr. R. Mythreyi, Joint Secretary of APSE (Tamilnadu).

## SPEAKER



### **Mr. Sachin Marihal**

Senior Manager- R&D

江苏集萃新型药物制剂技术研究所有限公司

Jiangsu Jicui Institute Of Advanced Drug

Delivery Technology Co., Ltd,

Nanjing, China

# APSE

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## International Webinar

19 March 2021

11 AM (IST)

### Building a Career and research path in Pharmaceutical Industry : China Market Practical tips and approach

Link to Join

<http://bit.ly/APSEMARCH>



Dr. Milind Parle  
President, APSE



Dr. Hanumanthachar Joshi  
Secretary, APSE



Dr Manasa Deepa R  
Jt. Secretary, APSE (Karnataka)  
MODERATOR

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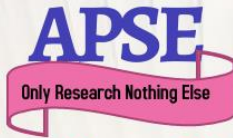
Ph: +91-821-2489988, 9663373701

APSE organized an international webinar on “Building a Career and Research Path in Pharmaceutical Industry: China Market Practical Tips and Approach”. The talk was delivered by **Mr. Sachin Marihal**, Senior Manager, Jiangsu Jicui Institute of Advanced Drug Delivery Technology Co., Ltd., Nanjing, China on 19<sup>th</sup> March 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).



**Dr. Palanisamy Sivanandy**

International Medical University (IMU),  
Kuala Lumpur, Malaysia.  
Vice President, APSE (Malaysia)



## International Webinar

Theme: Pharmacovigilance in 21st Century

12 Feb 2021

11 AM (IST)  
1:30 PM (MYT)

Patient Safety Culture in Malaysian  
Community Pharmacy Setup

Link to Join  
<http://bit.ly/apse2021>



**Prof. Milind Parle**  
President, APSE



**Dr. Hanumanthachar Joshi**  
Secretary, APSE



**Simanchal panda**  
Jt. Secretary, APSE, MODERATOR

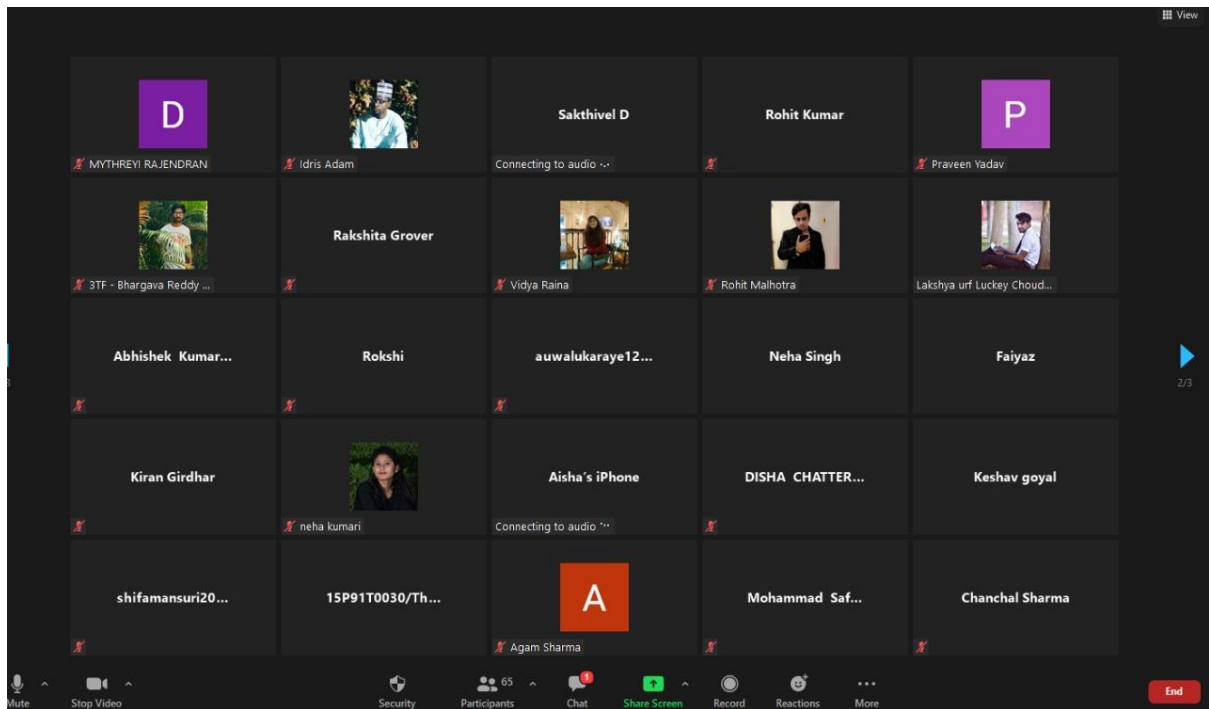
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MORE INFO:  
founderapse@gmail.com  
Ph: +91-821-2489988, 9663373701

APSE organized an international webinar on “Pharmacovigilance in 21<sup>st</sup> Century”. The talk was delivered by **Dr. Palanisamy Sivanandy**, Vice President of APSE (Malaysia), International Medical University (IMU), Kuala Lumpur, Malaysia on 12<sup>th</sup> February 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; and it was moderated by Dr. Simanchal Panda, Joint Secretary of APSE.



Zoom Participants of APSE organized an international webinar on “Pharmacovigilance in 21<sup>st</sup> Century”. The talk was delivered by **Dr. Palanisamy Sivanandy**, Vice President of APSE (Malaysia), International Medical University (IMU), Kuala Lumpur, Malaysia on 12<sup>th</sup> February 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; and it was moderated by Dr. Simanchal Panda, Joint Secretary of APSE.

International Webinar on

## The Emerging Role of Nutraceuticals in Prevention & Treatment of Cardiovascular Diseases

30 APRIL 11 AM

Link to register:  
<http://bit.ly/apseapril2>

Speaker



Dr. Satish Kumar Sharma  
Pro Vice Chancellor, Glocal University, Saharanpur, UP  
National President, pesots



Dr. Milind Parle  
President, APSE



Dr. Nirmal Singh  
Professor & Head, Dept. of Pharm. Sciences, Punjabi University, Patiala. President, APSE- Punjab



Dr. K.S.G. Arulkumaran  
Principal, KTN College of Pharmacy Chalavara, Kerala  
President, APSE- Kerala



Dr. Hanumanthachar Joshi  
Principal, Sarada Vilas College of Pharmacy, Mysuru.  
Secretary, APSE

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Dr. Manasa Deepa R  
Jt. Secretary, APSE- Karnataka  
MODERATOR

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Dept. of Pharm. Sciences, Punjabi University, Patiala  
KTN College of Pharmacy, Puliyanamkunnu, Kerala  
Sarada Vilas College of Pharmacy, Mysuru

**APSE**

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Website: [www.apseweb.com](http://www.apseweb.com)



APSE organized an international webinar on “The Emerging Role of Nutraceuticals in Prevention & Treatment of Cardiovascular Disease”. The talk was delivered by **Dr. Sathish Kumar Sharma**, Pro Vice-Chancellor, Global University, Saharanpur, UP, on 30<sup>th</sup> April 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. Nirmal Singh, President of APSE (Punjab); Dr. KSG Arulkumaran, President of APSE (Kerala); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

Webinar on

## Pharmacometrics and its Applications

14 June 11 AM

Link to register:  
<http://bit.ly/apsejune>

Speaker



**Dr. Surulivelrajan Mallayasamy**  
Manipal College of Pharmaceutical Sciences, MAHE, Manipal



Dr. Milind Parle  
President, APSE



Dr. Hanumanthachar Joshi  
Secretary, APSE



Dr. Manasa Deepa R  
Jt. Secretary, APSE- Karnataka  
MODERATOR



Dr. Md. Naseeruddin Inamdar  
Principal, East West College of Pharmacy  
Bengaluru, CHAIRPERSON

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Scientists & Young minds*



Dr. G. Narayana Murthy  
Principal, National College of Pharmacy  
Shimoga, CO- CHAIRPERSON

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**East West College of Pharmacy, Bengaluru**  
**Sarada Vilas College of Pharmacy, Mysuru**

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Website: [www.apsepharm.org](http://www.apsepharm.org)



APSE organized an international webinar on “Pharmacometrics and its applications”. The talk was delivered by **Dr. Surulivelrajan Mallayasamy**, Manipal College of Pharmaceutical Sciences, MAHE, Manipal, on 14<sup>th</sup> June 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. Md. Naseeruddin Inamdar (Chairperson), Principal, East West College of Pharmacy, Bengaluru; Dr. G. Narayana Murthy (Co-chairperson), Principal, National College of Pharmacy, Shimoga; and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

Webinar on

**Glucose Antimetabolite 2-Deoxy-D-Glucose as Promising Candidate for Tackling COVID-19**

**9 July 2021  
11 AM**

**Speaker**



**Dr. Rakesh Kumar Sharma**  
Vice Chancellor  
Saveetha Institute of Medical and Technical Sciences  
(deemed to be University), Chennai

Link to register:  
<http://bit.ly/apsejuly9>



Dr. Milind Parle  
President, APSE



Dr. Sharad Wakode  
Vice President, APSE



Dr. Hanumanthachar Joshi  
Secretary, APSE



Dr. Mukhesh Nandave  
Asso. Professor  
Dept. of Pharmacology, DPSRU  
Chair- Scientific Session

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Scientists & Young minds*



Dr. Manasa Deepa R  
Jt. Secretary, APSE- Karnataka  
MODERATOR

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**Sarada Vilas College of Pharmacy, Mysuru**

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APSE organized an international webinar on “Glucose Antimetabolite 2-Deoxy-D-Glucose as Promising Candidate for Tackling COVID-19”. The talk was delivered by **Dr. Rakesh Kumar Sharma**, Vice Chancellor, Saveetha Institute of Medical and Technical Sciences, Chennai, on 09<sup>th</sup> July 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Sharad Wakode, Vice president of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. Mukhesh Nandave, Asso. Prof., Department of Pharmacology, DPSRU (Chair-Scientific Session); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).





Zoom image of APSE organized international webinar on “Glucose Antimetabolite 2-Deoxy-D-Glucose as Promising Candidate for Tackling COVID-19”. The talk was delivered by **Dr. Rakesh Kumar Sharma**, Vice-Chancellor, Saveetha Institute of Medical and Technical Sciences, Chennai, on 09<sup>th</sup> July 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Sharad Wakode, Vice president of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. Mukhesh Nandave, Asso. Prof., Department of Pharmacology, DPSRU (Chair-Scientific Session); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

Webinar on

## Clinical Research - Career Opportunities for Pharmacy Professionals

24 July 11 AM

Speaker



**Bhausaheb Patil**  
Sr. Director - Quality Management  
IQVIA Limited, UK

Link to register:  
<http://bit.ly/apsejuly24>



Dr. Milind Parle  
President, APSE



Dr. Sharad Wakode  
Vice President, APSE



Dr. Mahendra Singh Rathore  
Principal, Geetanjali Institute of  
Pharmacy, Udaipur, Rajasthan  
Chair- Scientific Session



Dr. Hanumanthachar Joshi  
Secretary, APSE  
Principal, SVCP, Mysuru



Dr. K S G Arul Kumaran  
Vice President, APSE- Kerala  
Principal, KTNCP, Chalavara



Dr. Manasa Deepa R  
Jt. Secretary, APSE- Karnataka  
MODERATOR

Organized By  
Association of Pharmaceutical Scientists & Educators (APSE)  
In association with  
Sarada Vilas College of Pharmacy, Mysuru  
KTN College of Pharmacy, Chalvara, Kerala

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Website: [www.PostersOnlyWeb.com](http://www.PostersOnlyWeb.com)



APSE organized an international webinar on “Clinical Research – Career Opportunities for Pharmacy professionals”. The talk was delivered by **Dr. Bhausaheb Patil**, Sr. Director-Quality Management, IQVIA Limited, UK, on 24<sup>th</sup> July 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Sharad Wakode, Vice president of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. Mahendra Singh Rathore, Principal, Geetanjali Institute of Pharmacy, Udaipur, Rajasthan (Chair-Scientific Session); Dr. KSG Arulkumaran, President of APSE (Kerala); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).



Zoom image of APSE organized international webinar on “Clinical Research – Carrier Opportunities for Pharmacy professionals”. The talk was delivered by **Dr. Bhausaheb Patil**, Sr. Director-Quality Management, IQVIA Limited, UK, on 24<sup>th</sup> July 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Sharad Wakode, Vice president of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. Mahendra Singh Rathore, Principal, Geetanjali Institute of Pharmacy, Udaipur, Rajasthan (Chair-Scientific Session); Dr. KSG Arulkumaran, President of APSE (Kerala); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

**SPEAKER**



## International Webinar

21 May 2021

11 AM (IST)

### Introduction to Phytochemical Electrochemistry: Mother Nature and Electron-Transfer Application Point of View

#### Dr Annamalai Senthil Kumar

Professor, Nano and Bioelectrochemistry  
Research Laboratory, CO<sub>2</sub> Research and Green  
Technology Centre, School of Advanced Sciences  
(SAS), Vellore Institute of Technology (VIT)  
University, Vellore.

Registration Link  
<https://forms.gle/UpPwBu32e2NriDMq5>  
Or Scan the QR CODE



Dr. Milind Parle  
President, APSE



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Association of Pharmaceutical Scientists & Educators

KTN College of Pharmacy, Puliyanamkunnu, Kerala  
Sarada Vilas College of Pharmacy, Mysuru



Dr. K.S.G. Arulkumaran  
President, APSE- Kerala



Dr. Manasa Deepa R  
Jt. Secretary, APSE (Karnataka)  
MODERATOR

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**MORE INFO:**

Dr. Hanumanthachar Joshi,  
Secretary, APSE, [founderapse@gmail.com](mailto:founderapse@gmail.com)  
Ph: +91-821-2489988, 9663373701



APSE organized an international webinar on “Introduction to Phytochemical Electrochemistry: Mother Nature and Electron-Transfer Application Point of View”. The talk was delivered by **Dr. Annamalai Senthil Kumar**, Professor, Nano and Bioelectrochemistry Research Laboratory, Vellore Institute of Technology (VIT) University, Vellore on 21<sup>st</sup> May 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. KSG Arulkumaran, President of APSE (Kerala); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

**"Winning Edge"**  
CONNECTING YOUR MERIT TO SUCCESS.  
*A Skill Development Program.*

**04<sup>th</sup>**  
September 2021

Time:  
2:30Pm - 4:00 Pm

**K.T.N COLLEGE  
OF PHARMACY**  
*Presents*  
**CHEERY TALKS - SERIES II**

Speaker 

**Asish Das Gupta**  
Consultant - Learning  
and Development

Theme:  
Skills of presenting oneself to get  
perceived positively by the people  
who matter most in the professional  
world.

  
**Dr. Milind Parle**  
National President -APSE

  
REGISTRATION  
FORM LINK

  
**Dr. Hanumanthachar Joshi**  
President, APSE - Karnataka  
Principal, SVCP- Mysore

  
**Dr. K.S.G. Arulkumaran**  
President, APSE - Kerala  
Principal, KTNCP, Palakkad

  
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**Association of Pharmaceutical Scientists & Educators (APSE)**  
In association with  
**Career Guidance & Placement cell,  
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www.ktncollegeofpharmacy.net ktnpharm@gmail.com

APSE organized a Skills Development Program on “Winning Edge” – Connecting your merit to success”. The talk was delivered by **Dr. Asish Das Gupta**, Consultant – Learning and Development, on 4<sup>th</sup> September 2021; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. KSG Arulkumaran, President of APSE (Kerala); Dr. V. Gopal, President of APSE (Tamilnadu & Pondicherry); and Dr. B. Pavan Kumar, President of APSE (Andhra Pradesh & Telangana).

Webinar on

# Know the Pharmacognosist in You

18 January 2022

11 AM

Speaker



Prof. Dr. V. Gopal  
Registrar Academic, Principal  
Mother Theresa PG & Research Institute of Health Sciences,  
Puducherry



Dr. Milind Parle  
President, APSE

Link to register:  
<http://bit.ly/apse2022>



Dr. K.S.G. Arulkumaran  
Principal, KTN College of Pharmacy  
Chalavara, Kerala  
President, APSE- Kerala



Dr. Hanumanthachar Joshi  
Principal, Sarada Vilas College  
of Pharmacy, Mysuru.  
Secretary, APSE

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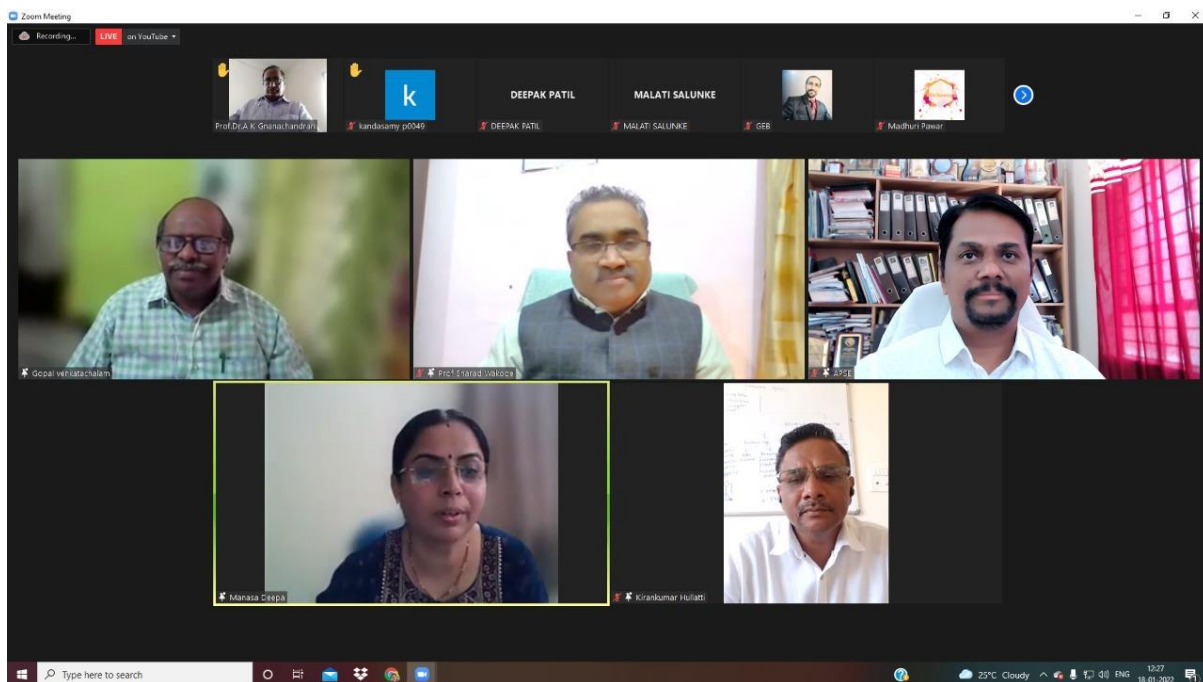
Dr. Manasa Deepa R  
Jt. Secretary, APSE- Karnataka  
MODERATOR

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Sarada Vilas College of Pharmacy, Mysuru

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APSE organized an international webinar on “Know the Pharmacognosist in You”. The talk was delivered by **Prof. D.V. Gopal**, Registrar Academic, Principal Mother Theresa PG & Research Institute of Health Sciences, Puducherry, on 18<sup>th</sup> January 2022; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. KSG Arulkumaran, President of APSE (Kerala); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).



Zoom image of APSE organized international webinar on “Know the Pharmacognosist in You”. The talk was delivered by **Prof. D.V. Gopal**, Registrar Academic, Principal Mother Theresa PG & Research Institute of Health Sciences, Puducherry, on 18<sup>th</sup> January 2022; the session was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Dr. KSG Arulkumar, President of APSE (Kerala); and it was moderated by Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

# MMK & SDM MAHILA MAHA VIDYALAYA



Krishnamurhupuram, Mysuru-570004  
Managed by: SDM Educational Society @, Ujire  
President: Padmavibhushana Dr. D. Veerendra Heggade



Accredited by NAAC with B Grade

Department of Microbiology & IQAC  
In Collaboration with  
Association of Pharmaceutical Scientists and Educators (APSE)

Organising

International E-Conference

on

“Recent Research and Innovations in Life Science  
2022- Nutraceuticals in Healthy Aging”



Date: 3<sup>rd</sup> & 4<sup>th</sup> February 2022

### Registration Fee Details:

Delegates:Rs.200, Research Scholars : Rs.150 & Students- Rs.100

Last Date for Abstract Submission on or before January 31st, 2022

Click on the given link for registration

<https://forms.gle/kQWTxpXtsZhLn1tH6>

Contact Details: 9845653689 / 8197469778

### Conference Theme:

**Neutraceuticals in Healthy Aging**

**Sub Themes:** Food Science & Bioprocessing, Neutraceuticals, Agricultural Science, Molecular Biology, Drug Discovery, Environmental Science, Medical Science, Bioremediation, Marine biology.

### Guidelines for the submission of Abstracts:

Abstracts not exceeding 250 words are invited for oral presentation in any of the themes of the conference. The one page abstract should be typed in 12 point, Times New Roman, normal font & single space. Authors are requested to email the soft copy to [rajarajeshwari.r@sdmmkmysore.in](mailto:rajarajeshwari.r@sdmmkmysore.in)

### Guidelines for the Poster Presentation:

The duration of the presentation must be focused and is restricted to only 6 mins. As in any research presentation, the outline includes statement of the problem, description of the methodology, summary of the work, and then the presentation of results. Conclusions should leave the delegates with a clear take away message.



### Chief Patron

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APSE organized the international Conference on “Recent Research and Innovations in Life Science 2022 – Nutraceuticals in Healthy Aging” with the Department of Microbiology & IQAC, NMK & SDM Mahilamaha Vidyalaya Institute, Mysuru. Chief organizers: Prof. Sainath Malligemadu, Principal, NMK & SDM Mahilamaha Vidyalaya Institute, Mysuru; Dr. Hanumanthachar Joshi, Secretary of APSE; Organizing Secretary: Smt. Atiya Sameen M.P., and Smt. Rajarajeshwari R., and IQAC Coordinator Smt. K.S. Sukrutha. The special topic “You are old as You Feel” was delivered by Dr. Milind Parle, President of APSE.



<b>3-2-2022</b> <b>INAUGURATION- 10.00AM</b>	
<b>TECHNICAL SESSION</b>	
10.30-11.00AM	<b>Topic: "Concept of Nutraceuticals in Ayurveda"</b> Dr. Sukesh M K Resident Medical Officer, Govt. Ayurveda Hitech Panchakarma Hospital, Mysuru
11.15-11.45AM	<b>Topic: "Challenges and Opportunities of Nutritional Therapy for Neurovascular Aging- Future Perspectives"</b> Dr. Arunachalam Muthuraman M Associate Professor, Pharmacology Unit Faculty of Pharmacy, AIMST University, Semeling Bedong, Kedah Darul Aman, Malaysia.
11.45 -12.15PM	<b>BREAK</b>
12.15-2.00PM	<b>POSTER PRESENTATION (VIRTUAL)</b>
<b>4-2-2022</b>	
10.30-11.00AM	<b>Topic: "Jamu Consumption for Healthy Ageing"</b> Ms. Neny Purwitasari Faculty of Pharmacy Universitas Airlangga Surabaya- Indonesia
11.15AM- 11.45AM	<b>Topic : "Evaluation of Shelf- Life period of Laung &amp; Darchini by accelerated stability study models using the marker compounds Eugenol and Cinnamaldehyde"</b> Dr. Amina Yasmeen Associate Professor & HOD Department of Pharmacology Govt. Unani Medical College & Hospital Bengaluru
12.00-12.30PM	<b>Topic : "You are old as You Feel"</b> Prof. Milind Parle Professor Guru Jambheshwar University of Science and Technology Hisar, Haryana Former Deputy Director, AICTE.
1.00PM	<b>VALEDICTORY</b>





# 2<sup>nd</sup> International Conference on Healthy Aging & Research (2<sup>nd</sup> ICHAR-2022)

On 21 & 22<sup>nd</sup> March, 2022

Registration link:  
<https://bit.ly/3soOliR>

Web: [www.svcop.org](http://www.svcop.org)  
Email: [icharapsc@gmail.com](mailto:icharapsc@gmail.com)

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Sarada Vilas college of Pharmacy, Mysuru, India  
AIMST University, Bedong, Malaysia



**Topics:**

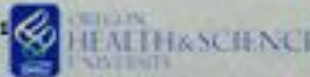
Alternative & Complementary Medicine, Artificial Intelligence, Drug discovery, Metabolic Disorders, Natural products, Nutritional and functional food, Public health, Traditional Medicines, Translational research, Yoga & Naturopathy.

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**Contacts**

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# 2<sup>nd</sup> International Conference on Healthy Aging & Research (ICHAR-2022)

On 21 & 22<sup>nd</sup> March, 2022

Registration link:  
<https://bit.ly/3soOliR>

Web: [www.svcop.org](http://www.svcop.org)  
Email: [ichar.apsc@gmail.com](mailto:ichar.apsc@gmail.com)

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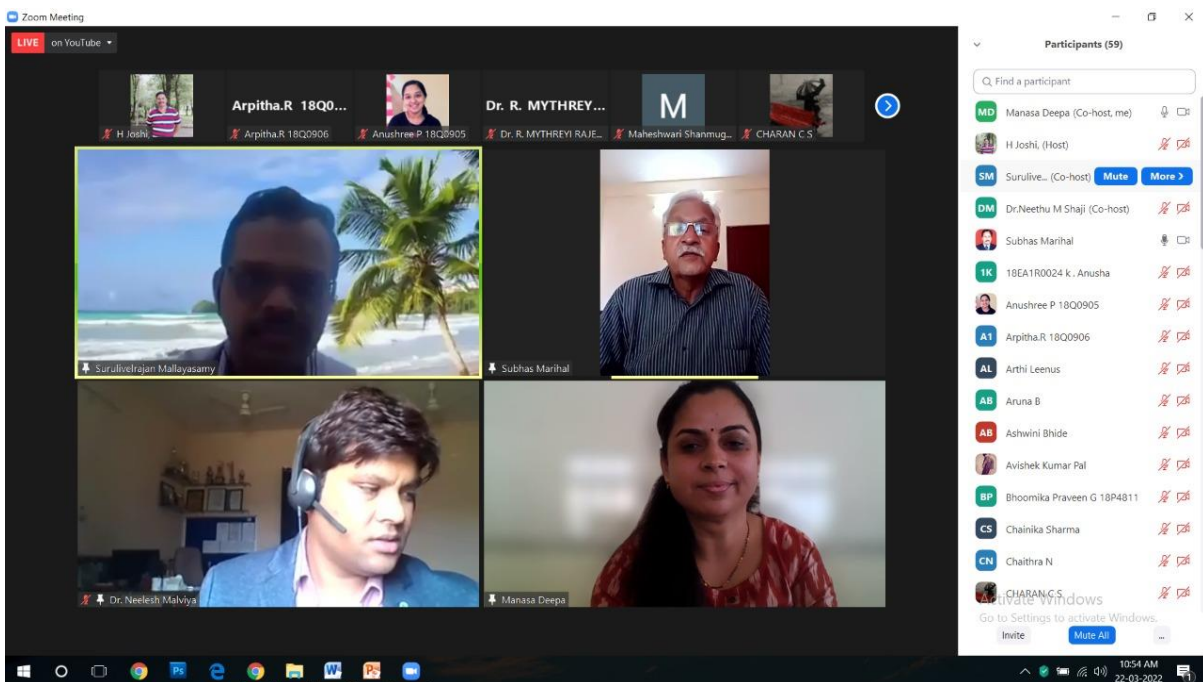
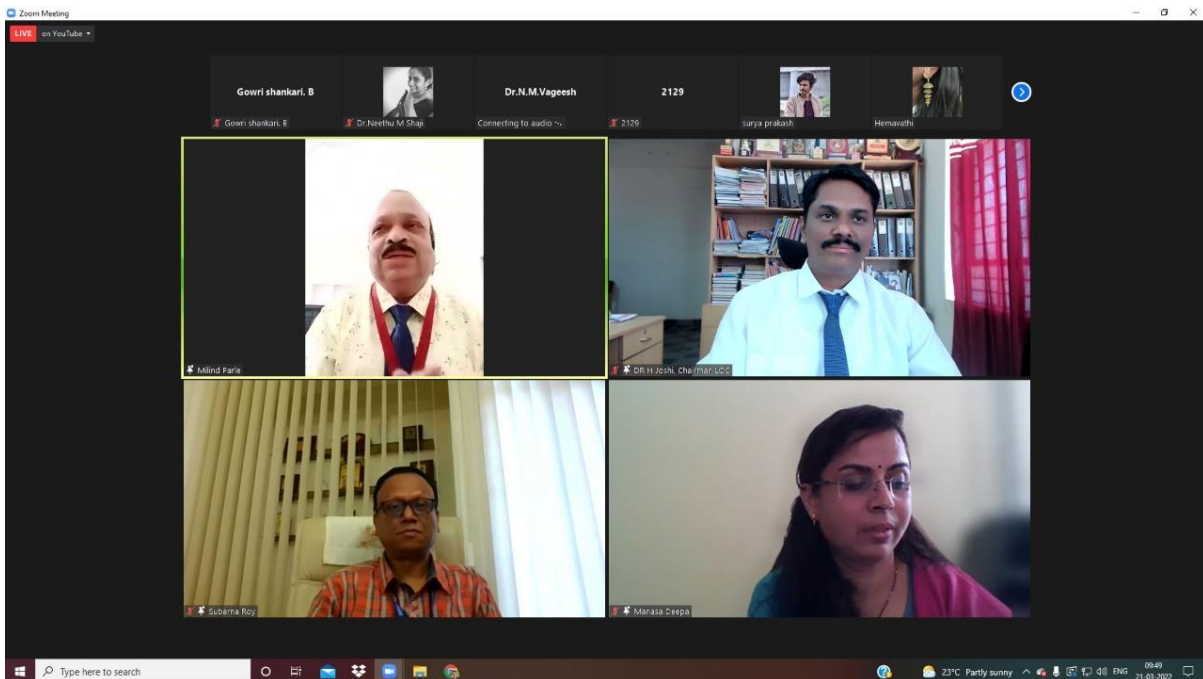
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Dr. Kiran Kumar Hullatti, +919448800184  
Treasurer, APSE

APSE organized the 2<sup>nd</sup> International Conference on “Healthy Aging & Research” (ICHAR-2022) with the collaboration of Sarada Villas College of Pharmacy, Mysuru; ICMR, New Delhi, India; AIMST University, Malaysia; on 21-22<sup>nd</sup> March 2020. The conference was chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; Organizing Secretary: Dr. A. Muthuraman, Vice-president of APSE (Malaysia); Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka); and with all APSE executive committee members (ICHAR-2022 event - Zoom Images are below).





Members of APSE felicitated **Dr. Subarna Roy**, Director, NITM, Indian Council of Medical Research, Belagavi, for their support to ICHAAR 2022



Members of APSE felicitated **Dr. Montu Kumar Patel**, on his appointment as the new President, of the Pharmacy Council of India, New Delhi

# National Pharmacy Poster Competition

Organized by

**ASSOCIATION OF PHARMACEUTICAL SCIENTISTS &  
EDUCATORS (APSE)**

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**SARADA VILAS COLLEGE OF PHARMACY, MYSURU**



**THEME : Role of Pharmacy Professionals in  
Health Care**

## Important Dates

**Last date for registration : 25th Sept. 2022, 5pm**

**Last date for poster submission : 30th Sept. 2022, 5pm**

**Date of poster presentation : 06th Oct. 2022**

**Eligibility :** The contest is open to the students from any of the pharmacy institutions as well as Research Scholars. The contestant should have a valid student identity card/Library Card/ any proof of being a pharmacy student or scholar to be eligible for participation.

**Prizes :** **FIRST, SECOND & THIRD, MOMENTO + CERTIFICATE.**  
Participation certificates to all participants

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**Contact : Dr. Manasadeepa, Joint Secretary, APSE.**

**Mobile : +919448861038**

**Amith M N - +917353182609**

**Email ID : [svcpyoga@gmail.com](mailto:svcpyoga@gmail.com)**



**Scan to register**

APSE organized the National Pharmacy Poster Competition in association with Sarada Villas College of Pharmacy, Mysuru; on 06<sup>th</sup> October 2022. Session chaired by Dr. Milind Parle, President of APSE; Dr. Hanumanthachar Joshi, Secretary of APSE; and Dr. Manasa Deepa R., Joint Secretary of APSE (Karnataka).

# Articles



## ‘Golden Milk’: Best Recipe for Viral Infections



**A**yurveda is the traditional Indian system of medicine. It is strongly recommended that ‘Golden milk’ can use for various ailments including viral infections. Our nature has various herbal plants for the treatment of chronic infectious disorders. Some of the plants act as mono-typical and others act synergistically to produce effective therapy. The various Ayurvedic formulation is most effective than mono-typical actions. Moreover, a scientific community like allopathic medicines is always in demand for evidence of that formulation's active ingredients and molecular mechanism in a biological system. Thus, the recognition of this type of medicine remains challenging.

Our ayurvedic formulation of ‘Golden milk’ is also called ‘*Haldi Doodh*’. It is administered for the treatment of wound healing, joint pain, fatigue, digestive problems, and breathing problems. The major ingredients of golden milk are cow milk, turmeric, black peppers, and ginger. Besides some minor ingredients are also suggested to add in this formulation like coconut milk or almond milk (if allergy to cow milk); cinnamon stick (as an aromatic condiment and flavouring additive); sweetener *i.e.*, maple syrup, palm sugar, coconut sugar, sugar cane (mostly suggested palm sugar); and coconut oil (for a tropical smoothie and promote high-density lipoprotein (HDL) level at low dose). Health drinks like green tea and turmeric drinks have anti-microbial actions along with immune-boosting properties. Scientifically, it proved that it modulates (regulates) the various immune cells like T-cells; B-cells; and natural killer cells against various pathogens including viral infections.

### The preparation of ‘Golden Milk’

1. Take a small saucepan to add major ingredients and minor ingredients as per requirements.
2. Whisk to combine all ingredients and warm over medium heat (Until hot around 50 °C; not boiling for 4 minutes) – whisking is required frequently.
3. Turn off the heat application and taste to adjust sweetener, intense spice, and flavour.
4. Take immediately under warm conditions (Best to take fresh; reheat is less likely recommended).
5. Take 3 to 4 times after light meals.

### The science behind the ‘Golden Milk’

**M**ilk is making strengthens bones and muscles due to the availability of a rich quantity of calcium. Bone strength and calcium are essential for active immune functions and the generation of immune cells to fight against the viral pathogen. Besides, experimental evidence suggested that the presence of additional nutrients like vitamin D, phosphorus, potassium, and magnesium strongly supports immune cell functions. It is also supporting the improvement of brain health; balance of body weight (due to its immense nutritive value);

### Ingredients for ‘Golden Milk’

#### Major:

- ✓ 1 1/2 cups<sup>ϕ</sup> of milk (cow / coconut / almond source)
- ✓ 1 1/2 tsp\* ground turmeric powder
- ✓ 1 pinch<sup>ψ</sup> ground black pepper
- ✓ 1/4 tsp ground ginger

#### Minor

- ✓ 1/4 tsp ground cinnamon
- ✓ 1 tsp coconut oil
- ✓ Sweetener
- \* tsp = tablespoon (1 tsp = 5.69 grams).
- ϕ cups (1 cup = 375 ml)
- ψ pinch (1 pinch = 0.36 g)





keeps the healthy heart functions due to the presence of potassium and conjugated linoleic acid (CLA) via lowering of bad cholesterol formation.

**T**urmeric has major active ingredients like curcuminoids *i.e.*, curcumin. Curcuminoids are natural polyphenol compounds and it is widely present in the turmeric, and ginger families. It is producing poly-targeted drug actions like inhibition of lipoxygenase (for anti-inflammation); irreversibly binding CD13/aminopeptidase enzyme (for prevents tumor invasion and angiogenesis); reduce the expression of intracellular proteins *i.e.*, CTLA4 and FOXP3 protein and mRNA levels (modulates the interaction between the immune system and tumor cells / viral pathogens). Besides, it has direct interference with viral replication machinery and suppression of cellular signalling pathways of viral replication.

**G**inger has bioactive components like 6-gingerol, 6-shogaol, and 6-paradol. The major aromatic components are zingiberene and bisabolene. It is known to produce betterment of stomach problems like motion sickness, morning sickness, upset stomach, gas, diarrhea, and irritable bowel syndrome (IBS). Moreover, gingerols and zingerone are known to have shown potential antiviral activity via inhibition of viral replication and block the viral entry mechanism to host cells. Besides, it stimulates the mucosal cells mediated secretion of Interferon type B (IFN- $\beta$ ). Experimentally, ginger extracts are shown to prevent chikungunya, herpes, Norwalk, influenza-A, common cold, and retroviral viruses including respiratory syncytial virus. Even Ayurvedic and Siddha formulations also have major ingredients such as ginger against the progress of coronavirus-associated complications.

**B**lack pepper has multiple active ingredients like piperine, capsaicin, and chavicine. Experimentally, piperine is well known to enhance the bioavailability of other compounds. Moreover, black paper is also used in various ayurvedic formulations. It is known to treat cancer, Alzheimer's, depressant, measles, nerve pain, and itchy skin (scabies), and also helps to quit smoking, and trouble swallowing. Piperine produces antiviral action via the inhibition of virus-replicating enzymes especially dengue and ebola viruses. Therefore, it is also called as '*king of spices*'. Hence, natural ingredients like vitamin D, phosphorus, conjugated linoleic acid, curcumin, piperine, gingerols, and zingerone are treated for various viral infections via multitargeted cellular and molecular mechanisms. Therefore, polyherbal formulations like Ayurvedic formulations have a promising role in the prevention of viral infections.

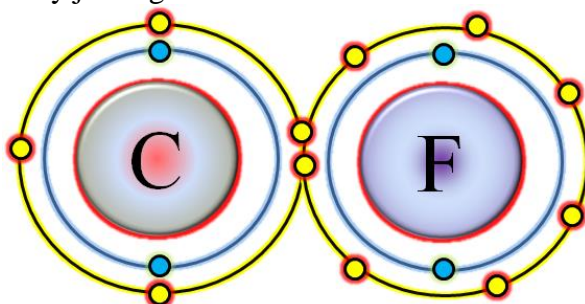
.....Written by



**Dr. Arunachalam Muthuraman**  
Faculty of Pharmacy,  
AIMST University, Malaysia.

## 'Forever Chemicals' - Red Alert; What Need To Do?

Chemicals are contributes a vital role in every plant and animal kingdom. Chemicals are formed with multiple bonds like hydrogen bonds, covalent bonds, and so on. Almost all chemical bonds are breakable by heat, sunlight, and water. Certain chemical bonds are forever due to strong bondages. More than 4700 groups of compounds are all noticed as forever chemicals which are contributed to our day-to-day life. Almost all chemicals are not formed naturally; it is created by joining carbon and fluorine atoms.



It is the strongest bond in organic chemistry, which means these chemicals cannot be broken down by heat, sunlight, and water. Hence, these chemicals are not eliminated by the environment and remain in '*Forever Chemicals*' on the earth. These chemicals are used since the 1940s; for making heat, moisture, and water-resistant items. It is very dangerous to humans; it can cause cancer, increase the level of cholesterol, raise the risk of heart disease, reduce the responses to vaccines, deteriorate growth even cause neurodegeneration. In short, these chemicals shorten our lifespan; reduce our quality of life including alteration of baby-bearing capability by multiple ways of biological alterations (Langenbach and Wilson, 2021).



These forever chemicals are known as perfluorooctanoic acid (PFAS), perfluorooctanoic acid (PFOS), perfluorooctanesulfonic acid PFOA, and so on. The most common forever chemicals are PFOS and PFOA are found in water, kitchen appliances, and food chain products including stain-resistant carpets. These are the things made with forever chemicals. Further, microwave popcorn bags, non-stick pots, food packaging materials, pizza boxes, water-resistant makeup products, shampoo, dental floss, paints, varnishes, and rain proof coats all are made with forever chemicals again. Basically, any material promising water resistant and moisture resistance; is bound to have PFAS (forever chemicals). Moreover, primers and furniture are also coated with forever chemicals. What will do these forever chemicals in our bodies, studies revealed that exposure to forever chemicals can interact with our hormones, immune system, and reproductive system which leads to raising the risk of cancer, autoimmune disorders, and birth defects respectively (Beans, 2021).

Moreover, it affects the growth of the infant, and alteration of learning and behaviour. The story of West Virginia is revealed that, the Teflon-making plant in Parkersburg, USA. Teflon is a chemical, commonly used for making non-stick pans. The waste water of this Teflon plant made the contamination of the drinking water river of Parkersburg. Most people were exposed to the high content of these forever chemicals; even farmers lost hundreds of cattle. The research reports 70000 adults in the Parkersburg area are found higher content of forever chemical (PFOA; 4400 ppb) in the bloodstream with elevated cholesterol, ulcerative colitis, thyroid dysfunction, testicular & kidney cancer, preeclampsia and elevated blood pressure during pregnancy (Grandjean *et al.* 2017).

According to 2007 Centers for disease control (CDC) reports clearly stated that there is a link between forever chemical (PFAS; 400 ppb) and birth defects even liver damage. It means tiny molecular exposure to forever chemicals can cause these kinds of problems. Moreover, **US-Environmental Protection Agency** (US-EPA) suggested that forever chemicals in drinking water should not exceed 70 parts per trillion (ppt) before the incident of Parkersburg. Later, CDC revealed that EPA had over-estimated the consumable amount of forever chemicals. Thereafter, the European Commission set the acceptable limit of forever chemicals in drinking water as 100 ppt whereas environmental working organizations suggested that, forever chemicals should not exceed more than one ppt in drinking water. Even, the mobile flow in water pollutes the rivers, groundwater, and drinking water. The continuous exposure to forever chemicals accumulates PFAS every day, over time the levels of forever chemicals build up beyond the limit in our body (Miner *et al.*, 2021).

In India, one study in 2016 found 15 types of forever chemicals found in one or many locations of the river of Ganga. However, the origin of the Ganga River has not been found in any forever chemicals. Moreover, the levels are high at the end of the Ganga River at Yamuna in Allahabad. Almost all the fish samples of the Ganga River had forever chemicals (Miner *et al.*, 2021). These killer chemicals were also found in the Rohr and Mona rivers of Germany in 2006. This situation is continued in Europe and the United States. They started to minimize the use of forever chemicals in 2000. Many parts of the world still have not studied the exposure of forever chemicals. In 2008 study revealed that the forever chemicals are found in the breast milk of Indian women with 46 ppt level whereas the safest limit is only 1 ppt. In American study reported that the forever chemicals are found in milk at 1850 ppm and in breast milk content of forever chemicals are 2000 times higher than safe limits. In addition, Americans contain at least one forever chemical in their blood. It is also found in arctic regions. In the current scenario in India, these killer chemicals are present in all water aquifers where deeper than 100 meters of ground water. These forever chemicals are found in mangroves of the Sundarbans forest which is one of the largest forests in the world (140,000 hectors) and lies in the delta of the Ganges, Brahmaputra, and Meghna Rivers. Even, it is found in river dolphins and pigs. According to scientific reports, these chemicals are well connected to our food chain and are present in 98 % of the Indian population.

This is absolutely a man-made disaster with these forever chemicals because these synthetic chemicals are not present natural environment; in another way, it is chemically synthesized for various uses. It started during the world war period and it continued to date for the application of makeup sets, stain-resistant carpets, pizza boxes, and forever chemicals-coated cookware for fried foods without oil. In fact, the law of nature is reversing the when wrong handling of science which tends to '**Boomerang**'. Some things happened in the forever chemicals crisis. Now, these chemicals won't leave our bodies and it is a matter of time before to build up their levels. Governments should ban these chemicals immediately. Certain countries are banned these forever chemical usages like Denmark (banned to use of PFAS chemicals in food packaging). The result shows that there is no PFAS chemical in McDonald's French fries bags in Denmark whereas in other countries (UK and Czechia)

French fry bags still have forever chemicals (Selin *et al.*, 2021). In India, these forever chemicals are not banned yet. However, listed two forever chemicals (hexachlorobenzene and polychlorinated biphenyls) must be eliminated or restrict the production of toxic chemicals by Stockholm Convention on Persistent Organic Pollutants (POPs). In 2020, India adopted benchmarks for restricting forever chemicals but the industry is replacing restricted PFAS with other equally harmful forever chemicals, so no point to restrict the preparation of forever chemicals. However, we can limit the exposure to these deadly forever chemicals by following the manner, testing the local water supplier and packed drinking water, checking the labels to stop the buying of chemicals coated with fluoro compounds with the name '**PTFE**' and picking the item labeled '**PFAS-free**' or '**PFC-free**'; if you using makeup set avoid/replace the water-resistant products and can choose traditional natural makeup products; avoid to use of non-stick pans and can prefer the steel or iron utensils; avoid the use of dental floss with PTFE coated products, and avoid to consume the pizza boxes packed products and can prefer the home made food; avoid the popcorn prepared with microwave device and can choose the popcorn with traditional preparation; do not buy the water-resistant clothes, carpets and gloves with a coating of forever chemicals and can prefer the normal clothes and carpets because the traditional products are tried & tested even it is forever proven for the safe and better life.

### **Highlights**

- **PFAS** are a group of synthetic, fluorinated chemicals used worldwide since 1940s.
- PFAS are found in food containers (First identified in US population), Teflon, and even microwave popcorn.
- PFAS linked with multiple health issue like cancer, thyroid disorders, immune dysfunction, low birth weight and decreased fertility.
- **Expert's advice** the simplest way to escape from PFAS chemical associated health issue is avoiding the non-stick cookware; use the home made food products; using PFAS-free drinking water and materials.

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### **.....Written by**



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## Palm oil mill effluent-derived beta-carotene: The hidden treasure in Malaysia

The palm oil industry has tremendous contribution to the economy of Malaysia. Palm oil is obtained from the fruit of the oil palm tree (*Elaeis guineensis*). The oil palm is grown in tropical regions, mainly in Indonesia, Malaysia, and Thailand. It originates from the tropical forest of West Africa. The genus *Elaeis* is one of the members of the palm family (Arecaceae). The palm trees yield fruit bunches after 3 years of planting and have a productive life span of approximately 25 to 30 years.



**Figure 1:** Process of palm oil – POME and collection of beta-carotene from palm fruit.

The palm oil industry has grown tremendously worldwide. 48.9 million tonnes of palm oil (75% of worldwide palm oil production) were exported. At present, Southeast Asian countries, especially Indonesia and Malaysia are the main producer of palm oil. In 2017, Indonesia is the largest producer and exporter of palm oil followed by Malaysia. In 2020, Malaysia's gross domestic product (GDP) is 336.7 billion USD and the palm oil industry contributed 2.7%. Nevertheless, the growth of the palm oil industry is associated with environmental issues. A great expansion of palm oil plantations requires massive deforestation before the cultivation of oil palm trees. Besides, this could lead to loss of biodiversity which may impact flora and fauna, and even threaten certain animal species like Orangutan. Further, synthetic pesticides and fertilizers used can also disrupt the environment, particularly aquatic organisms. One of the waste products of the palm oil industry is palm oil mill effluent (POME). POME is a liquid oil palm biomass and it is composed of sterilizer condensate (36%), separator sludge (60%), and hydro-cyclone wastewater (4%). About 5 - 7.5 tons of water is needed in the production of 1-ton crude palm oil and more than half of the water turns out as POME. The resulting POME is usually collected in an open pond and it releases methane ( $\text{CH}_4$ ) and carbon dioxide ( $\text{CO}_2$ ) gas.

Generally, POME is a brown colour and has a stinky smell. It is a thick and viscous colloid made up of water, oil, and suspended solids. Besides, it is highly acidic with high organic content (nitrogen and phosphorus) which leads to high levels of both biological oxygen demand (BOD) and chemical oxygen demand (COD). Therefore, when POME is disposed to any water source directly without any treatment, it will threaten the water reservoir by reducing the oxygen content and causing acidification & eutrophication. Hence, it is necessary to treat POME before disposal in a public place for the prevention of environmental pollution.

Now-a-days, POME also acts as resource materials for the preparation of biofuel, nutraceuticals, cosmetics, and pharmaceutical preparation. Based on the fermentation of POME, various products like acetone-butanol-ethanol (ABE), polyhydroxyalkanoates (PHA), water-soluble antioxidants *i.e.*, phenolic acids, flavonoids, lignin,  $\alpha$ -cellulose carbohydrate, protein, nitrogenous compounds, lipids, minerals including carotenoids are isolated. Large quantities of  $\alpha$ -carotene and  $\beta$ -carotene (BC) are identified in POME. The carotenoid concentration is expressed based on retinol equivalents (RE; vitamin A). The POME has 15 times more RE than carrots and 300 times more RE than tomatoes. Some reports revealed that the fraction of POME is useful for various ailments. POME-derived carotenoids are treats cancer, ovarian tissue injury, brain trauma, and vascular complications like hypertension and stroke. BC was also reported to ameliorate streptozotocin-induced Alzheimer's disease in a mouse model. Besides, *in silico* molecular docking also showed that BC has a high binding affinity towards AChE. The supplementation of carotenoids including BC in AD cases can reduce the production of ROS and the A $\beta$  content in the red blood cell. This leads to increased expression of antioxidant enzymes, lowered cholesterol levels, reduced A $\beta$  levels, diminished inflammation of the neuronal system, normalization of mitochondrial dysfunction, and blood-brain barrier. A meta-analysis of the randomized controlled trial (RCT) that involved carotenoids and cognitive performance reported that carotenoids are beneficial in improving cognitive performance. The large yield of BC is isolated from POME and it could be a value-added product isolated from POME. There are reports on the extraction of BC from POME whereas there is no research published on the effect of POME-derived BC on neurodegenerative disorders.

Dementia is a progressive neurovascular disorder with deteriorated cognition dysfunctions and affects the quality of life. Vascular dementia (VaD) is the second most common cause of dementia. The occurrence of VaD is linked with various risk factors like diabetes, hypertension, and so on. Unfortunately, the commercially available medicines for the treatment of VaD are limited. Natural medicines have a promising role in the management of neurovascular disorders like VaD. In view of this, the potential pharmaceutical and economic value of POME together with the research gap for VaD treatment; **Dr. Arunachalam Muthuraman** applied Fundamental Research Grant Scheme (FRGS) grant to the Ministry of Higher Education (MOHE), Malaysia (Project ID: FRGS/1/2019/SKK08/AIMST/02/3). This project was approved by MOHE, Malaysia with an amount of 189,800 Malaysian Ringgit. We would like to thank FRGS – Ministry of Higher Education, Malaysia for supporting this study. Currently, our research results revealed significant fruitful results for the management of VaD. It will extend near future for more clinical advancement to use this agent for VaD.

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**The waste of plenty is the  
resource of scarcity.**  
Thomas Love Peacock



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## Coffee: Health Benefits or Deleterious Effects

Coffee contains a mixture of complex phytochemical compounds that is more than 1000 different phytochemicals such as caffeine, chlorogenic acid, caffeic acid, lactone, diterpene, cafestol, and kahweol. Coffee is also rich in vitamin B<sub>3</sub>, magnesium, and potassium. Around 70-80% of the world's population drinks coffee at least once a week. According to Food and Agriculture Association, the global intake of coffee is around 7 million ton yearly. Coffee is very popular due to its taste, smell, and caffeine effect. Most consumers feel active and increase their capacity to be awake after drinking coffee. Coffee is further divided into two types with and without caffeine. Coffee without caffeine is gaining attention among consumers. In this type of coffee, most of the caffeine is removed through a Swiss water process. In this process soaked raw nuts are used to remove the caffeine. Coffee without caffeine will lose some of the taste as compared to normal coffee. In general, coffee intake is classified into four that is once a while (less than a cup per day), low (one to three cups per day), low (one to three cups per day), medium (three to five cups per day) and high (more than five cups per day).



The coffee effect on human health is investigated in recent years. Based on different research carried out, different outcomes were obtained that consider coffee as showing beneficial or deleterious effects on health. In certain research conducted, it was reported that coffee can cause negative effects on sexual hormones. Excessive caffeine intake can cause different sexual problems ranging from impotence to miscarriage. Based on research carried out in Denmark in 2013 on 18478 women, excessive coffee intake during pregnancy is linked with baby death during delivery. Various research showed that coffee intake by pregnant women can reduce the body weight of the delivered baby. This is due to high coffee intake will impair nutrient and mineral absorption by bones, hence increasing the risk of osteoporosis. Research showed that drinking four or more cups of coffee in a day can reduce bone density in menopausal women. However, adding milk to coffee is a way to prevent bone resorption. Caffeine can increase glycogen secretion by the liver and cause an imbalance in sugar levels in the blood. This is also known as hypoglycemic (low sugar level) and causes body weakening, sweating, tremor, and tachycardia. Coffee is a strong diuretic agent. Excessive intake of coffee can cause dehydration. Individuals that consume five to six cups of coffee will experience skin dryness and other health problem. It also can enhance wrinkles. Research showed that the advantage and disadvantages of coffee intake depend on the amount of coffee consumed.

Caffeine in coffee can help in reducing depression and increase emotion via its psychostimulant effect. Research showed that baked coffee can protect nerve cells. Other studies had shown that 12.5 mg caffeine showed a significant cognitive effect. Caffeine, trigonelline, and ferulic acid in coffee can help in reducing the risk of Alzheimer's disease. These phytochemicals present in coffee have been proven to show neuroprotective effects. In 2009, a researcher in Finland and Sweden reported that individual who drinks coffee in

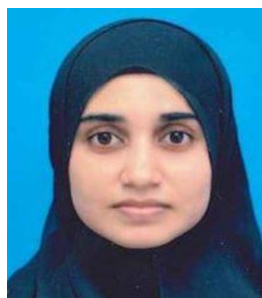
between three to five cups per day experiences a reduced risk of dementia and Alzheimer's as compared to those that do not consume coffee. Coffee is rich in antioxidants (potassium, niacin, and magnesium). Coffee also can increase insulin insensitivity, reduce inflammation and reduce the risk of diabetes.

Research carried out indicated that medium coffee intake that is between three to four cup per day reduce the risk of heart failure. However, increase coffee intake that is more than four cups per day increases the risk of heart failure. This indicates that the benefits of coffee intake depend on its amount. Coffee intake can reduce the risk of Type 2 diabetes mellitus. This effect is linked with caffeic acid and chlorogenic acid that suppress the formation of amylin which is responsible for glycemic control. Coffee also contains minerals such as magnesium and chromium that is important in insulin control that eventually controls glucose in the blood. According to the Scientific Information Institute in World Diabetes Prevention, Congress drinking coffee of three to four cups per day can help in preventing Type 2 diabetes. In addition, caffeine had been revealed as a potential compound in tumors suppression. Phytochemicals such as kafestol and kahweal presence in coffee are proven to demonstrate their anti-carcinogenic effect. Phytoestrogen lignan, flavonoid, and polyphenol in coffee are also showing an anticarcinogenic effect by preventing DNA methylation of human cancel cell culture and it deactivating the tumorigenic process. Coffee is the main source of chlorogenic acid that contributed to its antioxidant effect. This compound can reduce the risk of kidney, colon, breast, endometrium, and hepatic cancer. Research showed that one cup of coffee consumption is linked with reduced cancer risk up to 3%. In conclusion, coffee provides more advantages on health depending on its intake amount, consumption method, and health condition of the consumers.

#### **TIPS**

1. Consume organic coffee as coffee seed plantation is one of the biggest plantation that being exposed to pesticide.
2. Reduce sugar, cream or flavours in coffee as excessive addition of this compound reduce its health benefit.
3. Consumption of one to three cup of coffee per day [three cups of coffee (250 mg caffeine/day)] does not provide negative health effect as long as healthy life style is practiced.
4. As for pregnant women, caffeine intake should be limited to less than 200 mg/day. Based on research evidence published in American Journal of Obstetrics and Gynecology, it was found that women that take 200 mg or more caffeine every day, is having greater risk of miscarriage.
5. Individual that must avoid coffee consumption: hyperactive kids; individual with depression or insomnia; individual with ulcer disease; individual with heart problem; and individual with migraine
6. Certain medication will have an interaction with caffeine. Consumers must discuss with doctor or pharmacist regarding this interaction possibility each time taking medicine from clinics.

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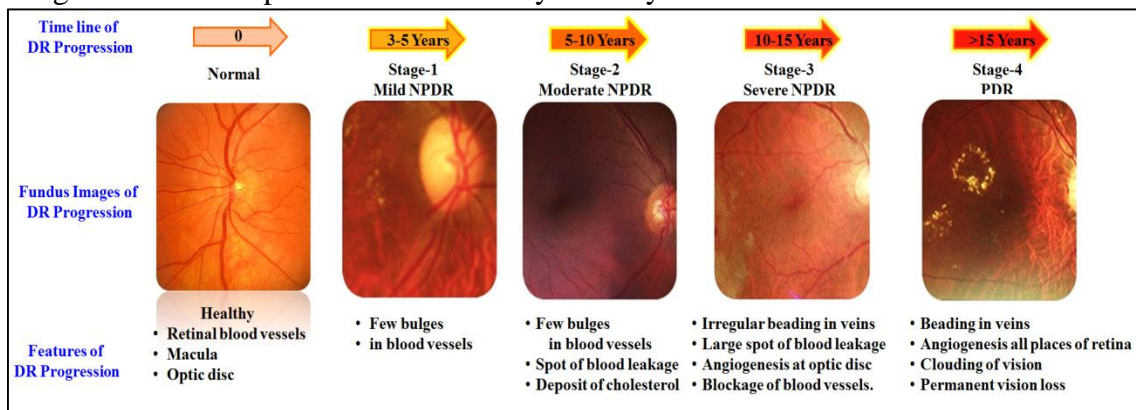
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## Palm oil mill effluent derived beta-carotene – Magic bullet for better vision in diabetic retinopathy

Diabetes is a chronic (long-lasting) health condition that affects how your body turns food into energy. If you have diabetes, your body either doesn't make enough insulin or can't use the insulin it makes as well as it should. When there isn't enough insulin or cells stop responding to insulin, too much blood sugar stays in your bloodstream. Over time, that can cause serious health problems, such as heart disease, kidney disease, and worst it can cause vision loss (diabetic retinopathy). Diabetic retinopathy (DR) is a complication of diabetes, caused by high blood sugar levels damaging the back of the eye (retina). It can cause blindness if left undiagnosed and untreated. Retinal is highly light-sensitive tissue and damage of the retinal-blood barrier together causes proliferative and non-proliferative DR (PDR and NPDR). At the early stage, the DR doesn't show any symptoms. Later is shown mild to severe visual impairments. Moreover, the visual impairment with DR is contributing to the changes in quality of life. It is the most common type of macular degeneration along with severe visual defects. Globally, the burden of DR raises 93 million people and the prevalence rate of DR is higher every year. In Malaysia, the prevalence rate of DR rate is 28.1 %; and the macular degeneration rate is 26.7%. However, it usually takes several years for diabetic retinopathy to reach a stage where it could threaten your sight. Clinically, four major stages of DR are categorized in diabetic patients as stage 1: mild non-proliferative retinopathy; Stage 2: moderate non-proliferative retinopathy; Stage 3: severe non-proliferative retinopathy; and Stage 4: proliferative retinopathy: blood vessels grow on the retina (Sripriya *et al.*, 2017). This means that new blood vessels and scar tissue have formed on your retina, which can cause significant bleeding and lead to retinal detachment, where the retina pulls away from the back of the eye. At this stage, there's a very high risk you could lose your vision. Treatment will be offered to stabilize your vision as much as possible, although it will not be possible to restore any vision you've lost.

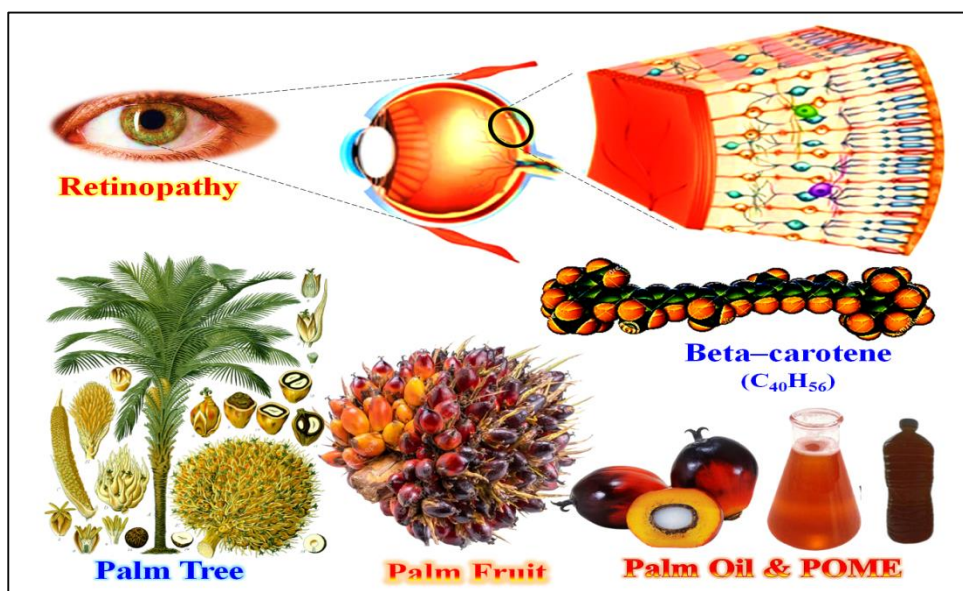


In chronic diabetic conditions, high blood sugar levels cause damage to blood vessels in the retina. These blood vessels can swell and leak. Or they can close, stopping blood from passing through. Sometimes abnormal new blood vessels grow on the retina. All of these changes can steal your vision. The expression of various factors like vascular endothelial growth factor (VEGF), apoptotic proteins, cytokines, advanced glycation end product (AGE) and endothelin (ET) peptides are playing a key role in the progression of proliferative and non-proliferative DR. Moreover, these factors are evidenced to cause damage to retinal layers, vascular leakage, angiogenesis, neurodegeneration (optic nerve), and inflammation of blood-retinal barrier functions. Besides, rodents (rats & mice) and zebrafish are very commonly employed preclinical models for the study of DR and screening of newer molecules for DR disorders due to the involvement of similar pathophysiological mechanisms (neurovascular and microvascular complications) of diabetic patients (Heckler

and Kroll, 2017; Luo *et al.*, 2019). The treatment of DR remains challenging in the health care system.

Moreover, the available medicines for the management of DR are limited like ranibizumab (derived by monoclonal antibody) and aflibercept (derived by recombinant DNA technology) are injected via the intravitreal route. Other treatment options include Injections: Your healthcare provider injects medication, such as anti-vascular endothelial growth factor drugs or corticosteroids, into your eye. Laser surgery: Your healthcare provider uses a laser to reduce swelling in your retina and new blood vessel growth. The lasers shrink blood vessels or stop leaking. Vitrectomy: Your healthcare provider may recommend this outpatient eye surgery if you have cloudy vision due to leaking blood vessels. During a vitrectomy, the eye doctor makes a small incision in the eye. Apart from these modern treatments, recent studies on natural medicines like Ruscus extract tablet; sanqi tongshu capsule; and tetramethylpyrazine, xueshuantong, xuesaitong & puerarin injections are shown potential effects in diabetic complications including DR (Zhang *et al.*, 2018). The provider can repair the blood vessels and remove scar tissue.

In addition, palm oil is one of the most versatile food products in the world. It's used for preparing meals as well as an ingredient in margarine, ice cream, and many other foods. Crude palm oil (CPO) is the world's richest natural plant source of carotenes in terms of retinol. CPO possesses 1% minor components which amongst them are the carotenoids, vitamin E (tocopherols and tocotrienols), and sterols. The orange colour of palm oil is due to the presence of these carotenes. Its concentration normally ranges between 400 and 3500 ppm and it contains about 15 times more retinol equivalents (vitamin A) than carrots and 300 times more than tomatoes. Carotenes also help to prevent night blindness, eye problems, and skin disorders. Since carotenoids are expected to grow in importance and value, their recovery from palm oil and its by-products is important. Many studies also reported that Palm oil mill effluent (POME) and proven as one of the richest sources of pro-vitamin A *i.e.*, beta carotene. Furthermore, vitamin A is well known to produce better vision, acts as the best nutrient for renovascular functions, and regulates opsin and rhodopsin cycles (Se-Hwan *et al.*, 2020).



Nevertheless, Malaysia is the second-largest producer of palm oil, and the annual palm oil production of Malaysia is 19.8 million tons; producing 26.7 million tons of solid biomass and 30 million tons of palm oil mill effluents (POME) (Bala *et al.*, 2018). Subsequently, POME-derived biomass is steadily rising in Malaysia. The Malaysian Palm Oil Board (MPOB) initiated the government policy to promote the maximum utility of palm oil-

derived products and minimize the wastage of palm tree-based products along with regularizing green technology and environmental safety. Additionally, MPOB also works toward the vision to produce palm oil-based multiple by-product preparations and rise the commercial value. However, a certain issue was addressed to manage the solid and liquid waste of POMEs. The Environmental Pollution Control Board also suggested identifying the multiple usages of POMEs and their waste products like medicinal use, biofuel, and cosmetics to avoid the scarcity of pollution problems (Vijay *et al.*, 2016). Hence, therapeutic benefits are expected from the POME-based beta carotene in the management of DR.

In view of this, the potential medical and commercial value of POME-derived products can help to fill the research gap for DR treatment; **Mr. Aswinprakash Subramanian, Dr. Arunachalam Muthuraman** research team applied for Fundamental Research Grant Scheme (FRGS) grant to Ministry of Higher Education (MOHE), Malaysia in 2021. This project was approved by MOHE, Malaysia with an amount of 163,500 Malaysian Ringgit. We are grateful to the Malaysian Ministry of Education for financing this research work under the FRGS grant (FRGS/1/2021/SKK0/AIMST/03/4). Ongoing this research work will make fruitful results and a great impact on the management of DR.

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# Clinical and Digital Skills for Pharmacists

## - unavoidable skills in the century

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**P**atient-focused pharmacists work closely with physicians and other health care professionals to provide optimal patient care. Some pharmacists in traditional product-centered practice settings use clinical pharmacy skills in a limited capacity, such as when they obtain a medication history or triage a patient to self-care with nonprescription drugs. Some pharmacists have no traditional product-centered responsibilities and instead provide full-time patient-focused care. Regardless of the setting and the degree to which patient-focused skills are used, patient-focused care is an integral part of the practice of pharmacy. The term pharmaceutical care is used to describe the broad-based, patient-focused responsibilities of pharmacists. Pharmaceutical care is the “responsible provision of drug therapy to achieve definite outcomes that improve a patient’s quality of life.” Pharmaceutical care requires expert knowledge of therapeutics; a good understanding of disease processes; knowledge of drug products; strong communication skills; drug monitoring, drug information, and therapeutic planning skills; and the ability to assess and interpret physical assessment findings. In recent years, the health care sector rapidly moving toward the digital world by introducing artificial intelligence, and digital technological tools in health screening, diagnosis, prescribing, medication record maintenance, and so on.

**D**igital healthcare has become, more than ever, a common practice in hospitals, community pharmacies, and other sites of pharmaceutical care delivery, as well as an integral part of pharmaceutical research and development. The International Pharmaceutical Federation (FIP) Development Goal 20 (Digital health) commits to having, global, enablers of digital transformation within the pharmacy workforce and effective processes to facilitate the development of a digitally literate pharmaceutical workforce. The FIP has published the FIP Development Goals, which is a key resource for transforming the pharmacy profession over the next decade globally, regionally, and nationally. They align with FIP’s mission to support global health by enabling the advancement of pharmaceutical practice, sciences, and education and are set to transform pharmacy in alignment with wider global imperatives underpinning the United Nations Sustainable Development Goals (SDGs).

**H**aving a set of global development goals enables the identification of commonalities across all areas of the profession, as well as some unique attributes in each area. It is believed that it is imperative to bring pharmaceutical sciences, pharmacy practice, and the pharmaceutical workforce and education together into one transformative framework for the profession to set out the goals for development for the next decade.

**T**here are multiple challenges to the implementation of digital health education, which include a) Lack of standards: there are currently little to no best practices in terms of what digital health education is required for healthcare professionals, b) Lack of trained academics: one of the most considerable limitations is that there is a shortage of academics in the healthcare environment with both experience and knowledge to propagate digital health education at large, c) Partnerships: healthcare education institutions cannot teach digital health topics alone, d) Materials and samples: teaching digital health involves other issues regarding the technological needs for hands-on instruction. There are issues now challenge healthcare academics to integrate electronic health records constructs into their teaching and coursework to mimic current practice; identifying and then utilizing digital health technologies as teaching material will prove a logistical hurdle, e) Required spaces: Lastly, concerning the acquisition of devices and software for teaching just mentioned, the creation of a digital health space to house relevant technologies to be utilised may be an issue.

**D**igital health is an interdisciplinary endeavour spanning multiple market sectors and requires expertise in fields of science and backgrounds that are not traditionally thought of as being directly related to medicine. This includes issues such as regulatory oversight and validation of the technology in health but also implications of behavioural sciences, user interface/user experience design, mathematical insight on artificial intelligence (AI)/machine learning construction, gamification design, and more.

**T**he global studies strongly advocate that all students in pharmacy and pharmaceutical sciences need to graduate with basic knowledge and skills for patient-centered clinical and digital health. To upskill and train the existing workforce with clinical and digital health skills, continuous professional development and specialisation are critically important. To date, there has been insufficient attention given to workforce development for implementing new systems of clinical and digital health delivery. Employers and universities can unlock the potential of the pharmaceutical workforce through education strategies. To mitigate the variation in the readiness and responsiveness of pharmacy education and training, collaboration across pharmacy schools could be a way to speed up the adoption of digital health education.

**P**rofessional organisations which include academic institutions and healthcare settings should support the pharmaceutical workforce by providing access to clinical and digital health tools, investing in digital health education, and developing guidance on how to apply digital health technologies in practice. A professionally driven advocacy effort can ensure the integration of clinical and digital health into pharmacy education and support the inclusion of digital health in educational and accreditation standards. Pharmacists with advanced knowledge in clinical and digital technologies can provide better patient care than others, which will eventually reduce the patient waiting for the diagnosis, and treatment and to avail other health facilities.

## **Alzheimer's disease: How far have we come??**

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**Preamble:** Even though the malady of dementia existed for around thousands of years, the correlated neurodegenerative alterations taking place in certain regions of the human brain were detected in recent times. Today, we are aware that dementia is a primary manifestation of Alzheimer's disease (AD). Alois Alzheimer, a German Physician carefully described the symptoms of a 51-year-old woman, Auguste Deter, who was under his observation and care at the state Asylum in Frankfurt (Germany) in 1907. Alzheimer's disease is a complex irreversible neurodegenerative disorder, which progressively impairs the cognitive abilities of the patient and adversely affects different regions of the brain including the medial temporal lobe, hippocampus, cerebral cortex, and neocortical structures. The major clinical signs of AD are marked by dementia, aphasia, apraxia, agnosia, agraphia, dyslexia, anomia, loss of executive functions, abnormal personality, difficulties in performing day-to-day tasks, and bizarre behavior. The cholinergic and amyloid theories were postulated as two key causes of AD, which is a multifactorial disease. Furthermore, several risk factors, including advancing age, hereditary variables, head injuries, vascular illnesses, infections, and environmental factors, contribute to the disease. Alzheimer's disease currently has no known cure, however, some therapies can only improve the symptoms. This review's objective is to provide a concise explanation of AD etiology, pathophysiology, diagnosis, and currently available treatments.

**Epidemiology:** AD forms the top-most primary basis of dementia, affecting around 50 million individuals worldwide, and is ranked as the fifth chief reason for death globally. In the US alone, more than 6 million individuals live with AD today, and this number is expected to rise to 14 million by 2050. Similarly, in Western Europe, dementia affects ~2.5% of people within the age group of 65–69 years, escalating to about 40% of those aged between 90–94 years, and by 2050, there would likely be 18.9 million patients suffering from dementia in Europe and 36.5 million in East Asian countries<sup>5</sup>. The life expectancy in developing countries like India has almost doubled from 37 years in 1950–1960 to 69 years in 2015–2020<sup>6</sup>. The enhanced lifespan of the human race around the globe in general, Indians and Japanese in particular has resulted in a huge number of Alzheimer's patients. Alzheimer's disease affects men and women almost equally. A significant risk factor for Alzheimer's disease is aging. Age-related changes in metabolism, oxidative stress, neuroinflammation, and immune response dysregulation are associated with a higher prevalence of neurodegenerative disorders in the elderly population.

**Pathophysiology of Alzheimer's Disease:** The two types of neuropathological changes that can be used to diagnose AD are positive lesions and negative lesions. Positive lesions (due to accumulation) are detected in the brains of AD patients and are characterized by the aggregation of neurofibrillary tangles, amyloid plaques, dystrophic neurites, neuropil threads, and other deposits. Negative lesions (due to losses) are characterized by significant atrophy

brought on by neuronal, neuropil, and synaptic losses. Moreover, additional factors such as neuroinflammation, oxidative stress, and damage to cholinergic neurons could result in neurodegeneration.

- **Senile Plaques (SP):** The extracellular beta-amyloid (A $\beta$ ) protein deposits known as senile plaques appear in a variety of morphological forms, including neuritic, diffuse, dense-cored, classic, and compact type plaques. Proteolytic cleavage enzymes such as  $\beta$ -secretase and  $\gamma$ -secretase are responsible for the biosynthesis of A $\beta$  deposits from the transmembrane amyloid precursor protein (APP). One amyloid peptide A $\beta$  -42, 42 amino acids in length, is produced by the  $\gamma$  secretase and has pathogenetic relevance since it may form insoluble toxic fibrils and accumulates in senile plaques isolated from Alzheimer's disease patients' neurons. The amyloid deposits accumulate slowly with aging because of the resistance of A $\beta$ 41-42 to degrade in our bodies. The easiest strategy to reduce A $\beta$  production is to reduce  $\gamma$ -secretase activity.
- **Tau Theory:** The  $\tau$  protein is a highly soluble protein that is linked to the microtubules and its function under normal conditions consists of stabilizing them. These microtubules provide support for structural changes, axonal transport, and neuronal growth. Tau protein typically undergoes phosphorylation and dephosphorylation during normal physiology, with pronounced hyperphosphorylation occurring in patients with the illness. The phosphorylation disequilibrium leads the phosphorylated tau (HP-tau) to collect into dense compact paired helical filaments (PHF) inside the cell, destroying the neuron that it is meant to be nourishing and causing the NFT seen in post-mortem AD brains – eventually **killing the neuron**. NFTs promote cell dysfunction by reducing the number of synapses causing neurotoxicity.
- **Genetic Factors:** Following the isolation and sequencing of the elements found in vascular amyloid and amyloid plaques, the APP gene was subsequently cloned on chromosome 21. Presenilin 1, Presenilin 2, and APP are the mutant genes in charge of familial AD or early-onset AD.
- **Oxidative Stress:** The brain is a highly oxygen-dependent organ, making it susceptible to ROS's negative effects. The brain has a significant amount of iron (a potent ROS catalyst), a lot of peroxidized polyunsaturated fatty acids, and only a little number of enzymes and other antioxidant molecules. Thus, oxidative stress has a major impact on the emergence of NDs like Alzheimer's disease. An analysis of brains at various stages of AD revealed elevated levels of 4-hydroxyhexenal (HHE), a lipid peroxidation marker, in the early stages of the disease. Alzheimer's disease brains had higher levels of acrolein and aldehydic lipid peroxidation by-product. The most prevalent antioxidant in most brain cells is GSH.

#### **Factors contributing to Alzheimer's Disease:**

**Environmental Factors:** Air pollution, nutrition, metals, infections, and many other environmental risk factors can cause oxidative stress and inflammation, which raises the likelihood of developing AD.

- a) **Air Pollution:** National Ambient Air Quality Standards (NAAQSs) have identified six air pollutants as being harmful to human health: lead, ozone (O<sub>3</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), particulate matter (PM), and sulfur dioxide (SO<sub>2</sub>). In individuals exposed to air pollutants, there is a link between oxidative stress,

neuroinflammation, and neurodegeneration, with the presence of hyperphosphorylated tau and A $\beta$  plaques in the frontal cortex. Air pollution can cause an increase in A $\beta$ 42 formation, accumulation, and impaired cognitive function.

- b) **Diet:** Antioxidants, vitamins, polyphenols, and fish are a few dietary supplements that have been shown to reduce the risk of AD, while saturated fats and a high-calorie diet have been linked to an increase in AD risk. In addition to the fact that AD patients experience issues with eating and swallowing that may raise the risk of malnutrition, deficiencies in minerals including folate, vitamin B12, and vitamin D may result in a decline in cognitive function.
- c) **Metals:** Metals are found in nature and biological systems, and they can be classified into bio-metals that have a physiological function in living organisms (such as copper, zinc, and iron), and toxicological metals which do not possess any biological function (such as aluminum and lead). Studies have shown that Al builds up in the cortex, hippocampus, and cerebellum regions, where it interacts with proteins to produce the misfolding, aggregation, and phosphorylation of highly phosphorylated proteins like tau protein, which is indicative of AD.
- d) **Infections:** Chronic infections of the CNS can lead to an accumulation of A $\beta$  plaques and NFT, making them one of the risk factors for AD. *Chlamydia pneumoniae* bacteria can cause late-onset Alzheimer's disease (AD) by activating astrocytes and cytotoxic microglia, interfering with calcium regulation and apoptosis, which impairs cognitive function and raises the likelihood of developing AD.

**Medical Factors:** Various diseases may contribute to the progression of Alzheimer's disease.

- e) **Cardiovascular Disease (CVDs):** CVDs are acknowledged as a significant risk factor for AD. For example, a stroke is linked to a higher risk of dementia due to the loss of cerebral tissue, which accelerates the degenerative process and affects amyloid and tau pathology.
- f) **Obesity and Diabetes:** An increase in body fat is linked to a decline in the blood flow to the brain, which encourages brain ischemia, memory loss, and vascular dementia. Increased microglia are a result of brain inflammation, which also affects neurogenesis and reduces synaptic plasticity. Insulin receptor substrate 1 (IRS-1) can be impacted by microglia, and this can prevent intracellular insulin signaling, which is crucial for the health of the nervous system. Therefore, a change in insulin action may cause the buildup of A $\beta$  and decrease the AD-related tau protein breakdown.

**Diagnosis:** A patient who is suspected to have AD should undergo several tests, including a neurological examination, magnetic resonance imaging (MRI) of the neurons, blood testing for vitamin B12, and other diagnostics in addition to the patient's medical and family history. Elevated homocysteine levels are a particular sign of vitamin B12 deficiency and can harm the brain by increasing calcium influx, inducing apoptosis, and oxidative stress.

**Treatment:** N-methyl d-aspartate (NMDA) antagonists and cholinesterase enzyme inhibitors are the two classes of drugs that have been approved officially to treat AD. The two types of cholinesterases are acetylcholinesterase, which is mostly found in the blood and brain synapses, and butyrylcholinesterase, which is primarily found in the liver. In AD therapy, cholinesterase inhibitors are administered in two stages: the initial dose-escalation phase to reach a therapeutic dosage and the maintenance phase to maintain the therapeutic level for



long-term therapy. Cholinesterase may aid in delaying the decline of brain function in those with mild to severe Alzheimer's disease. Nowadays, cholinesterase inhibitors used for the treatment of AD are donepezil, rivastigmine, and galantamine. On the other hand, the NMDA antagonist prevents the over-activation of the NMDA glutamate receptor and hence,  $\text{Ca}^{2+}$  influx which promotes cell death and synaptic dysfunction. In addition, the Mediterranean diet (MD), intellectual exercise, and higher education may all slow the deterioration of AD and memory loss and improve cognitive abilities.

**Concluding Remarks:** It's now a well-established fact that Alzheimer's disease is the foremost leading cause of the impairment of learning ability and memory among the aging population all around the globe. Although the exact causative factors of the ailment have not been identified, several hypotheses are available to explain the pathogenesis of AD. The patients surviving till the cruel stage of AD experience long-faced difficulties in routine daily activities such as wearing clothes, bathing, swallowing, and visiting the washroom, even if we ignore the escalating costs of caregivers. In the severest form of the illness, AD patients are not able to perform even the simplest physical tasks of day-to-day life and are dependent upon caregivers till the very last breath, thereby making the life of close family members miserable. In recent years, translational and multi-disciplinary approaches from genetic, biological, and biomarker-based clinical investigations have contributed to unveiling the biochemical, physiological in addition to pathophysiological features of the  $\text{A}\beta$  pathway. Usually, the obvious memory mutilations crop up in AD patients after about five years of initiation of deposition of  $\text{A}\beta$  plaques. Therefore, when one is suspected to have AD, most of the time, one has by now encountered serious neuronal damage. Therefore, an early diagnosis of AD becomes crucial. Currently, no radical cure for AD is established. The consensus medicines that are prescribed for AD patients target only the symptoms to some extent without altering the internal deteriorating sequence of events. These drugs in no way halt the process of disease progression. When considering the need and the major healthcare burden, AD has a very small number of therapeutic agents in the pipeline participating in the drug development phases. This is a huge drawback when comparing the number of affected people and the cost of patient care. The current hypotheses point towards the agents that can either selectively inhibit  $\beta$  or  $\gamma$  secretases responsible for the formation of  $\text{A}\beta$  plaques, drugs that can selectively inhibit aggregation of  $\text{A}\beta$ , or drugs that can dissolve  $\text{A}\beta$  plaques. Although the beta-amyloid pathway is thought to be the most prominent, the ROS, tau, and AChE levels are equally important. Furthermore, neuroprotective drugs, neuro-regenerative agents, tau phosphorylation inhibiting drugs, and tau aggregation inhibiting drugs might also prove to be effective, provided they cross blood-brain-barrier, have reasonably good bioavailability, considerably longer half-life, and high therapeutic index. The breakthrough leading to the discovery of a safe and powerful anti-Alzheimer medicine would go a long way in improving the quality of life of all senior citizens.

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