PHARMACY PRACTICE
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DEPARTMENT OF PHARMACY PRACTICE
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EXERCISE INDUCED IMMUNOMODULATION IN COVID OUTBREAK

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As well, we all know Covid-19 (Corona Virus Disease -2019) caused by a novel corona virus now called severe a cute respiratory syndrome corona virus 2 (SARS-COV-19) has been responsible for large global outbreak. Most of the people with covid-19 experience mild to moderate illness, but around 15% progress to severe pneumonia and about 5% progress to acute respiratory distress syndrome.

It is important to consider the benefits of regular exercise-induced immuno modulators considering that most of the patients getting admitted in hospital have presented with comorbidities like hypertension, diabetes.

Coming to immunopathology of SARS-COV-2 infection involves both theinnate and adaptive immune system. After infection by the virus thereis an increase of neutrophils count and a decreasein the number of NK cells and the advent of leucopenia basedon the reduced percentage of monocyte, eosinophils and basophils. Regarding the adaptive immune response, proportional reduction in TCD4+ and TCD8+ lymphocyte has been observed. The additional elevated concentration of pro inflammatory cytokines including TNF alpha, IL-6, IL1 alpha, IL-8, IL-17, IL-2 leads to cross talk activation of neuro endocrine immune system with a consequent releaseof gluco corticoids which can impair the immuneresponse. This cause multiple organ failure.

It is vitally important that our immune cells maintain their ability to redeploy so that they may patrol vulnerable areas in our body, eg: upper respiratory tract of lungs to prevent viruses and other pathogens from gaining a foothold. Clinical and translational studies on humans have demonstrated that regular, moderate intensity exercise performed at least 3 times a week is beneficial for host immune defense. Exercise particularly whole body dynamic cardio-respiratory exercise instantaneously mobilizes billions of immune cells, especially those cell types, that are capable of carrying out effects and functions such as recognition and killing of virus infected cells . The mobilized cells firstly enter the blood compartment frommarginated vascular pools ,the spleen and the bone marrow and trafficking to where increased immune defense may be required .

Their frequent recirculation between blood and tissue function to increase host immune surveillance makes us more resistant to infection and better equipped to deal with any infectious agent that has gaining a foothold.

Exercise also releases various proteins that can help to maintain immunity, particularly muscle derived cytokines, such as IL-6, IL-7 and IL-15. IL-6 have the direct immunecell trafficking while IL-7 promotes production of new T cells and NKcells compartments, all of which works in concert to increase our resistance to infection. Exercise is especially beneficial for older adults who are more susceptible to infection in general and for particularly vulnerable population during this covid 19 out break.

Not only can exercise have positive effect to immune system ,but it is also known as the counter for the negative effects of isolation and confinement stress in various aspects of immunity

However the greatest risk of covid 19 infection is exposure .Therefore we need to exercise by maintaining social distance and following proper hygienic counter measures

While exercise may not prevent us from becoming infected if exposed ,it is likely that keeping activewill boost up our immune system to help minimize the deterious effect of virus,ameliorate our symptom and expedite our recovery times

To avoid getting infected we need to follow certain everyday preventive actions as well.

- Wash hands frequently
- Avoid touching thenose,ears and mouth with unwashed hands
- Stay at least 6 feet's away from other people
- Stay home when you are sick
- Wear face masks
- Clean and disinfectant frequently touched objects and surface

Practicing those measures along with regular exercise could help us to beat the pandemic going out of control.Be safe and stay safe.

DEPARTMENT ACTIVITIES

- Organized a webinar on **"An Insight into Practice School in B.Pharm Curriculum", July 06, 2020.** Rev Fr. Manoj Mekkadath, Assoc.Director, SJGOI, inaugurated the webinar. Prof. R Mahesh M. Pharm., Ph.D., Professor, Department of Pharmacy, Birla Institute of Technology and Science, Pilani, Rajasthan was the resource Person.

- Nature club (Poonchola) of St. James' College of Pharmaceutical Sciences has celebrated **"World Environment Day" on June 5th** by planting medicinal plants in 'Nakshthravana'. Principal Dr. K. Krishnakumar, Mrs. Krishna Priya K.A, Asst. Professor, Dept. of Pharmacognosy, Mr. Davis, the Campus Supervisor coordinated the program.

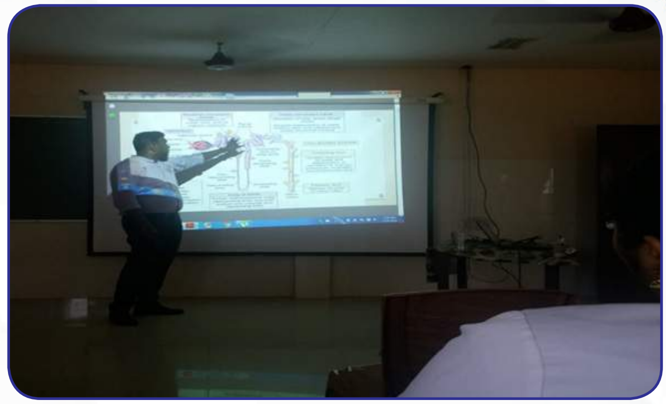
Dr,K Krishnakumar planting medicinal plant on "World Environment Day"

➢ Mr. JITHIN RAJ, PG Student, Dept. of Pharmaceutics, St. James' College of Pharmaceutical Sciences, participated as a volunteer duty during this Covid 19 pandemic from 30th April 2020 to 8th May 2020 (9 Days) at Community Health Center Kulakkada, Kollam, Kerala. (As per the order Circular Number. C2/1300/2020/G.M.O Kollam/ Date:28/04/2020).

➢ VIth Pharm D (INTERNS) Ward-wise Case Presentations were conducted at Department of Pharmacy Practice and reviewed by the eminent doctors Dr. T.K Manoj (Neuro.Surg), Dr. Niroop (Gen.Med) and Dr. Saral (Intensivist) of St. James' Hospital .

Ward wise Presentation of PharmD Interns

➢ Dr. NIROOP (Gen.Med) of St. James' Hospital, conducted class on the topic "Drug Selection in Renal Failure" for VIth Pharm D (INTERNS) on February 5th 2020.



Dr. Niroop Taking a session at Department of Pharmacy Practice

➢ VIth Pharm D (INTERNS) actively participating in all possible ways during the pandemic. From March 25th onwards interns are voluntarily involving in COVID-19 screening counter & also helping in collecting structured questionnaire to identify the persons at high risk for COVID-19. Interns also have voluntarily taken up pharmacy duties during this time period.

Helping hands to Pharmacy Staff

Pharm D Interns at screening counter.

➢ The members of the IPASF St. James' College of Pharmaceutical Sciences-Chapter in coordination with student's council conducted an awareness program on the "Current Scenario of Novel Corona Virus & it's preventive measures" at sacred heart college, Chalakudy on 6th February 2020.

Pharm D students during the awareness programme at Sacred Heart College, Chalakudy

➢ Some of the Pharm D students of both (4th & 5th year) have voluntarily taken up pharmacy duties during pandemic from March 25th to June 6th 2020.

Pharm D volunteers at St.James Hospital during pandemic season.

➢ The students & members of the IPASF St. James' College of Pharmaceutical Sciences-Chapter also reached the public by counseling the individuals by visiting their homes in the municipal ward & educating them about the preventive measures, hand washing techniques to prevent the pandemic disease. They distributed the pamphlets which includes the preventive & safety measures against COVID-19 on 7th February 2020.

Public Awareness by Pharm D students Regarding COVID -19

➢ Some of the Pharm D students of 4th, 5th & 6th year have actively participated in Pulse Polio Vaccination from January 19th to 21st 2020 at Taluk Head Quarters Hospital, Railway Station and Bus Stand.

Pharm D students at public service for polio immunization

➢ Dr. MERINA BENNY, General Manager - Quality Assurance and R&D, Arjuna Natural Extract gave a talk on"Women Entrepreneurship" on March 10th, 2020 conducted in St. James college of Pharmaceutical Sciences. Dr. K. Krishnakumar Principal, inaugurated the function and gave welcome Speech. Mr. Aravind R, Asst. Professor, Department of Pharmacognosy, gave Vote of thanks.

Dr. MERINA BENNY, General Manager - Quality Assurance and R&D, Arjuna Natural Extract during her interactive session on "Women Entrepreneurship".

➢ Mr. O. A BABU, Sub Inspector, Thrissur City Police, Mobile and traffic unit, gave a talk on "Women Empowerment" on January 10th, 2020 conducted in St. James college of Pharmaceutical Sciences. The talk was followed by training session for the girl students of Pharm D First year, B. Pharm First Semester and M. Pharm First Semester Dr. K. Krishna kumar Principal, inaugurated the function and gave welcome Speech. Mr. Aravind R, Asst. Professor,

Mr. O. A BABU, Sub Inspector, Thrissur City Police, Mobile and traffic unit during his interactive session on "Women Empowerment"

➢ **World Cancer Day 2020**

In connection with World Cancer day on 4th February 2020, St. James' college of pharmaceutical sciences conducted a seminar on topic "Recent advances in cancer therapy " by Ann Maria Binoy, 5th Year Pharm D and collage competition on topic "Awareness on cancer".

Ms. Ann Mary Binoy of Fifth year Pharm D student presenting seminar on Cancer Day

Collage competition about the topic "Awareness on Cancer"

➢ National Science Day 2020

In accordance with National science day 2020, St. James college of pharmaceutical sciences organized an Inaguaral session and a science lecture on **"Women in Science and Technology "** by Geethakutty P. S, Professor and Former Rigestrar of Kerala Agriculture University ,Thrissur on 27.02.2020.

Fr. Manoj Mekkadath, Associate Director. SJGOI inaugurating the National Science Day

➢ Workshop on soft skill training programme was conducted to our 5th Pharm D, final year B Pharm and M Pharm on 3rd and 4th March 2020. Principal Dr. K Krishnakumar inaugurated the session. Workshop was handled by Mr. Sony Varghese, Executive Director Easy Link Academy, Thrissur. Aptitude training, computing skills, language skills and career placement options for pharmacy students were the highlights of the session

Workshop on soft skill development programme

➢ International Women's Day

In connection with International women's day on 7th March 2020, St. James college of pharmaceutical sciences conducted poetry competition. The theme of this year international women's day is " I am generation equality : Realizing women's rights".

Poetry competition in connection with International Women's Day

ACHIEVEMENTS

➢ Dr. DINESHKUMAR B, Professor & HOD, Dept. of Pharmaceutics, St. James' College of Pharmaceutical Sciences-received the RULA International Award 2020 for Best Researcher in Nanomaterials and Cancer Research at Trichy, Tamilnadu on 26th of January 2020.

➢ Dr. DAVID PAUL, Asst. Professor, Department of Pharmaceutical Analysis, St. James' College of Pharmaceutical Sciences, won the Young Scientist Award at ICAPHS-2020 – an international seminar organized by NITTE University (Mangalore) on 22nd February 2020.

Institute of Scholars (InSc) is an emerging techical professional organization, situated at Bangalore.. From our college, four faculty members has been selected for various InSc awards 2020 for teir academic and research activities..

➢ 1. Dr. K. Krishna Kumar, selected for the InSc Best Principal Award 2020.

➢ 2. Dr. Dineshkumar B, selected for InSc HOD of the year Award 2020.

➢ 3. Dr. David Paul, Selected for InSc Young Achiever Award 2020.

➢ 4. Dr. L. Panayappan, selected for InSc Academic Excellence Award 2020

SEMINARS ATTENDED

DEPARTMENT OF PHARMACY PRACICE

- Mrs Lincy George & Mrs Rosmin Jacob, Faculty of Pharmacy practice department attended Two day National conference on "A paradigm shift for emerging Paraphernalia in advancement of cancer research" at Nirmala college of pharmacy , Muvattupuzha on 28th & 29th Feburary 2020 as a delegate & resource person for poster evaluation.
- Mrs Rosmin Jacob attended Four days ''Pharmawebinar series 2020'' conducted at Excel college of Pharmacy, Nammakal, TN on April 29th to May 2nd 2020.
- Mrs. Lincy George attended one-week online Faculty Development Programme on ''Pharmaceutical Education and Research'' conducted at Bapatla College of pharmacy, Andhra Pradesh on 13th to 18th May 2020.
- Mrs. Lincy George participated a webinar series on" APC online convention" conducted by Alwar Pharmacy College, Rajasthan from 16th – 22nd May 2020.
- Mrs. Lincy George attended one-week online International Faculty Development Programme on ''Innovations in Drug Delivery System'' organised by Bapatla College of pharmacy, Andhra Pradesh, in association with IPA education Division on 31st May 5th June 2020.
- Mrs Rosmin Jacob Participated in One week Online National Faculty Development programme on "Nanotechnology in Health care "organized by Department of Pharmaceutical Quality assurance & pharmaceutics Shri Vishnu College of Pharmacy, Vishakhapatnam in association with crystal growth & Nano-science research Centre Government college Rajahmundry & IPA Educational division from July 15th 2020 to July 20th 2020.
- 13 webinars by Mrs Lincy George, 8 webinars by Mrs Rosmin Jacob , 4 webinars by Mrs Aji Varghese, 8 webinars by Dr .Alfet Raju , 5 webinars by Dr.Krishnaprabha C ,6 webinars by Mrs Maria George and 1 webinar by Dr Grace Thomas from the Department of Pharmacy Practice.
- IIIrd Sem M.Pharm students Abhishek M J, Igna Thankachan, Jesna Jose, Riya George of Pharmacy practice department attended 5th international conference on clinical pharmacy entitled ''Innovative approaches in delivering pharmaceutical care'' organized by Manipal college of Pharmaceutical sciences on 10th to 12th January 2020 .
- Ist semester M pharm students of pharmacy practice department attended one day national seminar entitiled "Expanding the frontiers in the development of pharmacy profession" organized by Nazerath college of Pharmacy,Thiruvalla on 18th January 2020.
- All Students of PharmD 2016 & PharmD (PB) 2019 Batch attended an international conference

on " advances in pharmaceutical & Health sciences -ICAPHS-2020" organised by NITTE Mangaluru from 20th to 22nd February 2020.

- Anna Thomas of Vth PharmD 2015 batch & Swapna savo, Aiswarya babu, Sandra Davis, Meenu Varghese, Sona Davis, Deslin Davis of IVth PharmD 2016 batch Attended a three day webinar series I entitled "Listen to Legends" organised by Indian Pharmaceutical association -Students Forum from 29th to 31st May 2020.
- Students of IInd Sem MPharm have attended 5 webinars & Students of IVth Sem MPharm have attended 1 webinar from the department of pharmacy practice.
- Anna Thomas of Vth PharmD 2015 has attended 3 webinars & Roopa Vijayakumar of II Pharmd (PB) 2018 batch has attended 1 webinar, Aiswarya Babu, Meenu varghese, Jeenet Johnson of IVth Pharm D2016 batch have attended 1webinar each and Jes James, Delma C.D,Glen Loui Raphy of IIIrd Pharm.D 2017 batch have attended 1webinar successfully.

DEPARTMENT OF PHARMACEUTICS ANALYSIS

- Dr Smitha k Nair participated and presented a research paper entitled 'Formulation of milk thistle seed nanosuspension: its in-vitro hepatoprotective effect against HepG2 cell line' in an international conference on advances in pharmaceutical and health sciences, Organized by NGSM Institute of pharmaceutical sciences under the patronage of NITTE on 20th to 22nd February 2020.
- Dr. Dineshkumar B participated in the Virtual Faculty Development Programme on "Role of Teachers in Quality Enhancement and Accreditation" organised by the IQAC, Kristu Jayanti College (Autonomous), Bengaluru from May 11th, 2020 to May 18th, 2020.
- Dr. Dineshkumar B participated in four day webinar series on "Challenges and opportunities in Biological Research", organized by School of Basic & Applied Sciences, Shri Guru Ram Rai University, Dehradun. from 19th May to 22nd May 2020
- Ms. DonyLonappan, has participated in webinar series –I "Listen to Legends" held by Indian Pharmaceutical Association Students Forum from 29th May 2020 to 31st May 2020.
- Ms. DonyLonappan, Ms. Sminu Jos has participated in international expert webinar series on 'Recent advance in Pharmaceutical Research' organized by Oriental College of Pharmacy, Bhopal on 31st May, 02nd June and 06th June, 2020.
- Mr. Arun Franis of IV semM.Pharm Pharmaceutics has participated in international expert webinar series on " Recent advances in pharmaceutical Research" organized by oriental college of pharmacy on 31st May, 2nd and 6th June 2020

- 5 webinars by Dr Dineshkumar B, 7 webinars by Dr Smitha K Nair ,6 webinars by Mrs Rinku Jayaprakash, 10 webinars by Miss Dony Lonappan, 5 webinars by Mrs Amala Fetcy K, 11 webinars by Miss Sminu Jos have successfuly attended from the department of Pharmaceutics.
- Students of IVth sem M.pharm have attended 13 webinars & Students of IInd sem M.pharm have attended 21 webinars from Pharmaceutics department.

DEPARTMENT OF PHARMACEUTICAL ANALYSIS

- Dr. David Paul has participated in the Virtual Faculty Development programme on "Role of Teachers in Quality Enhancement And Accreditation" organized by IQAC Cell of Kristu Jayanti College (Autonomous), Bangalaru held from 11th - 18th May 2020.
- Dr Kavitha M.P and Dr David Paul have attended "APC Online convention" organized by Alwar College of Pharmacy, Rajasthan,on 16th -22nd May 2020.
- Dr. David Paul has participated in the E-Faculty Development programme on "Building Research and Innovative Culture Among Pharmacy Teachers" jointly organized by Dr. D Y Patil Institute of Pharmaceutical Sciences and Research, Pune and APTI, Jamshedpur, Jharkhand held from 18th – 22nd May 2020.
- Dr. Kavitha M.P has attended three days International webinar on "Quality Design" organized by Bapatla College of Pharmacy, Guntur, Andhra pradesh and IPA on 23rd -25th May 2020.
- Dr. David Paul has participated in the E-Faculty Development programme on "Future Challenges, Possibilities and Emerging Trends in Vaccines and Drug Development for Viral Diseases" jointly organized by Indian Pharma Educational Society and School of Pharmacy of ARKA Jain University, Jamshedpur, Jharkhand held from 25th - 30th May 2020.
- 7 Webinars by Dr. kavitha MP and 4 webinars by Dr. David Paul have attended from the department of Pharmaceutical analysis.
- Angel Mary Athulya V. A have attended International webinar on "Quality design" organized by Bapatla College of Pharmacy, Guntur, Andhra pradesh on 23rd to 25th May 2020.
- Students of IInd Sem MPharm have attended 2 Webinars and Students of IVth Sem MPharm have attended 1 Webinars from the Department of Pharmaceutical Analysis.

DEPARTMENT OF PHARMACEUTICAL CHEMISTRY

- Mrs. Meena Chandran attended National workshop on "Drug design and molecular docking", organized by Devaki Amma College of Pharmacy on 14th to 15th February 2020.

- Mrs Meena Chandran Attended 5 days e-Faculty Development programe on "Building Research and Innovative Culture among Pharmacy Teachers" organised by Dr. D Y Patil Institute of Pharmaceutical Sciences and research, Pimpri, Pune from 18th to 22nd May 2020.
- 4 webinars by Mrs Geetha Elias, 24 Webinars by Mrs Meena Chandran, 7 Webinars by Mrs Silvipriya K.S, 5 Webinars by MrsRizvana and 10 Webinars by MrsMariya Davis from the Department of Pharmaceutical Chemistry.
- Grace Shaji Chittilappilly of IInd sem M Pharm Pharmaceutical chemistry attended webinar on "Product Development in the Era of QbD and ICH Q8: A Primer for Academia" conducted by Vivekanand Education Society's College of Pharmacy, Bengaluru, Karnataka from 3rd to 5th June 2020.
- Students of 2nd Sem M.Pharm have attended 23 Webinars from the department of Pharmaceutical chemistry.

DEPARTMENT OF PHARMACOGONOSY

- Mr. Aravind R, has attended one Week National Online Faculty Development Program ICT Tools for Effective Teaching Learning, organized by School of Mathematical Sciences, Swami Ramanand Teertha Marathwada University, Nanded from 11th to 16th May 2020
- Mr Aravind. R, has participated in Three-day INTERNATIONAL WEBINAR on QUALITY BY DESIGN organized by INNOVATION CELL of Bapatla College of Pharmacy in association with Indian Pharmaceutical Association-Education Division from 23rd May to 25th May 2020
- 4 webinars by Mr Aravind R & 10 webinars by Mrs Krishna Priya K A. have successfully participate from Pharmacognosy department.

DEPARTMENT OF PHARMACOLOGY

- Mrs Asa Samuel participated as a delegate in the International conference on advances in pharmaceutical and health sciences ICAPHS -2020, at NITTE university, Mangalur ,participated as a delegate from 20th to 22nd Feb 2020
- Mrs Annshine Paul attended Two days national seminar on "A paradigm shift for emerging paraphernalia in advancement of cancer research" held at Nirmala College of pharmacy, Muvattupuzha from 28th to 29th Feb 2020 as a delegate & resource person for poster evaluation.
- 4 webinars by Mrs Asa Samuel, 5 webinars by Mrs Annshine Paul & 1 webinar by Miss Salu Martin have attended from Pharmacology department.

PUBLICATIONS

DEPARTMENT OF PHARMACY PRACTICE

- Alfy OO,Lincy George and K Krishnakumar;Comparison on Effect of Diabetic Mellitus, Dyslipidaemia and Cognitive function - A Systemic Review, World Journal of Pharmaceutical and Medical Research, June 2020, volume 6, Issue 7, Pg no 85-90.

- Angel George, Neelima K Rajan, Jinumol Joy and Lincy George; Medication Errors and its Outcome in Geriatric Patients in a Tertiary Care Hospital, International Journal of Pharmacy and Pharmaceutical Research, June 2020,Volume 18,Issue 3,Pg no 73-84.

- Jesna Jose, Lincy George and K Krishnakumar; A review on Association of CD14 with Associated Dementia and Markers of Brain Ageing and Injury, World Journal of Pharmaceutical and Medical Research, June 2020, volume 6, Issue 7, Pg no 91-93.

- Abhishek MJ, Aji Varghese, K.Krishnakumar, Igna Thankachan ; A Review On Influence of Complementary and Alternative Medicine In Type 2 Diabetic Patient, American Journal of Pharmatech Research , Feb 2020, Volume 10, Issue 1, Pg no 128-136.

- Aiswarya A A, Jismy Jose, Linsa Linet V, Alfet Raju Anthraper "Assessment of quality of prescribing in patients with hypertension at tertiary care hospital using prescription quality index (PQI)", international journal of pharmacy & pharmaceutical research, March 2020, volume 17, issue4, Pg no 259-278

- Jincy Kurian, Deepthi C. Denny, Dr. K. Krishnakumar and Igna Thankachan ; Role Of Clinical Pharmacist In Detection And Management Of Drug Related Problems - A Review, World Journal Of Pharmacy & Pharmaceutical Sciences, May 2020, Volume 9, Issue 5, Pg No 846-856.

- Riya George , Dr L Panayappan , Dr K Krishnakumar ; Inhalers Techniques In Asthma Control ,International Journal of Current Advanced Research, May 2020 , Volume 9, issue 05(B) , Pg no 22117-22119

- Aiswarya A A, Nooja Moinudeen, Thazneem Baegum. T.D, Alfet Raju Anthraper" Assessment of Adverse drug reactions in psychiatry inpatient department of tertiary care hospital using Naranjo

Scale", World Journal Of Pharmacy And Pharmaceutical Sciences, June 2020volume 9,issue 6, page no.1196-1206.

- Rosemary Jenson, Rosmin Jacob, Dr. K. Krishnakumar, Juno Joy and Shilga Francis; Role Of Vitamin D In Postmenopausal Women , World Journal Of Pharmaceutical Research, June 2020 Volume 9 , Issue 6 , Pg no 1009-1016.

- Shilga Francis, Aji Varghese, Dr. K. Krishnakumar, Juno Joy and Rosemary Jensen; A Clinical Outcomes Of TKR Surgery: A Post Operative Evaluvation, World Journal Of Pharmacy & Pharmaceutical Scineces, June 2020,Volume 9, Issue 6, Pg No 367-376.

- Amala Boban, Bincy T. Abraham, Dr. K. Krishnakumar, Lincy George And Jibin K. Recent Advancement In The Management Of St-Elevation Myocardial Infarction (STEMI), World Journal Of Pharmaceutical & Medical Research,June 2020,Volume 6, Issue 6, Pg No :125-129

- Mable Baby, Chithra Paul, Dr. Alfet Raju Anthraper, Dr. K. Krishnakumar; Importance Of Detecting Depression In Type 2 Diabetes Mellitus Patients: A Review, World Journal Of Pharmacy & Pharmaceutical Sciences, June 2020, Volume 9, Issue 6, Pg No 242-248.

- Juno Joy , Deepthi C. Denny , Dr. K. Krishnakumar, Rosemary Jenson and Shilga Francis; Applicability Of Robotic Surgery For Better Surgical Outcome, European Journal of Pharmaceutical & Medical Research, Jun 2020,Volume 7, Issue 6, Pg no 302-306.

DEPARTMENT OF PHARMACEUTICS

- Dr. Dineshkumar B and Dr. Smitha K Nair has published the e-book entitled on "Quality by Design Approaches in Pharmaceutical Developments" (E-BOOK ISBN: 978-93-90002-07-8). Book Authors: Hima Jose, Dineshkumar B, K. Krishnakumar, Smitha. K. Nair. The e-book published by Nikhil Gupta Academic Publication, New Delhi, in the month of March 2020.

- Dr. Dineshkumar B and Dr. Smitha K Nair has published the e-book entitled on "Artificial Intelligence in Drug Discovery and Development" (E-BOOK ISBN: 978-93-90002-11-5).
  Book Authors: Pressymol Benny, Smitha. K. Nair, K. Krishnakumar, Dineshkumar B. The e-book published by Nikhil Gupta Academic Publication, New Delhi, in the month of May 2020.

- Greeshma Sreenivas, K. Krishnakumar, Dinesh Kumar B. a review on polymeric micelles: in vitro cell line study against different cancer.International Research Journal of Pharmacy (Index: Elsevier) 2020, 11(5): 1-4.

- Arun Francis, K. Krishnakumar, Dineshkumar B.Carbon nanotube: its functionalization and applications in targeted drug delivery system.International Journal of Pharmacy and Technology (Index: Pubmed) 2020,12(1):7004-7022

- Pressymol Benny, Smitha K Nair, K. Krishnakumar. "Microballoon: gastroretentive drug delivery system for the eradication of helicobacter pylori". International Journal of Pharmacy and Technology (Index: Pubmed) 2020,12(1):32046-32059

DEPARTMENT OF PHARMACEUTICAL ANALYSIS

- Angel Mary Athulya V.A, Dr. Kavitha M.P, Dr. K. Krishnakumar, Dr. K. Kannan, Stability indicating analytical methods for Metformin combinations: A review, International journal of Innovative Pharmaceutical Sciences and Research,8(05),2020,1-10

- S Surendran, R Sapkal, David paul, S Nanjappan, Effect of resveratrol on dipeptidyl peptidase-4 inhibitors pharmacokinetics: An in vitro and in vivo approach, Chemico-Biological Interactions, Jan 2020, Volume 315, 108909

- Dr. Kavitha M.P, Asst. Professor, Department of Pharmaceutical Analysis, St. James' College of Pharmaceutical Sciences, appointed as reviewer, Journal of Applied Pharmaceutical Research (JOAPR).

- Dr. David Paul was appointed as an editorial board member of the journals BAOJ Pharmaceutical Sciences and World Journal of Pharmaceutical Sciences.

KSCSTE FUNDED PG PROJECTS

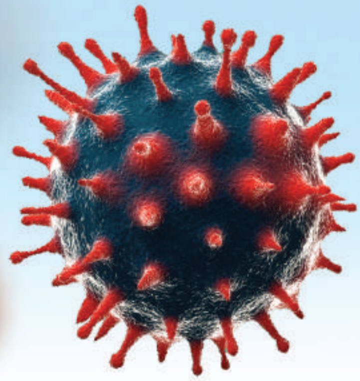
1. PG student Project entitled “Mangiferin incorporated collagen/chitosan scaffolds - formulation and in vitro wound healing activity” has been recommended for financial assistance under student project scheme of KSCSTE in the month of January 2020. Project student PI: Ms. Hima Jose, IVth Sem M.Pharm (Pharmaceutics) and Project PI: Dr.Dineshkumar B, Professor and HOD, Dept. of Pharmaceutics, SJCOPS, Chalakudy.

2. PG student Project entitled “Delivery of Resveratrol using chitosan functionalised single-walled carbon nano tube for in vitro cytotoxic activity.” has been recommended for financial assistance under student project scheme of KSCSTE in the month of January 2020. Project student PI: Mr. Arun Francis, IVth Sem M.Pharm (Pharmaceutics) and Project PI: Dr.Dineshkumar B, Professor and HOD, Dept. of Pharmaceutics, SJCOPS, Chalakudy.

3. PG student Project entitled “Formulation of Tinidazole loaded Microballoons: In vitro antibacterial activity against Helicobacter Pyroli” has been recommended for financial assistance under student project scheme of KSCSTE in the month of January 2020. Project student PI: Ms. Pressymol Benny, IVth Sem M..Pharm (Pharmaceutics) and Project PI: Dr.Smitha K Nair, Assistant Professor , Dept. of Pharmaceutics, SJCOPS, Chalakudy

4. PG Student project entitled “Development and validation of HPLC method for stability Indicating simultaneous estimation of metformin and alpha lipoic Acid: Quality by Design approach” with Angel Mary Athulya V.A as Student Investigator and Dr.Kavitha.M.PAssistant Professor , Dept. of Pharmaceutical Analysis , SJCOPS, Chalakudyas Principal Investigator was granted by Kerala State Council for Science, Technology and Environment (KSCSTE) under the student project scheme, 2019-2020.

5. PG Student Project proposal titled “Study on anticholinergic burden and its association with adverse outcomes in geriatric population” has been approved for financial assistance under student project scheme by Kerala State Council for Science ,Technology andEnvironment(KSCSTE) in which Student Investigator is Ms. Jesna Jose, IV Semester MPharm (Pharmacy Practice) and the Principal Investigator is Mrs. Lincy George Assistant Professor, Dept of Pharmacy practice, SJCOPS Chalakudy.



COVID-19

EMERGENCE

Coronaviruses were first identified by a group of virologists (J D Almeida, D M Berry, C H Cunningham, D Hamre, M S Hofstad, L Mallucci, K McIntosh, and D A J Tyrrell), who relayed their findings in 1968 to the journal Nature. In 2003, the Chinese population was infected with a virus causing Severe Acute Respiratory Syndrome (SARS) in Guangdong province. The virus was confirmed as a member of the Beta-coronavirus subgroup and was named SARS-CoV.The infected patients exhibited pneumonia symptoms with a diffused alveolar injury which lead to acute respiratory distress syndrome (ARDS). SARS initially emerged in Guangdong, China and then spread rapidly around the globe with more than 8000 infected persons and 776 deceases. A decade later in 2012, a couple of Saudi Arabian nationals were diagnosed to be infected with another coronavirus. The detected virus was confirmed as a member of coronaviruses and named as the Middle East Respiratory Syndrome Coronavirus (MERS-CoV). MERS-CoV is a member beta-coronavirus subgroup and phylogenetically diverse from other human-CoV. The infection of MERS-CoV initiates from a mild upper respiratory injury while progression leads to severe respiratory disease. Similar to SARS-coronavirus, patients infected with MERS-coronavirus suffer pneumonia, followed by ARDS and renal failure.Recently, by the end of 2019, WHO was informed by the Chinese government about several cases of pneumonia with unfamiliar aetiology. The outbreak was initiated from the Huanan seafood market in Wuhan city of China and rapidly infected more than 50 peoples. The live animals are frequently sold at the Hunan seafood market such as bats, frogs, snakes, birds, marmots and rabbits. On 12 January 2020, the National Health Commission of China released further details about the epidemic, suggested viral pneumonia. From the sequence-based analysis of isolates from the patients, the virus was identified as a novel coronavirus. Moreover, the genetic sequence was also provided for the diagnosis of viral infection. Initially, it was suggested that the patients infected with Wuhan coronavirus induced pneumonia in China may have visited the seafood market where live animals were sold or may have used infected animals or birds as a source of food. However, further investigations revealed that some individuals contracted the infection even with no record of visiting the seafood market. These observations indicated a human to the human spreading capability of this virus. The human to the human spreading of the virus occurs due to close contact with an

infected person, exposed to coughing, sneezing, respiratory droplets or aerosols. These aerosols can penetrate the human body (lungs) via inhalation through the nose or mouth.

Coronaviruses (CoV) have been identified as human pathogens since the 1960s. They infect humans as well as a variety of animals, including birds and mammals.Illness in humans is mostly respiratory or gastrointestinal infections, while symptoms can range from common cold to those of more severe lower respiratory infections. Viral shedding occurs via these respiratory and digestive systems and transmission can occur through different routes: fomites, airborne or faecal-oral.

Coronaviruses are enveloped positive stranded RNA viruses in the order of Nidovirales. Coronaviruses are minute in size (65–125 nm in diameter) and contain a single-stranded RNA as a nucleic material, size ranging from 26 to 32kbs in length .With their characteristic surface, the virions have a crown-like appearance under the electron microscope, which is why the viruses are named after the Latin word corona, meaning ‘crown’ or ‘halo’. The subfamily Orthocoronavirinae of the family Coronaviridae is further classified into four CoV genera: Alpha-, Beta-, Delta- and Gammacoronavirus. This virus was reported to be a member of the β group of coronaviruses. Beta-coronavirus genus is further separated in five subgenera (Embecovirus, Hibecovirus, Merbecovirus, Nobecovirus and Sarbecovirus).

To date, seven coronaviruses have been shown to infect humans. Common human corona-viruses Betacoronavirus HCoV-OC43and HCoV-HKU1 as wellas Alphacoronavirus HCoV-229E cause common colds but also severe lower respiratory tract infections in the youngest and oldest age groups, while Alphacoronavirus HCoV-NL63 is considered to be an important cause of (pseudo) croup and bronchiolitis in children. A broad range of coronaviruses are found in bats, which might play a crucial role in the virus evolution of Alpha- and Betacoronavirus lineages in particular. However, other animal species can also act as an intermediate host and animal reservoir.

The World Health Organisation (WHO) has declared the coronavirus disease 2019 (COVID-19) a pandemic. A global coordinated effort is needed to stop the further spread of the virus. A pandemic is defined as “occurring over a wide geographic area and affecting an exceptionally high proportion of the population.” The last pandemic reported in the world was the H1N1 flu pandemic in 2009.

On 31 December 2019, a cluster of cases of pneumonia of unknown cause, in the city of Wuhan, Hubei province in China, was reported to the World Health Organisation. In January 2020, a previously unknown new virus was identified, subsequently named the 2019 novel coronavirus, and samples obtained from cases and analysis of the virus’ genetics indicated that this was the cause of the outbreak. The novel virus was named as Wuhan coronavirus or 2019 novel coronavirus (2019-nCov) by the Chinese researchers. The International Committee on Taxonomy of Viruses (ICTV) named the virus as SARS-CoV-2 and the disease as COVID-19. This novel coronavirus was named Coronavirus Disease 2019 (COVID-19) by WHO in February 2020. The virus is referred to as SARS-CoV-2 and the associated disease is COVID-19.As of 15 May 2020, over 4,444,670 cases have been identified globally in 188 countries with a total of over 302,493 fatalities. Also 1,588,858 were recovered.

Coronaviruses are a family of viruses that cause illness such as respiratory diseases or gastrointestinal diseases. Respiratory diseases can range from the common cold to more severe diseases eg,

- Middle East Respiratory Syndrome (MERS-CoV)
- Severe Acute Respiratory Syndrome (SARS-CoV).

A novel coronavirus (nCoV) is a new strain that has not been identified in humans previously. Once scientists determine exactly what coronavirus it is, they give it a name (as in the case of COVID-19, the virus causing it is SARS-CoV-2). Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is the name given to the 2019 novel coronavirus. COVID-19 is the name given to the disease associated with the virus. SARS-CoV-2 is a new strain of coronavirus that has not been previously identified in humans.

Clinical Presentation

Coronaviruses are present with respiratory symptoms. Among those who will become infected, some will show no symptoms. Those who do develop symptoms may have a mild to moderate, but self-limiting disease with symptoms similar to the seasonal flu. Symptoms may include:

- Respiratory symptoms
- Fever
- Cough
- Shortness of breath
- Breathing difficulties
- Fatigue
- Sore throat

Less common symptoms

- aches and pains
- nasal congestion
- headache
- conjunctivitis
- sore throat
- diarrhoea
- loss of taste or smell
- a rash on skin or discoloration of fingers or toes

A minority group of people will present with more severe symptoms and will need to be hospitalised, most often with pneumonia, and in some instances, the illness can include ARDS, sepsis and septic shock. Emergency warning signs where immediate medical attention should be sought include:

- Difficulty breathing or shortness of breath
- Persistent pain or pressure in the chest
- New confusion or inability to arouse
- Bluish lips or face

High Risk Populations

The virus that causes COVID-19 infects people of all ages. However, evidence to date suggests that two groups of people are at a higher risk of getting severe COVID-19 disease:

- Older people (people over 70 years of age)
- People with serious chronic illnesses such as:
- Diabetes
- Cardiovascular disease
- Chronic respiratory disease
- Cancer
- Hypertension
- Chronic liver disease

Transmission of COVID-19

Evidence from other coronaviruses and respiratory diseases indicates that the disease may spread through large respiratory droplets and direct or indirect contact with infected secretions.The incubation period of COVID-19 is currently understood to be between 2 to 14 days. This means that if a person remains well after 14 days after being in contact with a person with confirmed COVID-19, they are not infected.

Respiratory infections can be transmitted through droplets of different sizes: when the droplet particles are >5-10 μm in diameter they are referred to as respiratory droplets, and when then are <5μm in diameter, they are referred to as droplet nuclei.According to current evidence, COVID-19 virus is primarily transmitted between people through respiratory droplets and contact routes.

Droplet transmission occurs when a person is in in close contact (within 1 m) with someone who has respiratory symptoms (e.g., coughing or sneezing) and is therefore at risk of having his/her mucosae (mouth and nose) or conjunctiva (eyes) exposed to potentially infective respiratory droplets. Transmission may also occur through fomites in the immediate environment around the infected person. Therefore, transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on the infected person (e.g., stethoscope or thermometer). **"The maximum transmission distance of SARS-CoV-2 aerosol might be 4 m"** (13.1 feet), according to a study published on April 10 on *Emerging Infectious Diseases,* a journal of the US CDC which also found that "SARS-CoV-2 was **widely distributed in the air and on object surfaces** in both the ICU and general ward (GW), implying a potentially high infection risk for medical staff and other close contacts",

The WHO defines **airborne transmission** as "the spread of an infectious agent caused by the dissemination of **droplet nuclei** that remain infectious when suspended in air over long distances and time" Airborne transmission is different from droplet transmission as it refers to the presence of microbes within droplet nuclei, which are generally considered to be particles <5μm in diameter, can remain in the air for long periods of time and be transmitted to others over distances greater than 1 m.In the context of COVID-19, airborne transmission may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed; i.e., endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.

There is some evidence that COVID-19 infection may lead to intestinal infection and be present in faeces. However, to date only one study has cultured the COVID-19 virus from a single stool specimen. There have been no reports of faecal–oral transmission of the COVID-19 virus to date.

Humidity (best if between 50% and 80%)

"It is assumed that temperature and humidity modulate the viability of viruses by affecting the properties of viral surface proteins and lipid membrane" Relative humidity (RH, or Saturation Ratio: the state of vapor equilibrium in room air) affects all infectious droplets **with respiratory viruses, independent of their source (respiratory tract or aerosolized** from any fluid) and **location (in air or settled on surfaces).** Relative humidity therefore affects all transmission ways but has the most pronounced effect on airborne transmission.

SOLIDARITY - A RAY OF HOPE AMIDST PANDEMIC

The Solidarity Trialis an international Phase III- IV clinical trial to help find an effective treatment for COVID-19 launched by WHO and partners.The trial was announced 18 March 2020 and as of 21 April, over 100 countries were participating.The total population size of the trial is reported to be 50,000 patients and the primary endpoint for the SOLIDARITY trial is all-cause mortality. The trial now compares four most promising drug treatment options such as Remdesivir,Lopinavir/Ritonavir,Lopinavir/Ritonavir with Interferon beta and Chloroquine for hospitalized patients with severe COVID-19 illness.

The drugs which treat COVID-19 should be:

- slow or kill the novel coronavirus called severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)
- could save the lives of severely ill patients
- given prophylactically to protect health care workers and others at high risk of infection

Hydroxychloroquine was originally included in the trial but this arm was stopped, as of 17 June 2020, as evidence from Solidarity (including the French Discovery trial data) and the recently announced results from the UK's Recovery trial both showed that it does not result in the reduction of mortality of hospitalized COVID-19 patientswhen compared with standard of care .

An experimental compound called RemdesivirOriginally designed for Ebola and related viruses, but showed no effect. However, this drug did have anti-viral effects against SARS and MERS causing coronaviruses in animal models. Additionally, case studies on COVID-19 patients suggest potential effectiveness. Remdesivir is a broad-spectrum antiviral with in vitro activity against coronaviruses and it is available as a lyophilized powder and concentrated solution. The recommended dose for adults and pediatric patients weighing 40 kg and higher is a single loading dose of 200 mg on Day 1 followed by oncedaily maintenance doses of 100 mg from Day 2.Remdesivir inhibits viral RNA polymerases and has broad spectrum activity against members of the filoviruses (eg, EBOV, MARV), CoVs (eg, SARS-CoV, MERS-CoV), and paramyxoviruses (eg, respiratory syncytial virus [RSV], Nipah virus [NiV], and Hendra virus). For patients requiring invasive mechanical ventilation and/or extracorporeal membrane oxygenation (ECMO), the recommended total treatment duration is 10 dayswhile all other patients require 5 days. But If a patient does not demonstrate clinical improvement, treatment may be extended for up to 5 additional days for a total treatment duration of up to 10 days. Up to now, the most characteristic adverse event seems to be increased liver enzymes (ALT, AST). For that reason, it is recommended to estimate their levels before the treatment is started. Remdesivir should be suspended or not initiated when ALT > 5 x upper limit of normal were confirmed and incase of renal function, RDV should not be used with a glomerular filtration rate <30 mL/min.As far as potential interactions with other drugs are concerned, no major contraindications have been identified so far, except for the precaution of using them together with other drugs with proven hepatotoxicity, as Rifampicin. Remdesivirdoes not cause alterations in the QTc interval.

A drug combination of Lopinavir and Ritonavir classified under HIV protease inhibitor recommended initially for the AIDS patients now shows potential activity for In vitro and animal model studies with respect to other coronaviruses (SARS-CoV and MERS-CoV). Ritonavir is combined with lopinavir to increase its plasma half-life through the inhibition of cytochrome P450. In the Discovery project, the suggested dose of the combination is 500 mg (400 mg lopinavir + 100 mg ritonavir) every 12 h for 14 days. Lopinavir and ritonavir may bind to Mpro, a key enzyme for coronavirus replication. This may suppress coronavirus activity. Lopinavir has activity, both in vitroand in an animal model, against Middle East respiratory syndrome coronavirus (MERS-CoV), Lopinavir/ritonavir is contraindicated in porphyria and caution is advised in patients with haemophilia, cardiac conduction disorders, pancreatitis, patients at increased risk of cardiovascular disease and those with structural heart disease. Common side effects include gastrointestinal disturbance, in particular diarrhoea, which is often worse in the first few weeks. Dyslipidemia, diabetes mellitus, pancreatitis and hepatic disorders have also been reported Drug interactions are common due to their inhibition of cytochrome P450, which can lead to increased levels of co-administered drugs that are metabolized by this enzyme. Drug-drug interaction may occur with simvastatin, combined oral contraceptives, anti-epileptic drugs and inhaled fluticasone. Pancreatitis has been observed in patients receiving lopinavir and ritonavir therapy, includingthose who developed marked triglyceride elevations. In some cases, fatalities have beenobserved.

Interferon-β in combination with lopinavir and ritonaviris an efficient inhibitor of the multiplication of SARS-CoV and MERS-CoV in cell cultures.Recently, combination treatments with IFN-beta, lopinavir-ritonavir, and ribavirin showed that the arm containing IFN-beta was superior in eliminating the virus from the nasopharyngeal swabs in phase II clinical trial. In a MERS-CoV mouse model, the combination lopinavir/ritonavir/interferon β-1a, used as prophylactic and curative treatments, revealed no significant decrease in the viral load. The study suggested a dose of lopinavir/ritonavir (400/100 mg) twice daily for 14 days, and interferon β-1b 0.25 mg subcutaneous every alternate day for 14 days. In the Discovery project, interferon β-1a will be added to the treatment Lopinavir/Ritonavir andadministered subcutaneously at the dose of 44 µg for a total of three doses in 6 days. IFN-beta increases CD73 in pulmonary capillaries. This is of utmost importance as CD73 is the key enzyme for vascular integrity under hypoxic conditions. The protective effect of IFN-beta on the lung is attributed to the clearance of pro-inflammatory ATP and pro-thrombotic ADP from circulation and converting them into highly anti-inflammatory adenosine via AMP step by CD73. Severely ill COVID-19 patients with increased levels of plasma cytokines (especially IL-6) show signs of immune exhaustion and poor IFN responses. Even in such cases, these patients would most likely benefit from IFN-beta, because it is the most potent anti-viral and anti-inflammatory agent of all interferons. It can induce the desired immune boost, but simultaneously downregulate IL-6 and IL-8 and impair extravasation of neutrophils into lungs.

Chloroquine and Hydroxychloroquine molecules can be classified as 4-aminoquinolines, and both have anti-plasmodial activities, but they remain two different molecules with some different metabolites. Chloroquine has been widely used since the 1950s for prophylactic and curative treatments of malaria. It is indicated for the treatment of malaria and extraintestinal amebiasis. Hydroxychloroquine is also prescribed for the treatment of malaria and also used successfully to treat lupus erythematosus and rheumatoid arthritis .In addition, it should be noted that chloroquine, essentially, and hydroxychloroquine, to a lesser extent, have been clinically tested for their anti-HIV activity .In the Discovery project, the suggested dosage for hydroxychloroquine is 400 mg for the initial dose, followed by 400 mg 12 h later and then 200 mg BID for up to 4 days. Alternatively, a higher dosage is proposed for chloroquine: 600 mg for the initial dose, followed by 600 mg 12 h later and then 300 mg BID for up to 4 days. Mechanisms may include inhibition of viral enzymes or processes such as viral DNA and RNA polymerase, viral protein glycosylation, virus assembly, new virus particle transport, and virus release. Other mechanisms may also involve ACE2 cellular receptor inhibition, acidification at the surface of the cell membrane inhibiting fusion of the virus, and immunomodulation of cytokine release. Hydroxychloroquine exhibited a higher in vitro antiviral effect compared to chloroquine when drug was added prior to the viral challenge. Safety Concerns were the use in COVID-19 patients outside of clinical trials or in a nonhospital setting is not recommended due to the potential for serious adverse events and drug interactions. Risk of cardiac arrhythmias (e.g., QT prolongation) reportedin seriously ill patients with other comorbidities so that avoid other QT prolonging agents whenever feasible. Risk of retinal damage, especially with long term use should also take for consideration.Caution in patients with G6PD deficiency, in diabetics and in significant drug interactions.On June 15, 2020, the FDA revoked the EUA for hydroxychloroquine stating that it is unlikely to be effective in treating COVID-19. Also, in light of ongoing serious cardiac adverse events and other serious side effects, the known and potential benefits of hydroxychloroquine no longer outweigh the known and potential risks for the authorized use. In addition, On 17 June 2020, Hydroxychloroquine (HCQ) arm of the Solidarity being stopped but this decision applies only to the conduct of the Solidarity trial and does not apply to the use or evaluation of hydroxychloroquine in pre or post-exposure prophylaxis in patients exposed to COVID-19.

The trial has a very high-level design which allows every individual country willing to participate in the study the ability to customize the protocol and can consider even more patients than the whole study. For example, Italy and Spain anticipated to recruit 600 and 2500 patients, respectively but these numbers seem random and not supported by the reality of the situation in both countries. The design is not double-blind, so there could be placebo effects from patients knowing they received a candidate drug. Enrolling patients in one single randomized trial will facilitate the rapid worldwide comparison of unproven treatments and thus will overcome the risk of multiple small trials not generating the strong evidence needed to determine the relative effectiveness of potential treatments.

With the SOLIDARITY trial, WHO launched an interesting initiative, yet may have been lacking the resources to secure aligned, high-quality implementation.

THE ROLE OF THE PHARMACIST IN PANDEMICS

Pharmacists need to take an active leadership role in developing emergency preparedness plans, volunteering as first responders, and staging disaster drills, according to a variety of experts on disaster planning. The latest wisdom regarding national disaster preparedness suggests that pharmacists should be available at points of medication and vaccine distribution, and they should be viewed as partners during emergency situations, especially when the emergency involves bioterrorism or an infectious disease outbreak.

Periodically throughout history various diseases have reached epidemic or pandemic proportions. The “Black Death” (bubonic plague) struck Europe several times, most recently in the 14thCentury. One-fourth of Europe’s population were killed – approximately 25 million people. The world has been ravaged by no less than seven cholera pandemics, six of them starting in the 19thcentury, with every continent except Antarctica suffering outbreaks. The most recent occurred in Indonesia in 1961.The influenza pandemic of 1918-19 killed more people than World War I, at somewhere between 20 and 40 million people. The initial response to any of these disasters must be local. In many instances it can be days, or even weeks, before assistance can arrive from outside the immediate disaster area. Therefore, communities need to be prepared for any of these eventualities with a disaster response plan. This plan should address mitigation, preparedness, response, and recovery activities.

To optimise the effectiveness of these groups they should include representatives from the pharmacy profession. While many government and non-governmental organisations have responsibilities to carry out crisis management planning, they should be encouraged to include the pharmacy profession in their action plans. Pharmacists can contribute to ensure that the disaster victims have timely accessibility to medicinal supply in fulfilling their current practice responsibilities as well as expanded roles of first responder, triage, immunisation, and first aid administration.

Pharmacists are the most accessible health professionals in many nations. Pharmacists are an intersection for virtually every health-system player – physicians, hospitals, patients, pharmaceutical companies, distributors and pharmacy benefit managers.

Role of pharmacists in both the planning and implementation of disaster/pandemic preparedness:

1. On the basis of education, training, experience and legal responsibilities, pharmacists can be a key participant in planning and execution.
2. The expertise of the pharmacist can be sought in

a). Developing guidelines for treatment of casualties and exposed individuals,

b). Selecting medicines and related supplies for national and regional stockpiles and local emergence inventories in emergency preparedness programmes,

c). Ensuring proper packaging, storage, handling, labelling, and dispensing of emergency supplies of medicines,

d). Ensuring appropriate deployment of emergency supplies of medicines.

3. Pharmacists can provide needed services outside the services they normally provide, particularly in the areas of first responder, triage, immunisation, first aid and administration of medicines.
4. Each phase requires different supplies and skills of the pharmacist. For example, the 'Search & Rescue Phase' involves trauma, lacerations, and injuries. The 'Recovery & Clearing Phase' involves infections, communicable diseases, diarrhoeal diseases. The 'Reconstruction & Re habilitation Phase' involves chronic physical & psycho-psychiatric conditions, other chronic ailments, crime-induced medical emergencies.
5. In the instance of a pandemic the pharmacist is well situated to provide education about prevention and detection of a disease. Pharmacists can also be a readily accessible resource for immunisations.

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