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JASON IFEANYI

A MESSAGE FROM OUR EDITOR-IN-CHEIF

"It is with great pride that we share with you our latest publication. These 5 ensuing articles are a culmination of the hard work and dedication exemplified by all 7 authors, as well as the entire editorial team, over these past few months. These authors have made the voluntary effort to advance the pharmacy profession through the dissemination of scholarly knowledge, and their efforts should be commended. I strongly urge all readers to consider getting involved with our newsletter, as there are several positions available! We are always looking to work with talented and motivated individuals. Below are a few frequently asked questions we receive from students, faculty, and preceptors.

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A: The Rho Chi Post does not dictate article topics. Students are free to choose an article topic of their choice. Should a student need help selecting a topic, we would be more than happy to help pitch ideas.

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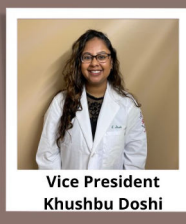
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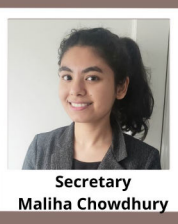
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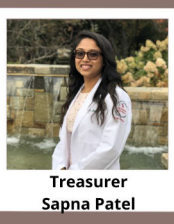
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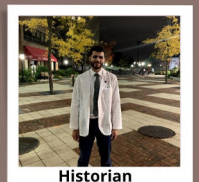
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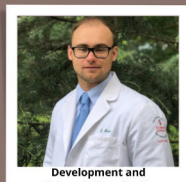
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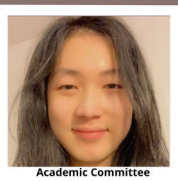
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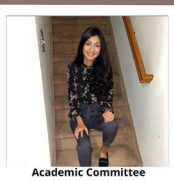
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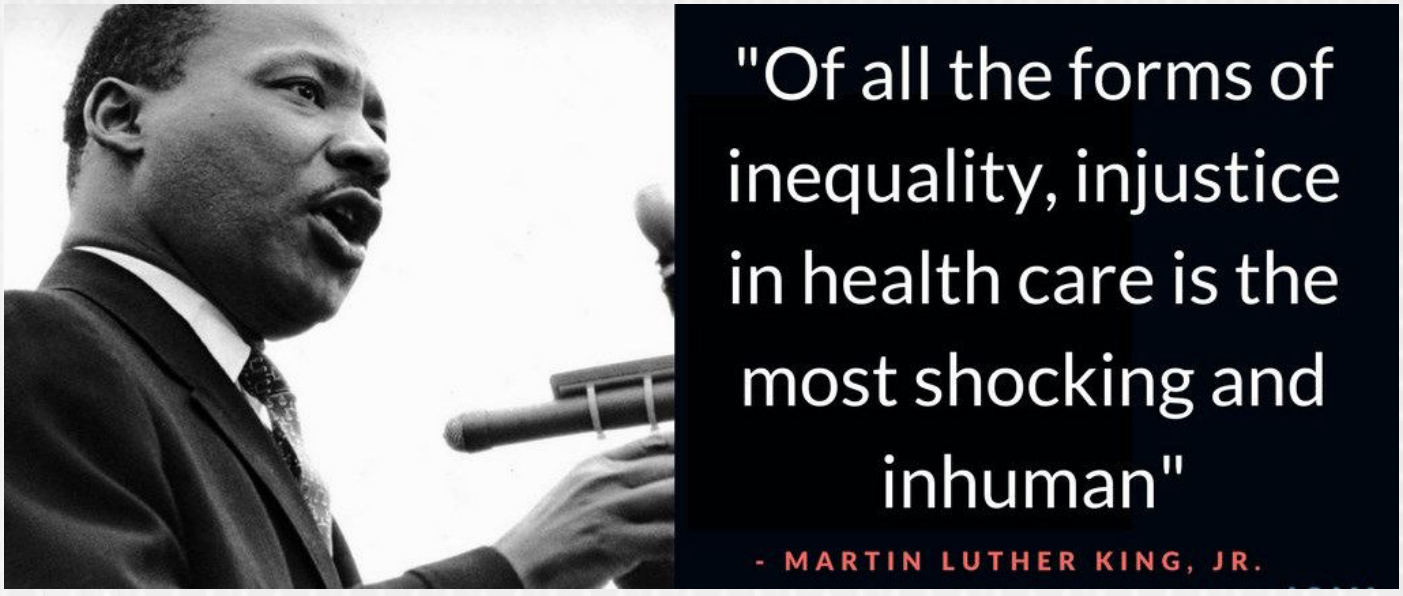

A Review of A Randomized Trial of a Transglutaminase-2 Inhibitor for Celiac Disease

By: Natalia Jucha, PharmD Candidate c/o 2022 and Helen Li, PharmD Candidate c/o 2023

Celiac disease is classified as an autoimmune disorder and occurs in individuals who cannot tolerate gluten. Dietary gluten induces an immune response and causes damage to the small intestine, particularly the duodenum and proximal jejunum. A small peptide called gliadin, present in wheat and several other cereals, is responsible for the pathogenesis of celiac disease. It is resistant to degradation by gastric pepsin and proteases in the small intestine.[2] Currently, there are no treatment options available for patients with celiac disease other than dietary restrictions.

Gliadin causes the disassembling of inter-enterocyte tight junctions, which are structures between cells that regulate the permeability of ions, macromolecules, and cells. Disassembling of tight junctions causes upregulation of zonulin, a peptide that is involved in tight-junction (TJ) regulation and that is responsible for gut permeability.[2] The upregulation of zonulin causes an increase in gut permeability which allows for gliadin to enter the lamina propria where it activates T-lymphocytes. The CD4+ cells produce inflammatory cytokines which can induce different inflammatory responses. Gliadin peptides can also activate CD8+ T-lymphocytes by interleukin (IL)-15. The increased density of CD8+ cells is the distinguishing factor of celiac disease as extensive infiltration of epithelium by CD8+ cells is associated with intestinal lesions of the villous surface.[2]

Tranglutaminase-2 is a celiac autoantigen in the intestinal mucosa. It modifies gluten peptides through deamidation; the removal of an amino group from a compound. This then allows for the presentation of these gluten-peptides by HLA-DQ2 and HLA-DQ8, two genetic markers which, when present, result in an increased risk for developing celiac disease. The gluten-peptide then induces CD4+ T helper cells, which cause activation of proinflammatory cytokines.[1] This inflammatory response causes villous atrophy and crypt hyperplasia and causes the production of transglutaminase-2 immunoglobulin A (IgA); a marker of celiac disease.

Currently, there are no treatment options available on the market and individuals must adjust their lifestyles to a "gluten-free" diet to prevent further damage. Based on the pathophysiology of celiac disease, transglutaminase-2 inhibitors could be a potentially helpful treatment option. A randomized, double-blind, multicenter, and placebo-controlled trial, aimed to determine the utility of a transglutaminase-2 inhibitor as a plausible treatment option. The primary endpoint of the study was the attenuation of gluten-induced deterioration of intestinal mucosal morphologic features. The intestinal mucosal morphologic feature was measured by the ratio of villus height to crypt depth in duodenal biopsy samples. The secondary endpoint assessed the changes from baseline to week 6 by measuring the density of CD3+ intraepithelial lymphocytes, and the modified Marsh-Oberhuber classification, which is the accepted scale for determining celiac disease severity.[3]

Individuals enrolled were asked to undergo a screening period that lasted 8 weeks. Within 4 weeks of screening, an upper gastrointestinal (GI) endoscopy with duodenal biopsies was performed before the administration of the first dose in order to provide histological data. The sample population included adults aged 18 to 65 years old who had received a biopsy- confirmed diagnosis of celiac disease 12 months prior to screening, who were HLA-DQ2 or HLA-DQ8 positive, who adhered to a strict gluten-free diet for at least 12 months, who presented with negative serologic testing for transglutaminase-2 antibodies, and who had a mean villus height to crypt depth ratio greater than 1.5. Overall, it was intended for 163 patients to undergo randomization, however four patients were excluded. Out of the 159 patients who underwent randomization, 17 patients were excluded from analysis pertaining to the effect of study drug treatment on the ratio of villus height to crypt depth. Sixteen patients were excluded because they did not undergo final endoscopy, while an additional patient was excluded because one of the samples obtained was not adequate for analysis.[4]

The trial was conducted at 20 sites in 7 different countries from May 16, 2018 to February 27, 2020.[4] Prior to taking the transglutaminase-2 inhibitor, each patient had at least 6 hours of fasting. The patients took either 10 mg, 50 mg, or 100 mg of ZED1227, the investigational medication, or a placebo. After 30 minutes, the patients ate a sponsor-provided biscuit containing 3 grams of gluten. For 6 weeks, patients were asked to continue their strict gluten-free diet, aside from the biscuit. Patients presented at week 0 to receive their drug or placebo, along with their sponsor-provided biscuit. Patients returned at week 2, 4, and 6 for assessments and at week 10 for a follow-up visit. A second endoscopy with biopsies was performed at

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week 6 or at the withdrawal visit. Patients kept a diary to record their daily use of ZED1227 or placebo, biscuit, food intake, other medications, and stool frequency/characteristics.[4]

Results show that the trial maintained 80% power as there were at least 34 patients in each assigned group. There were 35 patients in the 10 mg group, 39 patients in the 50 mg group, 38 patients in the 100 mg group, and 30 patients in the placebo group. For 10 mg, the ratio of villus height to crypt depth decreased to 1.85 from a baseline of 2.01 with a 95% confidence interval (CI) of –0.33 to –0.01. For 50 mg, the ratio decreased to 1.91 from a baseline of 2.04 with a 95% CI of –0.27 to 0.03. For 100 mg, the ratio decreased to 1.94 from a baseline 2.09 with a 95% CI of –0.28 to 0.03. For the placebo, the ratio decreased to 1.39 from a baseline of 1.98 with a 95% CI of –0.78 to –0.44. All four group's ratio of villus height to crypt depth displayed decreases from baseline after 6 week treatment. However, only the 10 mg and placebo group showed a statistically significant decline, as the confidence intervals for the 50 mg and 100 mg group crossed zero (0).[4]

For 10 mg, the estimated difference in the ratio of villus height to crypt depth versus placebo at week 6 was 0.44, with a 95% CI of 0.15 to 0.73 ($p=0.01$). For 50 mg, the difference was 0.49 with a 95% CI of 0.20 to 0.77 ($p=0.001$). For 100 mg, the difference was 0.48 with a 95% CI of 0.20 to 0.77 ($p<0.001$). These values all showed statistical significance. The differences from placebo in the change in intraepithelial lymphocyte density were –2.7 cells per 100 epithelial cells with a 95% CI of –7.6 to 2.2 in the 10 mg group, –4.2 cells per 100 epithelial cells with a 95% CI of–8.9 to 0.6 in the 50 mg group and –9.6 cells per 100 epithelial cells with a 95% CI of –14.4 to –4.8 in the 100 mg group.[4] Although the data meets statistical significance in terms of the study's adjusted p-value, the confidence intervals for the 10 an 50 mg groups crossed 0, showing that there could be potentially no difference between those groups and placebo regarding change in intraepithelial lymphocyte density.

There were limitations in this study. One of the limitations of this study is that patients were followed for a short duration of six weeks which one could argue is not enough time to assess the long term effects of the treatment. Of note, the drug manufacturing company responsible for producing ZED1227 was responsible for conducting and overseeing this study, resulting in potential bias due to sponsorship. In the demographic characteristics of the patients, 100% were white and about 80% were women. Unfortunately, the study did not include a racially/ethnically diverse population of subjects. Additionally, after week 6, there was damage present in all 4 assigned groups as there were decreases in the ratio of villus height to crypt depth.

Transglutaminase-2 inhibitors such as ZED1227 can be a potential avenue for manufacturing companies to explore for the treatment of celiac disease; however, trials would have to be longer, larger, and more diverse to truly determine statistical and clinical significance. In the meantime, it is important that pharmacists continue to encourage patients to implement the current lifestyle modification recommendations as more research surfaces.

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CDC Expands Eligibility for COVID-19 Booster Shots

By: Fatima Amjad, PharmD candidate c/o 2022

Pharmacists have truly taken on the role of superhero during the coronavirus disease 2019 (COVID-19) pandemic. As of April 6, 2022 more than 239.1 million COVID-19 vaccine doses have been administered by community pharmacies across the United States.[1] Community pharmacists have gone above and beyond immunizing eligible patients presenting to their pharmacies, and continue to do so with the expanded availability of booster vaccinations.

Currently, three COVID-19 vaccines are authorized for administration in the United States: Pfizer, Moderna, and Johnson and Johnson (Janssen). Pfizer is authorized for children 5 years and older, while Moderna and Janssen are indicated for those 18 years and older. Both the Moderna and Pfizer vaccines are administered as a two-dose primary series with an additional third dose recommended at least 4 weeks after the 2nd dose for moderate or severely immunocompromised individuals.[2] Janssen is administered as a single primary dose, with an additional 2nd dose of an mRNA vaccine (Pfizer or Moderna) given at least 4 weeks after the first dose for moderate or severely immunocompromised individuals.[3]

All COVID-19 vaccines are administered intramuscularly, with Moderna given as a 0.5 ml dose with a minimum 28 day interval between primary series doses, while Pfizer is administered as a 0.3 ml dose with a minimum 21 day interval between each primary series dose. Conversely, the Janssen COVID-19 vaccine is administered as a single 0.5 ml primary series dose. It is important to note that this Pfizer dose applies to patients 12 years and older. For those less than 12 years old, the authorized dose is 0.2 ml with the same 21 day minimum interval.[2]

On November 19th of 2021, the Food and Drug Administration (FDA) expanded its initial emergency use authorization (EUA) for the Pfizer vaccine. This allowed for a single booster dose to be administered at least 6 months after completion of a primary series with any EUA approved COVID-19 vaccine in patients 18 or older.[4] There have been numerous changes and updates since November 19th. As of March 13th, 2022 booster shots are available for all 3 EUA COVID-19 vaccines. Pfizer booster vaccinations are recommended for those age 12 and older whereas both Moderna and Janssen booster vaccinations are recommended in those age 18 and older.[2] Both Pfizer and Moderna are to be administered at least 5 months after completion of the primary series, whereas patients who were vaccinated primarily with Janssen may receive a booster vaccine at least 2 months thereafter. Patients who are immunocompromised may receive their booster shot at least three months after completion of their primary series with Moderna or Pfizer, and two months after completion with Janssen.[2,3]

Patients who received a primary dose series are eligible to receive a booster dose with any EUA authorized vaccine. For example, if a patient received two primary series doses with Moderna, and would like to receive their booster shot with Pfizer, they would be able to do so as long as it has been at least 5 months. The same is true with patients who completed their primary series with Pfizer and would like to receive Moderna. It is important to note that patients 12-17 years old are only eligible to complete their booster shot with the Pfizer vaccine, being that Moderna and Janssen are indicated for those 18 years and older.[2,3]

It should also be mentioned that although patients who completed their primary series with Janssen can also complete their booster shot with the same Janssen vaccine, this is not preferred. The FDA recommends completing booster vaccines with either Pfizer and Moderna. In the event that Moderna or Pfizer is unavailable, or if a patient prefers Janssen despites the potential adverse events (clotting), then Janssen may be administered.[2,3] The Pfizer booster vaccines are still being administered as a 0.3 mL dose , whereas the Moderna booster vaccines are being administered as half of the original dose (0.25 mL) seen in the primary two-dose series. The Janssen booster vaccine is still administered as a 0.5 mL dose.[2,3]

Most recently as of March 29, 2022 the CDC has authorized the administration of a second COVID-19 booster vaccine in individuals at high risk. This includes individuals at least 50 years of age or older or adults aged 12 years and older who are moderately to severely immunocompromised.[2] For these patients, the 2nd booster should be administered at least 4 months after the patient has received their first booster dose. [2]

Due to the continually evolving nature of the COVID-19 vaccine recommendations, it is essential that healthcare providers stay cognizant of any updates to ensure that patients are receiving the right vaccine for them. With expanded availability

CDC Expands Eligibility for COVID-19 Booster Shots

By: Fatima Amjad, PharmD candidate c/o 2022

of booster vaccines, community pharmacists will continue to play a pivotal role in national immunization efforts.

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Molnupiravir: A Prospective Oral Antiviral for Treatment of COVID-19

By: Justin Budz, PharmD Candidate c/o 2023

On January 19th, 2020, a 35-year-old man in an urgent care clinic in Snohomish County, Washington was the first to be confirmed by the Centers for Disease Control and Prevention (CDC) to be infected with Coronavirus Disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] As of March 10, 2022, the United States (US) has accumulated 79,248,406 total cases, with 961,260 of those cases resulting in deaths. Two years after the first case, the US has made great progress towards curbing infection of COVID-19. This is largely due to vaccination efforts; as of March 10, 2022, over 216.4 million Americans (65.2% of the US population) have been fully vaccinated, over 254 million Americans (76.6%) have received at least one dose, and over 95 million Americans (44.2%) have received an additional booster dose. Even with these impressive vaccination rates, new variants of COVID-19 are still causing on average 78.3 weekly cases of COVID-19 per 100,000 US citizens.[2]

Transmission of COVID-19 mainly occurs via inhalation of airborne droplets and particles containing the virus. Once inside the body, the virus utilizes surface spike protein to bind to Angiotensin-Converting Enzyme 2 (ACE2) receptors present on pneumocytes in the alveoli of the lungs. Once bound to ACE2, the virus enters the host cell via either membrane fusion or endocytosis.[3] Inside the cell, viral RNA is translated into polyproteins which aid in the replication and transcription of viral proteins. These proteins are packaged in the Golgi apparatus and are eventually assembled into new viruses that can exit the cell via exocytosis to infect new cells.[4] COVID-19 operates mainly as a respiratory disease. As infection persists, the patient will commonly present with dry cough, fever, and shortness of breath.[5]

Current Proposed Treatment Strategies for COVID-19

With better understanding of COVID-19's replication process, RNA-Dependent RNA-Polymerase (RdRp) became a drug target of interest. RdRp plays a crucial role in the replication of COVID-19 and remains present in different variants of coronaviruses. Upon translation of mRNA, RdRp acts to replicate the viral genome. If the function of RdRp is inhibited, it would prevent the release of the virion from the host cell.[6] A large benefit of using RdRp as a target is that there is no known equivalent of RdRp in humans, therefore greatly reducing the risk of RdRp inhibitors damaging regular host cells.[6]

Remdesivir (Veklury®) is one of few antiviral drugs authorized for the treatment of hospitalized adult and pediatric patients with COVID-19. Remdesivir is an RdRp inhibitor. It is formulated as an adenosine nucleotide prodrug that is first metabolized to a nucleoside monophosphate via carboxyesterase 1 or cathepsin A. The nucleoside monophosphate is then phosphorylated by cellular kinases to form the pharmacologically active nucleoside triphosphate metabolite. Remdesivir triphosphate acts as an analog of adenosine triphosphate (ATP) and has high selectivity over natural ATP for incorporation into nascent RNA chains of RdRp, resulting in delayed chain termination during replication of viral RNA. Remdesivir exhibits antiviral activity against COVID-19 in primary human airway epithelial cells with a 50% effective concentration (EC50) of 9.9 nM after 48 hours of treatment. After 72 hours of treatment, remdesivir inhibits the replication of COVID-19 in continuous human lung epithelial cells with an EC50 value of 280 nM.[7]

Although remdesivir is a successful treatment option for hospitalized COVID-19 patients, its largest setback is that it can only be administered as an IV injection, limiting its accessibility to patients within a hospital or inpatient acute care setting. Common side effects (incidences occurring $\geq$ 5%) observed with remdesivir are nausea and increased alanine and aspartate transaminase (ALT/AST) concentrations.[7] Even with the development of remdesivir, there is still a substantial demand for medications that are safe, tolerable, and orally effective against COVID-19. Current RdRp inhibitors that have been under investigation for use against COVID-19 include molnupiravir, galidesivir, ribavirin, sofosbuvir, and tenofovir disoproxil fumarate. Molnupiravir stands out from the prospective RdRp inhibitors not only due to its success in clinical trials but because it can be administered as an oral dosage form for the treatment of non-hospitalized COVID-19 patients.

Molnupiravir: Overview

Molnupiravir was originally developed by scientists at Emory University in Atlanta, Georgia for the treatment of alphavirus infections.[8] Prior to the COVID-19 pandemic, it was in pre-clinical testing for seasonal influenza. Molnupiravir demonstrated anti-influenza activity and good oral bioavailability in mice, ferrets, and nonhuman primates.

Molnupiravir: A Prospective Oral Antiviral for Treatment of COVID-19

By: Justin Budz, PharmD Candidate c/o 2023

Additionally, these early studies showed that molnupiravir was orally effective against coronaviruses, including SARS-CoV and middle east respiratory syndrome coronavirus (MERS-CoV).[8] As the COVID-19 pandemic began to develop, the pre-clinical studies began to shift and an agreement to develop molnupiravir as an oral treatment for non-hospitalized COVID-19 patients was signed between Emory University, Ridgeback Biotherapeutics, Wayne & Wendy Holman, and Merck.[12] Molnupiravir became a drug of promise as new pre-clinical studies showed that molnupiravir proved effective at reducing COVID-19 infection by blocking transmission in ferrets.[12]

Molnupiravir is formulated as a ribonucleoside analog that is first converted to n-hydroxycitidine (NHC) and then phosphorylated by host kinases to create the active form NHC-triphosphate. NHC-triphosphate acts as a competitive substrate for RdRp in COVID-19.[9] Upon binding to RdRp, molnupiravir disrupts normal RdRp function, causing low-frequency mutations across the viral genome. Predominant mutations were observed as transitional substitutions in nucleotides; changing cytosine to uracil and guanine to adenine. As a result, RdRp generates mutated RNA copies which will eventually lead to a viral error catastrophe, or the accumulation of mutations above a tolerable threshold, resulting in severe impairment or complete loss of viral replication.[10]

Molnupiravir: Completed Clinical Trials

Molnupiravir progressed to Phase 1 clinical trials sponsored by Ridgeback Biotherapeutics. The study was conducted using 130 participants (109 male, 21 female) ages 19-60 years old. Most participants were White (n =122), followed by Black/African American (n = 4). The average BMI of participants was 24.8 kg/m^2.[11] The phase 1 clinical trials evaluated molnupiravir using single and multiple-dose administrations in a randomized, double-blinded, and placebo-controlled study. Administration of doses ranging from 50 - 1600 mg produced a mean Cmax value of 13.2 ng/mL with a tmax between 0.25 - 0.75 hours. Half-life elimination was about 7 hours. The Cmax and AUC increased in a dose-proportional manner with no accumulation following multiple doses. Absorption of molnupiravir was 36% lower when administered with a meal.[12]

Primary outcomes of this phase 1 clinical trial focused on accounting for the number of participants with treatment emergent adverse events.[12] The main observed adverse effects included headache, diarrhea, and rash. Molnupiravir did not exhibit any negative effects on vital functions or hematological parameters. Doses were well tolerated between 50 - 800 mg given twice daily and 50 - 1600 mg given once daily for a duration of 5 days. Based on the results of this phase 1 clinical trial, molnupiravir exhibits a quick onset of action, a wide therapeutic window, and a safety profile with good patient tolerance.[12]

Exposure-response analyses from phase 2 clinical trials proved that an 800 mg dose of molnupiravir was the most appropriate for further investigation into phase 3 of the MOVe-OUT trial funded by Merck Sharp and Dohme.[13,14] MOVe-OUT is a phase 2/3, double-blind, parallel-group, randomized, placebo-controlled trial evaluating the safety and efficacy of molnupiravir in non-hospitalized adults with COVID-19.[14] The study was conducted on 1433 participants (698 male, 735 female) who were 18-90 years of age. Participant races included White (n = 813), Black/African American (n = 75), and Asian (n = 49). A total of 1,424 (99.4%) participants had at least 1 risk factor, the majority being obesity (73.7%), followed by age over 60 years (17.2%), diabetes mellitus (15.9%), and a serious heart condition (11.7%). Participants were randomly assigned in a 1:1 ratio using a centralized, interactive-response technology system to receive either four 200-mg capsules of molnupiravir or identical placebo, administered by mouth twice daily for 5 days. Participants were followed for 29 days.[14]

Inclusion criteria included laboratory confirmed SARS-CoV-2 infection, onset of signs or symptoms of COVID-19 within 5 days, and at least 1 risk factor for development of severe illness from COVID-19.[14] Exclusion criteria included an anticipated need for hospitalization within the first 48 hours, dialysis or estimated glomerular filtration rate less than 30 mL per minute, pregnancy, unwillingness to use contraception during the intervention period and for at least 4 days after completion of the regimen, severe neutropenia, platelet count below 100,000 per microliter, and SARS-CoV-2 vaccination. The use of any therapies intended as COVID-19 treatments were prohibited through day 29.[14]

The primary endpoint was the incidence of hospitalization for more than 24 hours or death through day 29.[14]

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Results concluded that participants receiving molnupiravir had a lower risk of hospitalization or death through day 29. In the molnupiravir group, 6.8% (48/709) of participants were hospitalized as compared to 9.7% (68/699) of participants in the placebo group (95% CI, −5.9 to −0.1).[14] The trial also reported 1 death (0.1%) in the molnupiravir group and 9 deaths (1.3%) in the placebo group. The risk of death decreased by 89% (95% CI, 14 - 99) when using molnupiravir compared to placebo.[14]

The secondary endpoint was based on the World Health Organization (WHO) 11-point Clinical Progression Scale and on COVID-19 symptoms reported by patients through day 29.[14] In regard of the WHO Clinical Progression Scale, participants in the molnupiravir group showed improved outcomes by day 5 in comparison to the placebo group, with increasing differences observed by days 10 and 15.[14] In regard to COVID-19 signs and symptoms, resolution of symptoms was more likely in the molnupiravir group than in the placebo group; 30.4% of participants in the molnupiravir group experienced at least 1 adverse event compared to 33% in the placebo group. The most frequently reported adverse events in the molnupiravir and placebo groups were COVID-19 pneumonia (6.3% vs 9.6%, respectively), diarrhea (2.3% vs. 3.0%, respectively), and bacterial pneumonia (2.0% vs. 1.6%, respectively).[14]

FDA Issues Emergency Use Authorization

Data from the MOVe-OUT trial supported the claim that oral molnupiravir is an effective treatment for COVID-19. As a result, on December 23rd, 2021, the Food and Drug Administration (FDA) issued an emergency use authorization (EUA) for Merck's molnupiravir for the treatment of mild-to-moderate COVID-19 in adults positive for SARS-CoV-2 and who are at high risk for progression to severe COVID-19, including hospitalization or death.[15] Molnupiravir is only recommended as an alternative when COVID-19 treatment options authorized by the FDA are not accessible or clinically appropriate. It is administered as four 200 milligram capsules taken by mouth every 12 hours for 5 days, for a total of 40 capsules. Molnupiravir should be initiated within 5 days of COVID-19 symptom onset. It is not authorized for pre- or post-exposure prevention of COVID-19 or for initiation of treatment in patients already hospitalized. Molnupiravir should be avoided in patients younger than 18 years of age as it may affect bone and cartilage growth. Molnupiravir should also be avoided during pregnancy as findings from animal reproduction studies show that molnupiravir may cause fetal harm. Females of childbearing age are advised to use a reliable form of birth control during treatment and for 4 days after the final dose. Males of reproductive age are advised to use a reliable form of birth control during treatment and for 3 months after the final dose.[15]

Many patients infected with COVID-19 can fully recover from the infection with minimal medical intervention.[16] However, upon progression to severe disease, both harm to patient health and strains on healthcare systems can be of result. Vaccination remains the most important intervention to lower the risks of hospitalization and death from COVID-19.[17] However, new variants of COVID-19 continue to jeopardize high-risk patients, making early treatment options ever so more important. Treatments such as remdesivir and monoclonal antibodies are currently authorized for at-risk outpatients with COVID-19.[18] Both agents require administration via infusion or injection in a hospital or inpatient acute care settings. The concurrent FDA issued EUA of nirmatrelvir/ritonavir (Paxlovid ®) and molnupiravir provides patients with multiple oral treatment options that can be easily administered by the patient at home within a shorter time frame of the onset of symptoms and for less of a cost.

Conclusion

As access to new treatments such as molnupiravir emerge, not only does the world become more prepared against new variants of COVID-19 but it also comes closer to shutting the doors of the pandemic. It is essential that pharmacist and other health care practitioners alike stay cognizant of COVID-19 updates so that patients receive the best care possible.

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The Controversial use of Aducanumab (Aduhelm™) for Alzheimer's Disorder

By: Aamir S. Dave, PharmD Candidate c/o 2023 Judith L. Beizer, PharmD, BCGP, FASCP, AGSF

Alzheimer's and Dementia

Dementia is characterized by the loss of memory and other cognitive abilities that interfere with daily life. Alzheimer's is a progressive neurological disease and is the most common type of dementia, accounting for greater than 60-80% of dementia cases.[1] Although Alzheimer's is not a normal part of aging, increasing age is the greatest known risk factor of this disease.[1] As recently as June 7th, 2021 a new treatment for Alzheimer's in the form of aducanumab (Aduhelm™) has been approved, and has been met with intense controversy.[2]

The pathology of Alzheimer's involves two key markers: neurofibrillary tangles of tau protein and beta-amyloid neurotic plaques.[3] Neurofibrillary tangles of tau protein are intracellular deposits that can be used to aid in the diagnosis of Alzheimer's by looking at elevated tau protein levels in the cerebrospinal fluid (CSF). Beta-amyloid is a 36-43 amino acid long peptide. Beta-amyloid levels in the CSF can also be used as a diagnostic tool for Alzheimer's. The formation of beta-amyloid plaques starts from the Amyloid Precursor Protein (APP).[2] APP can be processed by two different enzymes: alpha-secretase and beta-secretase. When APP is cut by alpha-secretase and then by gamma-secretase, a non-amyloid compound is formed that is harmless. However, when APP is cut by beta-secretase first and followed by gamma-secretase, it creates the toxic beta-amyloid neurotic plaques seen in Alzheimer's. Beta-amyloid is chemically "sticky" and clumps into entanglements called "fibrils." These fibrils form a mat called beta-sheets which are responsible for blocking cell-to-cell communication and activate an inflammatory immune system process that results in the destruction of brain cells.[2] Understanding this process has made beta-amyloid a target for potential treatment options of Alzheimer's disease. This treatment target led to the development of aducanumab.

Cholinesterase Inhibitors, NMDA Antagonists, and the Treatment of Alzheimer's

The treatment of Alzheimer's involves the use of cholinesterase Inhibitors. This includes drugs like donepezil, rivastigmine, and galantamine. The rationale behind use of these drugs involves the neurotransmitter acetylcholine and its levels within key neuronal synapses that affect memory and cognition. Brain acetylcholine levels in patients with Alzheimer's and other types of dementia were significantly lower than patients of normal cognitive ability, relative to age group.[4] Additionally, it was found that the use of anticholinergic drugs in patients with Alzheimer's had the potential to make them forget things from the night before. These findings led many researchers to associate the loss of cholinergic transmission with dementia. Cholinesterase's are a class of enzymes involved in the breakdown of acetylcholine to acetic acid and choline.[4] By inhibiting this enzyme, acetylcholine levels increase, thereby correcting the cholinergic shortage. This class of drugs does not cure Alzheimer's but instead slows the progression of cognitive decline.

Memantine is another common drug used for Alzheimer's. It is an N-methyl-D-aspartate (NMDA) antagonist. It is believed that over-stimulation of the NMDA receptor by the neurotransmitter glutamate also contributes to the neurocognitive decline seen in Alzheimer's.[5] Memantine has been shown to improve daily living scores in multiple functionality tests. In a meta-analysis conducted on memantine monotherapy use in Alzheimer's patients, memantine modestly improved cognitive function, Alzheimer's-associated behavioral function, activities of daily living, global function assessment, and stage of dementia when compared with placebo.[5] Similar to the cholinesterase inhibitors, memantine does not cure Alzheimer's but has been shown to slow progression.[5]

The failure of both these drug classes as monotherapy to stop the progression of Alzheimer's gave rise to the idea that Alzheimer's is a multifactorial disease and many different biological markers may have to be addressed to slow the progression.[4] This led to the use of cholinesterase Inhibitors and memantine in combination. While there was some clinical benefit to the use of these drugs in combination, the overall effect was not clinically significant or sustainable long term.[4]

The Controversial use of Aducanumab (Aduhelm™) for Alzheimer's Disorder

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Aducanumab's (AduhelmTM) Development and Purpose

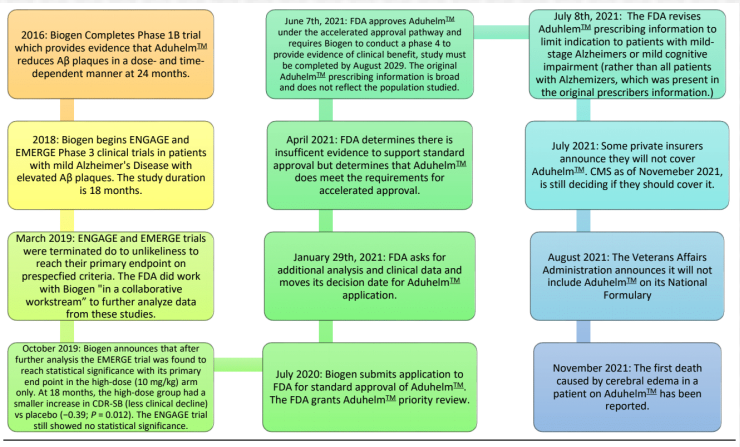

Figure 1: The above figure shows a timeline of Aduhelm's clinical trial, approval process and post-approval findings from 2016- November 2021.[9,10]

Aducanumab-avwa (Aduhelm™) is a recombinant human IgG1 monoclonal antibody (mAB) that is expressed in a Chinese hamster ovary cell line. It targets a conformational epitope on the beta-amyloid protein in both its soluble oligomeric forms and insoluble plaque forms with high affinity.[6] Aducanumab was originally derived by Neuroimmune, a biotech company in Switzerland. It was taken from healthy donors who were cognitively normal. The researchers hypothesized that these donors had immune systems that could successfully resist Alzheimer's disease. They used a process called "reverse translational medicine" to turn the derived antibodies into therapeutical antibodies.[11]

Dosing of Aduhelm™

The Food and Drug Administration (FDA)-authorized dose of aducanumab is 10mg/kg actual body weight given as an IV infusion, which must be achieved through an initial titration sequence (see table 1) that occurs over the first 7 infusions or 28 weeks.[6] Each infusion is given over approximately one hour preferably every 4 weeks, but at least 21 days apart. For missed dosing, resume administration of the same missed dose as soon as possible. There is no adequate data to determine if Aduhelm™ can be used safely in pregnancy or lactation. However, in animal studies of female rats at concentrations 0, 100, 300, or 1000 mg/kg/week; there was no adverse effect on embryofetal development.[6] There were also no adverse effects on prenatal and postnatal development throughout pregnancy and lactation.

IV Infusion (Every 4 weeks)	Aduhelm Dosage (administered over approximately one hour)
Infusions 1-2	1 mg/kg
Infusions 3-4	3 mg/kg
Infusions 5-6	6 mg/kg
Infusions 7+	10 mg/kg

Table #1: Approved titration sequence for Aduhelm™.

The monitoring parameters for Aduhelm™ include a brain MRI within one year prior to the start of treatment, before the 7th infusion (the first full 10mg/kg dose), and the 12th infusion.[6]

Aduhelm™ is available in 2 different volumes, 1.7 mL and 3.0 mL. Both have a concentration of 100mg/ml and come as single-dose vials. Aduhelm™ can be added to an infusion bag of 100 mL of 0.9% sodium chloride injection, USP.[6] It is not recommended to use other diluents to dilute Aduhelm™. After dilution it should be used immediately, however, it can be refrigerated at 2-8 degrees C for 3 days or stored at room temperature up to 30 degrees C for 12 hours.[6]

Aduhelm™ Clinical Trials

There were 2 major trials involved in the accelerated FDA-approval of Aduhelm™ for the treatment of Alzheimer's. These trials were the ENGAGE (NCT 02477800) and EMERGE (NCT 02484547) phase 3 clinical trials. Both trials were randomized, multicentered, double-blind, placebo-controlled, parallel group studies in patients with early-stage Alzheimer's. The primary outcome was a 78-week change from baseline in Clinical Dementia Rating scale Sum of Boxes (CDR-SB score.) The CDR-SB score assesses three domains of cognition: memory, orientation, and problem-solving. The score for each category is defined by a degree of severity ranging from 0-3, with a score of "0" being no performance disability and a score of "3" being severe performance disability. The scores are summed for a total score range between 0-18. There were 3 treatment arms in both studies (placebo, low-dose Aduhelm™, and high-dose Aduhelm™.) Dosing, in both trials, was based on APOE (Apolipoprotein) ε4 carrier status. APOE ε4 is a protein associated with the earlier onset and increased risk of dementia.[7] In the low-dose group, APOE ε4 carriers received 3 mg/kg and non-carriers received 6 mg/kg. APOE ε4 carriers in the high-dose group also received 6 mg/kg, while non-carriers received 10 mg/kg.

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The EMERGE trial found a statistically significant difference in the primary outcome in the high dose arm only (difference vs. placebo -0.39 [95% CI -0.69 to -0.09].)[7] While this outcome is statistically significant, clinical significance was not reached as a minimal change of the CDR-SB score of 1-2 points is required for that distinction. The ENGAGE trial observed no statistically significant difference in the change from baseline in CDR-SB in both the low and high dose arms.[7] In a meta-analysis of both studies, the combined data showed no statistically significant results in the high dose or low dose treatment arms (difference in CDR-SB vs. placebo -0.18 [95% CI -0.50 to 0.24] and (-0.21 [95% CI -0.43 to 0.00]) respectively.[7] The meta-analysis had high heterogeneity between the EMERGE and ENGAGE with an I^2= 74.65% and a low heterogeneity between the EMERGE and ENGAGE with an I^2= 0%.

The outcomes of the EMERGE and ENGAGE trials failed to provide definitive and justifiable proof of the efficacy of Aduhelm™ for Alzheimer's. However, in post-hoc analyses, the FDA and the manufacturer, Biogen, attempted to explore a hypothesis for the differing results of the EMERGE and ENGAGE trials. This led to the finding that 9 of the high-dose arm participants were identified as "rapid progressors" as their CDR -SB score worsened by 8 points over the 78-week period. Whereas the other arms in both trials only had 4-5 "rapid progressors." When removing these outliers, the ENGAGE trial did show benefit in Aduhelm™. However, statistical significance could not be determined, and the result was still not clinically significant.[7] This is why FDA approval of aducanumab has been controversial and has been met with intense scrutiny.

In a safety analysis, ARIA (Amyloid-Related Imaging Abnormalities) due to edema and effusion (ARIA-E) or hemorrhage (ARIA-H) was the safety event of highest concern. The incidence of ARIA-E or ARIA-H at approved dosing (10mg/kg) was 41.3%.[7] In both studies, dosing was stopped until ARIA was resolved. Other common adverse events were headache (20.5% at 10mg/kg), falls (15.0% at 10mg/kg) and diarrhea (8.9% at 10mg/kg).[7]

On November 9th, 2021 it was reported that the first suspected death due to cerebral edema, believed to be ARIA-E induced by aducanumab, occurred in a 75 year old female patient who had been taking the drug for their Alzheimer's disease. Not much has been released about the patient but it is believed that the patient had no other conditions that could have caused the cerebral edema. In a statement to Reuter's (a news agency company), Biogen said "We continue to work with the reporting physician as well as global regulators to further understand the case."[9]

Discussion

The efficacy of Aducanumab for the treatment of Alzheimer's is questionable despite its accelerated FDA approval. Its inability to show clinically significant efficacy at the approved dosing raises concern about the effectiveness it will have outside the strict parameters of a clinical trial. It is important to note that both the ENGAGE and EMERGE clinical trials were stopped prior to completion as the researchers believed they were unlikely to reach their primary endpoint on prespecified criteria. It was not until the FDA decided to work with Biogen that statistical significance was found in only one treatment arm out of one of the two trials.[10]

Aducanumab's safety profile shows a high risk of ARIA, headache, and falls which is highly significant since most patients that will be using Aduhelm™ will be of advanced age and are more likely to be effected by these adverse effects. As of November 11th, there is one case of a cerebral edema causing death in a patient on Aduhelm™. This is still being investigated but early results suggest this cerebral edema was ARIA-E induced and was caused by Aduhelm™.[9] The cost of Aduhelm™ is estimated to be around $56,000 per year or $4,312 per infusion for an "average weight patient."[8] This is an extremely expensive price to pay for a drug that has non-convincing evidence proving its efficacy. Aduhelm™ is also unlikely to be covered by Medicare and most private insurances.[9]

Upon initial approval, the Aduhelm™ package insert stated that it was indicated for all patients with Alzheimer's Disease.[10] However, this indication does not accurately reflect the population Aduhelm™ was tested in. A week after the approval of Aduhelm™ the FDA had to revise the package insert to state: "indicated for patients with mild Alzheimer's Disease" to match the population it was tested in.[10] The seemingly overwhelming amount of backlash of Aduhelm™ seems justified when every step leading up to Aduhelm™ approval is shrouded in controversy.

The controversial efficacy of Aduhelm™ calls into question the use of amyloid targeting agents for the treatment of Alzheimer's. As of August 2021, there is no evidence to suggest that Aduhelm™ will change the current treatment guidelines for Alzheimer's away from the cholinesterase inhibitors and memantine. A similar drug to Aduhelm™ named Donanemab is currently undergoing Phase 3 clinical trials. Both drugs are beta-amyloid plaque targeting monoclonal antibodies. It will be interesting to see how these drugs compare.

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YouTube Bans Misinformation About Approved Vaccines

By: Natalia Jucha, PharmD Candidate c/o 2022 and Zarin Chowdhury PharmD Candidate c/o 2023

Effective September 29th of 2021, YouTube will be banning prominent anti-vaccine activists and blocking channels promoting anti-vaccine misinformation. The company recently announced its expansion of medical misinformation policies. This includes prohibiting the sharing of misinformation regarding currently administered vaccines that are approved and confirmed to be safe and effective by the World Health Organization (WHO) and other health officials.[5] YouTube has hired thousands of moderators and has utilized high-tech image and text-recognition algorithms in an effort to police misinformation.

YouTube has mentioned that approximately 130,000 videos spreading misinformation about Coronavirus disease 2019 (COVID-19) vaccines were removed from its platform in the past year. The platform previously banned misinformation specific to coronavirus vaccines, but now, its updated policies will also block misinformation about routine immunizations, like those for measles and Hepatitis B, as well as general false statements about vaccines.[1] YouTube did, however, state that there will be exceptions to the new guideline in place. As a platform that promotes public discussion and debate, content about vaccine policies, new vaccine trials, and historical vaccine successes or failures will continue to be allowed. Additionally, personal testimonies with vaccines are allowed so long as the channel does not promote vaccine hesitancy, defined as a delay in acceptance or refusal of vaccination despite its availability.[6,7]

In 2019, the WHO listed vaccine hesitancy as one of the top 10 threats to global health as it "threatens to reverse progress made in tackling vaccine-preventable diseases."[6] Social media, while providing an unprecedented capacity for the public to communicate, has also been a major factor in the rise of unconventional opinions damaging to public health. Vaccine hesitancy is not a new phenomenon, however the proliferation of anti-vaccination misinformation through social media has given it new urgency, especially in light of the COVID-19 pandemic and hopes for widespread vaccination.

Majority of the misinformation that has circulated about COVID-19 vaccines has focused on vaccine development, safety, and effectiveness, as well as COVID-19 denialism. Monitoring online data related to vaccines can track vaccine misinformation in real-time and assist in negating its impact. According to the Centers for Disease Control and Prevention (CDC), monitoring through social media listening is a key strategy to quickly identify and address misinformation about COVID-19 vaccines.[8] Effective utilization of these strategies will serve clinicians well in providing individuals with the information they need to make well-informed health decisions, therefore negating the harmful effects of circulated misinformation.

A recent randomized controlled trial was conducted in February 2021 that measured the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. Overall, the authors found that regardless of previous intent to vaccinate, an individual's intent decreased with an increased amount of misinformation.[4] This study does not mimic real-life social media exposure, which is driven by complex algorithms that recommend more content that is similar to the content an individual is already interacting with as well as new content that potential followers, friends or family may send to each individual. The realm of social media and the algorithms that drive "viral" and recommended content, are very complex and cannot be replicated by a single study. However, this study does show how misinformation can lead to individuals making different decisions than originally intended.

Pharmacists can proactively engage with patients and the public regarding the accuracy of health information. It is important to listen with empathy and when possible, to correct misinformation in personalized ways. In addressing patients' concerns, every effort should be made to minimize the usage of technical language.[2] Individuals who do not speak the technical language

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may struggle to make sense of the material which can lead to misunderstanding or alienation. When possible, healthcare professionals should aim to find opportunities to promote health literacy on a regular basis.[3] This involves communicating effectively and paying close attention to what the patient is saying, and screen for language barriers. By increasing their health literacy, clinicians are providing patients a greater opportunity to recognize when the information being presented to them is inaccurate, consequentially allowing them to make better informed health decisions.[8] Aside from increasing health literacy, pharmacists can impact the underserved population by being more involved in the community: for example, by holding educational vaccine campaigns in churches or local gatherings.[3]

YouTube's policy decision to ban misinformation from the platform is a step forward in the right direction towards providing patients with the information needed to make well-informed health decisions. As algorithms on social media tailor content for viewers based on their previous engagement with content, misinformation becomes a vicious cycle for those that are already doubting vaccinations and other health-related information put out by practitioners and the government. Other social media platforms should follow suit in protecting public health as well as curbing misinformation. Lastly, healthcare professionals should correct false or misleading health information, share truthful health information, and direct people to reliable sources of health information within their communities and spheres of influence. After all, health and well-being are values that should be shared by everyone.

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RHO CHI POST: TEAM MEMBERS

@ Jason Ifeanyi
6th Year, STJ; Editor-In-Chief

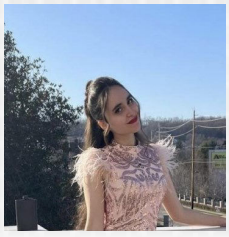
Last year I had the pleasure of serving as Social Media Manager and Staff Editor for the Rho Chi Post. It was amazing to see the growth we had as an organization , and the many students, faculty, and pharmacists we were able to connect our content with. I aim to continue and expand upon this growth as the new Editor-In-Chief this academic year. I look forward to working alongside this group of talented and driven students to effectively deliver newsletter publications that keep readers up to date on advancements made within the field of pharmacy .

@ Katharine Russo, PharmD
Graduate Copy Editor [Content-Focused]

The Rho Chi Post as been a forum for students, faculty, and staff to advance their knowledge in the field of pharmacy since 2011. The platform allows for students to practice their written communication skills while offering an innovative and creative workspace to bring together various aspects of the pharmacy profession. My involvement with the RCP during my years of study greatly impacted my education and I look forward to continuing my contributions as I start my career as a clinical pharmacist

@ Lexie Villariasa
6th Year, STJ; Copy Editor [Graphics-Focused]

With the world of pharmacy changing day by day, it can be challenging to keep up with all the updates. The Rho Chi Post provides an excellent platform for students to share their insights and thoughts on the happenings within the field. I'm excited to join the Rho Chi Post and a team that is passionate about the profession. With a passion in graphic design, I hope to continue the vision the newsletter has and am grateful for the opportunity to do so!



@ Nancy Yousry
5th Year, STJ; Finance & Outreach Manager

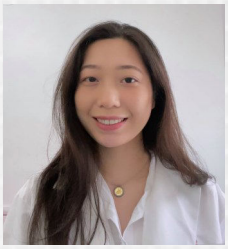
Beyond grateful and excited to embark on carrying Rho Chi's Mission of providing an invaluable literature medium to the Student Community in an empowering and influential way. In these ever changing times, it is crucial now more than ever to take on the invaluable active role of listening, learning and understanding the change of dynamics within our communities and what that means towards the future of Healthcare and the Pharmaceutical Field in its constant interdisciplinary evolvement. As Finance and Outreach Manager of the Rho Chi Post, I aim to ensure inclusivity in sharing diverse perspectives and raise awareness of just how capable we are as future Pharmacists in being able to innovate revolutionary solutions while advocating for our Passions, Profession and the sustainable wellbeing of our Patients.

@ Anna Diyamandoglu, PharmD
Graduate Copy Editor [Content-Focused]

Throughout my time in the PharmD program, my understanding of pharmacy as a profession has evolved and deepened as much as my desire to create awareness, particularly to non-science students, about the diverse role pharmacy plays in various healthcare and non-healthcare settings. I have always had an affinity for writing and look forward to combining my interests in literary composition, editing and pharmacy to produce relevant issues which both pharmacy students and non-pharmacy students alike will find relatable and take an interest in.

@ Daniela Farzadfar, PharmD
Graduate Staff Writer

Pharmacy is a constantly evolving profession. Writing for the Rho Chi Post gives me the opportunity to enlighten my peers and myself on changes occurring in the field that we are often not taught in the classroom. The Rho Chi Post serves as a creative outlet where students can express their opinions and share new information by combining their passion for writing and the pharmacy profession. I hope that my contribution to this newsletter inspires others to improve patient outcomes by staying up to date on recent changes.



@ Mandy Zheng
4th Year, STJ; Copy Editor [Graphics-Focused]

I am excited to be a part of Rho Chi Post, a place for pharmacy students to share insights, opinions, and new discoveries. As future pharmacists, the issues that exist in the US healthcare system will have to be addressed and improved by us. Rho Chi Post informs students on all aspects of pharmacy and serves as an example and inspiration for others. Pharmacy is an ever-changing and dynamic field, and there are vast career opportunities and pathways for pharmacy students. I look forward to working, listening, and learning from my fellow students and future colleagues; and I hope to serve as a guidance to others as others have

@ Aiša Mrkulić
6th year, STJ; Social Media Manager & Staff Writer

I am excited to have the honor of serving on the Executive Board as Social Media Manager, eager to showcase the award-winning work of our editorial team, staff and contributing writers alike. Since joining the Rho Chi Post as a Staff Writer, I have been a frequent contributor to the newsletter—sought out by prospective staff writers interested in using cowriting as a springboard for their own involvement with the Post. If this tells us anything, it's that the potential for expansion over the coming year is promising! Those interested in applying for the Staff Writer position always have the option to collaborate with our published authors. Certainly, all are free to contribute independently at any point; however, those who may be hesitant to do so might benefit more from a firsthand account of newsletter writing, with the added bonus of guidance from one of our own—a polished writer familiar with the process.

RHO CHI POST: TEAM MEMBERS

@ Ashley Dao

4th Year, STJ; Website Liaison

The Rho Chi Post offers a place for students, alumni, and faculty to collaborate and share their experiences. Each bringing their own perspectives and opinions. I am very excited to be part of the Rho Chi Post team. As someone who has always had a love for writing, I am grateful for the voice that the Rho Chi Post has given me. I have also had the opportunity to learn from the articles published by my peers. I hope that I can encourage more students to contribute to the Rho Chi Post. After all, without conversations, there can be no change.

@Rubab Hassan

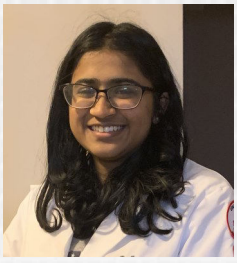
6th Year, STJ; Staff Writer

The Rho Chi Post gives pharmacy students the opportunity to explore their interests, whether it be editing, writing, or graphics, while also enhancing their skills and knowledge as student pharmacists. I am excited to be a part of the Rho Chi Post because it is a great way to expand on what I have learned during my time in pharmacy school and also keep developing my writing skills. Being a writer gives me an outlet to raise awareness on the advancements that are constantly happening in the field of pharmacy and allows me to be part of an amazing team in hopes of providing other students with our best work.

@ Holly Nguyen

4th Year, STJ; Staff Editor

The pharmacy profession treasures the continuous search for knowledge in the fast-paced, ever-changing catalog of old, new, and developing drugs and therapies, whilst maintaining a manner of grace and compassion in everyday settings among patients, medical professionals, and higher associates. The St. John's University Rho Chi Post is an emblem of this pursuit, bringing together an incredibly talented team of pharmacy students and graduates to present the latest pharmacy news to our fellow colleagues. I'm incredibly honored to be part of such an esteemed newsletter as a staff editor, which has since given me the opportunity to connect with a network of truly influential colleagues. I pledge to help aspiring student writers speak directly to the pharmacy community, in a voice that further empowers the words they convey.



@ Tiffany Dominic

6th Year, STJ; Staff Writer

My name is Tiffany Dominic and I am currently a sixth year pharmacy student. After being a dedicated reader of Rho Chi Post for years, I wanted to give back and be a part of this amazing community of writers and editors who work tirelessly to publish quality pieces of knowledge, news, and opinions. Being part of Rho Chi Post allows me to shed light on issues that aren't touched upon in our didactic courses and helps me connect students to real-world applications and approaches in pharmacy. I am beyond grateful that Rho Chi Post has given me the opportunity to continue my love for writing while also promoting patient advocacy and public health. I look forward towards writing about current events and essential healthcare issues while being part of this incredible team!

@ Mah Noor

Graduate, STJ; Staff Writer

Rho Chi Post is an amazing student-operated newsletter publication that is doing an astonishing job delivering updated news as well as giving students the opportunity to give back to the pharmacy community. As a staff writer, I hope to play a key role in educating students on the different aspects of pharmacy and how much growth takes place in this field. Reading the Post since freshman year has helped me gain a better understanding of what it means to be a pharmacist and I hope to achieve that same understanding in students who read my articles.

@ Bisma Sekhery, PharmD

Graduate STJ; Staff Writer

There are two things I am passionate about one which is pharmacy and the second which is writing. The Rho Chi Post is a professional newsletter, which allows students to educate as well as learn more about the field of pharmacy as it evolves. I am beyond excited to contribute to this newsletter and provide my fellow classmates and peers interesting news about pharmacy. I have always enjoyed reading The Rho Chi Post articles throughout pharmacy school. The articles were interesting and educational. This allows me to make an important contribution to society and spread awareness not only of new drugs and advancements in the field, but current issues in the pharmacy world. Having a voice is very important and writing for this newsletter allows me to have one.

@ Zarnab Jillani

6th Year; STJ; Staff Writer

The Rho Chi Post is a great platform for students to not only apply what they have been learning in school, but to break norms and report on pharmacy related events that are not always addressed in an academic setting. I look forward to writing for the Rho Chi Post because it will give me a way to delve deeper into what I'm studying at the moment and give me a chance to share that with my peers. Moreover, with the constantly changing world of pharmacy it is important to stay up to date and present the information in a creative way.

@ Richa Tamakuwala

6th Year, STJ; Staff Editor

Growing up, reading was always my favorite hobby. The way the authors were able to create such vivid images, the way they could make you feel what the characters were feeling, the way they captured their readers' attention so tightly that nothing else mattered in the moment all motivated me to start writing. Since starting pharmacy school, my writing has unfortunately been placed on hold, but after learning about Rho Chi Post, I'm excited to start writing again. Writing for Rho Chi Post will allow me, along with many other students, to do something I enjoy while updating fellow future pharmacists on the ever-changing field of pharmacy.

RHO CHI POST: TEAM MEMBERS

@ Jeremy Mesias

6th Year, STJ; Staff Editor

The field of pharmacy is constantly growing and improving with every coming day. Today's headlines become tomorrow's history. As healthcare leaders in a dynamic field, it is important to stay up to date. The Rho Chi Post serves as an excellent tool to help students become more informed about our profession, as well as providing them with the opportunity to contribute their own two cents to the conversation. I am excited to join the team and look forward to contributing to keeping students on top of current pharmacy advancements.

@ Anjali Rana

3rd Year, STJ; Staff Writer

My desire to learn about medicine and its effect on the human body began with a nebulizer. I had asthma as a young girl. At the age of ten, the vaporous gases from the pump never ceased to amaze me. My sickness, although unfortunate, fueled my interest in the functions, limitations, and exploitations of drugs. I have always had a passion for advocating for change and believe the Rho Chi Post adds great value to the community. As the world grows and develops each individual has an opportunity to express their thoughts on its development. Having the chance to become a Staff Writer provides me an opportunity to learn information about my peers to better assess the nature of their situation. When people begin discussing concepts at a younger age, they are able to influence people of their generation to care more about their own health. Combining concepts learned from pharmacy school with the mission to help those in need will create a stronger foundation for future healthcare professionals.

@Erica Tonti

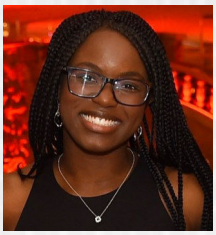
6th Year, STJ; Staff Writer

The profession of pharmacy is constantly evolving and adapting to the ever-changing field of healthcare. The Rho Chi Post serves as an amazing outlet for students to be informed, as well as to inform others, on the most up to date and relevant information. I could not be more excited to join the Rho Chi Post. This opportunity allows myself and my peers to take initiative and raise awareness of the advancements in the field of pharmacy. As a staff writer, I look forward to contributing to the Rho Chi Post and am grateful for the opportunity to educate students on the growth within our profession.

@ Arya Firoozan

5th Year, STJ; Staff Writer

Joining the Rho Chi Post is an opportunity to remain updated with new advancements in the science of pharmacy. The Post provides students with a platform to present the rest of the student body with interesting articles regarding new medications and important changes in the field. Keeping up with new developments and innovations is key to becoming a capable pharmacist. I am quite excited to join a team that is a voice of research and knowledge and look forward to contributing in a way that will benefit the pharmacy community.



@ Tolulope Omisakin

6th Year, STJ; Staff Editor

As an avid reader, I have always taken an interest in how things were written. Whether it be novels, journal articles, or magazine columns, there is always a peculiar way in which a writer tells a story. The real story is only 50% of what is written and the rest is in how the writer decides to disseminate that information. The Rho Chi Post serves as an amazing outlet for student pharmacists, allowing us to delve into the intricacies of different perspectives and ideas in the world of pharmacy. It also gives us the opportunity to decide how we want to detail these new found perspectives and ideas to our audience. As an incoming editor for The Rho Chi Post, I hope to enhance and curate the way each writer tells their stories and help them reach their audience at new levels.

@ Preethi Samuel

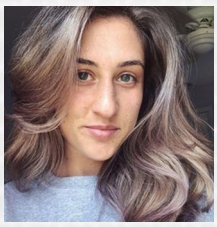
Graduate, STJ; Staff Writer

As future drug experts, we student pharmacists have a responsibility to take initiative and educate ourselves on advancements in healthcare, so as to improve the quality of patient care. The Rho Chi Post serves as a great platform for students to get information that is both accessible and accurate. To be a voice for my future, fellow pharmacists is to be heard and my patients cared for---as pharmacists are their best, sometimes their only, advocates. I hope that my contributions to the RCP spark readers' curiosity, and inspire conversations of how we may become better pharmacists.

@ Lyana Sayilar

6th Year, STJ; Staff Writer

I am thankful for the opportunity Rho Chi Post provides by engaging students, pharmacists, and faculty to learn from each other and spark new ideas, thoughts, and interests. The pharmacy profession is an ongoing and lifelong learning path and Rho Chi Post emphasizes and mirrors the importance of learning to provide pharmacists at our current jobs and patients in the future with recent information to improve patient care and outcomes. With the help of Rho Chi Post we can practice analyzing the literature that we read to improve our decision-making skills and communicate our findings with other members of the healthcare team.

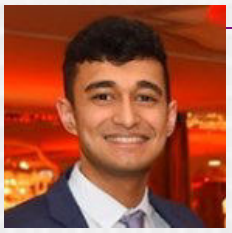


@ Dana Weinstein

6th Year, STJ; Staff Writer

I am so excited to be a part of the Rho Chi Post team. This opportunity allows both myself and my peers to be well informed about the ever-changing profession of pharmacy and the vital developments in science and healthcare. Beyond the classroom setting, this newsletter fills in the gaps for the most up-to-date and current advancements for students and faculty. As a staff writer, I look forward to acting as an educator, a motivator, and an executor to further the mission and goals of the Rho Chi Post.

RHO CHI POST: TEAM MEMBERS



@ Nishanth Viswanath

6th Year, STJ; Staff Writer

The profession of pharmacy is continuously expanding to meet new demands and offer novel platforms for innovation in healthcare. With an abundance of new information and guidance being published everyday, it can become difficult for students and professionals to stay updated with relevant information and find new outlets to learn. The Rho Chi Post not only allows us to be informed about the current state of our profession, but also allows students to voice their opinions and connect with each other through literature. I am excited to be part of its team, and hope to provide meaningful and resourceful contributions.

@ Edwin Gruda

6th Year, STJ; Staff Writer

My name is Edwin and I am a Doctor of Pharmacy student at St. John's University. My favorite aspect of pharmacy school is learning about the clinical and therapeutic components of drugs and diseases. As a kid, I was interested in both the math and sciences. The reason I chose pharmacy over other health care professions is because a lot of people rely on their medications to make them feel better. Pharmacists are the most accessible healthcare providers and are able to help patients optimize their drug therapy in order to improve their health. Throughout the beginning of pharmacy school, I volunteered at Columbia University Medical Center on the oncology department for one year. After that, I have been working as a pharmacy intern at Sandcastle Pharmacy, which is primarily an HIV specialty pharmacy. As a staff writer, I want to highlight the critical role of clinical pharmacists within an interdisciplinary team, in improving and enhancing a patient's quality of life.

MISSION

The Rho Chi Post is an award-winning, monthly, electronic, student-operated, faculty-approved publication that aims to promote the pharmacy profession through creativity and effective communication. Our publication is a profound platform for integrating ideas, opinions, and innovations from students, faculty, and administrators.

VISION

The Rho Chi Post aims to become the most exciting and creative student-operated newsletter within St. John's University College of Pharmacy and Health Sciences

Our newsletter continues to be known for its relatable and useful content

Our editorial team continues to be known for its excellence and professionalism

The Rho Chi Post essentially sets the stage for the future of student-operated publications in pharmacy

VALUES

Opportunity

Teamwork

Respect

Excellence

GOALS

To provide the highest quality student-operated newsletter with accurate information

To maintain a healthy, respectful, challenging, and rewarding environment for student editors

To cultivate sound relationships with other organizations and individuals who are like-minded and involved in like pursuits

To have a strong, positive impact on fellow students, faculty, and administrators

To contribute ideas and innovations to the Pharmacy profession