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# RHO PxCHI post

St. John's University College of Pharmacy & Health Sciences

THIS ISSUE'S FEATURED ARTICLE:

## FDA APPROVES TREATMENT FOR EARLY SYMPTOMATIC ALZHEIMER'S DISEASE, KISUNLATM (DONANEMAB-AZBT)

## About the Rho Chi Post

The Rho Chi Post was developed by the St. John's University Rho Chi Beta Delta Chapter in October 2011 as an electronic, student-operated newsletter publication with a team of three student editors and one Editor-in-Chief. Today, our newsletter boasts 12 volumes, over 90 published issues, and more than 600 unique articles to date with an editorial team of first to sixth year student pharmacists, as well as returning PharmD graduates.

The newsletter is distributed by St. John's University College of Pharmacy and Health Sciences to more than 1,500 students and faculty members. Our monthly electronic mailing list continues to extend readership far beyond campus.



## Mission

The Rho Chi Post is an award-winning, 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 and faculty.

## Vision

The Rho Chi Post aims to become the most creative and informative 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 sets the stage for the development of individual writing skills, collaborative team work, and leadership.

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## A Message from the Editor-in-Chief, Anjali Thykattil

It is with great honor that I introduce the Rho Chi Post's first issue of our 14th volume. I thank you for taking time out of your day to read over our newsletter. It is my intention that this issue teaches you something new, whether it be clinical, pharmacy news, or advice from our Rho Chi Talks or 6th Year Perspective. I would like to take a moment to thank our Editorial Team, Executive Board, advisors, and readers as this newsletter would not be possible without them. With this, I leave you to the rest of the issue, and I wish the student body a wonderful fall semester!

## Frequently Asked Questions

### Who can write for the Rho Chi Post Newsletter?

Anyone can write for the Rho Chi Post! Our newsletter is not exclusive to St. John's University students. The Rho Chi Post accepts articles on a daily basis!

### How do I submit an article?

You can submit an article by creating an account on our website! Go to www.rhochistj.org/RhoChiPost, click the login button from the upper menu bar, and click register. Upon making an account, you will be able to submit articles to our author inbox.

### Who determines article topics?

You are free to choose an article topic of your choice. Take a look at our Author Guidelines for ideas.

### What happens after I upload my draft article on the Rho Chi Post website?

Our Editor-In-Chief (EIC) will either edit the article directly or assign the article to a staff editor. If any revisions are needed, the editor will upload the article back to the portal, notifying the author via email. The author can then download the edited article, make the suggested revisions, and reupload the draft back to the portal. Additional drafts will be revaluated by our copy editors and then EIC, repeating this process. Once no further revisions are needed, the article is accepted for publication.

### Is there a deadline for authors to send revisions?

There is no deadline to submit revisions for an article. However, the quicker revisions are made, the quicker the article can move through our editing process. Once an article is accepted for publication, it will be moved into a queue to be placed into an upcoming issue.

# FDA Approves First Nasal Spray for Treatment of Anaphylaxis

By: Rebecca Sabzanov, PharmD Candidate c/o 2026

On August 9th, 2024, the Food and Drug Administration (FDA) approved Neffy, the first epinephrine intranasal spray, manufactured by ARS pharmaceuticals, for the treatment of anaphylaxis in adults and pediatric patients who weigh [1]at least 30 kilograms. Anaphylaxis is a severe allergic reaction which causes a multitude of symptoms, including skin reactions, respiratory problems, cardiovascular issues, and can therefore be life-threatening. Epinephrine is the first-line treatment of anaphylaxis and is usually administered via EpiPen, an auto-injector needle that is[2] administered into the thigh. Unlike traditional epinephrine delivery methods such as the EpiPen, Neffy is the first needle-free option to treat anaphylaxis.

Epinephrine is a sympathomimetic catecholamine that has dose dependent effects on both alpha-adrenergic and beta-adrenergic receptors. Smaller doses of epinephrine have a higher affinity for beta receptors, while higher doses selectively work on alpha receptors. On alpha-1 receptors, epinephrine promotes vasoconstriction, increased heart rate, and bronchodilation. This helps treats anaphylaxis as anaphylaxis leads to widespread vasodilation and airway constriction through the release of histamine and other inflammatory mediators from activated mast cells, which leads to hypotension. When epinephrine activates alpha-1 receptors, it reverses almost all signs of anaphylaxis by stabilizing mast cells, by causing vasoconstriction to counteract the extreme vasodilation that occurs, and by promoting bronchodilation through relaxation of the smooth muscles in the airway.[3]

In an analysis published by Elsevier, different administration methods of epinephrine were compared, specifically focusing on pharmacokinetic and pharmacodynamic profiles. These included: maximum plasma concentration (Cmax), systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR).4 Methods of administration of Epinephrine included manual intramuscular 0.3 mg epinephrine injection, autoinjector EpiPen, autoinjector Symjepi, and intranasal spray Neffy. The mean Cmax of Neffy (258 pg/mL) was comparable to the mean Cmax of Epinephrine 0.3 mg IM (254 pg/mL). EpiPen and Symjepi showed the highest mean Cmax values, 503 pg/mL and 438 pg/mL, respectively. For SBP, EpiPen had the highest mean systolic blood pressure maximum effect (18.1 mm Hg), followed by Neffy (16.9 mm Hg), Symjepi (14.9 mm Hg), and Epinephrine 0.3 mg IM (10.9 mm Hg). For diastolic blood pressure, Neffy was the only product of the ones tested which increased the mean DBP. The peak mean heart rate over time was highest for EpiPen, followed by Neffy, then Epinephrine 0.3 mg IM, and lastly Symjepi. The analysis concluded based on the results that Neffy showed comparable or higher pharmacodynamic responses relative to currently available delivery systems for epinephrine, despite having[4] lower end of Cmax.

The approval of Neffy is significant as the first non-injectable treatment of anaphylaxis and can address a critical barrier to timely treatment for those who have a fear of needles, commonly seen in both children who receive the medication and parents who need to administer the medication[5]. Besides its key feature of noninvasive delivery, it offers ease of use, requiring a single spray in one nostril, and portability, as it is small and convenient to carry. This is a substantial advancement in the management of anaphylaxis.

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## Advancements in Fertility Treatments: IVG vs. IVF

By: Ameena Qadri PharmD Candidate c/o 2027

Advancements in reproductive technology have considerably enhanced fertility treatments, with in-vitro fertilization (IVF) serving as the primary method for many years. IVF facilitates external fertilization of oocytes, offering a solution to infertility. However, this method has presented limitations due to its inability to produce viable gametes and its reduced success rates in older individuals. In contrast, in-vitro gametogenesis (IVG), a method that saw its first signs of success in animal trials in 2016, is now being studied as an alternative with the potential to address these limitations by generating functional gametes from pluripotent stem cells. Human gametogenesis involves the differentiation of germ cells into oocytes and spermatozoa, they combine to form a diploid zygote, initiating embryogenesis. At its core, human gametogenesis is the maintenance of totipotency during fertilization. Totipotency is the ability of a single cell to develop into an entire organism. IVG aims to replicate human gametogenesis in vitro, using stem cells to produce functional gametes.

Totipotent cells have the ability to form all cell types in an organism whereas pluripotent cells, such as Embryonic Stem Cells (ESCs) and Induced Pluripotent Stem Cells (iPSCs), can differentiate into[1] all cell types except extraembryonic tissue. IVG utilizes advanced stem cell technologies to create functional gametes in vitro. The primary types of stem cells used in IVG are Embryonic Stem Cells (ESCs) and Induced Pluripotent Stem Cells (iPSCs). Understanding these stem cells is crucial for comprehending the potential of IVG. Using two different types of stem cells creates two different potential methods when performing IVG. The first method, using Embryonic Stem Cells (ESCs), requires a pre-existing embryo; ESCs are extracted from the inner cell mass of a blastocyst. The Embryonic Stem Cells (ESCs) extracted from the embryo can then be cultured to form primordial germ cell-like cells (PGCLCs). These PGCLCs, can then be guided through the meiosis process and can then form viable gametes. This method allows for the creation of oocytes or sperm cells from these stem cells, which can then be used for fertilization to form embryos. Although this process is helpful for patients who are unable to produce more than one embryo from their pre-existing egg and sperm cells, this method does not help improve the conception rate for patients who are unable to produce any embryos on their own.

Pluripotent Stem Cells (iPSCs) offer an alternative to Embryonic Stem Cells (ESCs) by providing an ethical method for generating pluripotent cells since they do not require a preexisting embryo. Pluripotent stem-cell lines may be obtained through the reprogramming of somatic cells from[2] different tissues and species by the expression of specific factors. Since this process derives embryos from an individual's own cells, it significantly reduces the risk of immune rejection and providing a

safer and personalized approach to reproductive technologies. Like the IVG Embryonic Stem Cells (ESCs) method, Pluripotent Stem Cells (iPSCs) are used to generate PGCLCs, which are then cultured in an environment replicative to that of natural gametogenesis to produce haploid gametes. IVG uses either 46XX or 46XY somatic cells to make an oocyte or sperm cell from those lab based somatic cells and fertilize them with gametes of the opposite biological sex to make an embryo. This method has been demonstrated to effectively replicate critical aspects of meiosis, including chromosomal synapsis and recombination, with studies showing that "intracytoplasmic injection of the resulting spermatid-like cells into oocytes produced viable and fertile offspring."[3]

IVG has the potential to significantly enhance the accessibility and the success rate for fertility treatments by enabling the production of gametes from somatic cells, eliminating the need for viable gametes from the patient. This is particularly beneficial for individuals with non-functional gametes. Additionally, a study shows that “age-related fertility decline is a significant issue, with studies showing that fecundability decreases as women age, particularly after 35 years. By 40–44 years, half of women experience impaired reproductive capacity due to reduced ovarian[4] reserve and oocyte quality.” IVG creates a potential solution by generating gametes from somatic cells, which eliminates the issue of the lack of natural gametes due to age-related decline. IVG also allows for the generation of gametes in vitro, which can be screened for genetic abnormalities before fertilization. This could reduce the incidence of genetic disorders, offering a more precise approach to managing genetic risks compared to traditional IVF.

Despite its life changing impact, IVF has limitations, notably in older women. Research indicates that the failure rate for IVF cycles increases significantly with age. In a study conducted in 2023 involving women aged 41 and older, "211 started cycles, and 169 reached the oocyte pickup stage, resulting in a cancellation rate of 20%, compared to 10%[4] in the overall IVF group." These high failure rates reflect the difficulties of IVF in older women, who have decreased ovarian reserve and poorer oocyte quality. Moreover, IVF often requires multiple cycles, which can often cause significant physical, emotional, and financial burdens on patients. IVG may offer a more cost-effective and emotionally manageable option by hypothetically reducing the number of cycles needed and addressing infertility issues more efficiently and effectively.

While IVG holds immense potential, it faces several challenges. The technology is still in its early stages and still requires extensive research to ensure the safety and efficacy of IVG-derived gametes. Currently achieving complete meiosis and maintaining the genetic stability of the gametes produced pose as the most significant challenges. The long-term health effects of using IVG-derived gametes on offspring are also unknown, requiring further investigation to understand possible risks and ensure the safety and efficacy of the IVG process. Ongoing research is needed to address these issues and validate the reliability of IVG as a feasible reproductive technology. Despite the significant technical hurdles, in-vitro gametogenesis is a hopeful development in reproductive technology. IVG carries the potential to offer more inclusive and effective solutions for individuals facing infertility. While IVF has significantly impacted fertility treatments, the advancements offered by IVG

may address some of IVF's limitations, specifically regarding gamete viability and age-related fertility decline. Extensive research will be pivotal in eliminating current challenges and realizing the full potential of IVG.[5]

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## New York Providing Accessibility: Pharmacies Providing Hormonal Birth Control Without a Prescription

By: Amanda Nakhul, Biomedical Sciences c/o 2027

Reproductive rights, specifically abortion, has been a topic of contention for decades. From being pro-choice or pro-life, to debating the circumstances that permit abortion, various opinions have surfaced. Amid these opinions is one of the most critical issues: access. Contraceptive access can make or break a woman's choice to have an abortion and plays a major role in preventing unintentional pregnancies. According to the National Institutes of Health, "of women who had ever tried to get a prescription for hormonal contraception... 29% reported ever having problems obtaining a prescription or refills."[1]

This is reality for women regardless of whether they reside in conservative states, such as Indiana, or liberal states, such as New York. Recently, New York Governor Kathy Hochul passed legislation allowing pharmacists to provide hormonal contraceptives without a prescription. Though this action has pushed the state towards women's healthcare access, there are still points of concern.

First and foremost, to understand the importance of contraceptives, civilians need to acknowledge what exactly contraceptives do. Hormonal contraceptives are methods of birth control that utilize one's hormones to regulate or completely pause ovulation, thus, preventing unwanted pregnancy. The hormones released in the body typically consist of progesterone, its synthetic form, rogestin, and estrogen. As mentioned in the New York State Website, "the standing order signed by the State Health Commissioner pertains to three types of self-administered hormonal contraceptives that are approved by the federal Food and Drug Administration to prevent pregnancy, which include the following: oral hormonal pill, hormonal vaginal ring, hormonal contraceptive patch."[2] Oral hormonal pills are taken once daily, hormonal vaginal rings are left in for three weeks and removed for one week, and hormonal contraceptive patches are worn for one week. These methods are proven to be highly effective and provide benefits beyond preventing pregnancy, such as regulating periods, reducing menstrual-related pain or discomfort, and lowering the risk of endometrial and ovarian cancers. Unfortunately, like all medications, there are risks. In the case of hormonal birth control methods, women may experience nausea, weight gain, or mood changes.

Now that this law has passed in New York, pharmacies can dispense these forms of contraception without a prescription which eliminates an obstacle for women. Without needing a prescription, they can take control of their health immediately. Thus, relieving anxiety, especially for individuals who may not have regular access to healthcare. In rural areas, it is common for many people to lack insurance and be unable to visit a doctor. Because of this, pharmacies are their primary

access to healthcare. This is a notable and revolutionary step towards expanding reproductive health care. New York's decision to pass this legislation represents their pro-choice demeanor and advocacy of women's freedom.

For college and university students, having access to hormonal contraceptives without a prescription is important. Students who may be living far from home and dorm in New York, or are New Yorkers without proper health insurance, are all susceptible to unintended pregnancies and should have the resources they deserve. Also stated on the New York State website, "Governor Hochul also signed legislation in May 2023 to ensure that every student enrolled in a SUNY or CUNY college has access to medication abortion [3] on campus." Not only would a doctor's appointment be challenging to acquire, but time is limited.

In conclusion, the standing order in which oral hormonal pills, hormonal vaginal rings, and hormonal contraceptive patches are available without prescription is a remarkable step in increasing reproductive access for women. If women, teens, and adults are informed about what they can do with their bodies, the law can assist in providing more autonomy.

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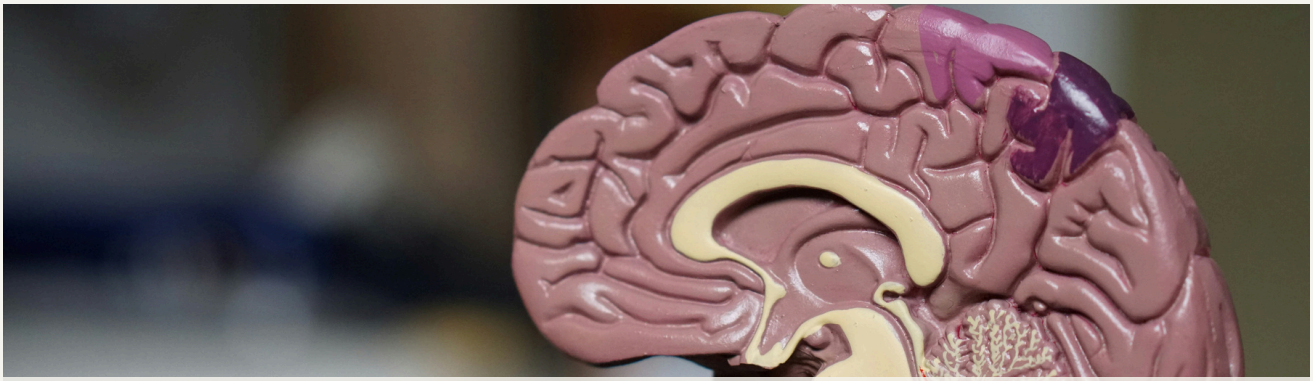

## FDA Approves Treatment for Early Symptomatic Alzheimer's Disease, KisunlaTM (donanemab-azbt)

By: Katelyn Hoosein, PharmD Candidate c/o 2025

Alzheimer's disease (AD) is a neurodegenerative disorder with symptoms that progressively worsen over time, including memory loss, impairment in judgment and problem solving, language deficit, social disengagement, irritability, agitation, aggression, and psychosis. AD typically occurs in patients 60 years of age and older, but, rarely, patients younger than 60 years old can develop[1] early-onset AD. The Centers for Disease Control and Prevention (CDC) estimates that 5.8 million Americans were living with AD in 2020 and this number is expected to increase to 14 million by 2060. In addition, the number of people living with AD doubles every 5 years beyond the age of 65 years.[2] After diagnosis, the average life expectancy of a person with AD is between 8 to 10 years, but may range from 3 to 20 years depending on the level of impairment and age at time of diagnosis. AD is thought to be the result of the formation of beta-amyloid plaques and neurofibrillary tangles. The beta-amyloid protein is created from the breakdown of a larger protein called the amyloid precursor. In AD, the beta-amyloid proteins clump together to form plaques, which disrupts cell signaling between neurons at the synapse. In addition, tau proteins bind together, leading to the formation of neurofibrillary tangles inside neurons. This disrupts cell signaling as well.[3]

There is currently no treatment to cure AD. According to the Alzheimer's Association, pharmacological therapy is aimed at maintaining quality of life and maximizing ability in performing daily activities by treating cognitive and non-cognitive symptoms and changing disease progression. Medications that treat cognitive symptoms, such as memory and thinking, include cholinesterase inhibitors (Donepezil, Rivastigmine, and Galantamine), glutamate regulators (Memantine), and a combination of both (Donepezil & Memantine (Namzaric)). Non-cognitive symptoms include sleep disturbances and agitation. Insomnia can be treated using an orexin receptor[4] antagonist called Suvorexant (Belsomra). There is currently one FDA-approved atypical antipsychotic, Brexipiprazole (Rexulti), used to treat agitation associated with AD. Medications that change disease progression aim to remove the

beta-amyloid protein and include Leqembi (Lecanemab) and Aduhelm (Aducanumab), which will be discontinued in November 2024.

On July 2, 2024, the Food and Drug Administration (FDA) approved Eli Lilly's Kisunla (donanemab-azbt) for adults with early symptomatic Alzheimer's disease, which includes patients with mild cognitive impairment and patients with the mild dementia stage with confirmed amyloid pathology.[5] Kisunla is a humanized monoclonal antibody that removes beta-amyloid plaques, one of the clinical features of AD.6 Kisunla is a 350 mg/20 ml (17.5 mg/ml) single-dose vial with an injection solution that is sterile, preservative-free, clear to opalescent, and colorless to slightly yellow to slightly brown. It must be kept refrigerated and protected from light. If refrigeration is not available, it can be stored in room temperature conditions for up to 3 days. It should not be frozen or shaken. Prior to administration, Kisunla must be diluted with 0.9% sodium chloride. Before dilution, Kisunla should be brought to room temperature. Then, the volume of Kisunla needed is withdrawn and mixed with enough 0.9% sodium chloride injection needed to make the final concentration between 4-10 mg/ml.6 The diluted solution is gently inverted to mix evenly, not shaken. After dilution, it is recommended to immediately administer the solution, but it can be stored refrigerated for up to 72 hours and at room temperature for up to 12 hours. The recommended dose of Kisunla is 700 mg every 4 weeks for 3 doses, then 1400 mg[6] every 4 weeks. It is administered as an intravenous infusion over 30 minutes.

A common side effect of Kisunla is headache. Kisunla has a warning for amyloid related imaging abnormalities (ARIA), which can be categorized into ARIA with edema (ARIA-E) or ARIA with hemosiderin deposition (ARIA-H). ARIA-E shows up on a brain MRI as edema or sulcal effusions, which is the leackage of fluid into the brain, and ARIA-H includes microhemorrhage and superficial siderosis, which is the deposition of hemosiderin in the brain due to blood extravasation. ARIA typically occurs within the first 24 weeks of treatment and is usually asymptomatic; however, headache, confusion, visual changes, dizziness, nausea, gait difficulty and seizures are common symptoms. The risk of ARIA is increased in patients that are apolipoprotein E ε4 (ApoE ε4) homozygotes, which accounts for about 15% of patients with AD.6 In addition to ARIA, Kisunla has been associated with intracerebral hemorrhages greater than 1cm in diameter. Other warnings and precautions with Kisunla include hypersensitivity reactions, including anaphylaxis and angioedema, and infusion-related reactions, including chills, erythema, nausea, vomiting, and dyspnea. Patients that develop an infusion-related reaction may have the infusion rate reduced or drug discontinued. Pre-treatment with antihistamines, acetaminophen, or corticosteroids may be useful prior to next dose to avoid an[6] infusion-related reaction.

The clinical effect of Kisunla was studied by the TRAILBLAZER-ALZ 2 trial, which was a multicenter, randomized, double-blind, placebo-controlled, phase 3 trial performed over 18 months[7] Participants were from 277 medical research centers/hospitals in 8 countries (United States, Australia. Canada,

Czech Republic, Great Britain, Japan, the Netherlands, and Poland). The study consisted of participants between the age of 60 to 85 years of age with early symptomatic Alzheimer's disease, which included mild cognitive impairment or mild dementia. Participants who were eligible also had screening Mini-Mental State Examination (MMSE) scores of 20 to 28 (indicating mild to moderate dementia or normal cognitive status), amyloid pathology ≥37 centiloids (a method of measure beta-amyloid in the brain) assessed with positron emission tomography (PET), and tau pathology also assessed by PET, which was categorized as low/medium or high tau. The study did not include patients with a significant neurological or psychiatric disease affecting the central nervous system other than AD, current serious or unstable illnesses, life expectancy less than 24 months, presence of amyloid-related imaging abnormalities of edema/effusion, more than 4 cerebral microhemorrhages, more than 1 area of superficial siderosis, and any intracerebral hemorrhage greater than 1 cm or severe white matter disease on MRI.7 8,240 patients were screened, but 1,736 were enrolled and 76% completed the[7] trial.

Participants in the TRAILBLAZER-ALZ 2 trial were randomly assigned in a 1:1 ratio by a computer-generated sequence with group assignments performed through baseline tau characteristics and enrollment site. 860 participants received donanemab (700 mg for the first 3 doses and 1400 mg after) and 876 received placebo, administered intravenously every 4 weeks for up to 72 weeks.[7] Amyloid plaque level was assessed at 24 and 52 weeks and, if it was less than 11 centiloids on one PET scan or less than 25 but greater than or equal to 11 centiloids on 2 consecutive PET scans, donanemab was switched to placebo in a blinded procedure. Final adverse event and efficacy assessments were performed at 76 weeks and ARIA monitoring occurred at 4, 12, 24, 52, and 76 weeks through MRI. If ARIA was detected, the participant had imaging every 4 to 6 weeks until resolved or stabilized.[7]

The primary outcome was change in the iADRS score, which is an assessment of cognitive and daily function, from baseline to 76 weeks in either the low/medium tau population or combined (low/medium and high tau) population. The score range for iADRS is 0 to 144, with lower scores indicating greater impairment, and the meaningful within-patient change is a change of 5 points for those with AD with mild cognitive impairment and 9 points for those with AD with mild dementia. Secondary outcomes included amyloid plaque reduction at 76 weeks, percentage of participants reaching amyloid clearance (defined as < 24.1 centiloids measured by PET at 24 weeks and 76 weeks), and adverse events.7 According to Figure 2 and Table 2, in the low/medium tau population, the mean change in the iADRS score from baseline to 76 weeks was -6.02 in the donanemab group and -9.27 in the placebo group (difference, 3.25 [95% confidence interval (CI), 1.88 to 4.62; P < 0.001), indicating a 35.1% slowing of disease progression with donanemab. In the combined tau population, the mean change in the iADRS score from baseline to 76 weeks was -10.19 in the donanemab group and -13.11 in the placebo group (difference, 2.92 [95% CI, 1.51 to 4.62, P < 0.001), indicating a 22.3% slowing of disease progression with donanemab.7 According to Figure 3a, in the low/medium tau population, brain amyloid plaque level decreased by 88.0 centiloids (95% CI, −90.20 to −85.87) with donanemab treatment and increased by 0.2 centiloids (95% CI, −1.91 to 2.26) with placebo at 76 weeks.[7]

In the combined tau population, brain amyloid plaque level decreased by 87.0 centiloids (95% CI, −88.90 to −85.17) with donanemab and decreased by 0.67 centiloids (95% CI, −2.45 to 1.11) with placebo. This indicates that donanemab cleared more amyloid plaque from the brain when compared to placebo. According to Figure 3b, in the low/medium tau population, 34.2% of patients (95% CI, 30.22%-38.34%) achieved amyloid clearance at 24 weeks and 80.1% of patients (95% CI, 76.12%-83.62%) reached it at 76 weeks in the donanemab group r56compared to 0.2% of patients (95% CI, 0.03%-1.02%) at 24 weeks and 0% of patients (95% CI, 0.00%-0.81%) at 76 weeks in the placebo group. In the combined tau population, amyloid clearance was achieved by 29.7% of patients (95% CI, 26.56%-33.04%) at 24 weeks and 76.4% of patients (95% CI, 72.87%-79.57%) at 76 weeks for the donanemab group and 0.2% of patients (95% CI, 0.07%-0.90%) at 24 weeks and 0.3% of patients (95% CI, 0.08%-1.05%) at 76 weeks for the placebo group.7These results indicate that in both the low/medium tau population and combined tau population, donanemab had higher rates of amyloid clearance when compared to placebo.[7]

The TRAILBLAZER-ALZ 2 trial also reported adverse events within both the donanemab and placebo groups. According to Table 3, the incidence of death was 1.9% (16 participants) in the donanemab group and 1.1% (10 participants) in the placebo group.7 The incidence of serious adverse events was 17.4% in the donanemab group and 15.8% in the placebo group. Treatment-emergent adverse events (ARIA-E, ARIA-H, COVID-19, headache, fall, infusion-related reaction, dizziness, diarrhea, fatigue, arthralgia, urinary tract infection, and superficial siderosis of the central nervous system) occurred in 759 or 89% of participants treated with donanemab and 718 or 82.2% of participants treated with placebo, with ARIA-E and ARIA-H having the highest incidence. ARIA occurred in 314 or 36.8% of participants receiving donanemab and 130 or 14.9% of participants receiving placebo. Of those cases, ARIA-E occurred in 205 or 24% of participants in the donanemab group and 18 or 2.1% of participants in the placebo group, and ARIA-H occurred in 268 or 31.4% of participants in the donanemab group and 119 or 13.6% of participants in the placebo group. 112 or 13.1% of participants in the donanemab group and 38 or 4.3% of participants in the placebo group discontinued treatment due to adverse events, the most common being ARIA, infusion-related reactions, or hypersensitivity reaction. Infusion-related reactions were occurred in 74 participants (8.7%) in the donanemab group and 4 participants (0.4%) in the placebo group. Anaphylaxis occurred in 3 patients in the donanemab group, but they were mild to moderate reactions.[7]

Alzheimer's disease is a progressive neurological disease which can be devastating for patients and their loved ones. The FDA's approval of Kisunla is a significant advancement in the management of Alzheimer's disease. Although there is no cure for Alzheimer's, Eli Lilly's Kisunla slows disease progression, allowing for improved quality of life and maximization of ability and independence for patients.

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# Rho Chi Talks: Dr. Hyunah Cho Leads Novel Nano-Based Optical Imaging Agent Research for Cancer Surgical Treatment Following $745,000 Grant from the NIH

By: Jennalynn Fung, PharmD candidate c/o 2025

Dr. Hyunah Cho, Ph.D., an Assistant Professor in the Department of Pharmaceutical Sciences, was awarded a $745,000 R16 Sure-First grant from the National Institute of General Medical Sciences (NIGMS). Her research is focused on developing nano-based optical imaging agents as prospective tools for brain imaging.

If applied clinically, they would improve tumor resectioning in brain surgeries by enhancing visual distinction of cancerous tissues from normal tissues, thus increasing surgical accuracy and precision, and lessening likelihood of iatrogenic injury. This innovation would provide surgeons the ability to more completely remove cancer from the brain, thus improving surgical outcomes, cancer remission rates, and patient survival. The imaging agents are composed of a fluorescent particle attached to a targeting moiety, which will drive the entire chemical compound towards a targeted tumor site. The fluorescence will become activated (or “turn on”) at the site of the tumor. Dr. Cho compares this to a candy which contains a fluorescent agent at its core – it remains inactive, until it arrives at the tumor, in which it breaks apart and releases the fluorescence – enabling surgeons to identify the tumor as glowing tissue more easily.

As an assistant professor, she has many students who are interested in working in her lab and has lots of advice for them when it comes to pursuing research. One of those tips is being realistic and understanding that 99% of research projects fail, and if they succeed, it takes much longer to directly reach the patient. All things considered, the research that Dr. Cho does today on nano-based optical imaging agents with the NIH grant may be just the beginning of biotechnological advancements that can benefit people around the world.

**Can you walk us through the inspiration behind your research on nano-based optical imaging agents for brain tumors?**

Many cancer patients often have surgery because surgery is a primary regimen to treat cancer. Greater than 50% of patients come back to hospitals because tumors regrow or metastasize somewhere. So, if there's a way to help surgeons to make better resections the first time so we can minimize them coming back for another surgery, start thinking about contrast agents and visualize the tumor better. The contrast-based agent is fluorescent dye in polymer brain cells, and this is engineered to target brain cells. This imaging agent will paint the tumor. Surgeons wear surgical goggles, looking into the patient they might see colors coming from the tissue. Oftentimes, tumors may not be distinguished. Can look like fat or

surrounding tissue, but making a clean cut is difficult, especially the brain. Tumor or lungs you might scoop more to remove as much tissue as possible and that's safe but not with the brain, that is lethal. Because of this, it is important to show which is real tumor tissue and which is not. Using optical imaging, surgeons can have another tool. They can use their naked eye to remove it, and then use the goggles and recut if they missed anything. This ensures they can keep as many surrounding brain cells as possible that are normal.

**Can you explain in simple terms how the fluorescence signal 'switches on' when it arrives at the tumor site?**

Think about like a candy, see something in the middle of the candy, deliver the whole candy to the tumor tissues when the fluorescent agent in the candy, it is aggregated not showing the fluorescent signal, but once reaches the tumor cells, the candy breaks apart, the agent incorporated in the center will slowly come apart and will show much stronger fluorescence. Before they reach the tumor they show nothing, but once they reach it will break down at the tumor site and the fluorescence comes out.

**Why does the candy only break down at the tumor site?**

Attached to a targeting moiety, so it can be decorated with something else. The targeting moiety will shoot to the tumor and will then break, and the micelles will open.

**Is fluorescence a novel method?**

People have tried to show fluorescence from the beginning. But most studies, people tried to deliver something with strong fluorescence immediately.

However, the signals are strong, and it can go to other locations like the liver or kidney. I am one of the few who adopted the approach of trying to use this system intranasally. Through olfactory system, it will go to the brain. I don't see anyone else doing the intranasal route for the imaging, and that was one of the positive comments I got from NIH grant. They commented this as a high risk, high reward with intranasal delivery of the agent, especially for brain cancer. This can be exciting because if it works, it can open up a lot of new areas to study.

**How do you think nano-based imaging technologies will change the landscape of brain surgery in the future?**

The good thing about nanoparticles is that it can be used for different cancers and different organs. It can also decorate the nanoparticle surface with different peptides and antibodies. Antibody A will go to the liver. Antibody B will go to the brain. So, it depends on the site of action you expect. Because of this, you can really increase the specificity of the drug and decrease the side effects. When something is not targeted, it will go to the entire body and can hurt your hair follicles, your skin, and different organs. For example, chemotherapy patients will lose their hair and experience different side effects, because the drug goes everywhere. With nanoparticles, we can change the targeting and reduce side effects.

And with nanoparticles, you can make liquid form of the poorly soluble water drugs, and many chemotherapeutic agents are poorly soluble. But you still want to do injections, so you need excipients. This can cause allergic reactions. With the nanoparticles, you can

just add poorly water double drugs. Like putting it in the candy, and it will be hydrophilic. This way it can dissolve water and improve water solubility, but you don't need to add any excipients or alcohol. Often, you would need to add alcohol to add more drugs to the excipients, and alcohol is toxic. But with nanoparticles, you don't need those toxic excipients.

**In your view, what are some of the current gaps or limitations in brain imaging technologies that your research addresses?**

I am interested in nanoparticle development. This one of my few nanoparticle projects. Nanoparticles with natural ingredients like soybeans can incorporate hydrophobic or poorly water-soluble products and turn it into lotion or serum. That can be one of the projects, not too serious, more of a consumer product and more about consumer care. Other nanoparticle projects I want to visualize are for Parkinson's Disease, Alzheimer's, and ovarian cancer. This is a platform that depends on what drugs you have, agents, and targeting moiety. You can apply it to so many different areas. Nanoparticles was one of the things done in my PhD program, my thesis project. To me, it is an exciting time that people know how important nanoparticles are now!

One of the main issues with brain imaging, or imaging in general, is that in order to use fluorescent imaging, it must come with detection tools. So, you need a monitor and microscope that can really visualize the fluorescence. This can be challenging, especially when used simultaneously in a busy operating room, and may not be acceptable to surgeons who are operating at the same time.

The specificity–how do we guarantee how much of the nanoparticles and contrast agent actually goes to the tumor? Is it going to go 100% to the tumor or go to a different organ? Will the surgeons see it? Given how difficult it is to cure brain cancer, I think the future is bright. People will be willing to adopt and explore new and different techniques and modalities to help the surgeons.

**What are some of the ethical challenges or considerations that come into play when developing these kinds of imaging agents for brain surgery?**

Some challenges include using animal subjects and cancer cells, or performing in vitro work. We don't file an IRB. For animals, we need specific approval to get certain protocol approved. So we can execute animal studies with certain doses, dosing regimens, how we deal with animals if they are sick, when do we stop the animal study. Losing 10% of the body weight, they might be sic because of the cancer, because of the doses, there might be different reasons, so you have to be ethical. Sometimes want to do research and see the result, but the animal is getting sick, you have to top it. But sometimes have those tempting to continue, just one more day, maye there is results. Treat the same as a human subject, treat the animals with human respect.

Ethical way to sacrifice animals. Brave new world. Have to make sure you're not violating it. Animals experience pain and uncomfortable feelings, and have to make sure you're not going above what they can handle.

**What was the most challenging aspect of securing the $745,000 R16 Sure-First grant from NIGMS?**

Very difficult. Most of the faculty members not just school of pharmacy, everyone competes for the same award. There is fierce competition, most of the time faculty members need to apply over and over. It is difficult to get first trial, but i was lucky that i got it first time. It is very difficult. You apply, frustration comes, review the reviewers comments. There are nice ones, but many are rather negative you need how to deal with the negative comments and improve your proposals. These awards are pretty high in terms of funding, the money, so everyone wants to get an award, everyone wants a better research environment. Many times we assume we are not going to get in. 50% of me imagines that we will not get the grant. There might be people with more resources, students, so competing without knowing who else is entering, it is very difficult, federal funding from NIH and NSF. one of our goals is always to secure the funding. Once you secure the funding, it will open up so many opportunities. I can support my students, get the supplies they want. Before i secured the grant, I don't have enough funding. Sometimes they want to order more pricey supplies or animal studies, but I don't have funding to support it. But now I do. So now my students are very happy. So they don't have to look for something to borrow, they can just stock up. This award involve intense animal studies and expensive supplies and ingredients and a number of animals, so without securing the NIH grant, I wouldn't be able to conduct any of these studies. This will help me do more top notch research projects and publish papers in high impact journal. Get to work with more undergrads and Pharmd students.

And the fact that I work on this project, it is public information that I secured the grant and a brief summary of the grant, I get to work with people outside of the school. They know what projects I have done. I have received some emails from companies or others outside, and they asked if we can collaborate.

**How do you stay motivated and passionate about research, especially with the challenges that come with innovative projects like yours?**

Part of what motivates me is working with students, undergrad and graduate. They bring their own ideas and they got exciting results to share with me. Seeing them excited about research and digging in the details, to learn about the project, that's one of the motivations. I want to be here to motivate and support them to become researchers and scientists. Second is when I come up with an idea, a hypothesis. Will it really work? After the experiment I can confirm that my hypothesis is correct, that this is applicable to the real world, this is what I was thinking, and it is really true. It is very motivating;

Academic research is difficult to get on market, unlike findustry research projects which are highly likely to be commercialized and will reach the patient. For us, it takes longer and it is unfortunately unlikely that it will immediately reach the patient. But, I can see that what I publish can help others. I published a paper about rectal suppository of Artesenate, and found it was talked about in one of malaria association website, and that this is possible and this is the latest research so my academic research can be spoke about by physicians and healthcare providers and the potential work and this motivates me to do more.

### How do you balance your teaching responsibilities with your extensive research work?

Since I have the federal grant, the federal grant guarantees your teaching workload relief. Teaching 1 course less. I was supposed to teach 2 compounding classes, now just teaching one section and can spend more time doing more research. This is a benefit of the grant, you have more time spent on research and training students.

Not my first time teaching compounding classes, so not spending too much extra time to prepare for teaching. Course notes spent less because she already spent a lot of time in the beginning. It is a good balance because she has more time doing stuff in the lab.

### How do you decide which students to add to the research project?

This is for graduate students, but I'm also thinking that I want to include PharmD students and undergrad students. I always try to have as many students as possible. Usually, students reach out through email. They learn about my research through my classes. Some students they present things about their research at the symposium, or women in science talk. Students often think research is having good results, but 99% of the time we fail and figure out why we fail. So, I'm frank with the students that this is not always the reality, not always butterflies and flowers. You may spend a lot of time with the process, coming after class to run the experiment. I explain to them what goes into the research. Starting from small tasks, I want to have one or two undergrad students working on this task, would you be interested in doing so. I do a casual interview with them, explain the research, the lab, how we go about doing the research, then compare their schedule, willingness to time, and want them to spend 1 year in the lab.

I want them to see from beginning to end and write a paper or an abstract to present with me. If they meet all of those requirements, I will select the student. Also, about chemistry not about GPA not about extracurriculars, I just want to see if that student will match my level of excitement we will be sitting down and talking a lot so I see a few different elements and how many positions I have and including students. This grant work hasn't decided on how many students to have, but I'm hoping to have 1 or 2 undergraduate students to assist graduate students and in writing abstracts and writing papers together. I really want our undergrad students and PharmD students to be exposed to research. If you don't know what it is, you wouldn't really think about that area at all. Research can be frustrating, but really exciting and what you learn in the classroom can be explicable, so I want to share the knowledge and experience as much.

Around the time I had to graduate, I was thinking about career options, explored, went to seminars and webinars. I remember one of the talks done by faculty members was talking about injectable products, NDDS (novel drug delivery systems) products, nanoparticles, and so I chose a research rotation. He gave me so many opportunities, I really enjoyed it so much. I got to attend meetings outside of school and got to present research at ASHP. It is very rare for undergrad students to go and present, that was eye opener. I didn't know about all of that amazing research, people from the industry and academia. So, when I came back, I decided to do a masters and PhD. That was how I began to thinking about my career path in science and research.

**What advice do you have for students who are interested in pursuing research in pharmaceutical sciences?**

I am always telling students if they are interested in doing research that they should read and see what type of research they're interested in, and what faculty members can do. Just going through their bio or going through the St. John's website helps. This describes what research they do, what papers they have published. They can actually go to those papers and go through those and see what they are more interested in so they can narrow down the faculty members or labs in and outside of St. John's. Visiting the lab, making an appointment to see it, asking to shadow to see if there are no positions open. They can be more proactive, reach out to more faculty. Also, if they are truly interested and have certain ideas, they can suggest it to professors. Some students suggest it, it happens to me, and that can be an interesting collaboration. It can be a win-win situation because students can execute their own ideas and the professor might not have thought about it. All the faculty are truly excited to have students work with them. So just do a little bit of research and contact them, get their feet wet and see what they like the most. Can discuss their future career if they're seriously thinking about that so faculty should be able to advise.

# 6th Year Perspective: A Case Study on How to Best Manage Complicated Chronic Disease in Rural, Peripatetic, and Nomadic Populations

By: Jennalynn Fung, PharmD Candidate c/o 2025

**Introduction**

I'm a final year pharmacy student completing my Advanced Pharmacy Practice Rotations. I completed one of my ambulatory care pharmacy rotations at Crow/Northern Cheyenne Hospital in Crow Agency, Montana, which serves Native Americans. I had previously worked as a JRCOSTEP in summer of 2021 at the same site and sought to serve the community once again but on a more clinical level. During this rotation, I lead many patient visits for chronic conditions like diabetes, hypertension, hyperlipidemia, coagulative issues, and more.

**Case Presentation**

A 44-year-old national firefighter presented to the pharmacy clinic for medication management. He had no chief complaint, only presenting to the hospital to refill his medications in preparation of expected work-related travel for the next month. Upon evaluation, the patient had three major uncontrolled disease states which all required treatment.

**Patient History**

*Medical History*

- Type 2 Diabetes, diagnosed in 2021
- Hyperlipidemia, diagnosed in 2021
- Hypertension, diagnosed in 2023 – related to proteinuria
- Obesity – Class 1, Low risk

*Medications*

- Alogliptin 25 mg tab – 1 tab by mouth everyday
- Metformin 500mg XR tab – 2 tabs by mouth twice a day
- Rosuvastatin 20mg tab – 1 tab by mouth everyday

*Allergies*

- Ibuprofen allergy

*Social History*

Patient works as a national firefighter which requires him to carry a 65-pound pack and hike several miles through mountainous terrain. He typically works 30 to 32 days at a time and returns home for 3 days at a time during the fire season. He reports that his job can be stressful depending on where and who he is working with, bringing up anecdotes of emergency situations where local and state level fire departments would not cooperate with the national level.[1]

While on the job, he may stay at a hotel, vehicle, or in the field depending on what is available. When at home, sleeps-in the first day back. On the second and third day, tries to get housework and other domestic responsibilities done, including picking up his medications. Mentions he doesn't have time for an appointment with a provider.

Patient says he drinks a lot of Gatorade, provided by his job, and eats what is available to him while on the road.

This may be be grocery store or gas station food. He tries to watch YouTube videos to educate himself on diabetes and nutrition. Patient does not drink alcohol and does not mention exercising other than work. Reports trying to rest when back at home.

*Family History*
Mentions that all individuals on his father's side have high blood pressure and cardiovascular issues.

**Physical Examination**
*Vital signs*

- Heart rate: 86 beats per minute
- Blood pressure
  - Late 2024: 135/88
  - Early 2024: 135/88
  - Early 2023: 131/89
  - Early 2023: 138/93
  - Early 2022: 129/79
- Height: 170 centimeters (5 foot 5 inches)
- Weight: 94.9 kilograms (202.219 lb)
- Body Mass Index (BMI): 32.77
- O2: 97%
- RS: 18/min
- Temperature: 95.72 F (35.4 C)

*General appearance*
Awake and fully able to converse, sitting in chair. Appeared calm, comfortable, asymptomatic other than expressed increased thirst and frequent urination.

**Laboratory Values**

| GOAL | < 7% | 80-130<br>F<180 PP | < 70 | > 40 | < 150 |
|---|---|---|---|---|---|
| Year | A1C | Glucose | LDL | HDL | TRIG |
| 2024 | 12.3 | 564 | 208 | 44 | 184 |
| 2023 | | | 185 | 45 | 245 |
| 2023 | 11.3 | 278 | | | |
| 2022 | 13.7 | 346 | | | |
| 2022 | 15.1 | 387 | | | |
| 2021 | | | 146 | 45 | 576 |
| 2021 | 6.3 | 134 | 128 | 54 | 80 |

**Counseling Points and Patient-Provider Conversation**
New lab results did not arrive until after discussing treatment options based on the most recent available labs with the patient. Through the discussion, the patient confirmed that the last time he had received his medications was nearly 4 months prior. His medication non-adherence placed him at risk of his conditions progressing and worsening. He was open to restarting his previous medications, but also open to revising therapy as the pharmacist saw fit.

In previous visits with providers, he had expressed disinterest in injectable therapy.
During this clinic visit, he explained that he tried to manage his diseases without medication in the beginning. He said he was successful and lowered his A1C greatly. He explained he has been teaching himself about diabetes, diet and nutrition, and blood glucose through watching YouTube videos. He explained that he sometimes feels his blood glucose levels are low, and that he carries glucose with him to get his levels back up.

Based on guidelines, many different pharmacotherapy options were suggested for either initiation or discontinuation.[2]

Recommended by Diabetes guidelines:

- Metformin – patient was OK with continuing this. Explained the process of max dosing and advised him to take it with food.
- Insulin – due to the patient's glucose levels exceeding 300 and an A1C exceeding 10, it would be beneficial to initiate this. However, he explained that storing and refrigerating the insulin would be difficult. He also was not confident in his ability to do follow-up within two weeks over the phone with the pharmacy clinic.
- Ozempic – highly recommended by guidelines due to ability to help manage diabetes and other comorbidities simultaneously. He liked that it was a once weekly dose, but was not confident in his ability to store at room temperature during the fire season.
- Empagliflozin – can help significantly lower both the A1C and glucose by removing sugar from the blood and pushing it out through the urine. However, had to explain to him that with an A1C over 10, his body was already peeing out a lot of sugar. Thus, with the addition of this medication, glucose in urine would be even higher and would increase risk of developing urinary and genital infections. He was okay with this and decided it was worth trying. He was directed to call the pharmacy clinic phone number if any symptoms appeared, and he would need to see a provider if he developed an infection.

Not recommended by Diabetes guidelines:

- Alogliptin – won't do much for his A1C. Pharmacist's counseling point was that "it will be like a drop in the bucket, only impact by like 0.8." [3]

During care at the clinic, his blood pressure was taken. It was 147/99 upon first measurement; then, remeasured to be 137/93. Both values are still above goal, indicating a need for pharmacotherapy.[4]

Recommended by Hypertension guidelines:

- ACE Inhibitor/Angiotensin Receptor Blocker (ARB) + Dihydropyridine-Calcium Channel Blocker (DHP-CCB)
- Lisinopril (ACE Inhibitor) would be beneficial to start at a low dose, then titrate up to reach the goal. Lisinopril 10mg is appropriate.

Counseled on:

- Hypoglycemia – symptoms and ways to combat when levels are below 70
  - Pseudo hypoglycemia – the importance of understanding when blood sugar may feel low, but are not actually low
- Hyperglycemia – more than 125 FBG, more than 180 PPBG
- What to eat and how much carbs to eat (plate visual)
- Blood glucose logs to record at least 3 mornings for fasting, and 3 nights for post-prandial / before bedtime
- Importance of adherence to prevent progression of disease
  - For diabetes, preventing diabetic ketoacidosis, retinopathy, neuropathy, diabetic foot infections and more
  - For hypertension and hyperlipidemia, preventing cardiovascular disease

**Further Developments**

When labs arrived, this prompted immediate treatment. His LDL came back at 208 mg/dl, prompting the reinitiation of rosuvastatin that prevents the creation of cholesterol by selectively and competitively inhibiting HMG-CoA reductase. His A1C and glucose were 12.3 and 564, respectively, requiring insulin. 5 units of insulin Aspart were administered subcutaneously, then glucose was remeasured after 15 minutes. The blood glucose level dropped from 564 to 394. It was important to note that the patient was shocked to learn his sugar levels were above 500. He had mentioned during the beginning of the clinic visit that he has been feeling low. However, with a level above 500, it is extremely unlikely that it was true hypoglycemia, indicating that he might not truly understand how and when to recognize a real low blood sugar for his body, and may have underestimated his ability to manage the diseases without medicine.

**Outcome (Treatment and Plan)**

In clinic:

- Initiated Insulin Aspart 5 units SQ

Outpatient:

- Restarted Metformin XR 500mg – tapering according to guidelines, starting with 500mg XR QD for 1 week, then increasing by 500mg every week until a max total dose of 2000 mg/day.
- Restarted Rosuvastatin 20mg
- Initiated Lisinopril 10mg
- Fingerstick testing supplies – freestyle lancet, lite test strip, and glucose monitor

Patient will return to hospital to see a provider and pharmacist at the end of 2024 for updated diabetes and hyperlipidemia labs, as well as monitoring potential adverse effects from the medications (such as potassium changes due to lisinopril use, or the need for increasing dosages due to not reaching set lab goals).

**Barriers and Social Determinants of Health**

The patient's lifestyle and work require constant travel and long periods away from home, making it difficult to adhere to consistent medication schedules, access to care by providers and pharmacists, and difficulty in storing his medications. His housing is unstable; stay and temporary lodging can also contribute to lack of access to healthcare or medications. His diet being influenced by convenience rather than health can also contribute to worsening of his conditions. The stress of fighting fires and working in teams can also be a factor. His work being physically demanding may also lead him to believe that his level of exercise is sufficient to manage his diseases without medicine. Being involved in the firefighter work culture may also contribute to his belief that he is tough and can combat problems on his own without any help.

National health policy and work policies may make it more difficult to obtain care. The availability of telehealth and nationwide pharmacy networks could be scarce depending on where he is stationed for work. Firefighters who declare insulin dependency are required to pass more physical examinations to work on the front lines, which may discourage a patient from taking insulin even if it helps them manage their conditions, because it has the possibility of affecting his income.[5]

In addition, individual level social cognition and cognitive control processes can play a part in how he interprets the disease state and its ability to be managed without medication. Although he states he was previously an EMT, he mentioned he switched careers due to too many examinations as an EMT.

Thus, he likely has some health literacy but may not exercise or strengthen his medical vocabulary regularly. He attempts to educate himself about diabetes and nutrition by watching YouTube videos, but the accuracy and quality of that information is not verified. His belief in managing diabetes through diet alone may stem from misconceptions about the severity of his condition or the necessary role of medications in treatment. His understanding of hypoglycemia versus pseudo hypoglycemia may also be lacking. Although he states he is willing to restart medications, his inability to regularly follow up with his providers and his inconsistent medication use suggest that his work-life balance may impair his ability to plan and execute long term health strategies.

There is also a question of the kind of support system he has at home; he may have a girlfriend, but unknown whether he has other ties to the community. Also remaining a question is whether his ability to manage his conditions improves after the fire season ends.

**Discussions**

In rural or underserved areas, patients like this firefighter, who are constantly on the move and unable to access regular healthcare, often fall through the cracks of the healthcare system. Without consistent follow-ups or the ability to access specialists frequently, many patients may struggle to manage chronic conditions, leading to worsened outcomes over time. This lack of access could contribute to higher rates of diabetes-related complications such as diabetic ketoacidosis, neuropathy, or cardiovascular disease.

Due to limited access to regular healthcare, it's difficult to adhere to the ideal management of chronic conditions like diabetes, hypertension and hyperlipidemia.

This patient, with an A1C of 12.3%, glucose of 564 mg/dL, and LDL of 208 mg/dL, would typically require more immediate follow-ups and lab monitoring every three months. However, the constraints of his lifestyle make this approach impractical. These situations emphasize the value of pharmacists in adapting rigid clinical guidelines to real-world conditions, where traditional care models may not always apply.

Pharmacists, as the drug experts, play a vital role in interpreting and applying these guidelines in a flexible manner, especially when patients don't fit neatly into standard protocols. In this case, the pharmacist recognized the urgency of the patient's uncontrolled diabetes and initiated insulin therapy with 5 units of insulin Aspart in the clinic, alongside restarting metformin and adding rosuvastatin and lisinopril. Ideally, the patient would need close monitoring, particularly with insulin initiation, including a follow-up within two weeks. But given the patient's nomadic lifestyle and challenges in accessing care, the pharmacist had to balance immediate intervention with the practicality of long-term adherence.

Recognizing that regular insulin use could be problematic due to the patient's limited ability to store the medication while on the road, the pharmacist considered other options, such as empagliflozin, which could offer glycemic control without the strict storage and administration requirements of insulin. This decision reflects the pharmacist's ability to apply clinical knowledge in a patient-centered way, adapting the rigid framework of care guidelines to suit the patient's unique circumstances.

Flexibility is key in such cases, and the pharmacist's expertise allows for tailored solutions that still prioritize patient safety and optimal outcomes. Beyond medication management, the pharmacist also plays a crucial role in educating patients about their condition and treatment. In this case, the patient received important counseling on the recognition of hypoglycemia, an especially pertinent concern when insulin is introduced. The pharmacist also emphasized the long-term risks of uncontrolled diabetes, which could impact the patient's overall health, work, and lifestyle if not properly addressed. While a follow-up appointment is scheduled for the end of 2024, the pharmacist's intervention ensures that the patient has a treatment plan in place that can function, even under less-than-ideal circumstances.

In summary, pharmacists are invaluable in managing complex patients who do not fit neatly into clinical guidelines. Through their deep understanding of pharmacotherapy and their ability to adjust treatment plans in a patient-centric manner, they help optimize care even when perfect management isn't possible. This case illustrates the importance of pharmacists in rural or underserved areas, where healthcare access is limited, and clinical flexibility is often required to meet patients where they are.

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# Meet the 2024-2025 Team Members

## Editorial Team & Production

### Anjali Thykattil
**Editor-in-Chief**

The Rho Chi Post serves as both a creative and educational platform that allows students and faculty to collaborate in sharing their knowledge with the pharmacy community. Unlike other pharmacy organizations at St. John's, it also allows for the unique experience of expanding research and writing skills outside of the classroom setting. As pharmacy students, it is imperative we continue to educate ourselves as the world of healthcare is ever-changing. I am honored to be a part of the Rho Chi Post's Editorial Team and look forward to serving as this year's Editor-in-Chief!

### John Ortiz
**Managing Editor**

Rho Chi Post is an opportunity for students to foster their writing and investigative skills concerning the pharmacy practice. Through Rho Chi Post, students are also exposed to novel information and perspectives that are present in the pharmacy community and in our own student body. By honing our understanding of new innovations and developments in pharmacy, we will be better adept at providing accurate information to readers and maintaining the continuous education expected of pharmacists.

### Bao Qi Chen
**Senior Content-Focused Copy Editor**

The Rho Chi Post is a bridge between students and the world we will soon enter once we graduate. My ambition is to promote intellect, values, and opportunities that not only allow students to be heard but also impact the pharmacy profession as a whole. I am honored to be a part of the Rho Chi Post's editorial team and work with colleagues who share this ambition. I am excited and grateful for this opportunity, and I look forward to working with everyone!

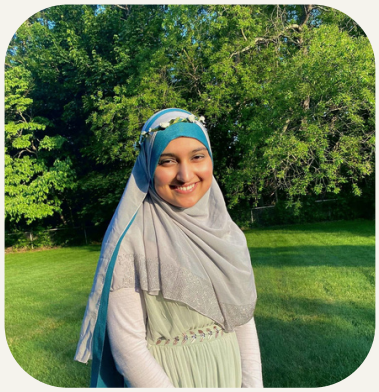
# MEET THE TEAM

### Warda Basher
**Senior Content-Focused Copy Editor**

Joining this esteemed team excites me with the opportunity to gain invaluable experience and insights into the latest trends in pharmacy. I am eager to expand my professional network and make significant contributions to the field. As a member of the editorial team, I'll be at the forefront of disseminating the most current news and knowledge, effectively impacting pharmacy professionals worldwide with timely and relevant information.

### Ramesa Anan
**Content-Focused Copy Editor**

Being in the Rho Chi Post means being part of an environment that allows me to grow both academically and professionally in the field of pharmacy. It means being able to participate with like minded individuals who strive to grow in the field of pharmacy by publishing newsletters with relatable and useful content. I hope to contribute to the continuing success of this student-operated newsletter and aid my team to the best of my ability.



### Sameeha Arshad
**Content-Focused Copy Editor**

To me, being a part of the Rho Chi Post means being part of a community that values knowledge sharing, collaboration, and making a positive impact in the field of pharmacy. It provides me with a platform to contribute meaningful insights, engage with fellow pharmacy students, and inspire others through informative articles and discussions. The opportunity to be a part of this publication is both rewarding and enriching, allowing me to grow professionally and connect with a diverse audience passionate about pharmacy and healthcare.

### Amanda Kim
**Content-Focused Copy Editor**

Being part of the Rho Chi Post means having the opportunity to help actively contribute to the advancement of the pharmacy profession. As an editor, I will be able to enhance my own writing, be inspired, and share the new innovations/issues within healthcare with my peers. I am very excited to join the team this year!

# MEET THE TEAM

## Laiel Bravo
### Content-Focused Copy Editor

The Rho Chi Post has been a segway for pharmacy students to immerse themselves in valuable research work, advancements, and issues within the field. As future pharmacists, it is important to be informed of the latest news and gain insight from the experiences/ideas of others so that we are equipped to further improve the healthcare system. I aspire to use this opportunity to not only enhance my own preparedness but also to help enhance my peers in being ideal professionals who provide exemplary care to patients.

## Zainab Masood
### Senior Graphics-Focused Copy Editor

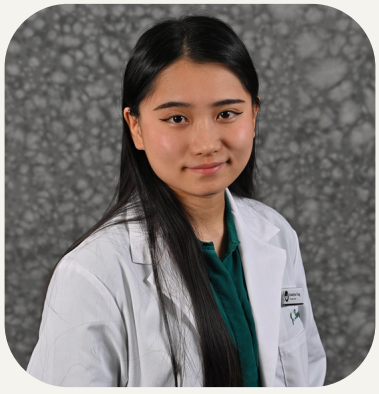
Being part of Rho Chi Post, which provides information on discoveries and research to others, is an honor. Taking insight from professionals and peers to educate others is a rather significant effort in the expanding and evolving role of pharmacists. I look forward to collaborating with the team in pushing this effort further while also learning from them.

## Nalisha Xu
### Graphics-Focused Copy Editor

By becoming a part of the Rho Chi editorial team, I wish to learn more about the pharmacy field and community by gaining insight through our publications. This position will not only allow me to broaden my views on the profession of pharmacy, but also explore topics related to the medical field as a whole. Through Rho Chi's team, I will utilize this experience to grow professionally, develop leadership skills, and be more involved in our community to improve my confidence and professionalism on my journey to becoming a pharmacist.

## Jennalynn Fung
### Senior Staff Editor

I am thrilled to have the opportunity to express my creativity, critical thinking, and research skills through contributing to the Rho Chi Post. The mission to promote intellectual discourse and showcase diverse perspectives aligns with my values; I look forward to putting my writing and editing experience to use in each issue, and hope that my involvement can ensure that future cohorts will also have this valuable platform available to them.



# MEET THE TEAM

## Sharupa Azmal
**Senior Staff Editor**

The Rho Chi Post serves as a notable forum for pharmacy students who wish to expose themselves to medical journalism. Being a staff editor of the Rho Chi Post means amplifying the voices of our writers and educating our readers regarding current events in healthcare. This role provides me with the opportunity to present insightful stories that are relevant to the pharmacy community and contribute to the advancement of the profession through writing.

## Anya Geiling
**Staff Editor**

Hello! My name is Anya, and I am very grateful to be a part of Rho Chi Post. As a rising Sophomore studying Nursing, I have a passion for understanding and sharing research about the medical field. I am ecstatic to be able to utilize my editing skills to assist with medical-related articles.

## Wajiha Uddin
**Staff Editor**

The Rho Chi Post is a robust community of pharmacy students that are dedicated to fostering growth and sharing newest technologies and innovations in pharmaceutical practice. Being part of the Rho Chi Post means being involved in the supportive network of peers that share a passion for pharmaceutical education, practice, and the drive for contributing to the advancement of pharmaceutical knowledge.

## Christiana Popovic
**Staff Editor**

As a member of the Rho Chi Post, I would be part of a professional community that shares insights, advancements, and challenges within the field of pharmacy. The Rho Chi Post not only empowers and educates, but it shapes the future of pharmacy through its engaging and concise writing.

# MEET THE TEAM

## Christine Mauceri
**Senior Staff Writer**

Every student deserves a voice, and to me, being a part of the Rho Chi Post allows us to make that voice heard. Whether it's through opinion pieces, talking about personal experiences, or educating on new pharmacy advancements, this newsletter sticks to its mission of promoting the pharmacy profession. As a Staff Writer, I am excited to learn, grow, and make meaningful contributions to the profession!

## Rand Ayoub
**Staff Writer**

Being in Rho Chi Post gives us the opportunity to shed light on crucial topics within healthcare to the St. John's Community. By using the skills and information given to us in our academic classes, this organization offers a chance for people to build on those skills and be able utilize them for the better. I look forward to contributing to Rho Chi Post as well as learning from an amazing group of people!

## Nivaj Haque
**Staff Writer**

Joining the Rho Chi Post will allow me to merge my analytical skills with my passion for public health, within the rapidly evolving field of pharmacy. This role helps keep us at the forefront of pharmacy innovations and enables me to contribute to keeping our pharmacy community well-informed. I'll explore new research and policy changes, aiming to enhance our collective understanding and application of pharmacy practices that positively impact patient care and healthcare delivery. I'm excited about starting this role and engaging in discussions that shape the future of our profession.

## Rebecca Sabzanov
**Staff Writer**

Being part of Rho Chi Post is an exciting opportunity for me to merge my passions for writing and pharmacy in a prestigious organization. I'm enthusiastic to contribute to such a respectful organization and collaborate with other members of the Rho Chi Post to produce meaningful content that will impact others.

# MEET THE TEAM

## Ameena Qadri
### Staff Writer

Being a member of the Rho Chi post means a great deal to me because it is the perfect outlet for me to write about pharmacy related topics that interest me the most. I feel that the Rho Chi post will also allow me to develop my writing skills both professionally and creatively. I sincerely appreciate your consideration and I am looking forward to joining the team!

## Michelle Flores
### Staff Writer

My name is Michelle Flores and an incoming fourth year pharmacy student. Having the opportunity to be a Staff Writer gives me the chance to educate others about pharmacy news. Pharmacy is a field that is constantly evolving and as future pharmacists, it is our responsibility to continue learning. Maintaining current knowledge benefits not only our patients but also enriches our own expertise. I'm thankful and excited to be a part of Rho Chi Post as a Staff writer this upcoming year!

## Amanda Nakhul
### Staff Writer

Hello! My name is Amanda Nakhul, I'm a rising sophomore and biomedical sciences major. I'm rather new to St. John's, so being a part of a high-quality collaborative organization such as the Rho Chi Post means the world to me. As a Staff Writer I am able to incorporate my passion for writing with my appreciation for Pharmacy and medicine. The Rho Chi Post provides a foundation for student-operated publications and it is an honor to be included in this journey.

## Royal Mussaleen
### Staff Writer

As a member of the Rho Chi Post, I see this as an opportunity to enhance the pharmacy profession. By highlighting the diverse roles pharmacists play; from ensuring medication safety and efficacy, conducting research, advocating for patient safety, to analyzing healthcare trends like telepharmacy and personalized medicine, and advancements in gene therapy and immunotherapy; I aim to showcase the impact pharmacists have on society's well-being. I intend to offer engaging perspectives on pharmaceutical developments, healthcare policy changes, and the role of pharmacists in regulatory affairs. Through my contributions, I hope to spark curiosity in our readers to explore the underlying reasons and mechanisms behind these processes.

# MEET THE TEAM

## Ariella Zadrima
### Staff Writer

As a pharmacy student and future pharmacist, I believe it is a quintessential duty to educate ourselves on current media regarding the medical field and continuously adapt to the new ideas we may face as we enter the pharmacy profession. With topics from emerging diseases to scientific advances made, it is important to be accustomed to new ideas that pertain to our potential responsibilities as a pharmacist. As a Rho Chi Staff Writer, I hope to discuss matters that will inform not only pharmacy students but the St. John's community as a whole on topics that have to do with general health and scientific developments. With my interest in writing and the pharmacy field, I hope to touch upon subjects passionate to me that can benefit our community and inspire our readers to integrate themselves into the ever-growing profession of pharmacy.

# MEET THE TEAM

## Social Media & Outreach

### Maliha Akter
**Engagement & Outreach Manager**

In my pursuit of becoming a knowledgeable and skilled pharmacist, I remain committed to staying informed about disease treatment and public-health policy. Being a part of Rho Chi Post provides an excellent platform for continuous education and knowledge-sharing with peers. Engaging with individuals from diverse backgrounds fosters critical viewpoints and discussions, all focused on enhancing patient-centered care. Additionally, the newsletter enables me to nurture my lifelong passion for writing while staying updated on the latest healthcare developments. As I embrace this transformative journey, I am dedicated to adapting, learning, and making a positive impact on patient well-being as a compassionate and competent pharmacist.

### Bhojranie Brahmanand
**Engagement & Outreach Manager**

The Rho Chi Post uses its platform to spread knowledge of groundbreaking discoveries that are changing the standard of care for society. It delivers a creative and innovative scope of the pharmacy world. As a school of pharmacy, it is pivotal to become aware of healthcare matters. In turn, we can strengthen our understanding of the field and become more competent pharmacy practitioners. I am excited to be joining the team this year as a staff writer. I look forward to working alongside like-minded individuals in cultivating writing pieces that will share the importance of this profession.

### Paulina Maczko
**Engagement & Outreach Manager**

As pharmacy students, I believe we have an obligation of staying informed on current healthcare topics, topics that the Rho Chi Post sheds light on. To be part of such a team is an honor, as students are granted the opportunity of a creative outlet, whether that is by writing the articles or organizing the newsletter. As a copy editor, I look forward to seeing first-hand how students voice their opinions, thoughts, and academic learnings. I'm grateful to be part of a team that allows students to understand what they are capable of, and simultaneously advance their writing, comprehension, and communication skills.

## Social Media & Outreach

### Celestine Van Sertima
**Engagement & Outreach Manager**

When applying to the Rho Chi Post, I was initially fascinated by their goals of providing the highest quality of information to the St. John's community through a student operated newsletter that cultivates both student spirit and expansion of knowledge. Through my passion for writing and health care, combined with my experience in graphic designing, I look forward to what I can contribute to the Rho Chi Post.

# MEET THE TEAM

## Advisors

### Dr. Ketan Patel
### MPharm, PhD

It is an honor to serve as a faculty advisor of Beta Delta Chapter of a 100-year-old prestigious society of pharmaceutical professionals – The Rho Chi Society. With great enthusiasm, I am committed to assist the Rho Chi member's endeavors in: (1) disseminating the latest information/technology in healthcare system; (2) promoting pharmaceutical field & career propulsive networking of current students, alumni, and faculties; and (3) facilitating the scholastic activities and recognizing the scholars.

### Dr. Mohammad Rattu
### PharmD, BCOP, BCPS, BCGP

I am thankful to have been the 2012 editor-in-chief of the Rho ChiPost newsletter, as well as on the 2019 alumni honor roll of the national Rho Chi organization. This is one of the most successful longitudinal projects at my alma mater, as evidenced by its decade-long persistence and teams of highly-motivated students. I remain available for professional support and assistance with the new year's initiatives.

# The Rho Chi Society

## Executive Board

### Esther Lee
**President**

Rho Chi Society is an academic honor society comprised of only the brightest in pharmacy that embodies its core values of intellectual achievement, critical inquiry, ethical standards, collaboration, and fellowship. Through various opportunities that Rho Chi, and other pharmacy organizations alike, have provided us, the members of Rho Chi are thankful for the guidance of the pharmacy professionals who preceded us and feel a profound sense of responsibility to extend the same support and mentorship to future generations. Driven by the same commitment to academic excellence and desire to both advance and contribute to the profession, our various academic committees, networking events, and service to community initiatives, have provided an abundance of opportunities for each member to develop their personal and professional skills, explore their interests in pharmacy, form valuable relationships, and mentor the next generation of pharmacists.

### Sharupa Azmal
**Vice President**

The Rho Chi Society cultivates intellectual curiosity and fosters students to be strong leaders and advocates for the pharmacy profession. Over the years, the events and initiatives offered by Rho Chi have played a pivotal role in shaping my sense of professionalism while nurturing a constant desire to reach my full potential. Being a member of Rho Chi signifies a commitment to excellence in every aspect of pharmacy. As Vice President, I hope to inspire both my peers and underclassmen to pursue their best selves, not only academically but personally, while embodying the core values of leadership, integrity, and service that are at the heart of our organization.

### Nalisha Xu
**Secretary**

Rho Chi's society creates an environment for everyone to support each other on their way to professionalism. It connects everyone through a foundation of pharmacy society to sharpen and promote communication, networking, and leadership skills. It is a community that gives everyone a sense of belonging and inclusiveness, as well as providing room for each individual to explore their own specialty and impact on the pharmaceutical field.

### Jamila Chowdhury
**Treasurer**

Rho Chi Pharmacy Honor Society is a prestigious organization that promotes academic excellence, leadership, and community among future leaders in pharmacy. By fostering collaboration and encouraging the pursuit of high scholarly achievements, Rho Chi members are able to learn from each other and maximize their growth as future healthcare professionals. The society provides a platform for aspiring pharmacists to lead with integrity, share knowledge, and make a positive impact on the field of pharmacy and healthcare as a whole.

# The Rho Chi Society

## Executive Board

### Isabel Gendin

**Historian**

Rho Chi Pharmacy Honors Society provides an environment that fosters academic excellence among pharmacy students and also explores the various aspects of the pharmacy field. As the Historian and Development and Outreach Coordinator, I view this organization as a powerful platform to encourage one another to aim for success within our academics, as well as building communication, leadership, and professional growth. Not only are we growing our pharmacy knowledge within the classroom, but Rho Chi allows students to explore the diverse pathways within the field through networking, leadership events, and collaboration. I am very honored to be part of a society that drives both personal and professional growth, and I am dedicated to upholding our mission to uplift future leaders in pharmacy.

### Kelly Yeung

**Academic Committee Chair**

Rho Chi Society is a distinguished academic honor society where students can collaborate and help each other, while following the core values of professionalism, service, and leadership. I am honored to accept my position on the executive board of this academic year and I hope to fulfill my duties so I can contribute to allow Rho Chi to positively impact the pharmacy society and help other fellow pharmacy students.