

An award-winning, bimonthly, electronic, student-operated newsletter publication by the St. John's University College of Pharmacy and Health Sciences Rho Chi Beta Delta chapter











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The Rho Chi Society encourages and recognizes excellence in intellectual achievement and advocates critical inquiry in all aspects of Pharmacy.

The Society further encourages high standards of conduct and character and fosters fellowship among its members.

The Society seeks universal recognition of its members as lifelong intellectual leaders in Pharmacy, and as a community of scholars, to instill the desire to pursue intellectual excellence and critical inquiry to advance the profession.



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## **RHO CHI POST: TEAM MEMBERS**



#### @ Karen Lin

#### 6th Year, STJ; Editor-in-Chief

The Rho Chi Post allows me to have an appreciation for interactive pharmacy learning as well as the art of writing. With each newsletter, my goal is to provide current information to readers who come across the Post. As an editor, I hope to make the newsletter one-of-a -kind and motivate and influence writers to explore science with their creative talents.



## @ Matthew Kahn

#### 5<sup>th</sup> Year, STJ; Graphics Editor

I've always loved graphic design, so I was thrilled at the opportunity to be a part of the Rho Chi Post team and contribute to future publications. I'm excited to explore new ways to make the Post even better, and also to be continuously exposed to new ideas in the pharmaceutical field.



## @ Sang Hyo Kim

#### 6th Year, STJ; Section Editor: Puzzles

Advances in technology and medicine, as well as improved quality of life, have prolonged lifespans and increased the geriatric population. Pharmaceutical industries and healthcare systems persistently work to find solutions to changing demands and new problems of the society. I wish to learn, educate, and prepare myself and others for the future.



#### @ Jack (Hongkai) Bao 5<sup>th</sup> Year, STJ; Staff Editor

In my 3<sup>rd</sup> year of pharmacy school, I was introduced to the Rho Chi Post, an award-winning newsletter run by students. My involvement began by simply reading monthly articles, but as time passed, my passion for writing grew. Coupled with my interest in pharmacy, I made the initiative to apply for a position. Now, as a team member, I believe that the Post is a great way for students and faculty to stay up to date concerning pharmacy news.





#### Graduate Copy Editor [Content-Focused]

My two great loves are innovative science and quality writing; the Rho Chi Post is an insightful combination of both. As an editor, I look forward to bringing relevant information and fresh perspectives to the student and faculty of St. John's University, as well as to making the Rho Chi Post a newsletter that offers something new to every reader.



As a member of the Rho Chi Post team, I have a vast appreciation of what it means to be a pharmacist in the rapidly evolving world of healthcare. As a graduate editor, I will continue to bring my passion for science and creativity to the Rho Chi Post.



#### @ Bharat Kirthivasan, PhD

**Graduate Copy Editor [Content-Focused]** I received my doctorate in Industrial Pharmacy researching nanoparticles for delivery to the brain. The only thing I enjoy more than reading a well-written piece of work is writing it. I am glad to work for the Rho Chi Post, and I encourage others to do the same.



#### @ Mei Fung

## 6<sup>th</sup> Year, STJ; Staff Editor & RCP Website Liaison

It's always interesting to see how the healthcare field evolves and all the advancements in pharmacy come to fruition. I joined the Rho Chi Post because it brings together a variety of these topics with distinguishing perspectives from our peers in pharmacy practice. I am ecstatic to join the team in continuing Rho Chi Post's endeavors in promoting the profession.



## **RHO CHI POST: TEAM MEMBERS**



## @ Alex Chu

#### 5th Year, STJ; Staff Writer

With a constantly evolving healthcare field, it is imperative that we keep ourselves up to date with the latest news. This is what led me to join the Rho Chi Post, which constantly comes out with interesting and informative topics. It is an honor to write for the Rho Chi Post, and I wish to contribute innovative and intriguing articles to this newsletter.



#### @ Jonathan Mercado 5<sup>th</sup> Year, STJ: Staff Writer

The Rho Chi Post breaks barriers for students that want a glimpse of their future and acts as an inspiration to work harder to achieve their goals. It is an embodiment of the motivation and intelligence that drives pharmacy students to be the most informed and capable professionals they can be. I am glad to a part of that mission and to channel my passion and interests through this newsletter.

#### @ Amy Nguyen

#### 4<sup>th</sup> Year, STJ; Events and Social Media Manager

Because the pharmaceutical industries and healthcare systems are constantly changing and evolving, it's important to stay up to date on such topics. The student-run Rho Chi Post brings such relevant issues with a creative twist to the table. As the Events and Social Media Manager, I hope to create more outreach events geared towards showcasing the importance and benefits of the Post to students, alumni, and faculty of St. John's University and from other campuses.



## **@ Gabrielle Flavoni** 6<sup>th</sup> Year, STJ; Staff Writer

Writing has always been an enormous passion of mine, and I'm blessed to join such an amazing team that encourages me to explore it. As a new Staff Writer for the Post, my goal is to aid others in staying up-to-date about the pharmacy world, while also utilizing a creative outlet to make an impact on those around me.



#### **@** Nicole Cheung

## 6<sup>th</sup> Year, STJ; Finance and Outreach Manager

As the Finance and Outreach Manager for the Rho Chi Post, I will act as the primary liaison and collaborate with the Graphics Editor to present information promoting our newsletter to other Rho Chi chapters. Using my experience of applying for NIH and Novo Nordisk Grants, I will assist with writing up proposal budgets as well as maintain accurate financial records. I am proud of our student-operated newsletter publication, and look forward to expanding our organization and network to create more educational workshops and further promote the pharmacy profession.

# RHO CHI

We are always looking for creative and motivated students to join our team! If you are interested in becoming a Rho Chi Post editorial team member, visit:

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## QUOTE OF THE MONTH

By: Matthew Kahn, Graphics Editor



## 2017's Immunization Guidelines Officially Released by the CDC

## By: Gabrielle Flavoni, PharmD Candidate c/o 2018

The release of this year's updated immunization schedule has sent a buzz throughout the healthcare industry. From small changes in the footnotes to an addition to an entire new table, the Advisory Committee on Immunization Practices (ACIP) has done what it could to clarify the guidelines, while also making it easier to read.<sup>1</sup> In ACIP's October meeting, members came together to vote on changes for this year's guidelines, and has since been backed with the FDA's approval.<sup>1</sup>

The first set of changes were made to the footnotes of the guidelines. In general, the footnotes were simplified and organized in a more standardized, condensed manner. The "Additional Information" footnote was moved to the cover page to better organize the information, and the general formatting of the footnotes was heavily revised.<sup>2</sup>

The second set of changes were made to the adult vaccination schedule itself. <sup>3</sup>

The changes are presented as the following:

- Hepatitis B: Suggests that a monovalent birth dose should be given to all newborns within 24 hours of being born.<sup>3</sup>
- Haemophilus influenzae Type b: This Comvax vaccine was removed since it is no longer available for use.<sup>3</sup>
- Pneumococcal conjugate: PCV7 vaccine was removed since all children who received PCV7 in their primary series have now exited that age range

- Influenza: Low effectiveness of the live attenuated influenza vaccine (LAIV) has been shown and is not recommended for 2016-2017 flu season.<sup>3</sup>
- Meningococcal ACWY: This vaccine is now promoted for adults with HIV for 2017. Adults who are at risk due to a meningococcal disease outbreak should also receive 1 dose of this vaccine.<sup>3</sup>
- Meningococcal B: Directions have been added concerning people 16-23. The new guidelines state that they may be vaccinated with discretion from health care providers. Also, three doses of this vaccine are recommended at 0, 1-2, and 6 month intervals for adults who are at an increased risk for meningococcal disease.<sup>3</sup>
- Tdap: Pregnant women are now recommended to receive a dose as early as 27-36 weeks.<sup>3</sup>
- HPV: New revisions indicate that the dose recommended is based on the age of the patient being vaccinated. Two doses is advised for people before their 15th birthday, yet three doses are recommended if the person has specific immunocompromised conditions listed within the section. Also, if females or males have not received these vaccines by 26 years old and 21 years old respectively, they are to be given a three-dose series of vaccinations at designated monthly intervals.<sup>3</sup>



The third set of changes were to Figures 1 and 2 of the Birth to Adolescent Schedule:

- In Figure 1, a column has been added for adolescents who are of 16 years of age. They have separated the 16 year old age block from the 17 and 18 year-olds in order to further emphasize the importance of men receiving the meningococcal conjugate vaccine (MenACWY) booster by the age of 16. A blue bar was also added to the HPV vaccine indicating that the vaccine is still safe to receive even in the absence of a high-risk condition.<sup>4</sup>
- In both figures, the standardized acronyms for vaccines are now used in order to simplify the information presented, and colored blocks are used to make the chart more visually pleasing; both lead to enhanced consistency and readability.<sup>5</sup>
- In Figure 2, the topic columns within the chart have been reorganized in order to have a better flow of information. Related topics were placed together, and special populations were linked together. They also changed the color block for MenACWY for HIV infection from purple to yellow.<sup>6</sup>

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[Author(s)]. [Article Title]. Rho Chi Post. [Year and Month Published]. [Volume]([Issue]):[Pages].

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## Evaluating Pharmacy Curriculum Outcomes Assessment and NAPLEX Performance, Phase 1

By: Zachary Piracha, PharmD Candidate c/o 2017

#### BACKGROUND

RHO CHI post

The pharmacy profession is constantly fortified by an ever-evolving process by which students of pharmacy become practicing healthcare providers licensed in their respective states. The National Association of Boards of Pharmacy (NABP) carefully regulates the dissemination of tests as well as the shifting forms of administration and its arcane question writing process, which has only been reported through anecdotal recollections from professors.<sup>1,2</sup>

Indisputably, the pharmacy student is often purposely shrouded in mystery regarding their ultimate licensing exam so that they may focus instead on the didactic coursework throughout schooling.<sup>3</sup>

However, student performance relevant to the North American Pharmacist Licensure Examination (NAPLEX) should be evaluated at certain crucial gap junctions in their learning, and this is accomplished with an annual exam known as the Pharmacy Curriculum Outcomes Assessment (PCOA). This serves as a benchmark for pharmacy students in their professional years of study across the country.<sup>2,4</sup> Scores are calculated and distributed back to students as a percentile against the rest of their year (in keeping with the same standardization they would face on the NAPLEX) including performance ratings in key categories such as medicinal chemistry, public health, and biostatistics in the score report.

Still, a true correlation between the basic science nature of the PCOA and the real-life applications employed during the NAPLEX is difficult to elucidate without a full analysis of the PCOA's 26 subcategories and the new format for the 6 hour NAPLEX examination beginning in 2017. Our goal is to assess how effective the PCOA is at evaluating preparatory material for the NAPLEX when offered to students.<sup>3</sup>

## METHODS

We wanted to determine whether or not the PCOA was helpful in gauging how well students performed on the NAPLEX. We asked 100 students in their final year of pharmacy school, who took the PCOA at least one time prior to taking NAPLEX, what their opinions of the PCOA were and how confident they felt about taking the NAPLEX. We also asked if the PCOA had given these students any insight on what to expect for the NAPLEX.

We offered all participants a chance to take a free sample simulation test geared towards the new NAPLEX format and to self-report their scores to us. Original preparatory information was provided by Jakstat Tutors LLC. The primary purpose was to elucidate a correlation between the PCOA and NAPLEX content, all while enhancing student confidence for the NAPLEX. The secondary purpose was to gauge how effective the practice material was in preparing students for the NAPLEX, which will be discussed in phase II of this trial.

## RESULTS

Of the 100 students, 40% of the group scored above the 60th percentile on the PCOA and the correlation coefficient was found to be 0.7. After 12 months of follow-up, the passing rate was measured and correlated through a linear regression with PCOA scores and NAPLEX simulation exam scores. This conclusion leads us to believe that the PCOA exam, coupled with supplemental study materials, is ample for preparing most students for the NAPLEX exam.

#### DISCUSSION

Because there was a correlation between PCOA and NAPLEX prep scores, we rejected the null hypothesis and accepted the alternative hypothesis. The secondary endpoint measured was time to study, which was selfreported number of hours per week each student claimed they studied for school. We sorted these students into heavy and low studiers and also saw a correlation based on their simulated NAPLEX exam scores. However, self-reporting could bring about recollection bias as well as reporting bias. This was not a primary endpoint of the study and further analysis should be performed.

Although this poll is subject to the several biases stated above, this study demonstrated how assessment material such as the PCOA may be correlated with student NAPLEX readiness. This wealth of information not only puts into perspective how student outcomes may appear, but may potentially shine light on areas that need fortification. The change of the NAPLEX format introduces an uncharted area in which we cannot assess new material. However, the PCOA gives students and committee members alike the opportunity to learn and self-assess while simultaneously adjusting coursework for an always-shifting board examination.

Future studies correlating NAPLEX performance and the PCOA need to be conducted with actual NAPLEX results which this study aims to do in its subsequent phase. These phase II studies we are conducting on the same cohort will evaluate which section's proficiency best predicts a student's pass or fail rate on the real-time exam. Future studies need to be conducted utilizing larger populations with more emphasis on illuminating the demographics behind NAPLEX performance and whether this factor could even outweigh the significance of early PCOA returns. Lending credence to the weight of PCOA scores could offer opportunities to extrapolate data that can be used to determine a causal factor in NAPLEX pass rates.

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## Rocket (Health) Science:

## Pharmaceutical Challenges at the Johnson Space Center

## By: Kimberly Lapierre, PharmD Candidate c/o 2017

Since its inception in 2003, the Johnson Space Center Pharmacy has taken giant leaps to advance the field of pharmacy on Earth and in space. Under the direction of pharmacist Tina Bayuse, the pharmacy is responsible for preparing medication kits for astronauts at the International Space Station, creatively approaching medication challenges that come with the extraterrestrial territory, and providing ambulatory care for the Flight Medicine and Occupational Medicine clinics.<sup>1</sup> The pharmacy packages two types of medication kits: convenience kits and contingency kits. Convenience kits include any medications a person on earth has on hand, whereas contingency kits are comprised of drugs that are needed in more advanced situations, such as infection or cardiac arrest.

The contents of these kits address any predicable or unpredictable medical complications an astronaut may encounter. The medication supply is tremendously important given the effects space travel has on the body. For example, osteopenia is a common side effect of spaceflight as weight bearing bones and muscles deteriorate. A decrease in gravity leads to lack of stressinduced bone remodeling and increased bone resorption. In an attempt to combat bone loss, astronauts may take bisphosphonates, like zolendronate or risedronate, or hormonal therapy, including selective estrogen receptor modulators (SERMs).<sup>2</sup> Secondly, astronauts experience decreased immune system functioning as a result of poorly reproducing T cells. This is further complicated by the existence of microbes with increased virulence due to adaption to the space environment.<sup>3</sup> Therefore, topical and systemic antifungals, antivirals, and antibiotics are included in the medication kits. Lastly, like any type of long term travel, space travel wreaks havoc on astronauts' sleep wake cycles, with the majority of astronauts using sleeping pills and stimulants. An observational study from 2012 that examined sleep habits of astronauts from 80 space shuttle missions found that 78% of

crew members took sleep promoting drugs, mostly zolpidem, on 52% of nights.<sup>4</sup>

In addition to considering the needs of the astronauts when preparing the kits, the pharmacy must stock drugs with space appropriate dosage forms. The volume of the drugs is taken into consideration when first time fliers or doctors are making requests. Furthermore, how medications are prepared can be an obstacle. Tina Bayuse cites that managing alcohol levels in medicines and the ability to take drugs while wearing a space suit are among the challenges.<sup>1</sup> Moreover, the dosage forms of medications can affect their stabilities, which is an important point to consider for long term missions.

The "Stability of Pharmacotherapeutic and Nutritional Compounds" study analyzed the stability of 35 different medications of various dosage forms such as liquids, tablets, and capsules. Multiple stability kits were launched into space in July 2006 and each returned for testing at various time intervals from June 2007 to November 2008.<sup>5</sup> The medications were tested for degradation and compared against a control kit that stayed on the ground. The results showed that the space kit medications degraded more rapidly than the ground control kits, with Augmentin® (amoxicillin/clavulanate) being the most unstable due to

the clavulanate component degrading by almost 50%. These results justify the space center's current policy of short dating the medications to expire six months before the manufacturers given date. Moreover, drugs that were repackaged were even more susceptible to degradation than if kept in their original packaging.<sup>6</sup> The decreased stability of medications in space contributes to another barrier: the need for more frequent resupply, which may not be possible on longer missions. Therefore, contingency kits that contain medications for emergency situations are not repackaged in order to preserve the shelf lives of its drugs.



Like prescribing and dispensing medications on Earth, space pharmacy comes with high stakes. Therefore, three different pharmacists check each medication kit before it goes into orbit. Also, astronauts are encouraged to undergo drug tolerance testing, or trial runs, to ensure that unwanted side effects do not occur when taking a medication for the first time.<sup>1</sup> These precautions minimize the inherent risk of taking medication in space. Although space pharmacy can be problematic, the Johnson Space Center Pharmacy team approaches each challenge with ingenuity and expertise to ensure the safety of each and every one of its astronauts.

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## Stevens-Johnson Syndrome: Physiological Progression and Management

## By: Omar Rahman, PharmD Candidate c/o 2017

Stevens-Johnson Syndrome is a unique skin disease that may be due to an infection, a response to medication, or other idiopathic causes. It is uncommon, as there are approximately only 20,000 cases worldwide annually. The etiology confirms that about half of the cases are in reaction to iatrogenic causes such as antibiotics, anti-convulsants, and anti-inflammatory medications. About a quarter of the cases are allotted to responses to infectious agents including, but not limited to Herpes Simplex Virus and Mycoplasma Pneumonia. The remainder of causes are idiopathic. <sup>1</sup>

The disease is typically characterized by fever, severe purulent conjunctivitis, and inflammation of mucosal tissue. Physiologically, Stevens-Johnson Syndrome is significantly attributed to major changes in lymphohistiocytic infiltrate around blood vessels. Other key aspects of pathophysiology include degenerative changes in endothelial cells of the capillaries, as well as epidermal edema and necrosis due to immune responses. <sup>1,2</sup> In looking for Stevens-Johnson Syndrome, one focuses initially on manifestations such as Niklosky's Sign, skin lesions, early symptoms of the upper respiratory tract, and viral illness. <sup>2</sup>

As the disease progresses through the first 1-2 days, stomatitis and conjunctivitis begin to become more apparent. Dermatological presentations also include skin lesions that begin as erythematous macules and progress to edematous papules, epidermal sloughing, and skin lesions (resembling the iris) which progress into bullae and vesicles within 1-3 days.<sup>1,2</sup> Major respiratory symptoms to be wary of are pneumonitis, pneumonia, and bronchiolitis, as they equate to the second cause of mortality. Patients often experience respiratory failure due to mucus retention and sloughing of the trachea-bronchial mucosa. Ocular manifestations related to this disease can be quite severe as complications typically include chronic conjunctivitis that can lead to ulcerated lesions, and even complete blindness.<sup>1-3</sup>

Gastrointestinal involvement may vary from symptoms like painfully crusty lips to oral lesions that can rupture. The most severe complication is bleeding caused by sloughing, which could extend as far as the entire GI tract.<sup>1</sup> Another critical complication is severe dysphasia, which makes it difficult to maintain proper nutrients. This loss of fluids and electrolytes can lead to the loss of blood-borne proteins, which makes the patient more susceptible to infection. Overall, the manifestations and complications of Stevens-Johnson syndrome can be quite serious and require intensive treatment.

Treatment is concentrated on establishing and eliminating the underlying cause of the disease as well as properly managing the symptoms. In terms of dermatologic healing, the first step would be to close all wounds with biological dressings such as xenografts. This allows for closure and re-epithelization. In order to manage the burn-like symptoms, one could use silver sulfadiazine.<sup>1,3</sup> Respiratory management includes postural drainage, nebulization, and suctioning. There should be close monitoring of arterial blood gases in order to detect signs of respiratory failure. Upon such signs, ventilator intubation should be strongly considered. For ocular treatment, the



patient should keep the eyes hydrated through the use of lubricant eye drops. This may be required up to a few months, but will prevent dry and photophobic eyes. <sup>1,2</sup> For gastrointestinal management, antacids and H<sub>2</sub> blockers should be used to stabilize gastric pH. In order to avoid irritation and stress-induced ulcers, gastric pH should be kept above 5. Fluids and electrolytes should be monitored every 6 hours. Replacement of lost fluids should be determined by the total body surface area affected, the volume of fluid lost, and the patient's weight.<sup>1,2</sup> In terms of infection management, high-dose cortisol therapy should be used aggressively in order to control and reduce lesions and sloughing. Antibiotics should also be administered based on local cultures. For initial management of the disease, IVIG should be considered.<sup>1</sup>

Stevens Johnson Syndrome proves to be a rare, but very serious condition of the skin and mucous membranes. It is due primarily to infection or reaction to medication. It begins with flu-like symptoms and continues to present more evident symptoms such as rashes and blisters. The condition spreads throughout many parts of the body and can impact them severely. It is an emergency condition that is treated through elimination of the underlying cause and subsequent management of symptoms. Medication, fluid replacement, wound dressings, and artificial tears are among the many of the methods aimed towards the management of this condition. Overall, the condition is one that can be critical, but manageable if attended to urgently.

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## The Relationship Between Blueberry Supplementation and Memory Function

## By: Amy Nguyen, PharmD Candidate c/o 2020 and Alex Chu, PharmD Candidate c/o 2019

One of the most common problems with aging is the ability to maintain brain function. Dementia is a collective term describing conditions revolving the impairment of various brain functions. Patients with dementia often experience progressive behavioral and neurological changes that include, but are not limited to, functional impairment, loss of independency, emotional problems, and behavioral disturbances. Among the many cognitive conditions, Alzheimer's disease is responsible for 60-80% of dementia and is the sixth leading cause of death in the United States, with estimates that 115 million people will develop the disease by 2050.<sup>1</sup> This has become a public health concern, for our health systems are neither socially nor economically equipped to assist the affected population. Currently, there is no cure and no effective therapy for dementia; however, there are possibilities of postponing or preventing cognitive decline with intake of various foods.

Stephen L. Defelice, the founder of the Foundation of Innovation Medicine, introduced the concept of *nutraceutics*, which utilizes "food, or parts of food, that provide medical or health benefits...beyond the tradition nutrients it contains" to prevent and treat diseases in 1989.<sup>2</sup> This concept instigated studies of nutraceutical influences regarding antioxidants, vitamins, and phytochemicals on the cognitive abilities of human beings. One of the most observed nutraceutical fruits is the Cyanococcus species in the Vaccinium genus, or more commonly known as the blueberry.

Principal ingredients of blueberries are water, carbohydrates, proteins, and fat; however, a serving of blueberries can provide approximately 192 kJ of energy and 10 mg of ascorbic acid, which equates to onethird of the daily-recommended intake.<sup>2</sup> Moreover, blueberries possess a particular flavonoid subgroup of phytochemicals called anthocyanins, which "have been credited with [the] capacity to modulate cognitive and motor function, to enhance memory, and to have a role in preventing age-related declines in neural function".<sup>3</sup> These anthocyanins are able to cross and accumulate beyond the blood-brain barrier; thus, they have been identified in the hippocampus and neocortex of the human brain, both of which are crucial for cognitive functions.

In the first controlled human trial examining neurological response to dietary intervention held by the University of Cincinnati Medical Institution, blueberries were proven to have potential neurocognitive benefits in response to participants with Mild Cognitive Impairment (MCI), defined as an "increased risk for dementia and represents the first clinical appearance of neurodegeneration for a substantial subset of individuals who will progress" to Alzheimer's disease.<sup>4,5</sup>

The study focused on sixteen older participants with age-related memory decline symptoms, such as prospective memory lapses. Their levels of memory impairments were measured using the Clinical Dementia Rating (CDR), which classified each participant with no impairment, mild decline, or mild, moderate, or severe dementia.<sup>4</sup> Nine of the participants were given a wild blueberry juice, prepared from ripe, frozen wild blueberries from Van Dyk's Health Juice Products Ltd (Caledonia, Nova Scotia, Canada), while the other seven consumed a placebo comparison with no juice or natural polyphenol but matched in composition and caloric load. Participants were dosed according to their body weight and were prescribed to drink the juice three times a day after meals for twelve weeks. Individuals between 54-64 kg consumed 444 mL/ day, those between 65-76 kg consumed 532 mL/day, and those between 77-91 kg consumed 621 mL/day. $^{4,6}$ ,



To accurately assess each participants' memory function, the Verbal Paired Associate Learning Test (V-PAL) and the California Verbal Learning Test (CVLT) were performed at the beginning of the treatment and in the final week of the treatment, with lower scores indicating a greater measure of memory decline. The V-PAL assesses the participant's ability to form novel associations, whereas the CVLT involves acquisition and retention of a list of words, both of which pertain to hippocampal processing and are pertinent to cognitive aging effects.

After twelve weeks, the V-PAL and CVLT cumulative learning scores of those given the blueberry juice improved significantly compared to those receiving the placebo juices (9.6 vs 7.2) [p=0.04].<sup>4</sup> Although the preclinical research of this study mainly concerned the antioxidant and neuronal signaling properties of the blueberry, recent studies have "supported the notion that anthocyanins can also enhance glucose disposal through a number of mechanisms," further enhancing neurocognitive functions.<sup>4</sup> The studies did have a limitation of small sample size because it was the first human trial on assessing potential benefit of blueberry supplementation.<sup>4</sup> Further research and larger clinical trials would have to be conducted in order to confirm a correlation between blueberry supplementation and decreased cognitive decline.

Based on preliminary findings, the outlook of blueberry supplementation to improve memory seems optimistic and sets a foundation to encourage and promote further human research on preventative supplemental measures on cognitive aging.

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## The Importance of Inhaler Education: A Comprehensive Review

## By: Jack (Hongkai) Bao, PharmD Candidate c/o 2018

Inhalers are one of the most prescribed therapies used to treat respiratory disorders in patients. Anticholinergics,  $\beta$ -agonists, and corticosteroids are all packaged into a miniature device that patients must use correctly every time to ensure delivery of their medication. To complicate matters, a myriad of inhaler types are available: metered-dose inhalers (MDIs), dry-powder inhalers (DPIs), and soft-mist inhalers (SMIs). Each type of inhaler possesses its own nuances and must be precisely used each and every time to deliver the correct dose. Complexities arise when a specific medication is available in only one type of inhaler, such as a DPI, but a patient is only familiar with an MDI. Fortunately, when used correctly, different types of inhalers are equally effective in delivering medication.<sup>1</sup>

Patients and healthcare providers both run into trouble when demonstrating correct inhaler technique. Whether healthcare providers are counseling patients on proper inhaler technique or their patients are using inhalers on their own, both parties are prone to errors. In fact, a few as one-half to one-third of all patients who are prescribed inhalers use them correctly.<sup>1</sup> Consequently, it is crucial to properly educate both patients and providers on the specificities of each unique device. Interestingly enough, a study in 2009 evaluated inhaler techniques among 142 internal medicine residents in Korea and found that a large majority of residents had inadequate inhaler technique.<sup>2</sup> This quickly changed after a single teaching session, where overall skills improved significantly.<sup>2</sup> This study demonstrated the importance of proper education whether directed towards the provider or patient; additional time spent on counseling inhaler users can ultimately improve healthrelated outcomes.

Healthcare providers themselves must be cognizant of patient preferences and ensure that dispensed inhalers are patient specific. For instance, it would be more convenient to dispense the same type of inhalers that patients have used their entire lives rather than dispensing new ones. In addition, emphasizing a few major key points about an inhaler rather than counseling patients on every detail will benefit the patients much more. These points may include the names and types of medication in inhalers or the necessity of shaking inhalers before use. Also, as some inhalers need to be primed before use, it is crucial to mention this to anyone who may handle these devices. And lastly, because all inhalers have different expiration dates, providers must mention this to patients so that they may replace their outdated inhalers as needed.

While using an inhaler, it is important to keep it clean. This ensures that drug is not being accumulated and blocking the mouthpiece, preventing the inhaler from working properly. Generally, most manufacturers recommend cleaning an MDI at least once a week.<sup>3</sup> They recommend taking apart the inhaler by removing the canister and cap and running warm tap water through the top and bottom for at least 30 to 60 seconds.<sup>3</sup> Following this, a patient must shake off excess water and allow the mouthpiece to try completely overnight.<sup>3</sup> Before using the inhaler again, a patient should administer 2 test sprays.<sup>3</sup> Instructions for cleaning DPIs and SMIs are much more simple. DPIs generally should not be washed with water, unlike MDIs. Usually a wet cloth is used to simply wipe the mouthpiece.<sup>3</sup> SMIs, unlike its competitors, do not require any cleaning at all.

Other points that providers can stress to patients include differentiating between their inhalers if they use more than one. Questions such as, "which inhaler do you use during an emergency" or "which inhaler do you use to prevent or control your asthma symptoms" are great for differentiating between rescue inhalers and controller inhalers.<sup>3</sup> Providers can also advise patients to keep their emergency inhalers with them at all times and to track the frequency of use. If patients require constant use of their emergency inhaler (>2 times/weekly), it may indicate inadequate maintenance control of their asthma and a subsequent revision of therapy may be necessary.<sup>4</sup> Lastly, it is always beneficial to use a teach-back approach when educating patients on inhaler technique. Asking patients to show how they use their inhalers offers opportunity for correction if necessary.

Demonstrated on the following pages are key points that healthcare providers, including pharmacy students, can use to educate themselves and their patients on inhalers. The charts are adapted from the Pharmacist's Letter article: *Clinical Resource, Correct Use of Inhalers*. **BACK TO COVER** 

RHO CHI

#### Metered-Dose Inhalers (MDIs)<sup>3</sup>

#### General steps for use:

- 1. Shake inhaler well (if necessary)
- 2. Breathe out fully through the mouth, away from the inhaler
- 3. Put mouthpiece in the mouth and tighten lips around it
- 4. Press canister down while inhaling DEEPLY and SLOWLY through the mouth
- 5. Remove inhaler from mouth
- 6. Hold breath for as long as possible (up to 10 seconds) and then breathe out
- 7. If a second dose is required, wait 30 to 60 seconds before repeated

## (See Table Below)

Brands	Shaking Before Use	Priming	Expiration
Advair HFA fluticasone/salmeterol	Yes	Before 1 <sup>st</sup> use: 4 sprays If not used for >4 weeks: 2 sprays	
Aerospan flunisolide	Yes	Before 1 <sup>st</sup> use, or if not used for >2 weeks: 2 sprays	
Alvesco ciclesonide	No	Before 1 <sup>st</sup> use, or if not used for ≥10 days: 3 sprays	
Atrovent HFA ipratropium	No	Before 1 <sup>st</sup> use, or if not used for >3 days: 2 sprays	
Dulera mometasone/formoterol	Yes	Before 1 <sup>st</sup> use, or if not used for >5 days: 4 sprays	Manufacturer's expiration date on packaging
Flovent HFA fluticasone propionate	Yes	Before 1 <sup>st</sup> use: 4 sprays If not used for > 7 days, or if inhaler is dropped: 1 spray	
ProAir HFA albuterol	Yes	Before 1 <sup>st</sup> use, or if not used for >14 days: 3 sprays	
Proventil HFA albuterol	Yes	Before 1 <sup>st</sup> use, or if not used for >14 days: 4 sprays	
QVAR beclomethasone dipropionate	No	Before 1 <sup>st</sup> use, or if not used for >10 days: 2 sprays	
Symbicort budesonide/formoterol	Yes	Before 1 <sup>st</sup> use, if not used for >7 days, or if dropped: 2 sprays	3 months after removal from foil pouch
Ventolin HFA albuterol	Yes	Before 1 <sup>st</sup> use, if not used for >14 days, or if dropped: 4 sprays	12 months after removal from foil pouch
Xopenex HFA levalbuterol	Yes	Before 1 <sup>st</sup> use, or if not used for >3 days: 4 sprays	Manufacturer's expiration



## Soft-Mist Inhalers (SMIs)<sup>3</sup>

#### General steps for use:

- 1. Hold inhaler upright
- 2. Turn base in direction of arrow until it clicks
- 3. Flip cap until it snaps open
- 4. Breathe out fully through the mouth, away from the inhaler
- 5. Put mouthpiece in the mouth and tighten lips around the end without covering air vents
- Press dose release button and inhale DEEPLY and SLOWLY through the mouth
- Hold breath for as long as possible, up to 10 seconds

## Dry-Powder Inhalers (DPIs): Diskus, Ellipta, Handihaler<sup>3</sup>

## General steps for use:

- 1. Hold the inhaler horizontally flat and place your thumb on the thumb grip
- 2. Slid the cover off using the thumb grip to expose the mouthpiece and lever
- 3. Slide the lever from left to right until it clicks
- 4. Breathe out fully through the mouth, away from the inhaler
- 5. Place mouth on mouthpiece and tighten lips around it
- 6. Inhale QUICKLY and DEEPLY through the mouth
- Remove the device from the mouth and hold breath for as long as possible, up to 10 seconds (See Second Table Below)

Brands	Shaking Before Use	Priming	Expiration
Combivent Respimat ipratropium/albuterol	No	Before 1 <sup>st</sup> use, or if not used for >21 days: Spray into air until visible spray is seen and then spray 3 more times; If not used for >3 days: 1 spray	
Spiriva Respimat tiotropium	No	Before 1 <sup>st</sup> use, or if not used for >21 days: Spray into air until visible spray is seen and then spray 3 more times; If not used for >3 days: 1 spray	3 months after
Stiolto Respimat tiotropium/olodaterol	No	Before 1 <sup>st</sup> use, or if not used for >21 days: Spray into air until visible spray is seen and then spray 3 more times; If not used for >3 days: 1 spray	assembling inhaler
Striverdi Respimat olodaterol	No	Before 1 <sup>st</sup> use, or if not used for >21 days: Spray into air until visible spray is seen and then spray 3 more times; If not used for >3 days: 1 spray	

Brands	Shaking	Priming	Expiration
Advair	No	No	1 month after removal from foil pouch
Flovent fluticasone	No	No	<u>50 mcg strength:</u> 6 weeks after removal from foil pouch <u>100 mcg and 250 mcg strengths:</u> 2 months after removal from foil
Serevent	No	No	6 weeks after removal from foil pouch

## (See First Table Below)

## Ellipta

General steps for use:

- Slide the inhaler cover down to reveal the mouthpiece
- 2. Breathe out fully through the mouth, away from the inhaler
- 3. Place mouthpiece between the lips and be careful not to block air vents
- 4. Breathe in DEEPLY and SLOWLY through the mouth
- Remove the inhaler from the mouth and hold breathe for as long as possible, up to 3 or 4 seconds (See First Table Below)

#### Handihaler

General steps for use:

- Remove inhaler cap by pressing green piercing button
- 2. Pull lid up and away to expose mouthpiece

- 3. Pull mouthpiece up and away from the base to expose center chamber
- 4. Remove 1 capsule from blister pack and place into center chamber of inhaler

RHO CHI

- 5. Close mouthpiece until it clicks
- 6. Holding the inhaler with mouthpiece pointed up, press the green piercing button once and release
- 7. Breathe out fully through the mouth, away from inhaler
- Place mouth around mouthpiece and tighten lips around it
- 9. Breathe in DEEPLY and hold breath for a few seconds
- 10. Remove mouthpiece from mouth
- 11. Repeat steps 7 thru 10 once more to ensure complete delivery of capsule contents
- 12. Open the mouthpiece and discard used capsule (See Second Table Below)

Brands	Shaking Before Use	Priming	Expiration
Anoro — umeclidinium/vilanterol	No	No	
Arnuity — fluticasone	No	No	6
Breo — fluticasone/vilanterol	No	No	o weeks after removal from foil fray
Incruse — umeclidinium	No	No	

Brands	Shaking Before Use	Priming	Cleaning	Expiration
Spiriva tiotropium	No	No	After each use: empty remains of capsule from the inhaler into trash by opening the cap and mouthpiece, turning the inhaler upside down, and tapping it firmly yet gently to remove any residue As needed: open the cap and mouthpiece and open the base by lifting the green piercing button. Rinse the inhaler with warm running water and air dry for 24 hours	Manufacturer's expi- ration date on the packaging

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## Word Search Puzzle: Antibiotics!

By: Matthew Kahn, Graphics Editor

## **Antibiotics**

C K H	N T E	I U C	C X M	Y F C	M V N	A W V	D Y V	N C A	I R N	L M C	C E O	R R M	C O Y	P P C	B E I	N N N	N E R	J M Y	O P P
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X	D	Н	N	L	I	N	C	0	M	Y	C	I	N	S	F	0	V	F	C
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Extra Credit: Which antibiotic class goes with which drug, and which class doesn't have a representative drug listed?



## Word Search Puzzle: Antibiotics!

Answers

## **Antibiotics**

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Н	Е	С	Μ	С	Ν	V	V	Α	Ν	С	0	Μ	Υ	С	Ι	Ν	R	Υ	Ρ
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Ρ	Т	Х	U	Ν	Ζ	Q	Ρ	Α	Х	F	Ν	D	L	Н	U	S	U	Ι	N
Y	Y	Т	F	U	G	S	U	L	F	0	Ν	Α	Μ	Ι	D	E	S	S	0
Y	D	С	Ι	L	V	G	L	Y	С	0	Ρ	E	Ρ	Т	Ι	D	E	S	X
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Т	Tetracyclines										Doxycycline								

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## MISSION

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Teamwork

Respect

Excellence

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