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CHOATE PUBLIC HEALTH

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EDITORS' NOTE

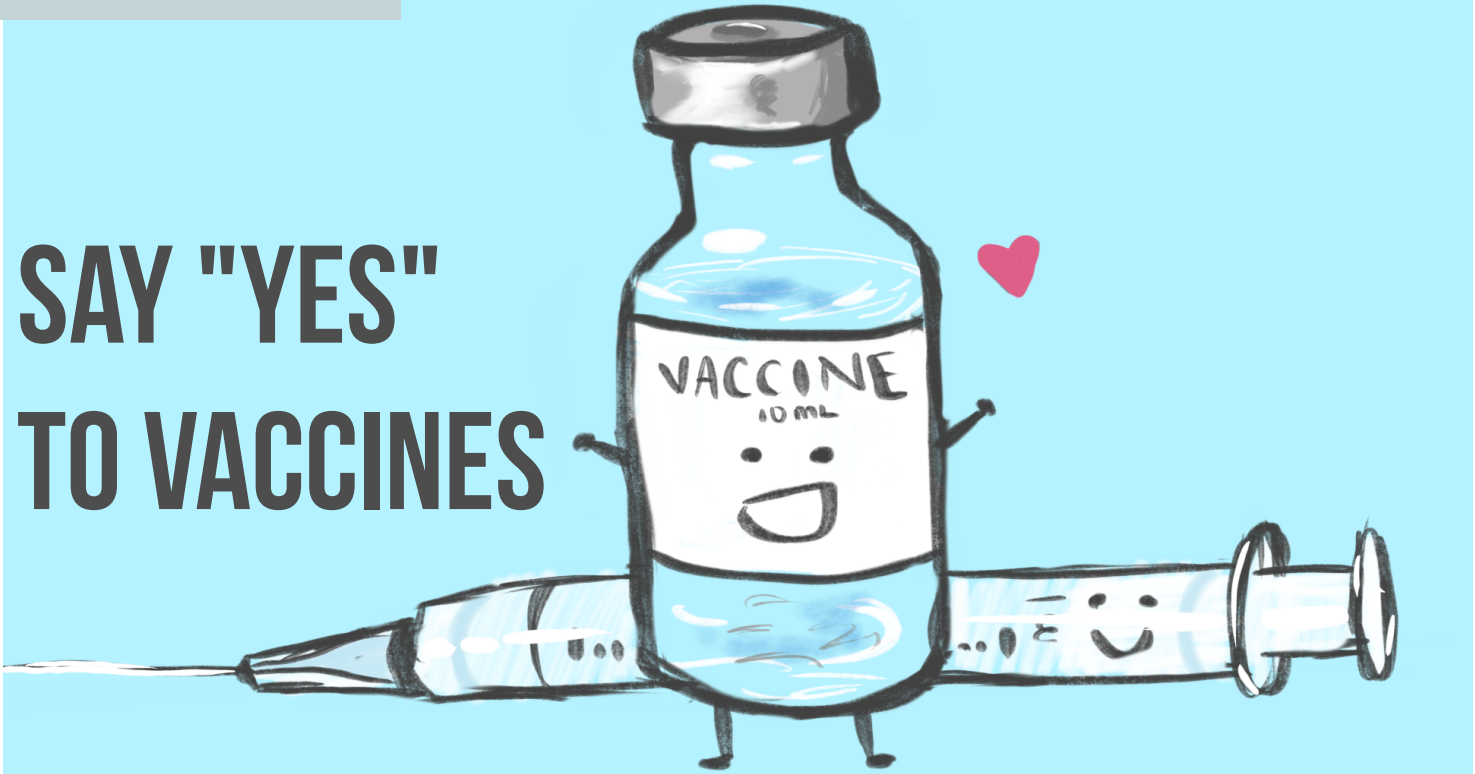
Dear Readers,

Welcome to the inaugural edition of the Choate Public Health Magazine! We are Ariel and Khushi, the editors-in-chief and co-founders of this publication. Through this magazine, we hope to educate the Choate community about important health-related topics in an informative yet engaging manner. The aim is to create a more healthy and mindful environment where students, faculty, and staff can be better informed of significant health issues that may have been misunderstood or are obscure. We attempt to transform these sensitive and complex topics into ones that can be discussed easily and comfortably. We also hope to facilitate a burgeoning interest in medicine and public health by encouraging motivated students to express their own opinions through research.

We look forward to making Choate a healthier place!

Best,
Ariel Hyunseo Kim & Khushi Tyagi

SAY "YES" TO VACCINES



by Nico Decker '20

Graphic by Nico Decker '20

No United States federal laws require childhood immunizations. Even if a public school requires certain vaccinations, medical, religious, or even philosophical exemptions are often allowed.

Many Americans who oppose vaccinations hold the view that vaccines do more harm than good; however, this belief does not match up with the facts. The Center for Disease Control (CDC) estimates that 732,000 American children were prevented from dying, and that around 322 million cases of childhood sickness were avoided between 1994 and 2014 as a result of vaccination. Dr. Sanjay Gupta, a practicing neurosurgeon and chief medical correspondent at CNN, believes that "the benefit of vaccines is not a matter of opinion. It is a matter of fact[1]."

There are many who oppose vaccines on the basis that they cause autism. However, studies including analyses of over 1.2 million children have shown that there is no link between autism and vaccinations. There should be no basis upon which to harbor fears about vaccinations. Dr. Gupta states, "You are 100 times more likely to be struck by lightning than to have a serious allergic reaction to the vaccine that protects you against measles."

Unfortunately, it is much easier to focus on the minimal bad over the good. Often times, children who have serious reactions to vaccines make it onto the news. This plants fear into the hearts of parents, and causes them to join the ever-growing legion against vaccines.

David Katz, the director of the Yale University Yale-Griffin Prevention Research Center, deems it just as insensible to be anti-vaccine because of one violent reaction as it would be to be anti-walking because one pedestrian got hit by a car. It is true that there are occasional conse-

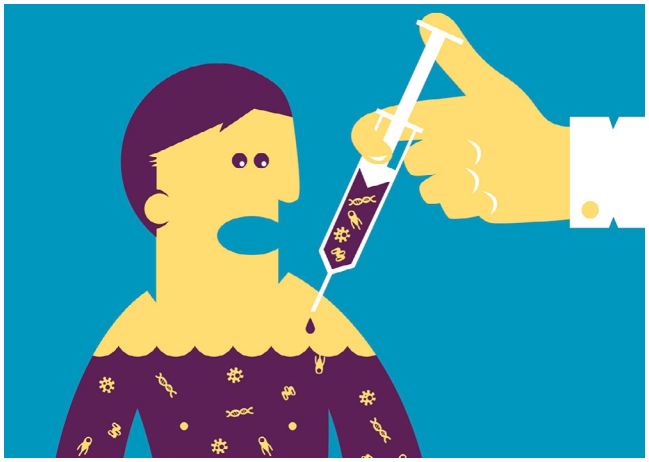
quences, but they are so minimal that the greater good should be what is accounted for.

An increasing number of parents are opting out of getting their children vaccinated. This may have an effect on the community's health. Vidhya Pathy '20 did not receive a rotavirus vaccination after she was born, causing lasting consequences. She contracted rotavirus shortly after birth, and was taken to the Intensive Care Unit (ICU) for over a week. Pathy believes that her peanut allergy, a very rare phenomenon among Indian people, was the result of her lack of a rotavirus vaccination.

Who chooses to have their own child unprotected from deadly diseases, and along with that, expose their community to harm? Vaccines have all but eliminated diseases that past generations faced, such as smallpox, mumps, polio, and measles. Only in areas where people go largely unvaccinated are there modern accounts of these diseases. Parents in first world countries have a choice to take care of their kids' health; it is shocking that many don't vaccinate their children. So many less privileged people around the world don't get to have this choice — they hope and pray for vaccines, to no avail.

"I don't think there is any philosophy that suggests having polio is a good thing," remarked Bill Gates.

"I don't think there is any philosophy that suggests having polio is a good thing[2]," remarked Bill Gates, summarizing the views of anybody tired of hearing complaints against vaccines.



Slate

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SUPER GONORRHEA: A SUPER PROBLEM

by Vidhya Pathy '20

Gonorrhea is a sexually transmitted disease (STD) most commonly found in people aged 15-24. According to Lori Smith on Medical News Today, up to 820,000 new cases are found each year in the US alone[1]. Caused by the bacteria Neisseria Gonorrhoeae, Gonorrhea wreaks havoc on not only the reproductive system, but also the eyes, throat, mouth, and rectum. Another consequence of this disease is the atrophying of the mucous membranes which are epithelial cells layered over loose connective tissue.

Gonorrhea manifests in many symptoms in both women and men. Women will experience vomiting, sore throat, bleeding between periods, heavier periods, green vaginal discharge, and painful intercourse. In extreme cases females may have ectopic pregnancy, where the fertilized egg attaches to a structure outside the uterus. Another uncommon complication is infertility. In men common symptoms include frequent urination, puslike urethral discharge colored white, yellow, and green, anal bleeding, and light sensitivity. Complications in males are sparse. Prevention methods include abstinence, condoms, dental dams, and exclusively having intercourse with one person who has already been tested and received negative results[2].

To determine whether the patient has contracted gonorrhea, doctors utilize urine samples, vaginal swabs, and cervix or anus swabs. Once the disease is detected, an antibiotic called ceftriaxone is administered via shot, and another antibiotic called azithromycin is prescribed[3]. Seven days later another testing is required to ensure the bacteria has left the system completely. Treatment not only is for infected adults. Because gonorrhea is transmitted from the mother to the baby during birth, in cases of pregnant women, the newborn baby will be given eye drops. These eye drops prevent the baby from spreading the disease.

Gonorrhea has existed and been recognized for a long time now. References to this STD date back to the Bible with the words "zav" for male and "zavah" as speculated by scholars. The earliest concrete mentions of Gonorrhea were in 1161 and 1256 were kings made proclamations to inhibit the spread of "the burning". This burning would refer to the sensation felt during intercourse when one has contracted the disease. Gonorrhea reemerged as "the clap" in 16th century. Sailors would inject mercury as means of ridding themselves of the disease. Dr. Wilhelm Gollmann, an English physician and author of the book, Homeopathic Guide to all Diseases Urinary and Sexual Organs, seconded the use of mercury as a cure as well as aconite, more commonly known as wolfsbane. At the turn of the century most cases of Gonorrhea were treated with silver nitrate, however soon a more effective drug called Progatrol replaced the silver nitrate.This type of colloidal silver was heavily marketed. Progatrol remained the main source of treatment until 1940 when antibiotics came into play[4].

Antibiotics have come a long way since

1940. Unfortunately, though, the disease has evolved too. Today scientists face a strain of gonorrhea that is completely resistant to antibiotics. Antibiotic resistance has raised health care costs as well as death tolls. 25,000 people die each year as a result of complications. Dr. Yonatan Grad, a professor at Harvard University, is on the forefront of research on this issue. He is approaching the problem with a different lens. Dr. Grad believes that looking at each case as undiagnosable and unique from the beginning of the treatment sequence. One possible solution he suggests is the use of antibiotics that have not been used for years due to obsoletion[3].

The first step in combating this issue is being aware. With this knowledge this generation can prevent outbreaks before they start. The moral of this story is be safe and use protection, but most importantly get tested!

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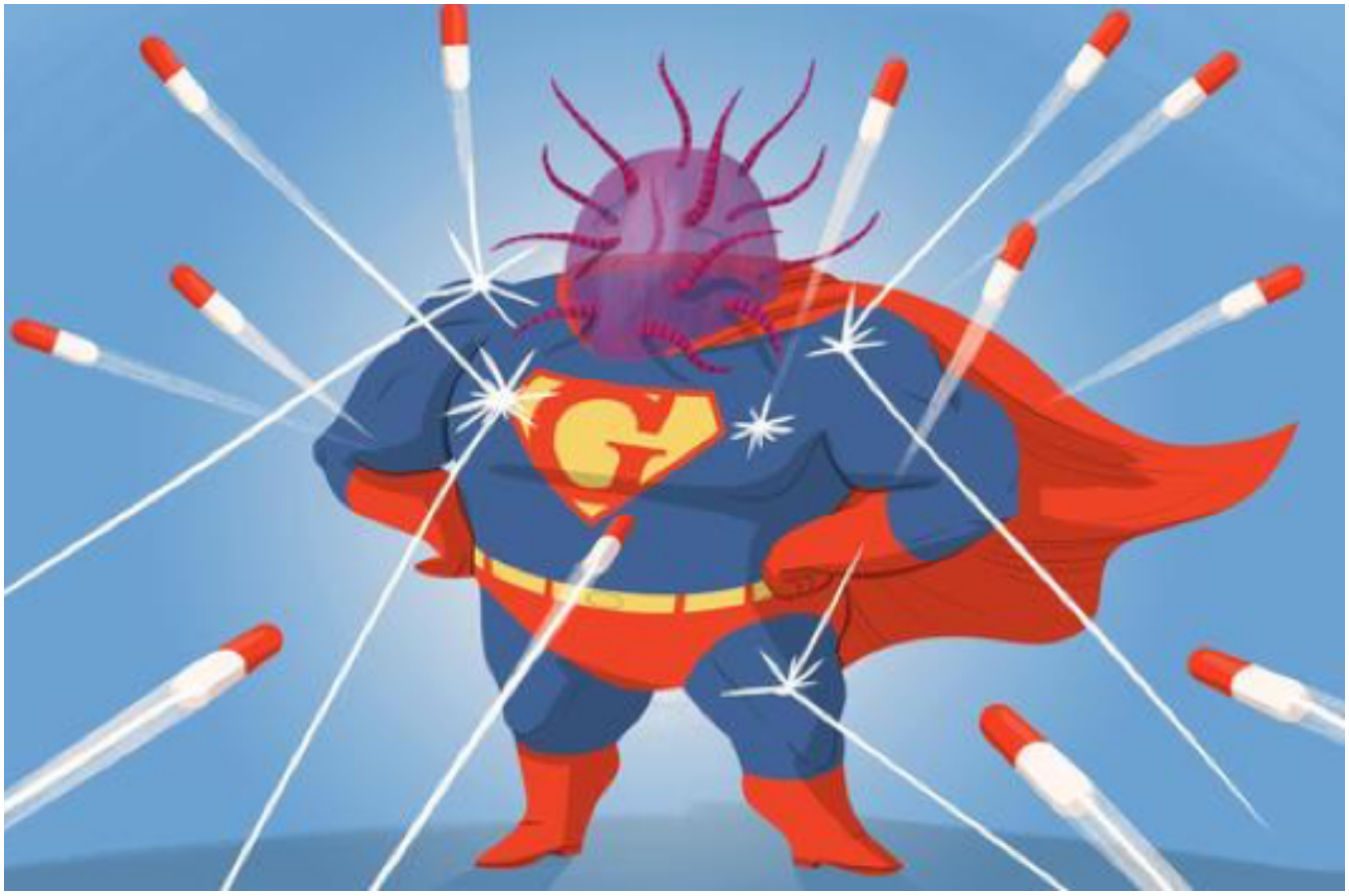

Thrillest

THE REAL REASON WHY YOU SHOULDN'T EAT COOKIE DOUGH

by Camille Grant '21

You've probably been told that cookie dough can make you sick. It's true: raw unpasteurized eggs can cause salmonella[1]. Salmonella is a foodborne illness that can cause death. However, egg-free cookie dough can still make you sick. How? The culprit is raw flour.

In 2016, an E. coli outbreak swept through 24 states and sickened 63 people that had never interacted with each other[2]. Escherichia coli, known as E. coli, is a common bacteria that can cause serious illness or death[3] if it produces Shiga toxins, which make smaller blood vessels in the body to hemorrhage[4]. 57% of 37 individuals interviewed by the Center for Disease Control (CDC) had used Gold Medal flour, 76% had used flour in the week preceding their illness, and 50% of 38 individuals had consumed raw dough or batter in the past week[5].

Scientists theorized that animal excrement contaminated the wheat before it was processed. This discovery is notable because scientists may have previously underestimated how long and how often toxic E. coli can survive in flour. Heat treatment and pasteurization can kill pathogens, but flour is not heat-treated because it can harm how well the flour rises. Considering these findings, all raw doughs, batters, homemade Playdough, or any product containing raw flour may be contaminated with E. coli.

Don't give up on your cookie dough dreams. Purchase the commercial version intended for raw consumption because they

Unsplash

are required to be heat-treated and pasteurized. Dr. Marguerite A. Neill suggested new protocol for handling flour in an interview with the New York Times: first, do not taste products containing raw flour, and second, wash your hands thoroughly after touching flour. Similarly, the CDC suggested that people bake all items with raw dough or batter before indulging, and urged restaurants not to provide customers with raw dough.

Dr. Brian J. Zikmund-Fisher at the University of Michigan disagreed with the CDC and Dr. Neill in an op-ed for CNN[7]. He considered the risk of flour contamination to be low, and claimed that your health can be preserved just by using pasteurized eggs and checking your flour bags to see if they have been recalled. You can easily see a list of product recalls by visiting foodsafety.gov, a U.S. government website that compiles recalls from the Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA). While you should take Dr. Zikmund-Fisher's precautions, also heed Dr. Neill and the CDC's recommendations.

STEPS FOR HANDLING FLOUR	
1.	Check if your flour is currently recalled or has been recalled by searching foodsafety.gov. Look at expiration and production dates because flour has a long shelf life so an older recall might still apply.
2.	Do not consume your raw flour product, not even for just a lick. It's not intended to be eaten raw. Cook it for the appropriate amount of time as recommended by your recipe guide at a high, sustained heat.[2]
3.	Wash your hands well. Sing the ABC song and lather using soap.

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CAR T-CELL THERAPY:

A REVOLUTIONARY TREATMENT AT A COST

by Laryssa Gazda '20

When most people think of the phrase "genetically modified," they think about how food can be altered to create a more favorable product. What if you could genetically modify your cells to fight cancer?

This, in essence, is what occurs in CAR (chimeric antigen receptor) T-cell therapy, a type of cancer immunotherapy. As the Dana Farber Cancer Institute phrases it, immunotherapy is the treatment of cancer by "inducing, enhancing or suppressing an immune response[1]." Immunotherapy is a "living drug" that uses a patient's own T-cells, which are white blood cells that track down and kill cancerous or infected cells, to treat his or her cancer. It is a fairly new idea compared to standard chemotherapy and radiation.

The CAR T-cell therapy called Kymriah™ was approved by the Food and Drug Administration (FDA) in August of 2017 and is currently being used to treat patients up to 25 years old with relapsed B-cell Acute Lymphoblastic Leukemia (ALL). ALL is a type of pediatric cancer in which a patient's bone marrow makes too many premature blood T-cells, decreasing the amount of room for healthy white blood cells, platelets, and red blood cells. It is the most common form of childhood cancer. The CAR T-cell treatment works by first extracting T-cells from a patient's tumor, selecting the ones that would be most effective against the tumor, then genetically modifying them to include a gene with a specific protein (the CAR) that will target the cancerous cells. The cells are multiplied in the lab, then injected back into the patient. This process is depicted in Figure 1.

The treatment itself is an amazing breakthrough. The FDA approval of Kymriah™ in 2017 was based on an international trial which showed an 82.5% overall remission rate among the 63 patients who were given a single dose of the treatment. Of those tested, 63% had a complete remission[2]. These promising statistics show how CAR T-cell therapy and immunotherapy in general have the ability to change the face of cancer treatment forever; however, there are still unavoidable obstacles.

The treatment itself costs roughly $475,000, making it one of the most expensive cancer treatments available and inaccessible for most families. Based on Kymriah™ clinical trials, the cost can ultimately add

up to an estimated $547,000 if pre-infusion treatment, hospital visits, and follow-up care are taken into account. Comparatively, it normally costs from $100,000 to $200,000 for ALL-targeted chemotherapy and $500,000 to $800,000 for a stem cell transplant, so this immunotherapy treatment could still be considered "cheaper" in some respects[2].

Even with the hefty price tag, it is important to think about the value of this potentially life-saving treatment. It could save many children's lives.

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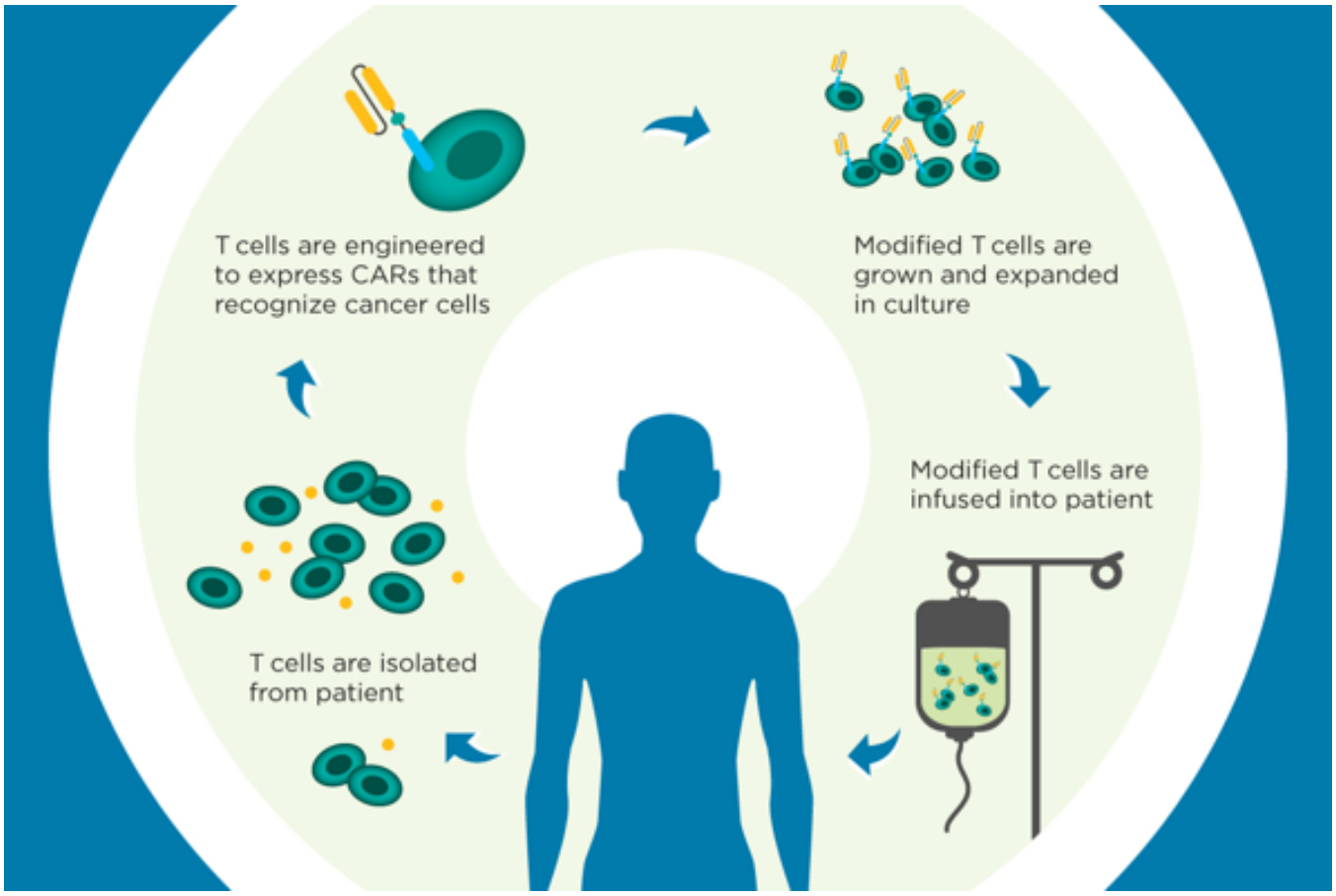
Figure 1.



Memorial Sloan Kettering Cancer Center

Graphic created by Nico Decker '20

LISTENING TO MUSIC BOOSTS CONCENTRATION

by Eliana Kim '20

As you walk around Choate campus, it is not difficult to find people who are listening to music. Students these days are accustomed to listening to music while studying claiming that music helps them focus on their work. This statement may be partially true. Generally speaking, music does help students concentrate on their work but it depends on what kind of music they are listening to and the work being done while listening to music.

Benefits of listening to music in general may include improvement in memory and a decrease in stress and anxiety. Research proves that listening to music releases dopamine, a neurotransmitter responsible for the body's attention, emotion, and learning. By releasing this "feel-good" neurotransmitter, listening to music also decreases the level of stress, which is 60% of the cause of diseases and illnesses according to the American Institute of Stress[1].

Benefits of listening to music in general may include improvement in memory and a decrease in stress and anxiety.

Listening to music activates the right and left brain that can improve memory and learning. However, there are certain kinds of music that shouldn't be heard while studying for certain subjects. According to Clifford Nass, a professor at Stanford University, "Music with lyrics is very likely to have a problematic effect when you're writing or reading. Probably less of an effect on math, if you're not using language parts of your brain[2]."

Music itself is a "stress reducer." It decreases blood pressure, heart rate, and anxiety levels. Especially when exam season is near and students are stressed, listening to music will help calm the body

down and concentrate. It is best to choose to listen to music that will keep you awake and focused but not music that is too upbeat since it can distract you. According to a study conducted by Northcentral University, it is highly encouraged to listen to classical music with a tempo range of 60-70 bpm while studying[3].

It is a common misconception that listening to music while studying is harmful. When listening to music, the brain actively reacts compared to when it is at rest. The activeness in the brain is what improves studying conditions such as concentration and memory. Therefore, students should listen to music while studying, but also to keep in mind to choose the "appropriate" songs depending on what tasks they are completing.

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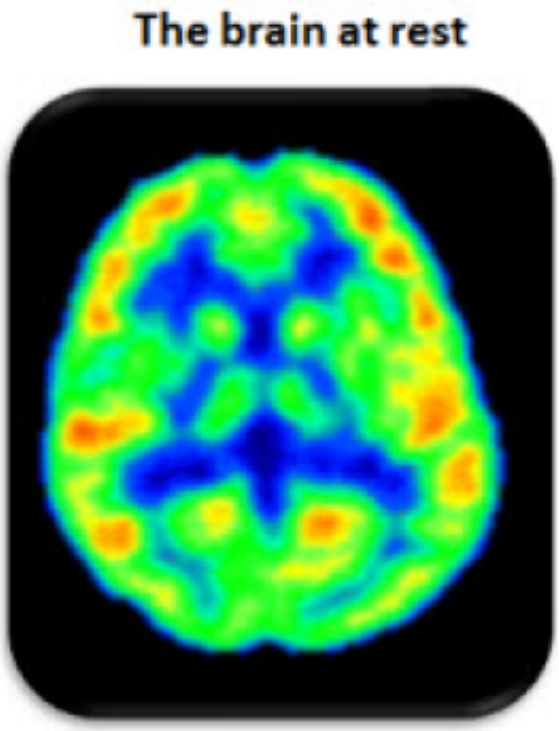

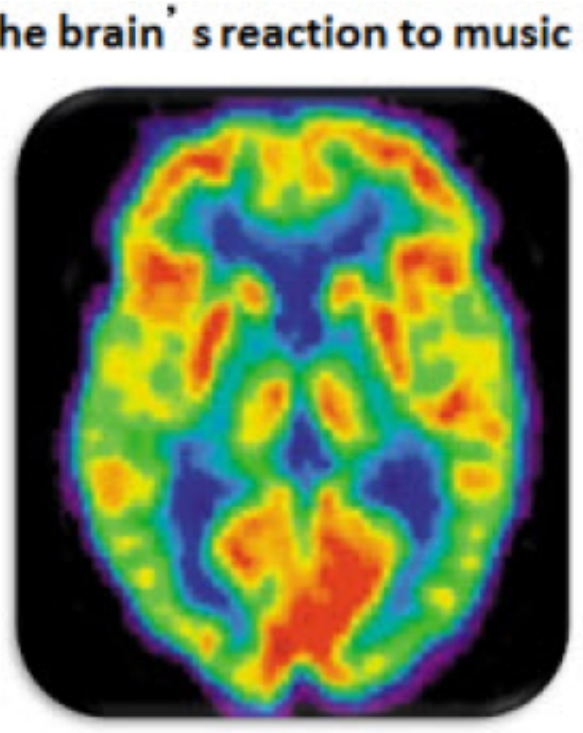

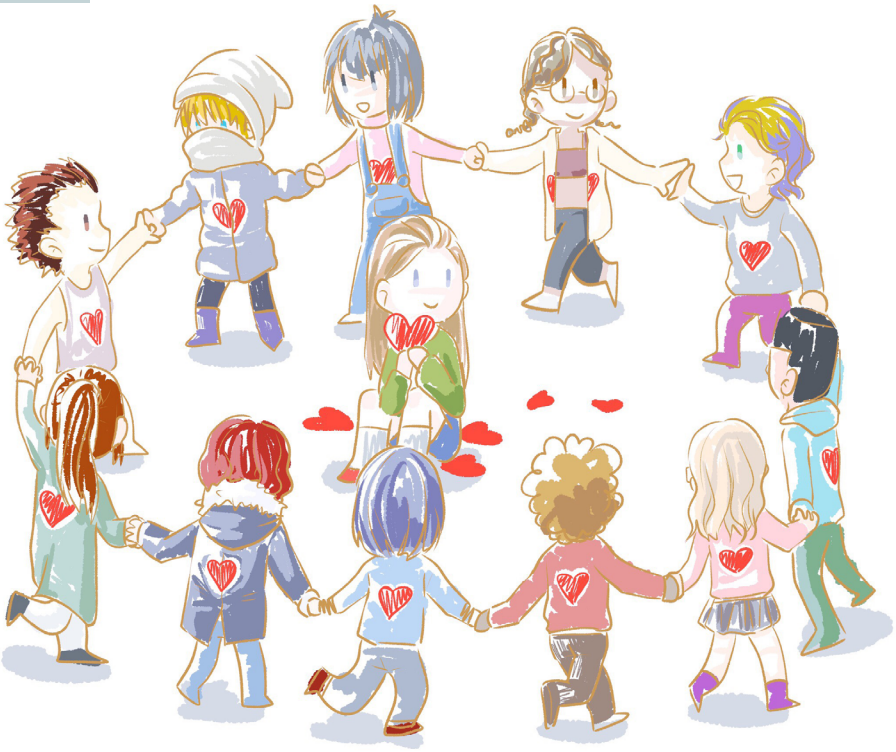

Graphic by Jacqueline Zou '20

HIV, THE FEAR OF ALL

by Wilson Wang '19

When people hear the words, "HIV" or "AIDS", they are often either shocked or afraid, thinking that the infected individual must have contracted it from unprotected sexual intercourse. However, is that really the case?

What is HIV? How does a person acquire HIV?

HIV, human immunodeficiency virus, is a virus that can be transmitted through specific bodily fluids. Only very certain bodily fluids such as blood, semen, pre-seminal fluid, rectal fluid, vaginal fluid, and breast milk of the infected individual can transmit HIV to another person. HIV can only be spread when these fluids come into contact with a mucous membrane (which is found inside the vagina, penis, mouth, or rectum), or damaged tissue, or is directly injected into the bloodstream (i.e. sharing a needle or syringe). HIV, however, cannot be transmitted through air or water, saliva, sweat, tears, closed mouth kissing, insects or pets, or sharing toilets, food, or drinks. People need to realize that majority of regular contact with an HIV-positive individual will not cause them to catch HIV[1].

How can you reduce your risks of getting HIV?

According to HIV.gov, you should get tested on a regular basis (based on your frequency of sexual contact with others) and get to know your partners' HIV status before any sexual contact. Also limit the number of your sexual partners. Treatments and tests for sexually transmitted diseases (STDs) should be conducted frequently. Having STDs can greatly increase the risk of HIV infection. When having sex, always use condoms correctly. Do not inject drugs, and if you do, never share your equipment with others. People that are at high risk of getting HIV should learn more about pre-exposure prophylaxis (PrEP),

which is a pill that greatly reduces the risk of HIV infection[1].

What does HIV do when it enters a person?

Once it's inside a person, it will attempt to destroy the person's immune system by replicating then destroying a kind of white blood cell: the CD4 cell (T cell). The T cell is responsible for combating diseases and infections. When the number of T cells decrease, the body's immune system becomes extremely weak, providing opportunities for various diseases, called opportunistic infections, to harbor. There are three stages of HIV infections: acute HIV infection, clinical latency, and AIDS (acquired immunodeficiency syndrome).

When people first become infected, they express symptoms similar to a bad case of the flu. This stage is called acute retroviral syndrome (ARS) or primary HIV infection. The HIV viruses are reproducing at a rapid rate and quickly destroying T cells.

Then the infected individual enters the clinical latency stage when the s/he experiences none or only mild symptoms. During this stage, the HIV viruses reproduce at a very slow pace, which cannot be detected by standard laboratory tests that count the number of HIV viruses. The infected individuals may live decades with clinical latency stage since treatments such as ART can keep the virus in check. HIV can still be transmitted by someone with very low or undetectable viral load.

When the immune system becomes extremely weak and is constantly under attack, the infected individual enters the most severe and final phase of HIV infection called AIDS. In this phase, people are very likely to experience opportunistic infections and die. However, this incurable process can be reversed back to the clinical latency stage with proper treatment[1].

How do you treat HIV?

Antiretroviral therapy (ART) is the treatment for HIV. With ART, the longevity of infected individuals can be prolonged drastically, making them live nearly as long as people who do not have HIV.

However, HIV can sometimes develop resistance when ART medicines are not taken properly. Aldatu Bioscience, co-founded by Iain Macleod, developed the first drug to detect drug resistance in ART. This product quickly detects mutations of HIV by changing the genome of HIV to match the desired genome of the test. When these nucleotide changes are detected, the test can then sensitively detect and select the mutations that may be associated with resistance[2].

New developments in HIV treatments are still being discovered. Maybe one day HIV can be completely eliminated. Safety precautions can greatly reduce the chance of HIV infection. Even if you are infected, it is not the end of the world. You should get treated immediately. If you know anyone who is HIV-positive, remember that they are not monsters — they are normal human beings and coming into contact with them will not get you infected.

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Q&A WITH DR. PETER A. MEANEY

by Waverly Griffin '21

Dr. Peter A. Meaney is an internationally recognized pediatric resuscitation scientist. He graduated from the University of Virginia, earned his M.D. from the Medical College of Virginia, completed his residency at the Children's Hospital of Pennsylvania, and received his master of Public Health from Harvard University. He is an Associate Professor of Critical Care and Anesthesiology at the University of Pennsylvania Perelman School of Medicine. Dr. Meaney has served as the director of Saving Children's Lives in Botswana since the program started in 2014 and is now starting another Saving Children's Lives project in Tanzania. This program is designed to educate pediatric health care providers in countries with less resources.

What is the goal of *Saving Children's Lives*?

Many doctors and nurses in lower to middle income countries don't receive continuous training to recognize emergencies, like they do in developed countries. We know that a large part of the several million children who die every year die of preventable causes, such as pneumonia and diarrhea. *Saving Children's Lives* is a program that is designed to train doctors and nurses who work in those environments.

How are you implementing the *Saving Children's Lives* program?

Part of implementing the program is recognizing what the problem is and that the same problem might be caused by different issues in different areas. For example, there are some parts of the world where they don't have enough doctors and nurses, and other parts of the world where they have enough doctors and nurses, but not enough supplies. In Botswana there is a relatively good primary health system: they have supplies, but they still have poor outcomes. It was recognized that the resource they needed was education, so it was a good environment to pilot a program for emergency training.

Peter teaching a class

What is happening now with the *Saving Children's Lives* program in Botswana?

Botswana is a very successful program. We reduced child mortality rates at the district hospital by 57% for children who got accepted for certain diseases in the first year. The Ministry of Health of Botswana has agreed that they want to take the pro-

gram and roll it out nationally, but we are still stuck on getting funding through the Ministry for the program. It requires you to be patient and, at the same time, not give too many resources when it's somebody else's responsibility to put in those resources.

What are the biggest medical issues facing children in Botswana and Tanzania?

The biggest issue for children in both of these situations is timely diagnosis of respiratory infections. Many people think that if you have safe and clean water, you will never get sick from diarrhea. That is a great concept, but it can lure you into a false sense of complacency. The truth is even in highly developed countries children still get sick from pneumonia and diarrhea, but not in the numbers that children do in places where they don't have safe water and vaccinations.

What are the biggest challenges to the program?

I think communication and finding what the natural rhythm of program development is are the biggest challenges. Tanzania and Botswana are both high-context cultures, compared to New England which is a low-context culture. You and I, when we are having conversation, will be very frank with what we think. If we disagree with someone, we will say we disagree with them. We will ask for something if we need it. Everything is fairly obvious. Botswana and Tanzania are high-context cultures, so it's not necessarily culturally appropriate to disagree with someone. It's perceived as a show of disrespect. This means when you are developing a program, if you are talking to someone and they are agreeing, it doesn't necessarily mean that they have really bought into the program's development. Working in a high-context culture, you have to look at other social signals of acceptance besides verbal agreement. For me, coming from such a low-context culture, it is very different.

Waverly Griffin '21 and Peter Meaney

What are the next steps for your programs?

The other challenge is that you think about the hundreds of millions of children who die every year from preventable diseases. You feel the need to rush, but programs need to have everyone who is key to the program's success into it, engaged, and involved. Part of program development is going slower than you think you can go to allow everyone to get to the right level.

We have shown that the *Saving Children's Lives* program works in Botswana. Now we are going to try another health care program in Tanzania. Botswana is a low malaria environment and has a high percent of severe malnutrition, while Tanzania is a high malaria area with even higher rates of malnutrition. In Tanzania the conditions are much worse and the resources much less, so we are trying to see if the same kind of program will work.

Some of the other projects are working on what makes education such a critical part of taking care of patients: working on patient support, developing new tools to be able to tell when a child is going to be really sick, providing different tests, and using new mobile devices to help doctors and nurses treat and track sick children.

Graphic by Jacqueline Zou ‘20

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