Title: Comparison Between Natural and Mainstream Medicine on a Molecular Level

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DATE	ACTION	RESOURCES USED	OTHER NOTES
September 29th, 2023	 Project topic decided Comparing natural and conventional medicine on a molecular level Slideshow template downloaded (from Slidesgo) Information provided about phenylephrine (from my mom) A drug recently found to be ineffective when taken by mouth (still effective when taken through nose, such as vapours) 	• SlidesGo	 Phenylephrine is the basis for my project as it is a type of synthetic drug that was only found to be effective in certain ways Phenylephrine idea was presented from my mom, Ramani Pathak
October 8th, 2023	 Research done on the "general idea" of the project 8% hospital admissions due to side effects from conventional 	 https://www.ncbi.nlm.nih. gov/pmc/articles/PMC52 97475/ 	

medicine

- Around 100,00 die
- More than 3x number of people that die to drunk drivers
- Deaths/hospitalizations due to side effects from herbal medicine is rare
- Herbs used in the medicine can be toxic/"contaminated" so this is not completely non-existent
- There could be chemicals or other things that could have come into contact with the plant posing a risk to people who are using the plant as medicine
- People normally use herbal/natural medicines because they have a generally lower death/hospitalisation rate
- Medicinal plants have antioxidant properties
- Many types of conventional and synthetic are based off of herbal

- https://www.genexa.com/
 blog/how-do-cough-drops
 -work
- https://www.imperial.ac.u k/news/166651/scientists
 -find-variant-streptococcal
 -bacteria-causing/
- https://www.researchgate.
 net/figure/Scanning-Elect
 ron-Microscopy-revealing
 -the-morphological-chang
 es-of-MRSA-cells-after-th
 e_fig1_344335903
- https://www.mdpi.com/2
 079-6382/8/4/251
- https://www.compoundch
 em.com/2015/04/02/thr
 oat-lozenges/

		1	
	or natural medicines that were		
	present before (eg: aspirin)		
• Main	Questions about this topic		
0	Are people willing to give up the		
	number of things that can be		
	treated using natural medicine in		
	exchange for effectiveness and		
	safety		
0	There are many different types		
	of natural medicines but there		
	might be more conventional		
	medicines as many synthetic		
	medicines are tailored for		
	specific infections/viruses		
0	Even though there may be less		
	types of natural medicines, they		
	are generally considered safer		
	and more effective and most		
	people prefer to take natural		
	medicines due to this		
0	Normally synthetic medicines		
	are based off of previous natural		
	medicine, however, the success		

	 rates of both the medicines differ vastly. Is there any specific reason? This would mean that the molecular structures would be slightly similar so why does the body react differently to both medicines (eg: honey and cough lozenges) 		
October 28th, 2023	 Some research added into slideshow Title slides, table of contents, background information, introduction and pictures added into honey vs. cough drop slide Introduction: Recently, a medicinal drug called Phenylephrine was found to be ineffective. In addition, From this I got the idea of comparing natural and synthetic medicines and looking at which are more effective as remedies for illnesses such as Influenza (flu). Background information: Natural 	 Links used in previous log https://www.simplyrecipe s.com/is-it-safe-to-eat-cry stallized-honey-7508590 https://www.amazon.ca/R icola-Cough-Drops-Hone y-Echinacea/dp/B085XM 1C92 	

	medicines are medicines created using natural ingredients, such as herbal medicines or honey, for example. Conventional medicines, are medicines made using artificial/man-made ingredients, such as over-the-counter medicines like cough drops. Currently, there is not much research on comparing if natural and conventional medicines are more effective. In this project, I will be looking at both types of medicines on a molecular level, meaning I am comparing the chemical composition of both, for		
November 1st, 2023	 example. Slideshow edited and more background information added 8% hospitalisations due to side effects and around 100,00 die due to this Hospitalizations due to herbal medicine is rare but there are still risks to herbal medicine 	 Links used in the October 8th log https://www.cerave.com/s kincare/acne/acne-control -gel https://parade.com/1398 229/kelli-acciardo/aloe-ve ra-benefits/ 	

	 such as contamination Many plants have medicinal properties and 10% of plants can be used in medicine, which might not seem like a lot but it is Synthetic medicines can be based off of plants and aspirin is an example of a medicine that is based off of an ancient remedy Aloe vera and acne gel picture slide added 		
November 3rd, 2023	 Research about cough drops (throat lozenges) conducted and added Throat lozenges (cough drops) are composed of either amylmetacresol, dichlorobenzyl alcohol or both in some cases Both compounds are shown to have an effect on bacterial infections Hexylresorcinol, another 	 https://www.compoundch em.com/2015/04/02/thr oat-lozenges/ 	

	 compound, has a mild anaesthetic effect After the lozenges are taken, sodium channels are blocked due to the anaesthetic effect, meaning that pain signals are not sent to the brain, causing reduced cough or even decreased throat pain Image relating to this topic also added from same website 		
November 4th, 2023	• More images added which show the chemical compositions of the compounds in cough drops	 https://www.compoundch em.com/2015/04/02/thr oat-lozenges/ 	
November 12th, 2023	 Slideshow edited Research conducted about aloe vera According to multiple studies conducted, the major molecular components of Aloe Vera (aleosin, aloin and emodin) have been shown to have properties that protect the skin 	 https://cen.acs.org/pharm aceuticals/Periodic-Graphi cs-chemistry-acne-treatme nt/100/i28 https://www.healthline.co m/health/beauty-skin-car e/aloe-vera-for-face#what -to-look-for 	

	 In addition, acemannan, aloe-emodin and aloin have been shown to also protect human skin by preventing inflammation Pictures of chemical composition of aloe vera added 	 https://encyclopedia.pub/e ntry/25567 	
November 13, 2023	 Research conducted on acne gel and added to slideshow Acne is caused when dead skin or a substance called sebum blocks follicles Benzoyl peroxide, tretinoin, tetracycline, azelaic acid and many more can be used in acne treatments like acne gel Benzoyl peroxide kills bacteria on skin (formed by the blockage) by oxidising the bacteria Tretinoin lessens acne by 	 Previously used links for research https://cen.acs.org/pharm aceuticals/Periodic-Graphi cs-chemistry-acne-treatme nt/100/i28 https://www.sciencedirect .com/science/article/abs/p ii/B9780128198285000 05X?via%3Dihub https://www.healthline.co m/health/aloe-vera-for-ac ne 	• Comparisons and benefits of studying this topic written by myself and not based off of online sources
	reducing the blockage of follicles by increasing the removal (shedding) of dead skin cells		

	Г	T	
0	Tetracycline is taken orally for		
	severe acne and erythromycin		
	and clindamycin are used		
	topically for mild acne		
0	Tetracycline increases sensitivity		
	to sunlight which leads to		
	decrease of acne		
0	Azelaic acid is an exfoliant used		
	to treat mild acne		
0	Co-cyprindiol reduces sebum		
	production and is used for		
	severe acne		
Compa	rison between aloe vera and acne		
gel			
0	Many research studies conclude		
	and support the idea that aloe		
	vera is one of the most effective		
	acne treatments as it is an		
	effective bacterial killer. Aloe		
	vera poses little to no risk in		
	terms of side effects and there is		
	high chance of success in aloe		
	vera acne treatments.		

• Acne gel have also been shown	
to be effective even though in	
some cases they may be less	
effective than aloe vera. A main	
concern with acne gel is the side	
effects that are imposed as there	
are many chemical compositions	
that can cause redness (itchiness)	
of skin.	
Comparison between honey and cough	
drops	
• According to one study	
conducted, taking one spoonful	
of honey every night was more	
effective than cough drops.	
Honey also does not present	
major side effects (1+ years old)	
• Most cough drops have been	
shown to be ineffective in	
combating cough. Additionally,	
the risk of severe side effects are	
also present. Overall, honey is	
more effective than cough drops.	

• Benefi	ts of study this topic	
0	Science: By studying this, it	
	could help combat future	
	diseases that can arise that are	
	similar to acne. It could also	
	pave the way for a new field of	
	science.	
0	Technology: By studying and	
	publishing studies, patients	
	would have access to	
	information about treatments	
	and decide how they want to	
	treat their acne.	
0	Society: Many kids and even	
	adults suffer from acne and by	
	studying treatment types, they	
	can find effective ways that work	
	for their skin type. This could	
	also reduce insecurities that	
	many people have.	
0	Environment: Studies about	
	natural medicines can help	
	_	
	increase the prevention in	

	diseases found in humans and animals. It could also encourage humans to reduce pollution to protect medicinal plants. • Summary slide for all comparisons added	
November 14th, 2023	 Research conducted on chemical composition of honey In most types of honey, the production of an enzyme called hydrogen peroxide promotes honey's antimicrobial properties Hydrogen peroxide is a mild antiseptic that can be taken orally to reduce mucus or the irritation in the mouth that many people experience during cough/colds The high sugar content and the low PH of honey also contributes to the prevention of the growth of microbial bacteria Honey also has amounts of 	 https://www.walmart.ca/e n/ip/halls-cherry-flavour- cough-drops-4-packs-of-9 -pieces-36-total-pieces/6 000084143768 (for Halls cough drops image) https://www.sciencedirect .com/science/article/abs/p ii/S2221169111600166? via%3Dihub https://www.ncbi.nlm.nih. gov/pmc/articles/PMC42 64806/ https://www.fortunejourn als.com/articles/chemical- composition-and-uses-of- honey-a-review.pdf

	Vitamin C, which is beneficial		
	when fighting colds or even		
	cough		
	• Few other slides also changed a little bit		
	(grammar, point form and the like)		
	• More information added to benefits slide		
	• By studying the chemical		
	compositions of natural		
	remedies on a molecular level,		
	we would be able to understand		
	if and how some natural		
	remedies work better than		
	conventional medicine and		
	possibly create new medicines.		
	• Cough drop image changed from Ricola		
	cough drops to Halls cough drops to		
	show a cough drop packet without		
	"made with natural ingredients" on the		
	front of the packet		
November 15th,	• Slideshow edited by Dr. Iaci Soares for	• No new sources used	• After presentations in
2023	feedback to be shorter for the purpose of		school, I was selected to
	presenting in school (to decide which		participate in CYSF

proje	cts are going to CYSF)	
с	Few edits made by me to	
	shorten slides for the same	
	purpose	
• Benef	its slide edited and made into two	
slides		
с	Science, technology, society and	
	environment slide stays the same	
с	Why on a molecular level: By	
	studying the chemical	
	compositions of natural	
	remedies on a molecular level,	
	we would be able to understand	
	if and how some natural	
	remedies work better than	
	conventional medicine and	
	possibly create new medicines.	
c	Image added about chemical	
	binding and not binding	
• Meth	ods slide added	
с	Search scientific Literature	
с	Scientific papers	
c		

	 Government websites Study The effects of Honey vc cough drops and its molecular effects in the body Study The effects of aloe vera vs acne gel and its molecular effects in the body Critically analyse the different products and summarise pros and cons 		
January 18th, 2024	• Meeting with mentor, Dr. Sara Bourke, and edits made to presentation (majorly better wording, grammar, etc.)	• No new sources used	
January 19th, 2024	• Formatting of slides adjusted and methods slide hidden from presenter view	• No new sources used	
February 2nd, 2024	 Looking at previous links for deeper understanding of the topic Slideshow edited 	 Previously used sources No new sources used	

February 8th, 2024	• Slideshow further edited based on Dr.	• Google Docs	
	Sara Bourke's feedback	• No new sources (below	
	• Image citations added	are the previously used	
	• New slides added for	sources for citations)	
	comparisons in specific areas for	• https://www.simplyrecipe	
	each (honey vs cough drops and	s.com/is-it-safe-to-eat-cry	
	aloe vera vs acne gel)	stallized-honey-7508590	
	• Slideshow shortened (to be less	• https://www.walmart.ca/e	
	text-heavy) and new document, named	n/ip/halls-cherry-flavour-	
	"Speech" created to put all present	cough-drops-4-packs-of-9	
	information on slides before shortening	-pieces-36-total-pieces/6	
	(so information doesn't get deleted)	000084143768	
		• https://www.compoundch	
		em.com/2015/04/02/thr	
		oat-lozenges/	
		• https://parade.com/1398	
		229/kelli-acciardo/aloe-ve	
		ra-benefits/	
		• https://www.cerave.com/s	
		kincare/acne/acne-control	
		-gel	
		 https://www.webmd.com/ 	
		drugs/2/drug-76035/hyd	

		rogen-peroxide/details	
February 9th, 2024	 Information added to aloe vera vs acne gel comparison slides Meeting with Dr. Sara Bourke Information added to slideshow in comment section 	• No new sources used	
February 14th, 2024	 Slideshow edited based on mentor's feedback New slide added for ingredients of acne gel listed on Cerave website (below is some information although not all is included on the slide) Ceramides Responsible for keeping skin moisturised and preventing germs from entering your skin Synthetic ceramides (pseudo ceramides) are used more often than natural ceramides Niacinamide 	 https://www.cerave.com/s kincare/acne/acne-control -gel#key-ingredients https://www.webmd.com/ beauty/what-to-know-abo ut-ceramides-for-skin https://www.webmd.com/ vitamins/ai/ingredientmo no-1534/niacinamide 	

	 Helps maintain healthy cells in the body Type of Vitamin B3 Found in common foods such as green vegetables, fish or milk Lactic Acid Salicylic Acid Glycolic Acid 		
February 15th, 2024	 Cerave slide completed (information/research below) Lactic Acid Is essentially produced by your body when the cells break down carbohydrates and they make energy that the body can use Is commonly used in over-the-counter exfoliants and face washes 	 https://www.verywellhealt h.com/lactic-acid-skin-car e-4178819 https://my.clevelandclinic. org/health/body/24521-1 actic-acid https://www.webmd.com/ drugs/2/drug-18-193/sali cylic-acid-topical/salicylic -acid-for-acne-topical/det ails https://www.verywellhealt h.com/glycolic-acid-1577 	

•	Can benefit the skin as	4	
	it can remove dead skin		
	cells, giving the		
	opportunity for new		
	skin cells to grow		
	instead (better skin)		
-	One of most common		
	uses for this, apart from		
	OTC exfoliants/scrubs,		
	is in acne treatment		
	Increases sensitivity to		
	the sun		
	Skin irritation (common		
	symptoms in chemicals		
	such as these)		
• Salicylia	: Acid		
	Normally applied		
	topically and used for		
	mild or moderate acne		
- I -	Also works like an		
	exfoliant and removes		
	dead skin cells leading		
	to a decrease in the		

	number of pimples
	formed (similar to lactic
	acid)
-	Side affects include
	allergies, although severe
	allergies are quite
	uncommon, and
	irritation or itchiness of
	skin
• Glyco	lic Acid
-	Smallest sized molecules
	of all AHA's
	(alpha-hydroxy acids,
	which include lactic and
	salicylic acid) which
	allows for better
	exfoliation of the skin
-	Apart from acne
	treatments, it is also
	used for anti-aging,
	brightening the skin,
	fading dark spots, or
	hydrating the skin

February 16th,	• Scales graphics added to benefits of each	 https://blog.bonsecours.co
2024	slide to show a comparison affect (from	m/healthy/how-many-cou
	SlidesGo template)	gh-drops-is-too-many/
	• Benefits slide, for both honey vs cough	• https://www.verywellhealt
	drops edited for new talking points	h.com/honey-and-diabete
	• Honey	s-5115267
	■ It takes a longer time for	• https://en.wikipedia.org/
	the honey to act on the	wiki/Ceramide
	body and a person may	• https://pubchem.ncbi.nlm.
	have to take honey	nih.gov/compound/Niacin
	multiple times to get the	amide
	desired effect	• https://www.toppr.com/g
	 While honey also 	uides/chemistry-formulas/
	contains sugar, there are	lactic-acid-formula/
	alternatives that have	• https://pubchem.ncbi.nlm.
	less sugar, such as raw	nih.gov/compound/Salicyl
	honey	ic-Acid
	 Cough Drops 	• https://pubchem.ncbi.nlm.
	 Relief from sore throats 	nih.gov/compound/Glycol
	is fast and nearly	ic-Acid
	instantaneous, or at least	
	it is supposed to be,	
	making it more	

	preferred as it provides		
	quick relief		
	■ Contain quite a bit of		
	sugar and people with		
	diabetes or sugar		
	problems are cautioned		
	when taking cough		
	drops (primary reason		
	for this is to appeal to		
	younger audiences, such		
	as kids, so it tastes more		
	like candy or to appeal		
	to adults who can't take		
	medicine easily)		
February 19th,	• New slide added for Halls (Cherry	• https://gethalls.ca/en/relie	
2024	Flavour) Ingredients specifically	f/halls-cherry-flavour-cou	
	 Menthol 	gh-drops	
	 Menthol is found in the 	• https://pubchem.ncbi.nlm.	
	peppermint plant and	nih.gov/compound/1S_2R	
	can also be made	_5S5-methyl-2-propan-	
	artificially	2-ylcyclohexan-1-ol	
	 Works by providing a 	• https://www.pharmacy18	

cooling effect to the 0.com/article/eucalyptusoil-253/ mouth which provides relief from sore throats https://www.webmd.com/ • drugs/2/drug-21050/men or cough thol-cough-mucous-memb Also increases the rane/details amount of saliva in the mouth https://www.mountsinai.o • Eucalyptus Globulus Essential rg/health-library/herb/euc 0 Oil alyptus Helps suppress cough https://www.healthline.co • m/health/9-ways-eucalypt Loosens mucus from us-oil-can-help#cough-reli chest and as a result helps remove mucus ef https://www.healthline.co (from the chest) and • m/health/food-nutrition/i makes it easier to s-soy-lecithin-good-or-ba breathe d-for-me#What-is-soy-leci Also presents multiple other benefits such as thin? https://www.healthline.co reducing joint pain and • disinfecting wounds m/nutrition/glucose-syru • Soy Lecithin р Helps all of the

ingredients in the cough

	 drops mix together Derived from soy and is present in many foods that we buy today Glucose Syrup Is a liquid sweetener that is used to make cough drops taste sweeter and to extend the shelf-life of foods Sucralose Is normal sugar that is likely present in our own homes 		
February 20th, 2024	 Slideshow changed to be according to CYSF format but new information not added Problem Method Data Conclusion Citations 	 https://emmettroyalhoney. com/bee-education/the-c hemistry-of-honey/ https://edu.rsc.org/soundb ite/hydrogen-peroxide/20 21244.article https://www.merckmanua ls.com/home/drugs/drug- 	

	 Acknowledgement Speech completed Picture citations added for pictures on honey slide, chemicals binding picture and the picture comparison picture on slide 2 	 dynamics/site-selectivity https://knowleswellness.c om/blog/traditional-medi cine-vs-modern-medicine -which-is-best/ 	
February 21st, 2024	 Acknowledgements added Parents Dr. Sara Bourke and Dr. Shahin Jabbari Dr. Iaci Soares Dr. Miri Renert and Ms. Madison Paul All sources cited 	• No new sources used	• I used Scribbr for my citations
February 28th, 2024	 Edits made based on Dr. Sara Bourke's feedback Hydrogen peroxide image changed as the image before was inaccurate Labels added to pictures on "CeraVe Key Ingredients" slide 	 https://simple.wikipedia.o rg/wiki/Hydrogen_peroxi de 	

February 29th, 2024	 Paper almost finished Converted to proper format of a research paper 	• Previously used resources	• Paper ready by March 1st for "trifold orientation session" in school
March 3rd, 2024	 New slide added to slideshow called "Future Goals" More research on receptor cells For future research, I would like to delve deeper into the topic of receptor cells and how the natural and conventional medicines interact with our body. This would include research about if our cells more receptive one type of medicine compared to the other and if this is the reason for side effects. Comparing more products If time permitted, I 	• No new sources used	

	would have liked to conduct more research on comparing more products and their effectiveness as the sample size was relatively small in this case. I would also have liked to expand this research and see if there are more places in which this research can be applicable.		
March 4th, 2024	 Project title changed to "Comparing Natural and Mainstream Medicine on a Molecular Level" Comparing more products future goal wording changed In the future, one of my goals is to compare more products and their effectiveness as the sample size was relatively small in this 	• No new sources used	

	case and generally conduct more research. I would also have liked to expand on this topic and see if there are more places in which this research can be applicable other than medicine.		
March 7th, 2024	• More work done on paper (mainly adding citations in)	• No new sources used	
March 8th, 2024	 First draft of paper finished and sent to mentor Paper, logbook and presentation all sent to mentor, Dr. Sara Bourke 	• No new sources used	
March 11th, 2024	 Meeting with Dr. Miri Renert for APA citations and editing help (15 minutes) Changes made to project based on feedback (primarily in-text and long citation changes, if any) 	• No new sources used	

March 12th, 2024	• Meeting with Ms. Madison Paul for	• Previously used sources	
	citations and editing help (longer	• https://www.verywellhealt	
	meeting)	h.com/oral-tetracycline-1	
	• Citations changed a little as	5840	
	there are different citation		
	formats for image and		
	information citations		
	• Meeting with Dr. Sara Bourke and entire		
	paper and presentation reviewed		
	• No major feedback on		
	presentation		
	• Title changed		
	 Comparing Natural and 		
	Mainstream Medicines'		
	Composition on a		
	Molecular Level and		
	Effectiveness		
	• Paper reviewed		
	■ Mainly sentence and		
	wording feedback		
	 Tetracycline changed as 		
	tetracycline slows down		
	bacteria growth (caused		

	by acne) and has anti-inflammatory properties, it does not prevent acne by increasing sunlight sensitivity		
March 13th, 2024	 Video recorded Everything put in CYSF platform Banner made on Canva Presentation and paper finalised 	• Zoom	