Project Notes:

Project Title: Examining Enhanced *Komagataeibacter hansenii* Production via Unconventional Food Waste

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Note Well: There are NO SHORT-cuts to reading journal articles and taking notes from them. Comprehension is paramount. You will most likely need to read it several times, so set aside enough time in your schedule.

Contents:

Knowledge Gaps:

This list provides a brief overview of the major knowledge gaps for this project, how they were resolved and where to find the information.

Knowledge Gap	Resolved By	Information is located	Date resolved
What materials are most effective for different kinds of implants	Literature	In Project Notes	11/5
Controlled drug release	Literature	In project notes	11/12
“Adaptable Implants”- adjust to patients needs, can alter drug dosages depending on real-time patient data	Youtube	←—	11/21
Sustainable approach to producing cellulose	Literature	In Project Notes	12/2
Cost-efficient approach to producing cellulose	Literature and talking to professor	In project notes and logbook where I have professional communication listed	12/5

Literature Search Parameters:

These searches were performed between (Start Date of reading) and XX/XX/2019.
List of keywords and databases used during this project.

Database/search engine	Keywords	Summary of search
Google	*Acetobacter Xylinum*	What this is, how it is used in typical research, knowledge gaps with the production of it
Google	Sustainable, cost friendly, bacterial cellulose production	Different food waste sources that have been used in the past to grow the bacteria

Tags:

Tag Name	
#background	#testingstrategy
#culturemedia	#effects

Article #1 Notes: Selecting the most appropriate treatment for each patient

Article notes should be on separate sheets

Source Title	Selecting the most appropriate treatment for each patient
Source citation (APA Format)	Beutler, L. E., Someah, K., Kimpara, S., & Miller, K. (2016). Selecting the most appropriate treatment for each patient. *International journal of clinical and health psychology : IJCHP*, *16*(1), 99–108. https://doi.org/10.1016/j.ijchp.2015.08.001
Original URL	Selecting the most appropriate treatment for each patient - PMC (nih.gov)
Source type	Scientific journal "Articles from International Journal of Clinical and Health Psychology"
Keywords	Psychotherapy, Treatment outcomes, Integration efficacy, Treatment fit, Theoretical study
#Tags	#STS, #specificcharacteristics, #treatment, #psychotherapeuticstrategies
Summary of key points + notes (include methodology)	This article discusses potential treatment options and how they vary based on different factors including unique needs and specific diagnoses. The STS (Systematic Treatment Selection) in particular is a form of treatment that relies heavily on patient's specific characteristics and interventions that match with those traits. Overall, this article covers various time periods and their main approaches as well as touching upon the methodology of STS and possible ways and ideas to test it.
Research Question/Problem/ Need	Forms of therapy and how to choose the best option based off conditions and characteristics How can you decipher which is the most effective treatment option for a certain patient?
Important Figures	No figures in this article
VOCAB: (w/definition)	STS- systematic treatment selection RCT= randomized clinical trials

Cited references to follow up on	1. Beck A.T., Rush A.J., Shaw B.F., Emery G. Guilford; New York: 1979. Cognitive Therapy of Depression. [Google Scholar] 2. Beutler L.E. Pergamon Press; New York: 1983. Eclectic psychotherapy: A systematic approach. [Google Scholar] 3. Beutler L.E. Making science matter in clinical practice: Redefining psychotherapy. *Clinical Psychology: Science and Practice.* 2009;16:301–317. [Google Scholar] 4. Beutler L.E. Welcome to the party, but. *Psychotherapy.* 2014;51:469–499. [PubMed] [Google Scholar] 5. Beutler L.E., Blatt S.J., Alimohamed S., Levy K.N., Angtuaco L. Participant factors in treatment conditions with dysphoria. In: Castonguay L.G., Beutler L.E., editors. *Principles of Therapeutic Change that Work.* Oxford University Press; New York: 2006. pp. 13–63. [Google Scholar]
Follow up Questions	What are other specific ways you could improve the accuracy of matching a patient with a treatment plan and how plausible would it be to implement that alongside STS? Is it feasible to consider every patient's condition and specific characteristics or is there any way to simplify the process while still attaining the same results? How was STS initially idealized and for what purpose?

Article #2 Notes: Automatic skin disease diagnosis using deep learning from clinical image and patient information

Article notes should be on separate sheets

Source Title	Automatic skin disease diagnosis using deep learning from clinical image and patient information
Source citation (APA Format)	Muhaba, K. A., Dese, K., Aga, T. M., Zewdu, F. T., & Simegn, G. L. (2021). Automatic skin disease diagnosis using deep learning from clinical image and patient information. *Skin health and disease*, *2*(1), e81. https://doi.org/10.1002/ski2.81
Original URL	Automatic skin disease diagnosis using deep learning from clinical image and patient information - PMC (nih.gov)
Source type	Scientific Journal "Articles from International Journal of Clinical and Health Psychology"
Keywords	Clinical images, deep model learning, skin diseases, early detection
#Tags	#lowresource, #timesaving, #deeplearning, #binaryclassification
Summary of key points + notes (include methodology)	By utilizing clinical images and patients' information for five common skin conditions, this led to the deep learning model having an accuracy of close to 98% when it came to classifying the condition. As skin diseases are one of the most common causes of human illnesses, affecting close to 900 million people at any time in the world, it's crucial to be able to detect signs and patterns of skin diseases early on to come up with a treatment option. This article focuses on using CAD to collect clinical images and use that data to continue to improve the identification of skin diseases.
Research Question/Problem/ Need	How can you use deep learning to aid in identifying skin conditions? *especially for low-resource areas where it's harder to see a dermatologist (this was designed into an app which makes it a lot more accessible)

Important Figures

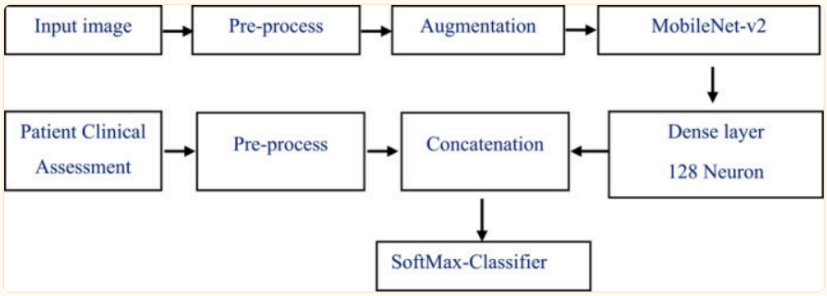
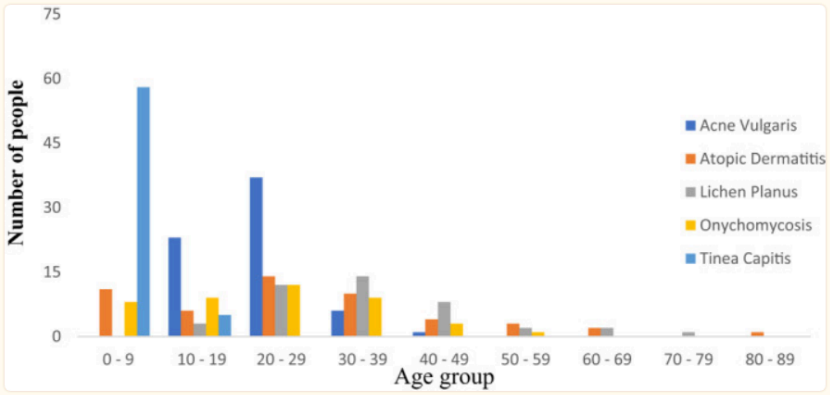


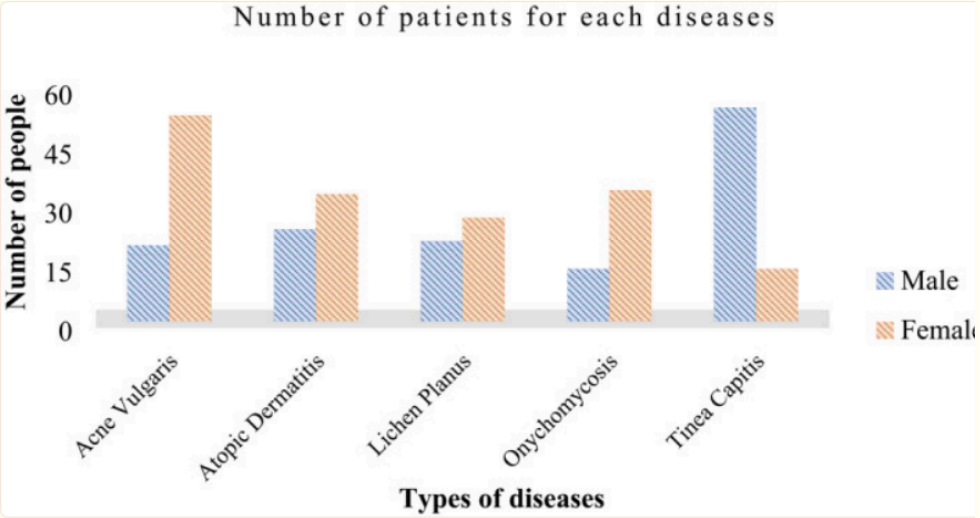
FIGURE 1

Block diagram of the skin disease multi-class classification system

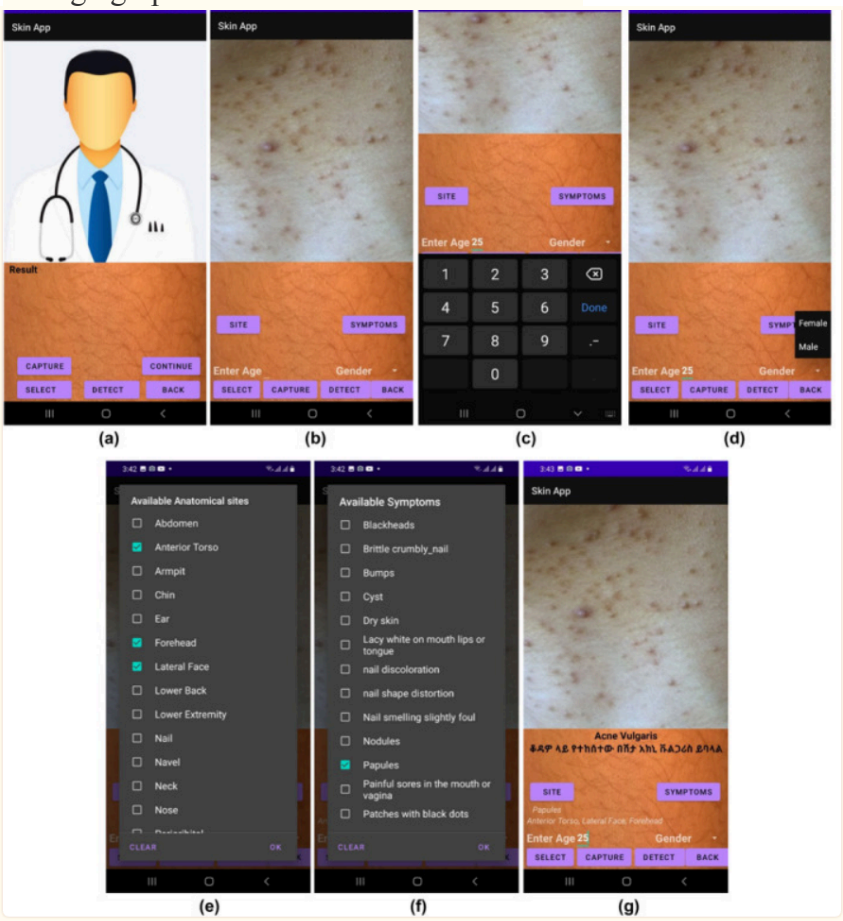
- This diagram provides a clear step-by-step of the proposed system and how it would work to identity the skin condition through various processes. By having these steps in a diagram, I found it a lot easier to follow and make sense of.



Age-wise distribution of five skin diseases



Gender-wise distribution of the five skin diseases

	- I think both of these bar graphs go together in providing more specific information regarding the five skin diseases in a visual way. Specifically, by highlighting the target ages and gender that gets affected by these conditions which I think is very useful to see through graphs instead of a number of tables.  FIGURE 9 An android application used for diagnosing skin diseases using clinical image and patient information. (a) Home page of the App. (b) Image Capturing. (c) Age information. (d) Gender selection. (e) Anatomical site selection. (f) Symptom list selection. (e) Predicted skin disease - This one gave a variety of pictures all showing the android application and it's functions. While it's nothing too specific, I find it's important to lay out all the different functions and options to better explain how the app works and how people can use it.
VOCAB: (w/definition)	CAD- computer-aided diagnosis Mobilenet-V2- deep-learning pretrained model designed to identity five common skin conditions

	SVM- support vector machine (proposed for classification of acne, eczema, psoriasis, benign, and malignant melanoma)
Cited references to follow up on	1. James WD, Berger TG, Elston DM, Odom RB. *Andrews' diseases of the skin: clinical dermatology*. Saunders Elsevier; 2006. [Google Scholar] 2. Recognizing neglected skin diseases. *World Health Org Glob*. 2018. [cited 2020 Aug 26]. Available from: https://www.who.int/neglected_diseases/news/WHO-publishes-pictorial-training-guide-on-neglected-skin-disease/en [Google Scholar] 3. Seth D, Cheldize K, Brown D, Freeman EF. Global burden of skin disease: inequities and innovations. *PMC*. 2018;6(3):204–10. [PMC free article] [PubMed] [Google Scholar] 4. Kelbore AG, Owiti P, Reid AJ, Bogino EA, Wondewosen L. Pattern of skin diseases in children attending a dermatology clinic in a referral hospital in Wolaita Sodo, southern Ethiopia. *BMC Dermatol*. 2019;5(19):1–8. [PMC free article] [PubMed] [Google Scholar] 5. Nutten S. *Atopic dermatitis: global epidemiology and risk factors*. Karger AG; 2015. [PubMed] [Google Scholar]
Follow up Questions	What other kinds of experiments can be made to help improve the accuracy rate of these skin disease diagnosis machines? How could you expand this idea to fit more than just five common skin conditions, what factors would you have to consider? As you expand into more and more types of skin conditions, how would you collect and organize that data most efficiently?

Article #3 Notes: Music Therapy Interventions for Deaf Clients with Dual Diagnosis

Article notes should be on separate sheets

Source Title	Music Therapy Interventions for Deaf Clients with Dual Diagnosis
Source citation (APA Format)	.Ward, Anna Johnson. "Music Therapy Interventions for Deaf Clients with Dual Diagnosis." *Voices: A World Forum for Music Therapy* 16, no. 3 (May 10, 2016). https://doi.org/10.15845/voices.v16i3.840.
Original URL	View of Music Therapy Interventions for Deaf Clients with Dual Diagnosis | Voices: A World Forum for Music Therapy
Source type	Research Article
Keywords	Deaf, language-dysfluency, vibrotactile feedback, music therapy, mental health, dual diagnosis, intellectual disability
#Tags	^^^
Summary of key points + notes (include methodology)	This article talks about using the concept of music therapy to aid Deaf people who have intellectual challenges and emotional or behavioral issues. As it discusses the principal connection between Deafness, music and its impact on mental health, and communication difficulties, this article emphasizes the value of interventions in music therapy that are specifically created for this demographic. The article also describes two case studies of music therapy sessions with Deaf patients who had "co-occurring disorders"s, going into detail on the objectives and strategies employed in these sessions to encourage emotional expression and coping mechanisms.
Research Question/Problem/ Need	How can we use music therapy to aid Deaf people?
Important Figures	None to note
VOCAB: (w/definition)	Deaf- linguistic-cultural minority of people with a hearing loss (Darrow, 2006a) caused by genetics, illness, or other reasons.
Cited references to follow up on	Abrams, B. (2011). Understanding music as a temporal-aesthetic way of being: Implications for a general theory of music therapy. *The Arts in Psychotherapy,*

	38, 114–119. doi: 10.1016/j.aip.2011.02.001 Altshuler, K., & Sarlin, B. (1962). Deafness and schizophrenia: Interrelation of communication stress, maturation lag, and schizophrenic risk. In F. Kallman (Ed.), *Expanding Goals of Genetics in Psychiatry* (pp. 52-62). New York: Grune & Stratton. Avon, A. (2006). Watching films, learning language, experiencing culture: An account of deaf culture through history and popular films. *The Journal of Popular Culture, 39*(2), 185–204. doi: 10.1111/j.1540-5931.2006.00228.x Darrow, A. (1993). The role of music in deaf culture: Implications for music educators. *Journal of Research in Music Education, 41*, 93–110. doi: 10.2307/3345402 Darrow, A. (2006a). Sounds in the silence: Research on music and deafness. *UPDATE: Applications Of Research In Music Education, 25*(1), 5–14. doi: 10.1177/87551233060250010102 Darrow, A. A. (2006b). The role of music in deaf culture: Deaf students' perception of emotion in music. *Journal of Music Therapy, 43*, 2–15. doi: 10.1093/jmt/43.1.2 Fulford, R., Ginsborg, J., & Goldbart, J. (2011). Learning not to listen: the experiences of musicians with hearing impairments. *Music Education Research, 13*(4), 447–464. doi: 10.1080/14613808.2011.632086
Follow up Questions	…removing stigma…future research…

Article #4 Notes: How does music affect your brain?

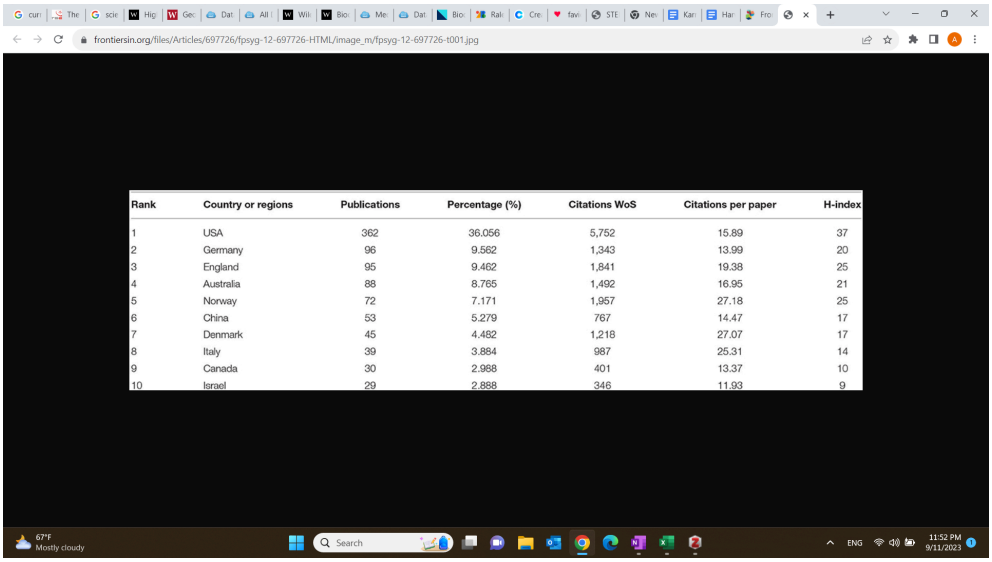
Article notes should be on separate sheets

Source Title	How does music affect your brain
Source citation (APA Format)	published, Becks Shepherd. “How Does Music Affect Your Brain?” livescience.com, December 15, 2022. https://www.livescience.com/how-does-music-affect-your-brain.
Original URL	https://www.livescience.com/how-does-music-affect-your-brain
Source type	Science Article
Keywords	Deaf, language-dysfluency, vibrotactile feedback, music therapy, mental health, dual diagnosis, intellectual disability
#Tags	#dopamine, #cognitivefunction, #stresslevels
Summary of key points + notes (include methodology)	This article addresses the influence of music on the brain and highlights a few significant ideas. Dopamine, the "feel-good" hormone, is released when you listen to music, and it can enhance cognitive performance, reduce anxiety and stress, and help you concentrate. Different musical genres stimulate the auditory cortex, limbic system, and motor cortex, among other brain regions. Music can assist with memory recall, and cognitive function, and may even help with depressive symptoms. By impacting the release of neurochemicals like serotonin and dopamine, it can also lower stress levels. Music has also been related to pain alleviation throughout

	medical operations. The article does in fact point out that how you listen to music and the type you listen to can also affect your emotional state of mind and overall mood.
Research Question/Problem/ Need	How does music affect the brain?
Important Figures	No figures included
VOCAB: (w/definition)	Dopamine- signaling molecule that acts as a chemical messenger in the nervous system and as a hormone that can affect many tissues in the body, associated with pleasure and happiness
Cited references to follow up on	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6397525/ (embedded in text)
Follow up Questions	How can we use this knowledge for future developments? What would those developments look like? What does knowing this allow for in the future?

Article #5 Notes: The State of Music Therapy Studies in the Past 20 Years: A Bibliometric Analysis

Source Title	The State of Music Therapy Studies in the Past 20 Years: A Bibliometric Analysis
Source citation (APA Format)	Li, Kailimi, Linman Weng, and Xueqiang Wang. "The State of Music Therapy Studies in the Past 20 Years: A Bibliometric Analysis." *Frontiers in Psychology* 12 (2021). https://www.frontiersin.org/articles/10.3389/fpsyg.2021.697726.
Original URL	https://www.frontiersin.org/articles/10.3389/fpsyg.2021.697726
Source type	Science "Review" Article
Keywords	Bibliometrics, global trends, research
#Tags	#musictherapy, #publications
Summary of key points + notes (include methodology)	This article focuses on the global trends in music therapy research between 2000 and 2019 through an approach known as "bibliometrics" analysis. As a whole, the article summarizes how music therapy essentially used evidence-based music intervention in order to address the different needs of individuals, whether it be physical, emotional, or cognitive. This article also analyzes various publications from the Web of Science database, specifically co-citations, collaborations, and trends. The number of publications on music therapy has grown significantly over the investigated period,

	with the United States dominating in terms of the number of research published and citations obtained. There are new areas for investigation, such as improvisational music therapy (IMT), which has shown success in treating diseases like drug misuse, depression, and autism. Keywords like "efficacy," "health," and "older adults" also represent substantial research trends. The results of the study help to pinpoint unified networks, developing subjects, and prospective research trajectories in the area of music therapy.
Research Question/Problem/ Need	Did the overall trend of music therapy publications rise over the years?
Important Figures	 This is a table showing the top 10 countries or regions of origin of study in the music therapy research field. I thought this was significant because it helped organize the data and paint a clearer picture of what they were talking about.
VOCAB: (w/definition)	Bibliometric- statistical analysis of books or other publications
Cited references to follow up on	Albornoz, Y. (2011). The effects of group improvisational music therapy on depression in adolescents and adults with substance abuse: a randomized controlled trial. *Nord. J. Music Ther.* 20, 208–224. doi: 10.1080/08098131.2010.522717 CrossRef Full Text | Google Scholar Association, A. M. T. (2018). *History of Music Therapy*. Available online at: https://www.musictherapy.org/about/history/ (accessed November 10, 2020).

	Google Scholar Benoit, C. E., Dalla Bella, S., Farrugia, N., Obrig, H., Mainka, S., and Kotz, S. A. (2014). Musically cued gait-training improves both perceptual and motor timing in Parkinson's disease. *Front. Hum. Neurosci.* 8:494. doi: 10.3389/fnhum.2014.00494 PubMed Abstract | CrossRef Full Text | Google Scholar Bernatzky, G., Bernatzky, P., Hesse, H. P., Staffen, W., and Ladurner, G. (2004). Stimulating music increases motor coordination in patients afflicted with Morbus Parkinson. *Neurosci. Lett.* 361, 4–8. doi: 10.1016/j.neulet.2003.12.022 PubMed Abstract | CrossRef Full Text | Google Scholar
Follow up Questions	None for this article

Article #6 Notes: **Aligning Kitwood's Model of Person-Centered Dementia Care with Music Therapy Practice**

Source Title	**Aligning Kitwood's Model of Person-Centered Dementia Care with Music Therapy Practice**
Source citation (APA Format)	Kelly, Lisa, Bill Ahessy, Ita Richardson, and Hilary Moss. "Aligning Kitwood's Model of Person-Centered Dementia Care with Music Therapy Practice." *Music Therapy Perspectives*, July 7, 2023, miad015. https://doi.org/10.1093/mtp/miad015.
Original URL	https://academic.oup.com/mtp/advance-article/doi/10.1093/mtp/miad015/7221285?searchresult=1
Source type	Journal Article
Keywords	Dementia, communicative musicality, collaboration
#Tags	#personcenteredcare, #musicengagement, #qualityoflife
Summary of key points + notes (include methodology)	This article covers the transformation in dementia care from a medical paradigm to person-centered care, with a strong emphasis on Tom Kitwood's concepts. Kitwood places a strong focus on developing personality, understanding the individual's perspective, and catering to their psychological needs. In line with this strategy, music therapy promotes person-centered care by targeting needs, encouraging teamwork, and promoting emotional expression. By using relaxation, stimulation, and validation, person-centered music therapy (PCMT) approaches and is helpful for people with dementia. They discuss the incorporation of PCMT in dementia care, stressing how it has the capacity to improve well-being and enhance person-centered strategies by focusing on the individual's unique circumstances and needs.

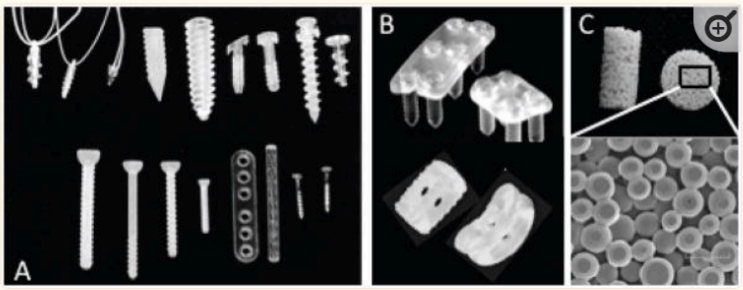
Research Question/Problem/ Need	What is the best way to offer care to patients with dementia?
Important Figures	None that I noted.
VOCAB: (w/definition)	PCMT- person centered music therapy
Cited references to follow up on	**Aldridge, D. (1994). Alzheimer's disease: Rhythm, timing and music as therapy. *Biomedicine & Pharmacotherapy* 48(7), 275–281. https://doi.org/10.1016/0753-3322(94)90172-4** **Google Scholar** **Crossref** **WorldCat** **Baird, A., Garrido, S., & Tamplin, J. (Eds.) (2020). *Music and dementia: From cognition to therapy*. Oxford Academic. https://doi.org/10.1093/oso/9780190075934.001.0001** **Google Scholar** **Google Preview** **WorldCat** **COPAC** **Baker, F. A., Stretton-Smith, P., Clark, I. N., Tamplin, J., & Lee, Y. C. (2018). A group therapeutic songwriting intervention for family caregivers of people living with dementia: A feasibility study with thematic analysis. *Frontiers in Medicine* 5, 151. https://doi.org/10.3389/fmed.2018.00151** **Google Scholar** **CrossrefPubMed** **WorldCat** **Baldwin, C., Capstick, A., Phinney, A., Purves, B., O'Connor, D., Chaudhury, H., & Bartlett, R. (2007). Conceptualizing personhood in dementia. In C. Baldwin & A. Capstick (Eds.), *Tom Kitwood on dementia: A reader and critical commentary*. Open University Press.** **Google Scholar** **Google Preview** **WorldCat** **COPAC** **Bradford Dementia Group. (2005). *Dementia care mapping: Principles and practice.* University of Bradford.** **Google Scholar** **Google Preview** **WorldCat** **COPAC**
Follow up Questions	-What would be the most beneficial future steps for this project in order for it to further develop?

Article #7 Notes: Short-Term and Long-Term Effects of Orthopedic Biodegradable Implants

Article notes should be on separate sheets

Source Title	Short-Term and Long-Term Effects of Orthopedic Biodegradable Implants
Source citation (APA Format)	Amini, Ami R., James S. Wallace, and Syam P. Nukavarapu. "Short-Term and Long-Term Effects of Orthopedic Biodegradable Implants." *Journal of Long-Term Effects of Medical Implants* 21, no. 2 (2011): 93–122.
Original URL	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3470866/#:~:text=Non%2Dpermanent%2C%20biodegradable%20implants%20offer,the%20need%20for%20secondary%20surgeries.
Source type	Scientific Journal
Keywords	biodegradable, orthopedic biomaterials, foreign body reaction, inflammation, fibrosis
#Tags	#foundation #initialresearch
Summary of key points + notes (include methodology)	- Biodegradable implants that are non-permanent, better alternative, temporary support, degrade at a rate matching tissue formation, eliminating need for secondary surgeries - Financial, psychological, clinical advantages in comparison to permanent medical implants - Metallic implants cost more for removal, making them a more expensive option, resorbable/biodegradable implants seven hundred dollars less per metallic implant - Often, metallic implants are too stiff/strong for most efficient bone healing, causes stress shielding (reduction in bone density caused by stress from an implant) - Study conducted by Mittal et al. found that 90 percent of patients found the biggest drawback of metal implants to be revision/removal surgeries

	- Therefore, resorbable implants= decreased expenses and decreased recovery time - Psychological impact from implant removal surgeries…added trauma, increases stress on patient and family - Resorbable implants= decreased stress shielding and lack of interference with imaging techniques - RI (resorbable implants can also be used as drug releasing devices*** (interested in doing more research on this), encapsulated with growth factors and antibiotics, potential to speed up recovery while preventing infections - Biodegradable polymers are also known as bioresorbable or bioabsorbable polymers - Commonly known- PGA (polyglycolide) and PLLA (polylactide) attracted much attention from orthopedic device community, excellent biocompatibility and tunable physical and degradation properties - Looking into developing implants that incorporate biopolymers (collagen and hyaluronic acid), combined with nano-hydroxyapatite or tri-calcium phosphate to create implants with bone-like composition - Mainly on screws, there's a lot of data available on biodegradable implants - "Surgical implantation of a biomaterial, regardless of its being inert and nontoxic, will initiate the on-set of a foreign body reaction" - Currently under development (meaning I can do more research if I chose)-scaffolds for bone tissue engineering, and cements and gels for bone defect filling - "histamine release by mast cells triggers the rapid migration of inflammatory cells, such as neutrophils and monocytes, towards the implanted biomaterial, and progression of a FBR" - Didn't focus on methodology for this article, just provided me with more background information
Research Question/Problem/ Need	(used this article to provide background information on a new topic)

Important Figures	 FIGURE 1 - This figure helped provide visual depictions of commonly used implants and what they are mainly used for
VOCAB: (w/definition)	- stress shielding (reduction in bone density caused by stress from an implant) - Resorbable implants- synonymous with biodegradable implants, made with degradable material
Cited references to follow up on	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6397525/ (embedded in text)
Follow up Questions	I still have a lot of questions on how exactly biodegradable implants can also work as drug carriers to help speed up recovery time while preventing infections. I think that could be really cool to look into because I never knew that was possible and that could definitely be a huge help for people who require medical implants. I had the main question from this section, how could you collect data on degradation rates of different polymers to help identity which materials are more efficient for different kinds of implants Later, I had the idea that I could do my own data in a lab by submerging different implant materials into simulated body fluids and recording their degradation rates as a way of collected data on the subject and using that to aid in my conclusions of which material is best What is the main thing I want to figure out in the next week or two is where I want to go with this project. After doing some research, this topic is really interesting and there's a lot of resources out there that keep fueling my interest. I want to commit to this topic and figure out what direction I'm trying to go with it because right now, I haven't decided and I'm a little stuck. I think with more research and using my brainstorming strategies (fishbone diagrams, mind maps), I can refine my topic into something more attainable for my science fair project.

Article #8 Notes: **This biodegradable brain implant delivers cancer-treating drugs**

Source Title	This biodegradable brain implant delivers cancer-treating drugs
Source citation (APA Format)	Whooley, Sean. "This Biodegradable Brain Implant Delivers Cancer-Treating Drugs." Drug Delivery Business, July 13, 2023. https://www.drugdeliverybusiness.com/biodegradable-brain-implant-delivers-cancer-treating-drugs/.
Original URL	https://www.drugdeliverybusiness.com/biodegradable-brain-implant-delivers-cancer-treating-drugs/
Source type	News Article
Keywords	#drugdelivery, #brainimplant, #bloodbrainbarrier
#Tags	#experiment, #implantfortumor, #ultrasoundwaves
Summary of key points + notes (include methodology)	- Chemotherapy drugs straight to the tumors - Tested with a drug called paclitaxel that typically struggles to break through the blood brain barrier - Blood vessel lining can stop chemotherapy from reaching cancer cells - Used mice, inserted implants in their brains behind the tumor - Used ultrasounds to weaken barrier and let the drug pass through - Results- the tumors in the mic shrunk and no reported side effects even after 6 months - Implant was created from glycine (benefits of this material included flexibility, stability, and ability to control the implants lifespan - Same method of creating pores in the blood brain barrier to let in tiny particles using voltage can be used for post-tumor removal surgery (treat cancer cells and dissolve over time)
Research Question/Problem/ Need	How can they use mice to test getting past the blood brain barrier with chemotherapy using ultrasound voltage?
Important Figures	None to note

VOCAB: (w/definition)	- Blood brain barrier- “shields the brain from toxic substances in the blood, supplies brain tissues with nutrients, and filters harmful compounds from the brain back to the bloodstream” - Paclitaxel- chemotherapy medicine - Glycine- piezoelectric amino acid, vibrates when exposed to electrical current
Cited references to follow up on	None to note
Follow up Questions	- What other ways can this method be tested to ensure it works - Would this process be the same for other similar drugs? If not, how can this method be altered to support the change?

Article #9 Notes: **Biodegradable implant could help doctors monitor brain chemistry**

Source Title	**Biodegradable implant could help doctors monitor brain chemistry**
Source citation (APA Format)	"Biodegradable Implant Could Help Doctors Monitor Brain Chemistry | Penn State University." Accessed October 9, 2023. https://www.psu.edu/news/institute-computational-and-data-sciences/story/biodegradable-implant-could-help-doctors-monitor/.
Original URL	https://www.psu.edu/news/institute-computational-and-data-sciences/story/biodegradable-implant-could-help-doctors-monitor/
Source type	University article
Keywords	Brain chemistry, biodegradable sensor, dopamine levels, neurotransmitter, neural diseases
#Tags	#avoidingsecondsurgery, #brainsensor

Summary of key points + notes (include methodology)	- Changes in brain chemistry can be monitored with wireless biodegradable sensor, no second operation necessary, harmlessly dissolve into body
	- Testing method- used mice, non-invasive procedure
	  - Inserted the device and could monitor dopamine levels
	  - Important neurotransmitter
	  - As well as pH levels, temperature and electrophysiology
	- Being able to measure dopamine levels through these sensors is crucial in correlating between many neural diseases
	- Silicone based implant with a semiconductor*
	- Inserted the device in a part of the mice's brains called basal ganglia

Research Question/Problem/ Need	This experiment was conducted to see if there was a way to use a biodegradable sensor to track dopamine levels in the brain.
Important Figures	None listed

VOCAB: (w/definition)	- *semiconductor is called TMDC- 2D Transition metal dichalcogenides, starting to get used more often in nanoelectronics
Cited references to follow up on	None listed
Follow up Questions	- How could they go about tracking different things in the brain besides just dopamine levels? - By doing this, what benefits would come from inserting a biodegradable brain sensor?

Article #10 Notes: 3D-printed implantable devices with biodegradable rate-controlling membrane for sustained delivery of hydrophobic drugs

Source Title	3D-printed implantable devices with biodegradable rate-controlling membrane for sustained delivery of hydrophobic drugs
Source citation (APA Format)	Picco, Camila J., Juan Domínguez-Robles, Emilia Utomo, Alejandro J. Paredes, Fabiana Volpe-Zanutto, Dessislava Malinova, Ryan F. Donnelly, and Eneko Larrañeta. "3D-Printed Implantable Devices with Biodegradable Rate-Controlling Membrane for Sustained Delivery of Hydrophobic Drugs." *Drug Delivery* 29, no. 1 (n.d.): 1038–48. https://doi.org/10.1080/10717544.2022.2057620.
Original URL	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8979538/
Source type	Scientific Journal
Keywords	Olanzapine, implant, 3D-printing, sustained delivery
#Tags	#testingstrategy, #using3DModels

Summary of key points + notes (include methodology)	**Background/Context:**
	• development of implantable drug delivery devices using 3D printing technology
	• implants are typically classified in two categories (matrix-type and reservoir-type)
	  ○ matrix-type- the drug is homogeneously dispersed
	  ○ reservoir-type- the drug is located at the core of the implant and release of drug is controlled by a membrane (reference from Stewart et Al in 2020)
	  ■ no initial burst drug release
	  ■ disadvantage- membranes typically created by non-biodegradable polymers (why is this a problem? Second surgery)
	• meant to release the hydrophobic drug olanzapine (OLZ) (medication for schizophrenia) over an extended period

- Implantable drug delivery systems =potential to revolutionize the treatment of various medical conditions
    - sustained and controlled drug release.

Problem Being Solved:

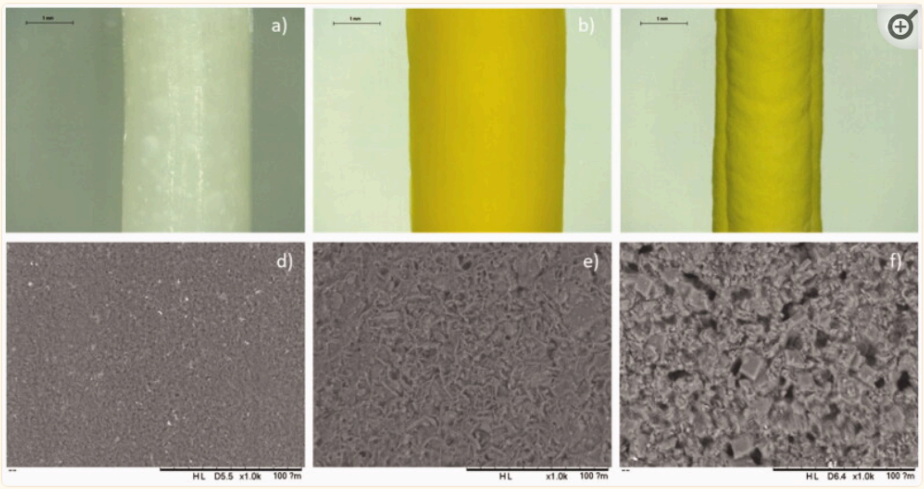
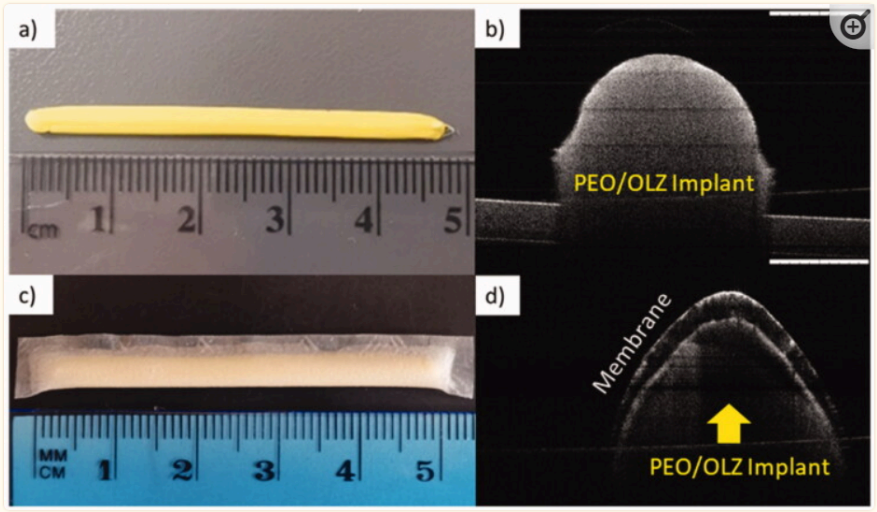
- The primary challenge= create implantable devices—>effectively deliver OLZ
    - hydrophobic (water repellent) drug (known for its efficacy against against certain diseases)
    - used in the treatment of conditions such as schizophrenia and anorexia, over an extended period
    - deliver OLZ without an initial burst release (happens during early stages of drug delivery, large amounts of the drug get released rapidly)
    - To accomplish this goal, required a combination of 3D printing techniques and rate-controlling membranes (provides a specific rate of drug release)
        - indicating that they wanted to create a reservoir-type implant
- Benefit of this- patient-tailored implants (because of approach's flexibility and controllability) (reference from khaled et al. in 2014)
    - Treatment could match individual patient and condition, more personalized which is beneficial to patients

Testing Strategies and Methods:

tests + experiments to ensure the drug delivery implants were put together correctly + the drug would be released the way it was meant to

- Drug release was studied for 6 months using…
- Microscopy Study: looked at implants under microscope to see how well drug was distributed throughout them
    - checked shape +size of the drug crystals to ensure everything was mixed properly
- Differential Scanning Calorimetry and Thermogravimetric Analysis (DSC-TGA): Specific machines to heat up + measure how implants reacted
    - helped them understand if there were any changes in the structure of the implants when the drug was added.
- Fourier Transform-Infrared Spectroscopic Analysis (FTIR): another machine that shone light on the implants to see how the different materials in them interacted
    - helped to check if there were any chemical reactions happening.
- X-ray Diffraction Assay (XRD): X-rays to see how the crystals in the implants were arranged
    - helped figure out the exact form of the drug inside the implants.
- Implant Assembly: special technique called Optical Coherence Tomography (OCT)

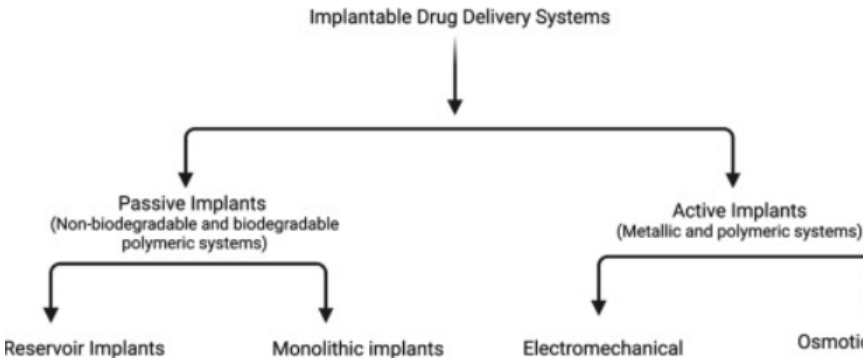
	○ look inside the implants without opening them up ○ could see how well the outer coating stuck to the implants. **Results: findings of study-** ● Both implant formulations (50% and 80% OLZ) == sustained drug release over 190 days ○ without initial burst release when coated with a PCL-based membrane (PCL- Polycaprolactone- biodegradable polyester) ● Implants with 50% OLZ have a faster initial release rate and then a gradual decline ○ But implants with 80% OLZ maintain a constant release rate over the entire duration ● Higher amounts of OLZ- higher viscosity formulations ○ Better-defined geometry (thinner) ■ Mixture did not flow when extruded ○ Formulation with 50% has lower viscosity, broader implants ● Cytocompatibility testing (property of not being harmful to cells) confirms that the PCL-based membranes used in the devices are safe for human cells. **Conclusions:** ● the study demonstrates the feasibility of 3D printing technology for creating implantable drug delivery devices ○ capable of sustained hydrophobic drug release ○ devices have potential applications in various medical conditions **Future research:** ● further research, including animal studies, is needed to ensure their safety + effectiveness ● study highlights need for addressing sterilization, quality control, and reproducibility aspects before considering clinical use ○ FDA actively works on providing guidance for researchers and companies in the field
Research Question/Problem/ Need	How to create 3D printed implantable devices to effectively deliver OLZ - Show the effectiveness of using 3d printed material

Important Figures	 - Model that displays the results of the experiment, shows how some implants are narrower and some are border depending on their concentration  - Shows implants with and without films to highlight the visual differences
VOCAB: (w/definition)	OLZ- drug used to treat schizophrenia Differential Scanning Calorimetry and Thermogravimetric Analysis (DSC-TGA): Specific machines to heat up + measure how implants reacted Fourier Transform-Infrared Spectroscopic Analysis (FTIR): another machine that shone light on the implants to see how the different materials in them interacted
Cited references to follow up on	1. Avti PK, Caparelli ED, Sitharaman B. (2013). Cytotoxicity, cytocompatibility, cell-labeling efficiency, and in vitro cellular magnetic

	resonance imaging of gadolinium-catalyzed single-walled carbon nanotubes. *J Biomed Mater Res A* 101:3580–91. [PMC free article] [PubMed] [Google Scholar] 2. Awad A, Fina F, Goyanes A, et al. (2020). 3D printing: principles and pharmaceutical applications of selective laser sintering. *Int J Pharm* 586:119594. [PubMed] [Google Scholar] 3. Ayala AP, Siesler HW, Boese R, et al. (2006). Solid state characterization of olanzapine polymorphs using vibrational spectroscopy. *Int J Pharm* 326:69–79. [PubMed] [Google Scholar] 4. Barrett SE, Teller RS, Forster SP, et al. (2018). Extended-duration MK-8591-eluting implant as a candidate for HIV treatment and prevention. *Antimicrob Agents Chemother* 62:e01058-18. [PMC free article] [PubMed] [Google Scholar] 5. Borandeh S, van Bochove B, Teotia A, Seppälä J. (2021). Polymeric drug delivery systems by additive manufacturing. *Adv Drug Deliv Rev* 173:349–73. [PubMed] [Google Scholar] 6. Burugapalli K, Razavi M, Zhou L, Huang Y. (2016). In vitro cytocompatibility study of a medical β-type Ti–35.5Nb–5.7Ta titanium alloy. *J Biomater Tissue Eng* 6:141–8. [Google Scholar]
Follow up Questions	- How can I use the testing strategy here in my own project testing (what parts can I apply?) - Is this kind of a project idea (3D printed models) effective and feasible to do?

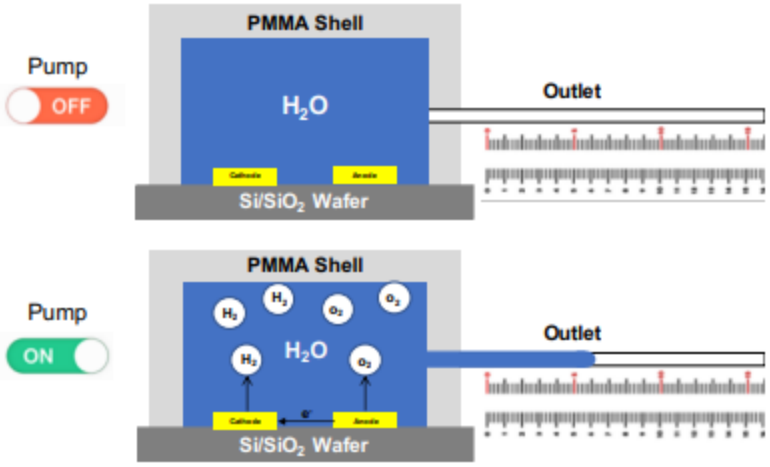
Article #11 Notes: 3D printed implantable drug delivery devices for women's health: Formulation challenges and regulatory perspective

Source Title	3D printed implantable drug delivery devices for women's health: Formulation challenges and regulatory perspective
Source citation (APA Format)	Al-Litani, Karen, Tariq Ali, Pamela Robles Martinez, and Asma Buanz. "3D Printed Implantable Drug Delivery Devices for Women's Health: Formulation Challenges and Regulatory Perspective." *Advanced Drug Delivery Reviews* 198 (July 1, 2023): 114859. https://doi.org/10.1016/j.addr.2023.114859.
Original URL	https://www.sciencedirect.com/science/article/pii/S0169409X23001746#b0085
Source type	Scientific Journal
Keywords	Drug delivery device, women's health
#Tags	#implications, #drugdeliveringsystem
Summary of key points + notes (include methodology)	Researchers are making exciting strides in the development of 3D printed drug delivery devices tailored for women's health. Employing technologies like FDM and materials such as polyurethane, studies have crafted implants with unique designs, like cone-shaped cervix tissue implants and porous structures, addressing challenges in drug loading for prolonged release. For biodegradable implants, polycaprolactone (PCL) and polylactic acid (PLA) show promise, especially with PCL's longer degradation suitable for extended applications. However, assessing mechanical properties consistently remains a gap, hindering insights into implant functionality. Despite solid-state characterization and drug release studies being common, inconsistencies in testing conditions make cross-study comparisons challenging. Regulatory bodies are actively working to establish guidelines, including the FDA and MHRA, recognizing the need for standards in this innovative

	field. The future beckons for optimizing process parameters and addressing regulatory challenges to unlock the full potential of 3D printed drug delivery systems, particularly in the realm of women's health. *Chat GPT Prompt: Please use the four parts of the same text to write a one-paragraph summary at a senior in highschool levels
Research Question/Problem/ Need	With there being a knowledge gap in drug delivering devices targeted towards women's health, how can drug delivery systems be optimized for this purpose?
Important Figures	 This figure did a good job summarizing and explaining the two types of drug delivery systems and what makes them different in a flow chart.
VOCAB: (w/definition)	Active implant- programmable drug release Passive implant- gradual release of drugs
Cited references to follow up on	Kumar, H., Prakash, A., Sarma, P., & Medhi, B. (2017). Three-dimensional drugs: A new era in the pharmaceutical development. *Indian journal of pharmacology*, *49*(6), 417. Mathew, E., Pitzanti, G., Larrañeta, E., & Lamprou, D. A. (2020). 3D printing of pharmaceuticals and drug delivery devices. *Pharmaceutics*, *12*(3), 266. Konta, A. A., García-Piña, M., & Serrano, D. R. (2017). Personalised 3D printed medicines: which techniques and polymers are more successful?. *Bioengineering*, *4*(4), 79.
Follow up Questions	What are other future developments that could be made with this research so it can be implemented into worldly use?

Article #12 Notes: Implantable 3D Printed Drug Delivery System

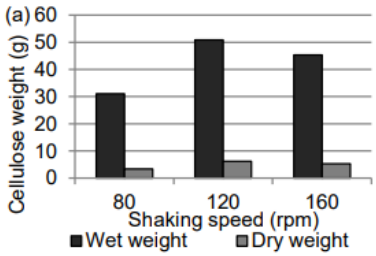
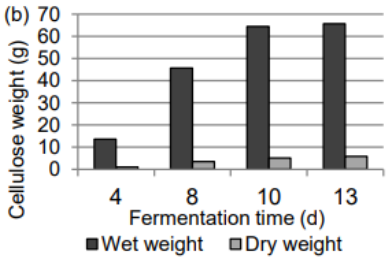
Source Title	Implantable 3D Printed Drug Delivery System
Source citation (APA Format)	Moussi, Khalil, Abdullah Bukhamsin, and Jurgen Kosel. "Implantable 3D Printed Drug Delivery System." In *2019 20th International Conference on Solid-State Sensors, Actuators and Microsystems & Eurosensors XXXIII (TRANSDUCERS & EUROSENSORS XXXIII)*, 2243–46. Berlin, Germany: IEEE, 2019. https://doi.org/10.1109/TRANSDUCERS.2019.8808496.
Original URL	https://repository.kaust.edu.sa/server/api/core/bitstreams/75054165-fd87-4bc3-903c-fc17a38f3ece/content
Source type	Conference Paper
Keywords	3D printing, drug delivery, electrolytic micropump, microneedles
#Tags	#exampleofsystem, #methodology
Summary of key points + notes (include methodology)	In this study, scientists have developed a compact drug delivery system for biomedical use. The system involves an electrolytic pump and microneedles, and a special 3D printing technique was used for fabrication. The microneedles demonstrated a controlled flow rate at different pressures, and the entire system, measuring only 3.9 mm ´ 2.1 mm ´ 2 mm, efficiently delivered 4 ± 0.5 µL within 12 seconds. The microneedles also showed promise for transdermal delivery through a skin-like material. This research represents a significant advancement in drug delivery, providing a miniature and precise method for targeted drug release, overcoming limitations of traditional delivery approaches. *Chat GPT Prompt: Please use the text to write a one-paragraph summary at a senior in highschool levels
Research Question/Problem/ Need	Is it possible to create a miniaturized drug delivery system that is still efficient and works effectively?

Important Figures	 This figure describes the setup of the electrolysis pump that they used in the system.
VOCAB: (w/definition)	In vivo- in the living organism In vitro- using a model organism
Cited references to follow up on	N. Elman and U. Upadhyay, "Medical applications of implantable drug delivery microdevices based on MEMS (Micro-Electro-Mechanical-Systems)," Current pharmaceutical biotechnology, vol. 11, no. 4, pp. 398-403, 2010. [2] J. Ambati et al., "Transscleral delivery of bioactive protein to the choroid and retina," Investigative ophthalmology & visual science, vol. 41, no. 5, pp. 1186-1191, 2000. [3] D. Schmaljohann, "Thermo-and pH-responsive polymers in drug delivery," Advanced drug delivery reviews, vol. 58, no. 15, pp. 1655-1670, 2006. [4] O. Yassine, A. Zaher, E. Li, E.A. Qiang, Alfadhel, J.E. Perez, M. Kavaldzhiev, M.F. Contreras, S. Li , S. T. Thoroddsen, N. M. Khashab, and J. Kosel, “Highly Efficient Thermoresponsive Nanocomposite for Controlled Release Applications,” Scientific Reports, vol. 6, p. 28539, 2016.
Follow up Questions	What is the purpose of making this design? What future steps have to be taken to apply this in real medical applications?

Article #13 Notes: Optimization of Bacterial Cellulose Production from Pineapple Waste using Different Fermentation Method

Article notes should be on separate sheets

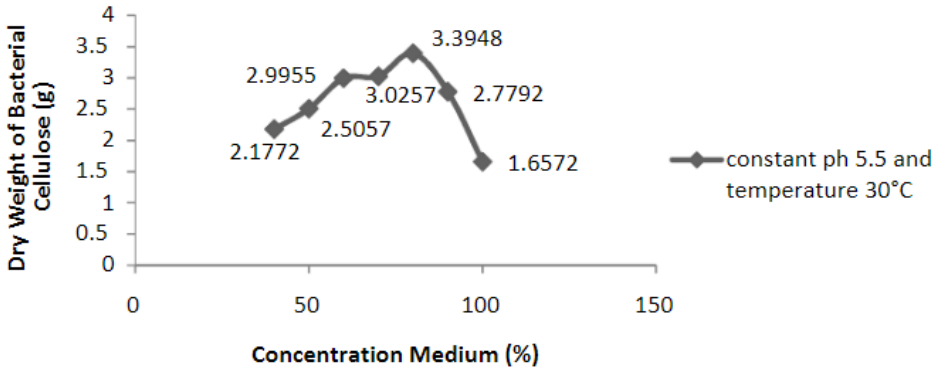
Source Title	Optimization of Bacterial Cellulose Production from Pineapple Waste using Different Fermentation Method
Source citation (APA Format)	Zakaria, Junaidi, and 亚之兰) アズラン Azlan Nazeri. (2012). “Optimization of Bacterial Cellulose Production from Pineapple Waste: Effect of Temperature, pH and Concentration.
Original URL	https://www.aidic.it/cet/20/78/094.pdf
Source type	Scientific Journal
Keywords	Pineapple waste, bacterial cellulose production
#Tags	#alternativesource, #pineapple
Summary of key points + notes (include methodology)	This research explores the use of pineapple waste to produce a special material called bacterial cellulose, created by Acetobacter xylinum bacteria. The scientists investigate how factors like temperature, acidity (pH), and the concentration of pineapple waste affect the production of bacterial cellulose. They conduct experiments to find the best conditions, discovering that optimal results occur at pH 5.50, temperature 30°C, and 80% pineapple waste concentration, yielding 3.3948g of bacterial cellulose. Further refinement using response surface methodology identifies even better conditions: pH 5.15, temperature 30.51°C, and 83.32% concentration, resulting in 3.4368g of bacterial cellulose. Tests confirm the presence of bacterial cellulose using Fourier Transform Infrared Spectroscopy. This study emphasizes the potential of using pineapple waste for eco-friendly bacterial cellulose production, which could have practical applications in sustainable materials. *This was generated by Chat Prompt: Write a paragraph long summary of the text at a senior in highschool level

Research Question/Problem/ Need	Can the weight of bacterial cellulose produced be increased by changing the culture medium to include pineapple waste as a natural carbon source?
Important Figures	  These two graphs display the weight of the bacterial cellulose at different shaking speeds and different fermentation times to see if these factors have an effect on how much is produced.
VOCAB: (w/definition)	Culture medium- the environment the bacteria is grown in
Cited references to follow up on	Arjmandi R., Suib N., Hassan A., Muhamad I.I., Pa'e N., 2017, Tensile and morphological properties of bacterial cellulose nanowhiskers reinforced polylactic acid nanocomposites, Chemical Engineering Transactions, 56, 1327-1332 Budhiono A., Rosidi B., Taher H., Iguchi M., 1999, Kinetic aspects of bacterial cellulose formation nata-decoco culture system, Carbohydrate Polymers 40, 137-143. Design Expert Version 7, 2007, Stat-Ease Inc, Minneapolis, USA. Hokkanen S., Bhatnagar A., Sillanpaa, M., 2016, A review on modification methods to cellulose-based adsorbents to improve adsorption capacity, Water Research 91, 156-173. Klemm D., Schumann D., Udhardt U., Marsch S., 2001, Bacteria synthesis cellulose – Artificial blood vessels for microsurgery, Progress In Polymer Science 26, 1561–1603. Mansor A.M., Lim, J. S.., Ani F.N., Hashim H., Ho W. S., 2018, Ultimate and proximate analysis of Malaysia pineapple biomass from MD2 cultivar for biofuel application, Chemical Engineering Transactions, 63, 127- 132.
Follow up Questions	Is this a feasible option for large-scale manufacturing and if so, what is the best way to incorporate this change into larger cellulose producing companies?

Article #14 Notes: Optimization of Bacterial Cellulose Production from Pineapple Waste: Effect of Temperature, pH and Concentration

Article notes should be on separate sheets

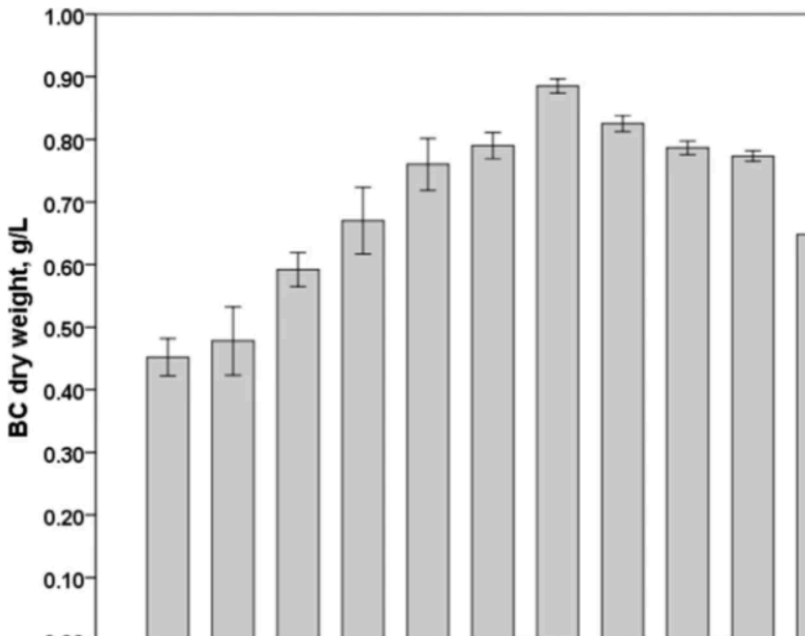
Source Title	Optimization of Bacterial Cellulose Production from Pineapple Waste: Effect of Temperature, pH and Concentration
Source citation (APA Format)	Zakaria, Junaidi, and 亚之兰) アズラン Azlan Nazeri. “Optimization of Bacterial Cellulose Production from Pineapple Waste: Effect of Temperature, pH and Concentration,” 2012.
Original URL	https://www.researchgate.net/publication/326550365_Optimization_of_Bacterial_Cellulose_Production_from_Pineapple_Waste_Effect_of_Temperature_pH_and_Concentration
Source type	Scientific Journal
Keywords	Pineapple waste, acidity, *Acetobacter Xylinum*
#Tags	#testingstrategies
Summary of key points + notes (include methodology)	This study aimed to make bacterial cellulose (Nata) from pineapple waste using a bacterium called Acetobacter xylinum. They tested two ways of growing it: one where it sits still (static) and one where it's stirred (agitated). Stirring it at a moderate speed with tiny particles (glass beads) added resulted in the most cellulose. The researchers discovered that yeast extract and potassium dihydrogen phosphate are crucial for making a lot of bacterial cellulose. They then figured out the best amounts for these ingredients, along with yeast extract, sucrose, and bactopepton, resulting in a 70.23% increase in bacterial cellulose compared to the static method. They also found that magnesium sulfate doesn't matter for this process. Using pineapple waste is great because it's a way to use up waste and be more environmentally friendly. This research helps us understand how to efficiently make a lot of bacterial cellulose from pineapple waste. Prompts: Please write a paragraph long summary of that text

	simplify this to a senior in highschool level
Research Question/Problem/ Need	Can pineapple waste be used as an alternative carbon source for the production of bacterial cellulose?
Important Figures	 This figure provides a good summary of the importance of the data collected by comparing the concentration of pineapple waste and its correlation with the yield of cellulose.
VOCAB: (w/definition)	*Acetobacter xylinum*-produces biopolymer bacterial cellulose
Cited references to follow up on	Esin Poyrazogiu Coban & Halil Biyik.(2011). Effect of various carbon and nitrogen sources on cellulose synthesis by Acetobacter lovaniesis HBB5. African Journal of Biotechnology, 10(27), 5346-5354 Guo, G.-L., Chen, W.-H., Chen, W.-H., Men, L.-C., & Hwang, W.-S. (2008). Characterization of Dilute Acid Pretreatment of Silvergrass for Ethanol Production. Bioresource Technology , 99, 6046-6053. Iguchi, M., and Yamanaka, S. (1997). Industrial use of bacterial cellulose. A review. Proceedings of International Workshop Green Polymer. Bandung Bagor, 47-54.
Follow up Questions	What other ways can you test the effects of an alternative culture medium on the production of cellulose? What testing strategies can you use to identify other properties that are affected by the change?

Article #15 Notes: Bacterial cellulose production by *Novacetimonas hansenii* MSCL 1646 on apple juice

Article notes should be on separate sheets

Source Title	Bacterial cellulose production by *Novacetimonas hansenii* MSCL 1646 on apple juice
Source citation (APA Format)	Kolesovs, Sergejs, Kristaps Neiberts, Sergejs Beluns, Sergejs Gaidukovs, and Pavels Semjonovs. "Bacterial Cellulose Production by Novacetimonas Hansenii MSCL 1646 on Apple Juice." *Applied Microbiology and Biotechnology* 106, no. 22 (November 1, 2022): 7449–60. https://doi.org/10.1007/s00253-022-12213-5.
Original URL	https://link.springer.com/article/10.1007/s00253-022-12213-5
Source type	Scientific Journal
Keywords	biomaterials , biopolymers, apple juice, cellulose production
#Tags	#alternativefoodsource, #alternative carbon source
Summary of key points + notes (include methodology)	*Chat GPT Prompt: Please use the text to write a one paragraph summary at a senior in highschool leves In this study, scientists explored the use of apple juice as a medium for producing something called bacterial cellulose (BC). BC is a useful material that can be used in various applications. The researchers tested different sources of nitrogen, which is an important ingredient for BC production, in combination with apple juice. They found that adding beef extract to the apple juice resulted in the highest production of BC. They also looked at the optimal concentrations of apple juice and beef extract, discovering that a specific combination led to significantly higher BC

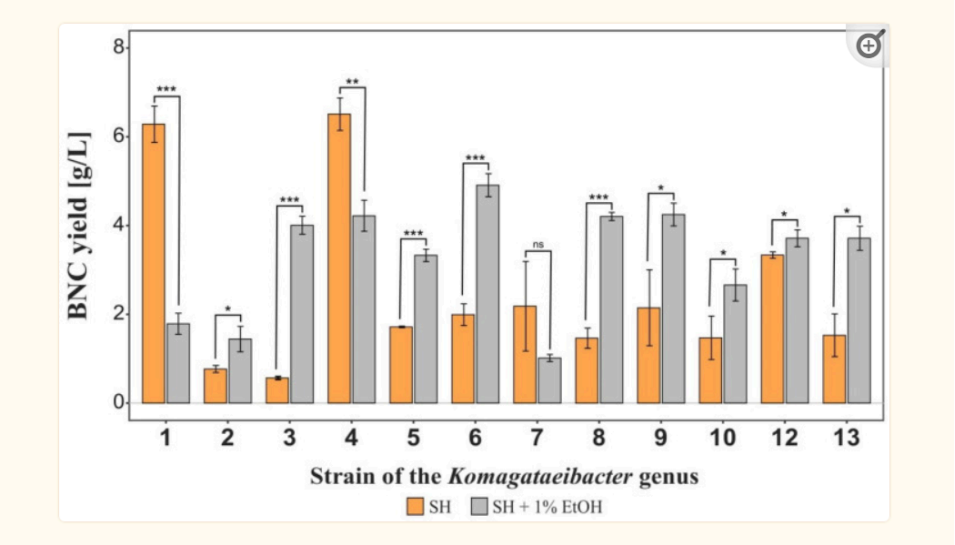
	production compared to a standard medium. The study not only focused on the quantity of BC but also examined its physical and mechanical properties. The findings suggest that apple juice, when combined with certain additives, could be a promising medium for producing BC with desirable properties for different purposes.
Research Question/Problem/ Need	How does changing the culture medium to implement apple juice affect the production yield of cellulose?
Important Figures	**Fig. 1**  This figure (the x-axis is cut out), shows the different apple juice concentrations and how they affect the dry weight of bacterial cellulose produced. The lines at the top represent the standard deviation of each of the samples.
VOCAB: (w/definition)	N. hansenii MSCL 1646, K. rhaeticus MSCL 1463 and N. hansenii DSM 5602- three types of AAB strains that were tested in this research for BC synthesis
Cited references to follow up on	Adebayo-Tayo B, Akintunde M, Sanusi J (2017) Effect of different fruit juice media on bacterial cellulose production by Acinetobacter sp. BAN1 and Acetobacter pasteurianus PW1. J Adv Biol Biotechnol 14:1–9. https://doi.org/10.9734/jabb/2017/34171 Andriani D, Apriyana AY, Karina M (2020) The optimization of bacterial cellulose production and its applications: a review. Cellulose 27:6747–6766. https://doi.org/10.1007/s10570-020-03273-9 Gorgieva S, Trček J (2019) Bacterial cellulose: production, modification and

	perspectives in biomedical applications. Nanomaterials 9:1–20. https://doi.org/10.3390/nano9101352
Follow up Questions	What other kinds of juices could someone use and what would the expected results be using this as a baseline?

Article #16 Notes: Comparative Analysis of Bacterial Cellulose Membranes Synthesized by Chosen *Komagataeibacter* Strains and Their Application Potential

Article notes should be on separate sheets

Source Title	Comparative Analysis of Bacterial Cellulose Membranes Synthesized by Chosen *Komagataeibacter* Strains and Their Application Potential
Source citation (APA Format)	Kaczmarek, Monika, Marzena Jędrzejczak-Krzepkowska, and Karolina Ludwicka. "Comparative Analysis of Bacterial Cellulose Membranes Synthesized by Chosen Komagataeibacter Strains and Their Application Potential." *International Journal of Molecular Sciences* 23, no. 6 (March 21, 2022): 3391. https://doi.org/10.3390/ijms23063391.
Original URL	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8950309/
Source type	Scientific Journal
Keywords	bacterial cellulose, Komagataeibacter, biomaterial, nanocomposite
#Tags	#bacterialcellulose #background
Summary of key points + notes (include methodology)	The article discusses the production and modification of bacterial cellulose, a versatile biological material, by different strains of Komagataeibacter bacteria. Various strains were analyzed for cellulose yield and membrane properties. Ethanol supplementation significantly influenced yield, and strains with and without ethanol were compared. Three promising strains were identified for further research. The study also explored the modification of bacterial cellulose by adding compounds like citrus pectin, apple pectin, wheat starch, polyvinyl alcohol, and polyethylene glycol. These modifications affected the material's properties, making it suitable for diverse applications, including wound dressings, drug delivery, and packaging. The article emphasizes the importance of strain selection and modifications in tailoring bacterial cellulose for specific purposes.

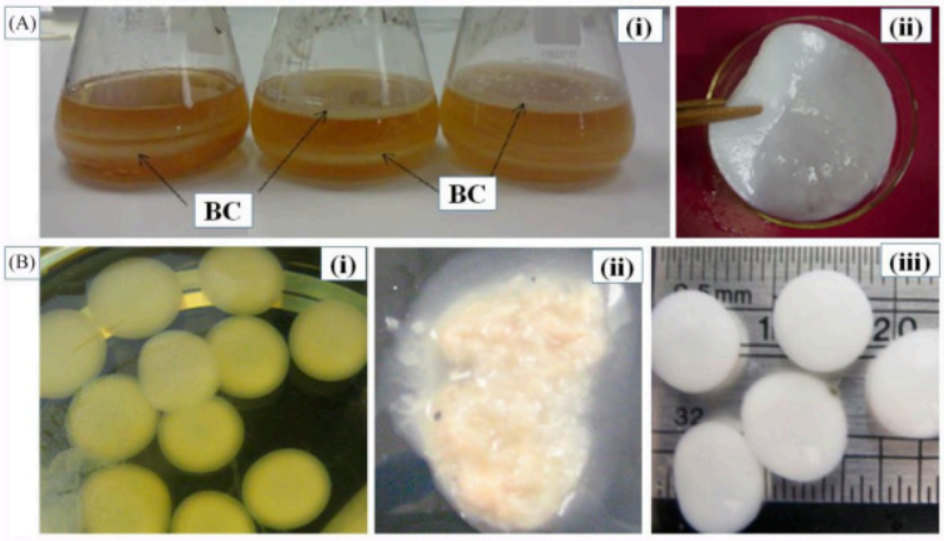
	*Chat GPT Prompt: Those are the three parts of one article, copy and pasted in order. Please write a senior in highschool level summary
Research Question/Problem/ Need	How can we choose the best microorganisms for the production of cellulosic materials that have the most potential for use in the creation of bio-inspired nanocomposites?
Important Figures	 This figure displays different strains of *Komagataeibacter* and how the yield varies using a bar graph to highlight the differences in different strains.
VOCAB: (w/definition)	BNC- Microbiologically synthesized cellulose Nanocomposites- solid structure materials, like nanoparticles, nanorods, and nanofibers
Cited references to follow up on	1. Chen C., Ding W., Zhang H., Zhang L., Huang Y., Fan M., Yang J., Sun D. Bacterial Cellulose-Based Biomaterials: From Fabrication to Application. Carbohydr. Polym. 2022;278:118995. doi: 10.1016/j.carbpol.2021.118995. [PubMed] [CrossRef] [Google Scholar] 2. Gorgieva S., Trček J. Bacterial Cellulose: Production, Modification and Perspectives in Biomedical Applications. Nanomaterials. 2019;9:1352. doi: 10.3390/nano9101352. [PMC free article] [PubMed] [CrossRef] [Google Scholar] 3. Ludwicka K., Kaczmarek M., Białkowska A. Bacterial Nanocellulose—A Biobased Polymer for Active and Intelligent Food Packaging Applications: Recent Advances and Developments. Polymers. 2020;12:2209. doi:

	10.3390/polym12102209. [PMC free article] [PubMed] [CrossRef] [Google Scholar] 4. Azeredo H.M.C., Barud H., Farinas C.S., Vasconcellos V.M., Claro A.M. Bacterial Cellulose as a Raw Material for Food and Food Packaging Applications. Front. Sustain. Food Syst. 2019;3:7. doi: 10.3389/fsufs.2019.00007. [CrossRef] [Google Scholar]
Follow up Questions	How can this research be directly applied into the real-world? What is its long term significance?

Article #17 Notes: Chapter 13 - Production and applications of bacterial cellulose

Article notes should be on separate sheets

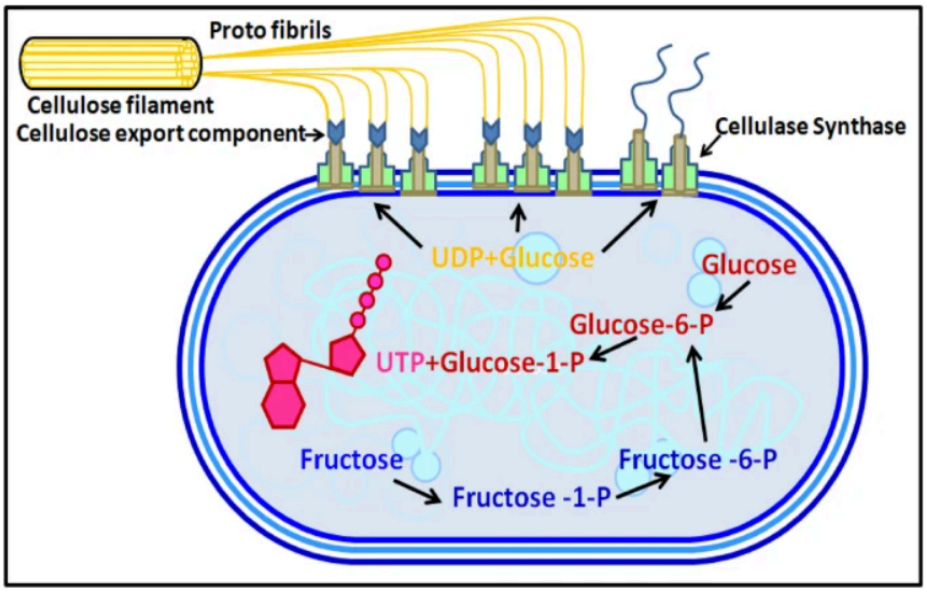
Source Title	Chapter 13 - Production and applications of bacterial cellulose
Source citation (APA Format)	Wahid, Fazli, and Cheng Zhong. "Production and Applications of Bacterial Cellulose." In *Biomass, Biofuels, Biochemicals*, 359–90. Elsevier, 2021. https://doi.org/10.1016/B978-0-12-821888-4.00010-1.
Original URL	https://www.sciencedirect.com/science/article/abs/pii/B9780128218884000101#:~:text=Bacterial%20cellulose%20(BC)%20is%20a,biomedical%2C%20and%20various%20other%20applications.
Source type	Scientific Journal
Keywords	Bacterial cellulose, production, properties, applications
#Tags	#generalbackground
Summary of key points + notes (include methodology)	Bacterial cellulose (BC) holds great promise across various fields. In the biomedical realm, BC is a key player in crafting artificial blood vessels and heart valves, showing advantages over traditional grafts. It also demonstrates potential in bone tissue engineering, offering a scaffold for cell growth and differentiation. BC's versatility extends to food applications, being deemed safe by the FDA. It contributes to the delightful texture of the Filipino dessert "nata-de-coco" and aids in creating fat-free or low-calorie foods. BC finds a place in cosmetics, where its nonallergenic nature makes it a valuable component in facial masks for moisturizing and cosmetic effects. The electronic field benefits from BC's fibrous structure, utilizing it in conductive membranes, biosensors, and batteries. Water purification sees BC in action through composite membranes for effective removal of pollutants. Additionally, BC has roles in paper manufacturing, textiles, enzyme immobilization, and more. Commercially, various BC-based products are already available, and ongoing research aims to enhance its properties and reduce production costs. Challenges like biodegradability are recognized, urging future research to unlock BC's full potential. *Chat GPT Prompt: Please use the three parts of the same text to write a one paragraph summary at a

	senior in highschool level
Research Question/Problem/ Need	This chapter covers the creation of BC, its characteristics, and its uses in numerous industries. It also promotes upcoming discoveries and studies regarding BC.
Important Figures	 These images highlight the different states of BC. For example, in its static condition, when it's agitated, etc.
VOCAB: (w/definition)	Agitation- stirring or disturbing something, specifically a liquid
Cited references to follow up on	Abeer, M. M., Mohd Amin, M. C. I., & Martin, C. (2014). A review of bacterial cellulose-based drug delivery systems: their biochemistry, current approaches and future prospects. Journal of Pharmacy and Pharmacology, 66(8), 1047-1061. Araújo, I. M., Silva, R. R., Pacheco, G., Lustri, W. R., Tercjak, A., Gutierrez, J., ... & Barud, H. S. (2018). Hydrothermal synthesis of bacterial cellulose–copper oxide nanocomposites and evaluation of their antimicrobial activity. Carbohydrate polymers, 179, 341-349. Chawla, P. R., Bajaj, I. B., Survase, S. A., & Singhal, R. S. (2009). Microbial cellulose: fermentative production and applications. Food Technology & Biotechnology, 47(2). Ciechanska, D. (2004). Multifunctional bacterial cellulose/chitosan composite materials for medical applications. Fibres Text East Eur, 12(4), 69-72.
Follow up Questions	In what applications are the least amount of research done on? What more can be looked at and studied to remedy this issue?

Article #18 Notes: Bacterial cellulose: A smart biomaterial for biomedical applications

Article notes should be on separate sheets

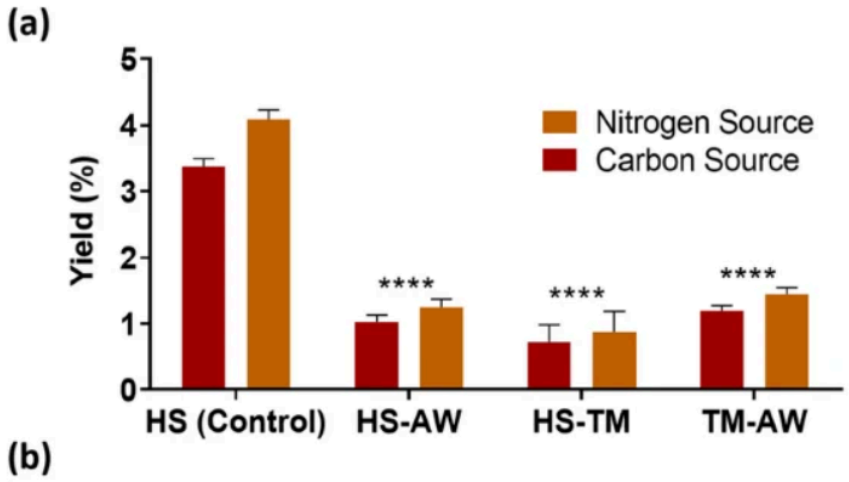
Source Title	Bacterial cellulose: A smart biomaterial for biomedical applications
Source citation (APA Format)	Pandey, Ashutosh, Mukesh Kumar Singh, and Annika Singh. "Bacterial Cellulose: A Smart Biomaterial for Biomedical Applications." *Journal of Materials Research*, August 17, 2023. https://doi.org/10.1557/s43578-023-01116-4.
Original URL	https://link.springer.com/article/10.1557/s43578-023-01116-4
Source type	Scientific Journal
Keywords	Biomedical applications, carbon source, biotechnology
#Tags	#realworldapplications, #usability
Summary of key points + notes (include methodology)	Bacterial cellulose (BC) emerges as a versatile material with promising applications in drug delivery, medical textiles, and cosmetics. In drug delivery, BC's biocompatibility and biodegradability make it an ideal carrier, with ongoing innovations expected to meet the rising demand for controlled drug release. Medical textiles benefit from BC's three-dimensional porous structure, finding use in wound care, implants, and oral protein delivery. The cosmetic industry explores BC's nanofibrous network for controlled drug release and skincare, showcasing its potential in various formulations. Overall, BC stands out as a multifaceted biomaterial poised to revolutionize diverse fields, from medicine to beauty products, driven by its unique properties and adaptability. *Chat GPT Prompt: Please use the three parts of the same text to write a one paragraph summary at a senior in highschool levels
Research Question/Problem/ Need	Better biocompatibility, zero cytotoxicity, and increased wellbeing will be made possible by this database in future product design.

Important Figures	 This figure outlines BC synthesis in *Acetobacter xylinum* highlighting specific points like cellulase synthase and the cellulose filament
VOCAB: (w/definition)	Nanofibrous network- network of ultrathin fibers Biocompatibility- a material's ability to effectively work without causing any effects to the environment it's in
Cited references to follow up on	Klemm, D., Kramer, F., Moritz, S., Lindström, T., Ankerfors, M., Gray, D., & Dorris, A. (2011). Nanocelluloses: a new family of nature-based materials. Angewandte Chemie International Edition, 50(24), 5438-5466. Portela, R., Leal, C. R., Almeida, P. L., & Sobral, R. G. (2019). Bacterial cellulose: A versatile biopolymer for wound dressing applications. Microbial biotechnology, 12(4), 586-610.
Follow up Questions	What is the best way to use the research shown in this article for the future? What more research needs to be collected?

Article #19 Notes: Sustainable bacterial cellulose production by low cost feedstock: evaluation of apple and tea by-products as alternative sources of nutrients

Article notes should be on separate sheets

Source Title	Sustainable bacterial cellulose production by low cost feedstock: evaluation of apple and tea by-products as alternative sources of nutrients
Source citation (APA Format)	Amorim, Lúcia F. A., Lengwan Li, Ana P. Gomes, Raul Fangueiro, and Isabel C. Gouveia. "Sustainable Bacterial Cellulose Production by Low Cost Feedstock: Evaluation of Apple and Tea by-Products as Alternative Sources of Nutrients." *Cellulose* 30, no. 9 (June 1, 2023): 5589–5606. https://doi.org/10.1007/s10570-023-05238-0.
Original URL	https://link.springer.com/article/10.1007/s10570-023-05238-0#:~:text=Thus%2C%20our%20findings%20substantiated%20that,remarkable%20physical%20and%20structural%20properties.
Source type	Scientific Journal
Keywords	Komagataeibacter xylinus, BC Production, kombucha
#Tags	#testingmethod, #alternativefoodsource
Summary of key points + notes (include methodology)	The study investigated the use of apple waste and a tea mixture as alternative feedstocks for bacterial cellulose (BC) production, a versatile material with potential applications in various industries. Researchers explored the combination of apple waste from Bravo de Esmolfe apples and a tea mixture as carbon and nitrogen sources, respectively, using a microbial consortium from kombucha. The results showed that, despite lower yields compared to the control using synthetic media, increasing the concentration of apple waste in the media led to higher BC production, especially in the TM-10AW medium. The study also assessed the optical properties, morphology, water holding and retention abilities, chemical composition, and crystallinity of the produced BC. The findings indicated promising outcomes for the TM-10AW medium, suggesting it as a cost-effective alternative for large-scale BC production, potentially widening its applications in fields such as biomedicine, food, packaging, textiles, and electronics.

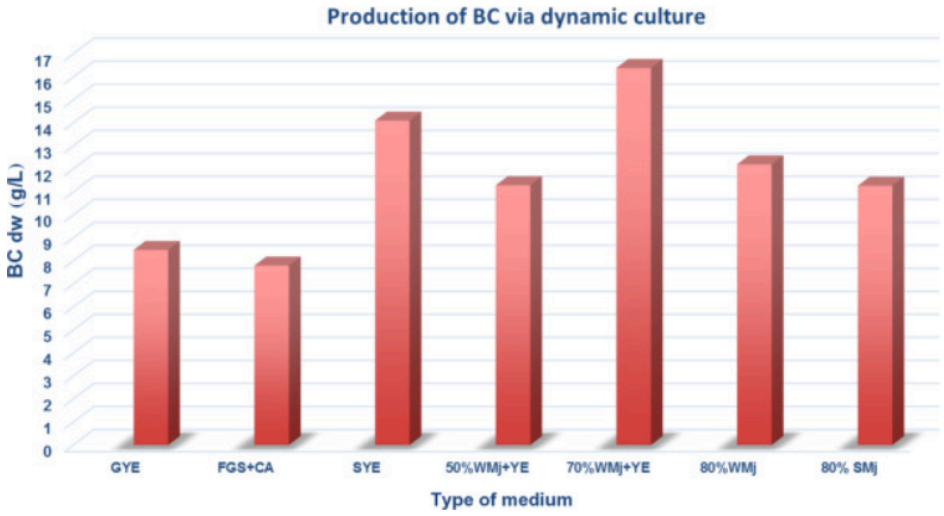
	*Chat GPT Prompts: Please use the three parts of the same text to write a one paragraph summary at a senior in highschool levels Research Question: Can apple waste and a tea mixture be effectively utilized as alternative carbon and nitrogen sources, respectively, for the production of bacterial cellulose (BC)?
Research Question/Problem/ Need	Can apple and tea by-products be used as alternative culture mediums to grow bacterial cellulose?
Important Figures	 This graph outlines the difference in percent yield between the control variable (HS medium) and the experimental variable, the alternative food source. This graph in specific highlights the differences between nitrogen and carbon sources as well.
VOCAB: (w/definition)	ANOVA T-test- used to test multiple populations (if any of the means are different from each other)
Cited references to follow up on	Abol-Fotouh, D., Hassan, M. A., Shokry, H., Roig, A., Azab, M. S., & Kashyout, A. E. H. B. (2020). Bacterial nanocellulose from agro-industrial wastes: Low-cost and enhanced production by Komagataeibacter saccharivorans MD1. Scientific reports, 10(1), 3491. Cheng, Z., Yang, R., Liu, X., Liu, X., & Chen, H. (2017). Green synthesis of bacterial cellulose via acetic acid pre-hydrolysis liquor of agricultural corn stalk used as carbon source. Bioresource technology, 234, 8-14. Fan, X., Gao, Y., He, W., Hu, H., Tian, M., Wang, K., & Pan, S. (2016). Production of nano bacterial cellulose from beverage industrial waste of citrus peel and pomace

	using Komagataeibacter xylinus. Carbohydrate Polymers, 151, 1068-1072.
Follow up Questions	Does this still stay a feasible option even when it's used in larger scale manufacturing?

Article #20 Notes: Chapter 11 - Biopolymers produced from food wastes: a case study on biosynthesis of bacterial cellulose from fruit juices

Article notes should be on separate sheets

Source Title	Chapter 11 - Biopolymers produced from food wastes: a case study on biosynthesis of bacterial cellulose from fruit juices
Source citation (APA Format)	Kosseva, Maria R., Siyi Zhong, Mengmeng Li, Juyan Zhang, and Natasia A. S. Tjutju. "Chapter 11 - Biopolymers Produced from Food Wastes: A Case Study on Biosynthesis of Bacterial Cellulose from Fruit Juices." In *Food Industry Wastes (Second Edition)*, edited by Maria R. Kosseva and Colin Webb, 225–54. Academic Press, 2020. https://doi.org/10.1016/B978-0-12-817121-9.00011-5.
Original URL	https://www.sciencedirect.com/science/article/abs/pii/B9780128171219000115
Source type	Scientific Journal
Keywords	Biopolymers, bacterial cellulose, biocomposites, fruit juices polyhydroxyalkanoates, polylactic acid, ultrasound-assisted biosynthesis
#Tags	#fruitjuices #testingstrategy
Summary of key points + notes (include methodology)	In this scientific study, researchers investigated the production of bacterial cellulose (BC) using watermelon and mandarin juices as growth media. The impact of ultrasound treatment on BC properties was explored, revealing changes in fibril dimensions, surface roughness, and crystallinity. The study aimed to achieve high BC yields by varying cultivation conditions, including static, dynamic, and semidynamic modes with ultrasound assistance. Notably, watermelon and mandarin juices proved effective as growth media for Komagataeibacter xylinus bacteria, with comparable BC yields to synthetic media. Ultrasound treatment exhibited promising effects, such as improved fibril diameters and pore sizes, though with a slight decrease in crystallinity. The study emphasizes the potential use of food waste, like fruit juices, for sustainable biopolymer production and discusses challenges and future considerations for scaling up the process. Overall, the research sheds light on optimizing BC production methods and highlights its

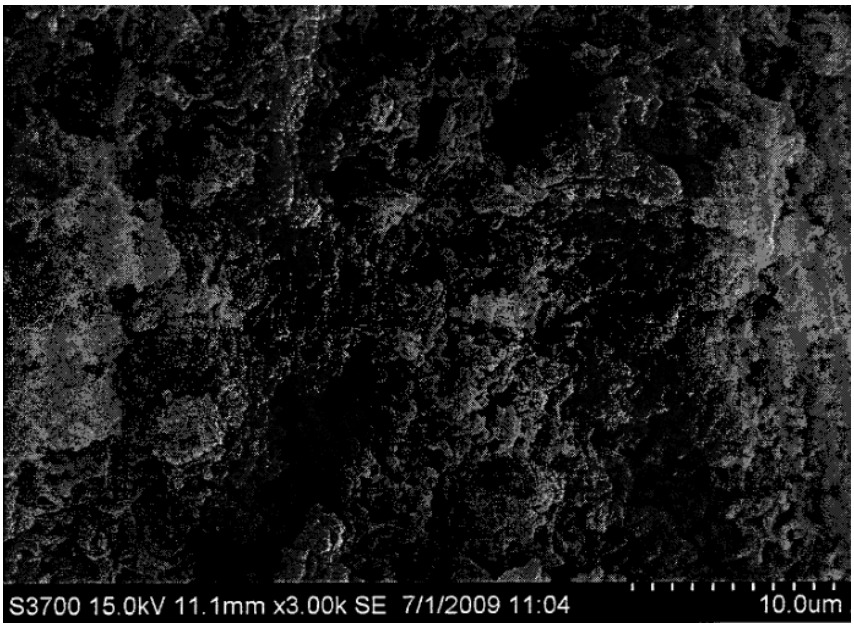
	potential applications in various fields. *Chat GPT Prompt: Please use the four parts of the same text to write a one paragraph summary at a senior in highschool levels
Research Question/Problem/ Need	Is there still efficient biosynthesis when you alter the culture medium to use fruit juices in place of the typical medium?
Important Figures	 This bar chart shows clear differences in types of mediums and how much bacterial cellulose is produced. By using a bar chart instead of another type of graph, it is very clear that certain mediums produce higher BC yields than others.
VOCAB: (w/definition)	Biodegradation is a chemical process during which microorganisms available in the environment convert materials into natural substances such as water, carbon dioxide, and compost Bioplastic is a type of biodegradable plastic derived from biological substances (sugar derivatives, starch, cellulose, and lactic acid) rather than petroleum; or a bioplastic is a biobased material. Biocomposites are materials composed of two or more distinct constituent materials (one being naturally derived), which are combined to yield a new material with improved performance over individual constituent materials.
Cited references to follow up on	Biondi, M., Ungaro, F., Quaglia, F., & Netti, P. A. (2008). Controlled drug delivery in tissue engineering. Advanced drug delivery reviews, 60(2), 229-242.

	Bayón, B., Berti, I. R., Gagneten, A. M., & Castro, G. R. (2018). Biopolymers from wastes to high-value products in biomedicine. Waste to wealth, 1-44. Cakar, F., Özer, I., Aytekin, A. Ö., & Şahin, F. (2014). Improvement production of bacterial cellulose by semi-continuous process in molasses medium. Carbohydrate Polymers, 106, 7-13.
Follow up Questions	What other research can be done to better support what was described in the article?

Patent #1 Notes: Method for fermented-producing bacteria cellulose with pineapple peel juice by two-step method

Article notes should be on separate sheets

Source Title	Method for fermented-producing bacteria cellulose with pineapple peel juice by two-step method
Source citation (APA Format)	刘冬梅, 吴晖, and 于淑娟. Method for fermented-producing bacteria cellulose with pineapple peel juice by two-step method. China CN101671708A, filed October 19, 2009, and issued March 17, 2010. https://patents.google.com/patent/CN101671708A/en.
Original URL	https://patents.google.com/patent/CN101671708A/en
Source type	Google Patent
Keywords	Pineapple juice, 2-step method, fermented-producing bacteria, bacterial cellulose
#Tags	#patent, #similarmethod, #testingstrategy
Summary of key points + notes (include methodology)	The innovative method described in the text offers a more efficient and cost-effective approach to producing bacterial cellulose using pineapple peel juice. Unlike traditional methods, this two-step fermentation process optimizes the activation and multiplication of Acetobacter xylinum, a key bacterium involved in cellulose production. By carefully controlling the nutrient composition, including the use of pineapple peel juice and Sucus Cocois, the method not only reduces production costs but also transforms waste into a valuable resource. The scientific approach to nutrient matching, involving K+, Na+, Ga2+, Mn2+, Mg2+, Fe2+, and somatotropin, contributes to a remarkable bacterial cellulose output exceeding 17.5g/L (dry basis). Moreover, the method shortens the production cycle, minimizes environmental impact, and ensures stability in product quality, making it suitable for large-scale production with significant reductions in costs and increased output. The provided embodiments illustrate the successful application and consistency of this innovative approach across different scenarios. *Chat GPT Prompts:

	Please write a one paragraph summary at a senior in highschool levels
Research Question/Problem/ Need	Research Question: Can apple waste and a tea mixture be effectively utilized as alternative carbon and nitrogen sources, respectively, for the production of bacterial cellulose (BC)? *Chat GPT Prompt: Please identify the central research question in this patent
Important Figures	 This is an image provided by the patent. While it didn't have a caption, it seems likely that this is depicting the bacterial cellulose produced using their method.
VOCAB: (w/definition)	Permeability- state of a material that causes it to allow liquids or gasses to phase through it
Cited references to follow up on	Patent: CN102250985A Patent: CN102260724A Patent: CN103790248A Patent: CN109757681A
Follow up Questions	What are the detailed biological mechanisms underlying the activation and multiplication of Acetobacter xylinum during the two-step fermentation process?

	Further investigation into the cellular and molecular aspects of bacterial cellulose production may provide insights for process optimization. How biocompatible is the bacterial cellulose produced using this method, and what novel applications could emerge in fields such as biomedical engineering, packaging, or environmental remediation? *Chat GPT Promt: What kinds of follow up questions can be asked to learn more about the patent

Patent #2 Notes: Method of producing bacterial cellulose

Article notes should be on separate sheets

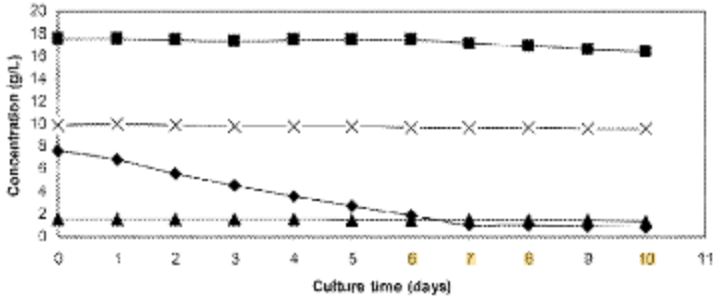
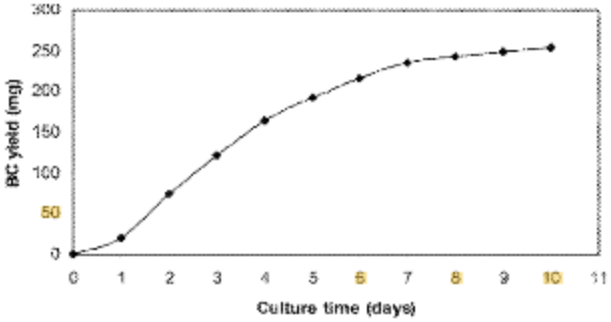
Source Title	Method of producing bacterial cellulose
Source citation (APA Format)	Tamai, Yutaka. Method of producing bacterial cellulose. World Intellectual Property Organization WO2007063854A1, filed November 28, 2006, and issued June 7, 2007. https://patents.google.com/patent/WO2007063854A1/en#patentCitations.
Original URL	https://patents.google.com/patent/WO2007063854A1/en#patentCitations
Source type	Google Patent
Keywords	Mushroom fruit, bacterial cellulose, cost-friendly
#Tags	#alternativesource, #testingstrategy
Summary of key points + notes (include methodology)	This invention introduces a novel method for producing bacterial cellulose, a special kind of cellulose with diverse industrial applications, using waste materials from mushroom production. Unlike traditional methods that are costly and involve complex processes, this approach makes use of by-products like mushroom beds and stone remnants to create a medium for cultivating cellulose-producing bacteria. The resulting bacterial cellulose has unique properties and can be used in various industries, ranging from medical pads to papermaking. This method not only reduces production costs but also contributes to sustainability by repurposing waste from mushroom cultivation. The study shows promising results, indicating that this innovative technique could offer a more economical and eco-friendly way to produce bacterial cellulose. *Chat GPT Prompt: Please use the text to write a one-paragraph summary at a senior in highschool levels
Research Question/Problem/ Need	How can bacterial cellulose be produced at the same quality using more cost-friendly alternatives?
Important Figures	N/A

VOCAB: (w/definition)	Mycellum- root-like structure of a fungus Polymer- natural or synthetic substances created by very large molecules
Cited references to follow up on	Patent:JP4709974B2 Patent:JP3772239B2 Patent:JP2005272405A Patent:JPS63296662A
Follow up Questions	Can the cultivation medium created from mushroom beds and stone remnants be optimized further to enhance bacterial cellulose yield or properties? Are there variations in the quality or characteristics of bacterial cellulose produced through this method compared to traditional methods? *Created with Chat GPT based off the prompt: What kinds of follow up questions can be made from this patent to learn more?

Patent #3 Notes: Bacterial cellulose based ‘green’ composites

Article notes should be on separate sheets

Source Title	Bacterial cellulose based ‘green’ composites
Source citation (APA Format)	Netravali, Anil N., and Kaiyan Qiu. Bacterial cellulose based ‘green’ composites. United States US9499686B2, filed September 19, 2013, and issued November 22, 2016. https://patents.google.com/patent/US9499686B2/en.
Original URL	https://patents.google.com/patent/US9499686B2/en
Source type	Google Patent
Keywords	Eco-friendly composites, production of bacterial cellulose, natural fibers
#Tags	#sustainableproduction #propertiesofBC
Summary of key points + notes (include methodology)	The text discusses the production of sisal fibers modified with bacterial cellulose (BC) and the creation of eco-friendly composites using BC with water-soluble polymers. In the first part, the study shows that coating sisal fibers with BC enhances their strength. The second part describes the development of 'green' composites by immersing BC in solutions of polyvinyl alcohol (PVA) and polyethylene oxide (PEO), resulting in improved mechanical properties. The third part presents detailed analyses, including tensile testing and spectroscopy, confirming the enhanced characteristics of these BC-based composites. Overall, the study suggests that BC modification improves the properties of natural fibers and contributes to the development of sustainable materials. *Chat GPT Prompt: Those are the three parts of one article, copy and pasted in order. Please write a summary at a senior in highschool level summary
Research Question/Problem/ Need	How can bacterial cellulose be produced in a way that is more eco-friendly and overall, a more sustainable approach to producing the cellulose?

Important Figures	 FIG. 1  FIG. 2 These figures provide a visual representation of how the BC yield is dependent on the culture time, and how more days of culturing affects how much is grown.
VOCAB: (w/definition)	Resins- used in polymer chemistry, highly viscous substance of synthetic or plant origin Agar plates- petri dish that has a growth medium in it, used to culture microorganisms
Cited references to follow up on	Patent: EP0197969A1 Patent: US5846213A Patent: US20050037082A1 Patent: US20080090939A1
Follow up Questions	Are there potential drawbacks or limitations to BC coating on natural fibers?

	Are there other natural fibers that exhibit similar improvements in IFSS when coated with BC? *Created with Chat GPT based off the prompt: What kinds of follow up questions can be made from this patent to learn more?