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# HORIZON

VOLUME 2, ISSUE 06, JUNE 2024

- THRIVING AWAY FROM HOME
- WOUND HEALING BY MAGGOTS
- A PROMISING APPROACH TO A STRESSFREE LIFE: MEDITATION
- SUPERBUGS; THE NEXT BIG CHALLENGE FOR MANKIND

# DEAN'S DESK



Dear students, we at Grodno State Medical University strive to provide students with top-quality education, but that's not it. GRSMU is also a hub for Scientific, Cultural, and Sports related activities. We wholeheartedly acknowledge that International students are an integral part of our university, and we take immense pride in that. Grodno State Medical University is glad to work with students from different countries and provide them with a stage to represent their nation and culture.



**DEAN OF FACULTY OF INTERNATIONAL STUDENTS  
DR. ALEKSANDER ALEKSANDEROVICH STENKO**

GRSMU celebrates its uniqueness in diversity, for in its true essence our university is a junction where students from various backgrounds and cultures come together as one big family. GRSMU has always encouraged students to explore further and beyond in every field they try their hands at. I hope that you like the novel concept of 'The Horizon' - a magazine that serves as a platform for the students to voice their opinions, share their takes and present their points of view.

'**The Horizon**' is a medium of extended communication where we can learn a lot from one another. I highly appreciate this initiative and personally support it. I look forward to reading the interesting blogs written by you.

# WELCOME TO THE HORIZON



“We all have fascinating stories to share!” For the longest time, I have had this idea of starting a magazine. But not just any conventional magazine, one that shall serve as a platform for the students and alumni of International faculty at Grodno State Medical University to share their stories. A platform that enables students to share their takes on various curricular and extracurricular aspects of medicine. Thus, the idea of **‘The Horizon’**, came to life.



**DR. MEHUL H. SADADIWALA, FOUNDER,  
CLASS OF 2023**

**‘The Horizon’** will be a creative intersection where students can freely give commentaries about Lifestyle, Culture, Productivity tips, and more. Throughout the years, many individuals at GrSMU have inculcated valuable skills and gained experience with a fair share of success in various disciplines. Maybe you run a successful YouTube channel or an educational website, or maybe you are a successful student-researcher or an educator, and so much more. 'The Horizon' enables students to share their personal experiences. The insights that you share will encourage other students to take further strides and explore future possibilities.

**‘The Horizon’** is supported directly by the Dean of the International Faculty, and it will operate under the supervision of the International Students' Scientific Committee. Students from 1st to 6th year, and even graduates, can submit their blogs to this magazine. The articles should directly or indirectly revolve around student life to share knowledge and the collective growth of students.

For inquiries and submissions.

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# EDITOR'S DESK



“ I'm a sixth-year medical student at Grodno State Medical University, Belarus. My passion for academic excellence is matched only by my commitment to fostering a culture of creativity and collaboration among my fellow researchers.

I believe that research is not only a scientific activity but also a creative and social one. I am always excited to take on new challenges and share my knowledge with others. Ultimately my goal is to use research to make a positive impact and change the world for the better.

As the Editor-in-Chief from April to June 2024, I am privileged and pleased to oversee the diligent efforts of all our authors in offering our readers the highest quality perspectives on compelling subject areas. I extend a warm invitation to all members to contribute their perspectives and engage in discussions this upcoming year as we collectively delve into the prospects of Horizon Magazine. ”



**POORNA GAYAN WATTALADENIYA**  
EDITOR-IN-CHIEF (APR-JUN, 2024)

“ I hold a degree from Grodno State Medical University in the year 2022. Presently, I am engaged in my clinical training at a governmental medical institution in Surat. My profound interest lies in the intricate mechanisms and physiological interplay within the human body, thus propelling me towards further exploration in the realm of medical sciences. Medical science, akin to a vast ocean and an infinite road, remains insatiable in its quest for knowledge. Hence, it is incumbent upon us to make our humble contributions towards its continuous advancement, benefiting not only ourselves personally and professionally, but also society as a whole.

As the chief editor from April to June 2024, I will assist my junior colleagues in their research endeavours, fostering a collaborative environment conducive to mutual learning. I extend a cordial invitation to fellow researchers to share their areas of interest for collective deliberation, culminating in a scholarly masterpiece ”



**DR. BHALALA PRIYANK BATUKBHAI,**  
EDITOR-IN-CHIEF (APR-JUN, 2024)

And a message to our dearest readers, we would like to invite you all, students and alumni, to share with us the blogs that directly or indirectly revolve around student life, to share knowledge and experiences that has had an impact on your growth within and outside the bounds of our university.

Concluding, let us alter the limitations of our individual efforts and collectively explore limitless Horizons.

## Cover Credits

Fathmath Zuha Ali

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# THRIVING AWAY FROM HOME

This blog is about exploring how the medical students residing in hostels navigate the bittersweet symphony of homesickness, striving to find harmony between the call of familiarity and independence.

## INTRODUCTION

WRITTEN BY  
AYSHA HAFEEL  
CLASS OF 2026

Each and everyone in this modern world likes to dream of the highest profession for themselves and be in the highest position. That is indeed a good thought and a good sign of evolution. Everyone has the right to dream, and all should be able to accomplish their dreams as their will and be good, versatile, humble humans to the world.

Among the people who are in thirst for victory, there is a group of people who choose to serve the world with kindness, hope, happiness, and many more emotions. The medical field is one of those pathways where you can help the society in many ways. Even though it sounds simple, there is a lot to go through to become a successful doctor.

In regard to fulfilling the dream of becoming a doctor, most students have to leave their hometown and have to travel far away from their comfortable zones, including their parents, siblings, home environment, neighbors, relatives, friends, pets, climate, food practices, and many more things, and come to a place where they don't know anyone to continue their studies.

As the medical degree seems to be a long learning process, it keeps a child away from all the things they love for more than 5 years. As a medical student, I know exactly how hard it is to be away from home for so long.



Nowadays, families seem to be very small, so parents and children seem to be more attached, and they find it difficult to live without each other. Especially when a child is with their parents, the child does not feel any threat because they surely know that their parents are always behind them as their guiding light (attachment theory). In fact, this child does not learn how to be independent, how to live a life without their parents. Homesickness is not only limited to higher education but also for boarding schools, sleep-away camps, military deployment, migrant workers, and immigration, etc.



## IMPACT ON MEDICAL STUDENTS

This situation in medical schools can be mainly identified among 1st-year students. Previous research on first-year residential students' adjustment at a university in the United States found that 31% of the 198 participants reported experiencing homesickness (Fisher & Hood, 1987). However, a more recent comparable study on first-year college students found that 94% experienced some level of homesickness during their first semester away from home (English, Wei, Davis, & Gross, 2016).

As they are very new to the environment, they feel insecure and scared. Most of them show very low performance in their educational process. They are reluctant to attend classes, have no mood to study, their class scores seem to be very low, and they do not like to face exams, etc.

If the feelings of homesickness persist for an extended period, it may have a significant impact on the student's emotional well-being. These students may experience prolonged sadness, crying episodes, isolate themselves from activities and events on campus, avoid social interactions, which will affect the student's attention, focus, and concentration in classes.

The physical impact on a child is also high. They may complain of headaches, loss of appetite, trouble sleeping, stomach aches, fatigue, lethargy.

Living a hostel life opens up another interesting chapter where you find both the positive and negative aspects together. This depends on who and how you live with the society. Almost all the students miss their home, all will be on the same page, but it's really nice if there is someone to help with the more affected one.

## HISTORY IS OUR MISTRESS

To overcome this situation, open conversations would be a great helping hand for the students and all who are away from home so that they can be pacified by making them realize that this is a common situation that everyone feels, and that they are not alone. It's better to make friends and be friendly to them and do work together.

The students can try making their living area very familiar as their home. They can change the setup inside the room and can have pets so their minds would be relaxed and pleased. Some can engage in their hobbies like music, gardening, dancing, singing, etc.

Calling your parents, siblings, friends, relations, and loved ones would also be an effective impact on this situation so that you won't feel you are far away from them. Studies have found that currently, the COVID-19 pandemic has been a triggering factor in increasing loneliness and social isolation, especially among older people, as they have to spend much time away from home in the hospital for treatments. Video calls have been a helping hand in this regard to widen the social circle by increasing the frequency of contact with existing resources.

If homesickness persists for a long time and becomes worse, a senior healthcare professional should help with the mental health of the student. Also, the children can make themselves busy with academic work so that they will be able to divert themselves from homesickness.

Homesickness does not last for a long time. This condition is gradually reducing once they are getting used to the new environment, the working process, and the people around them.

A Lot of studies show that these situations are shown less by senior students than in the 1st years. Over time, individuals form friendships and support networks within their new community, providing a sense of belonging and emotional support.

Creating a daily routine can provide structure and stability, which can help alleviate homesickness. Set regular study times, engage in activities you enjoy, and prioritize self-care. Having a routine can give you a sense of control and familiarity in your new environment. Join clubs, sports teams, or volunteer groups to meet new people and establish a sense of community. Participating in campus events and activities can help you feel connected and integrated into your new environment.

Take time to explore your new city or campus. Visit local attractions, parks, restaurants, or cultural events. Getting to know your surroundings can make you feel more connected to your new home and reduce feelings of isolation. Seek out fellow students who may be experiencing similar feelings of homesickness. Form study groups or socialize with classmates to establish new friendships and support systems.

Building connections with others who understand what you're going through can provide a sense of belonging. Exercise regularly, eat a balanced diet, and get enough sleep. Engage in activities that help you relax and reduce stress, such as practicing mindfulness and journaling.

## RESEARCH AND INITIATIVES ON HOMESICKNESS.

Homesickness has been assessed by asking participants to complete a questionnaire summarizing their homesickness during the past weeks. Questionnaire scores represent past homesickness, which reflects one's proneness to homesickness or overall disposition to homesickness more than one's momentary homesickness.

Homesickness can fluctuate within smaller time periods and is influenced by interpersonal factors. Studies have shown that homesickness can vary throughout the day, depending on the situation and interactions with others. As attachment figures play a central role in homesickness, it is considered an interpersonal phenomenon.

Homesickness tends to be experienced when individuals are physically separated from their attachment figures but remain in contact with them through means such as phone conversations. Therefore, levels of homesickness can vary within individuals depending on their interactions with different people.



In general students use SNSs primarily for socialization, entertainment, and academic tasks, spending an average of 3.38 hours per day. Self-comparison on SNS profiles is common, with Snapchat usage positively linked to self-esteem and TikTok usage negatively associated with weight status. Exercise is prevalent among students for weight management.

Overall, students have a high level of body esteem, but nearly half experience moderate to high levels of loneliness. Age and gender differences play a role, with younger students exhibiting more loneliness and depressive feelings and spending more time on SNSs, while men have higher self-esteem and perceive better mental health compared to women. As adults, we should know how to cope with social media in a wise manner so.

## CONCLUSION

Thriving away from home is a transformative journey that allows individuals to grow, adapt, and discover their true potential. While it is natural to experience homesickness and face challenges when living in a new environment, it is important to remember that with time, resilience, and a proactive mindset, one can not only overcome homesickness but also create a fulfilling and thriving life away from home. By embracing new experiences, building a support network, taking care of physical and mental well-being, and actively engaging with the opportunities around them, individuals can truly make their new environment feel like home and unlock their full potential. With determination, openness, and a willingness to embrace change, thriving away from home becomes an exciting and empowering chapter in one's life journey.

## References

- Noone C, McSharry J, Smalle M, Burns A, Dwan K, Devane D, Morrissey EC. Video calls for reducing social isolation and loneliness in older people: a rapid review.
- Homesickness in social context: An ecological momentary assessment study among 1st-year university students Maaiké H. Nauta, Marije aan het Rot, Henk Schut, Margaret Stroebe.
- Body-Esteem, Self-Esteem and Loneliness among Social Media Young Users Lavinia Maria Pop 1, Magdalena Iorga 1 2, Raluca Iurcov 3.

# WOUND HEALING BY MAGGOTS

This blog is about the importance of the use of maggots for healing of wounds and ways in which they are used.

WRITTEN BY  
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ARUFINU.  
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## INTRODUCTION

This is done through a procedure called Maggot Therapy which is also known as Larval Therapy or Debridement Therapy. Maggot Therapy utilizes larvae of green-bottle fly which applied to an infected wound in order to destroy infected and necrotic tissues. In addition to that they maintain clean wound after debridement. Maggots are manufactured in a particular unit by well trained staff at Biomonde a company with many years of experience in wound management



## WHAT AFFECTS WOUND HEALING?

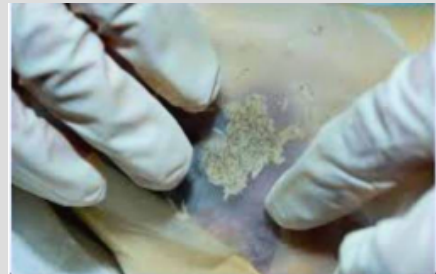
It is affected by intrinsic and extrinsic factors that can be divided into systematic or local such as gender and age, sex hormones, stress, ischemia, obesity, alcoholism, smoking, chemotherapy, uraemia, jaundice, fibrosis just to mention a few.

## HOW CAN YOU INTRODUCE MAGGOTS ?

They can be introduced in two ways on infected wound

### 1 FREE RANGE MAGGOTS

This can also be called direct method since the maggots are introduced directly to the wound and a special dressing system is used to retain them. It is usually kept for 3 day.



### 2 BIOBAG DRESSING

The larvae is placed inside a dressing pouch which is sealed with a foam which aids to the growth of maggots. It is only at the completion of treatment that the maggots dressing is opened. This procedure takes about four days but it is also possible for the dressing to be removed daily after a daily check up. The maggots size is generally smaller than that of a grain of rice but during the treatment it can increase to 12mm.





### HOW CAN YOU INTRODUCE MAGGOTS ?

Chronic wounded patients such as those with soft tissue wounds ( neuropathic foot ulcer, leg ulcers, non-healing traumatic or post-operative wounds and pressure ulcers) and non-healing necrotic skin. In addition to that only patients who have given their full consent without any objections to this therapy are eligible.

### VENOUS LEG ULCERS

It is approximated that 2% of population in developing countries experience chronic wound which is a hidden phenomenon that increases with aging population. Fortunately maggots are easily found there. It is a important to note that chronic wound is a silent epidemic. Apart from that 6.6 % of Malaysia by 2030 it is expected to have reached a period of an aging population. The patients that would have given their full consent and have no objections to this therapy thus no ethical barriers will be bridged.

### ADVANTAGES OF MAGGOTS THERAPY

- 1.They facilitate the more effective way of removal of non- viable tissues.
- 2.Rapid maturation of tissue granulation.
- 3.Faster reduction of wound surface compared to conventional dressing ( hydrogel dressing).
4. It is safe, efficient and simple to use.

### DISADVANTAGES OF MAGGOTS THERAPY

- 1 Does not have any effect on disinfection or any complete healing of the wound.
- 2 It requires evidence before including it in the patient's treatment.

### EFFECTS OF MAGGOTS THERAPY ON A WOUND SITE

It is expected to have a unique scent due to the chemicals released by maggots when they feed on the nonviable tissues. Apart from that there is an appearance of a pink discharge which usually makes the wound site is wet this must not alarm you for it expected during this procedure.

It has been said that most patients do not feel anything during the treatment, they are usually comfortable but patients in particular with poor circulation usually feel pain. In addition to that the pain reduces significantly after the treatment on the infected wound.

### WHAT SHOULD NOT BE DONE DURING THIS TREATMENT

Do not wash the wound or souse it in water. Do not sit with the site of the wound where the maggots were applied. Do not sit too close to the heat such as radiation and fire, for it may lead to the drying up of the maggots tissues and their death.

### IN CONCLUSION

In October 2014 an electrical literature was performed using midline, Emabase and Cumulative Index of Nursing and Allied Health Literature. The eligible patients had chronic wound with an intervention involved in the comparison of different maggot species with hydrogel dressings such as those with diabetic foot ulcers.

Results of 580 patients were taken. This proved that maggots can only facilitate wound healing by debridement of non viable tissues but can not disinfect or completely heal the wound. It is important that this method can only be used at specific stages of the wound healing treatment and other methods are used to aid for complete healing.

This therapy is gradually being implemented more and more in hospitals. It is important to note that this therapy has no significant side effects and actually takes less time than conventional dressings to clean these wounds.

### References

- <https://www.chelwest.nhs.uk> >maggot therapy.
- [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov) maggot therapy in wound healing and factors affecting wound healing.
- <https://books.openbookpublishers.com>.

# A PROMISING APPROACH TO A STRESSFREE LIFE: MEDITATION

This blog is about understanding stress - an inevitable part of our lives and subsequently approaching it through simple meditation tactics

WRITTEN BY  
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MATHOTAARACHCHI.  
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## HEALTHY MIND, HEALTHY LIFE.

We as medical students, are constantly driven by thoughts of determination, motivation and self-perseverance. This perseverance is truly uncanny. Nevertheless, this eager to improve and succeed, has provoked an extremely competitive environment for each and every one of us who thrive.

And it is said that “every rose has its thorn” and need not say, our sparkling lives are very much overwhelmed by stress. Some would say stress improves performance and fruitful results, whilst some would agree to disagree. And my blog is for those of you who seek rather a simple strategy to cope with stress and stressful situations: MEDITATION.

## THE WANDERING MIND

Before we dive into why and how mediation benefits, let’s look at the causes of stress itself. Needless to say, we as medical students experience our fair share of stress. In case you might wonder what stress is, it’s simply “the body’s response to changes or stimuli”, a definition which we all surely have studied in our physiology classes. Thus, stress is an inevitable part of a medical student’s life. These stress triggers are individualized. May it be work pressure, peer pressure, financial worries, relationship issues, health issues, you name it. As we speak someone might already be stressing out!

## HOW DOES STRESS OCCUR?

Stress is a neural response of our amygdala, the very popular ‘fight and flight’. However, the definition of stress nowadays has very much become a ‘fight for a happy and balanced life’ instead. Pathological stress is potentially chronic, psychological and life-threatening.

## WHY SHOULD WE COPE WITH STRESS?

Well, simply put, extreme stress can trigger and could potentially affect physical, mental and social wellbeing, the mere definition of "health". Stress-induced tachycardia, depression, anxiety, altered sleep-wake cycles, suicidal thoughts, weakened immune system are only a few of the very common examples

## HOW DOES MEDITATION HELP US COPE WITH STRESS?

Meditation, particularly mindfulness-based techniques can help us cope with stress with ease and resilience. And one may wonder, why meditation? Well, in comparison to comfort-eating, social media, or any other 'distractions' we usually engage ourselves in, meditation invites us to cope with stress by addressing our thoughts, rather than by eliminating them. Instead of reacting with chaos, we do learn to respond with purity and perseverance.

Meditation, creates a space between your thoughts, emotions and your response to them. Instead of being casted away by mental activity, the practice of meditation "invites you to witness what happens in your mind without judgment". Meditation, simply put, is the equivalence of a workout to the body.

The more you exercise, the more resilient and volatile your mind becomes. It is of importance to mention that studies suggest meditation can in fact, alters the structure and functioning of the amygdala, particularly it reduces the size. Thus, reduces our mind's response to stress and stressful situations.

## THE PRINCIPLES OF A MINDFUL MEDITATION



Meditation creates a new perspective for perception of situations and people. Meditation benefits us in three approaches.

### 1. Present time awareness.

If we question ourselves as to what stresses us out, its simply the thoughts from our past or the future. Yes, the future is quite challenging. Yes, we all thrive to be exceptional doctors. Yes, we constantly want to make our parents proud, yet dwelling upon it is simply not an answer. Similarly, one should not dwell on one's wrongdoings, mistakes or even experiences of the past. Neither you, nor I can change them. Hence, it's fair to say, the first principle of mindful meditation involves contemplation in the present moment. Particularly forget the "it should have s' and 'I could have s' and simply put your mind to ease and rest.

### 2. Acceptance

Meditation teaches us of self-appreciation. It builds self - acceptance, self-confidence and reassurance. It helps us accept stressful situations, thoughts and emotions, not through resistance, but acceptance.

### 3. Nonjudgmental thinking.

As a major part of self-acceptance, meditation eradicates negativity and criticism. Thus, enables one to judge one's self in an optimistic manner. Isn't that what we all want?

## MEDITATION TECHNIQUES TO RELIEVE STRESS

### 1. Mindfulness Meditation

Sit comfortably, and focus on your breathing. It's fair to describe it as focusing your attention to the flow of a river and not wanting to jump in. If physical sensations or thoughts interrupt your meditation, note them and then return your focus to breathing.

### 2. Music Meditation

Contemplation of sounds, rhythms or even music. While I'm sure most of us listen to music, this is minus the intrusion of thoughts and emotions. While meditating, think of nothing but the music. If your thoughts stray, focus back to the music and stay there. If you find it hard to focus on the music, you might want to change to a different one.

### 3. Body Scan Meditation

Here, contemplate on different parts of your body, from your toes to your head. Concentrate on the posture and alignment while visualizing your body. Begin anywhere for example, the top of your head, left foot etc. Focus there and continue breathing slowly and deeply. Next, move to another part of your body and do the same.

Slowly redirect your mental awareness from one area of focus to another. Some people find it helpful to imagine releasing one body part as they breathe out and moving on to the next as they breathe in.

#### 4. Mantra Meditation

Contemplation of a single word or phrase. Breathe slowly and steadily through your nose as you begin to chant your mantra. You can say it out loud or silently. It often helps to match the mantra to your breathing. You could use syllables like “om”, “joy” or even phrases, for example “I am calm”.

#### 5. Walking Meditation

Meditation does not necessarily need to be stationary. Contemplation of pace and walk too, is in fact a choice of meditation. Focus on your walk, as you keep one foot behind the other while slowing pacing up and down in your dorm, in the street or anywhere which might seem fit. You tend to focus on your gait and footsteps, freeing yourself from distractions.

#### 6. Loving-Kindness Meditation

I’m sure this technique is quite a familiar one. Divert your mind on kindness towards yourself and others by silently repeating a series of compassionate phrases. For example: “May you be happy. May you be healthy.” This technique not only instantly sets your mind on ease, but also helps you to deal with disapproval of a certain situation or person, thus aids you to detach yourself from hate, disappointment or even envy.



### WHAT TO DO IF YOU GET DISTRACTED?

Well, simply put, do not let your mind wander. Bring yourself to the present moment and do not be hard on yourself for you, yourself are a human being.

### CONCLUSION

“Healthy mind, healthy life”, isn’t it? Well I couldn’t agree more. Let’s not let our minds’ wander, with that being said, I hope this blog greatly benefits you in your daily stressful lives. C, till next time.

#### References:

1. <https://www.calm.com/blog/meditation-for-stress>
2. <https://www.mindful.org/how-to-manage-stress-with-mindfulness-and-meditation/>
3. <https://www.healthline.com/health/body-scan-meditation>
4. <https://www.healthline.com/health/mantra-meditation>
5. <https://www.cnet.com/health/mental/how-to-meditate-with-music-in-5-steps/>



# SUPERBUGS; THE NEXT BIG CHALLENGE FOR MANKIND

This blog is about the development of antibiotic resistance and emergence of Super bugs as one of the major threat to human kind.

WRITTEN BY  
LAKINDU SOORIYAARACHCHI  
CLASS OF 2025

## INTRODUCTION

"SUPERBUGS" what comes to your mind when you first read or hear this word? Well, whatever comes to your mind, I bet you won't give much thought about it afterwards as you happily go about your life. But unfortunately, you wouldn't be able to brush aside the thought that easily in the near future... WHY? I'll tell you about it in a bit.

But first, what actually are superbugs? They can be simply understood as strains of bacteria, viruses, parasites and fungi that are resistant to most of the antibiotics and other medications commonly used to treat the infections they cause. The general term used for this scenario is antimicrobial resistance (AMR).

They are mostly found in hospitals and other healthcare facilities where they frequently are in contact with antibiotics and other antimicrobial drugs.

I'll be focusing my attention on bacteria as they are the most common and abundant type of superbugs which affect us. But keep in mind all the other types of microbes can emerge as resistant superbugs.

We are living in a world roaming with bacteria. They are so ubiquitous that you will find them in every corner of this planet, from the deepest and darkest depths of the ocean to the top of the tallest mountains. Bacteria have evolved to survive in harshest environments you can imagine.

They are found in polar ice caps, and places where neither oxygen nor sunlight reaches. I think you won't be surprised when I say they are also growing in radioactive waste, toxic chemicals & boiling hot springs.

But of all the places bacteria are found, they seem to have a special affinity to the human body. There are more than 10,000 different species of bacteria living on or in the human body at any given time. In fact, there are more bacterial cells living in humans than that of our own cells

## ANTIBIOTICS AND EMERGENCE OF RESISTANCE TO THEM.

Even though there are trillions of bacteria living inside us, not all of them are harmful. In fact, some of them are of great use to us. Well, the problem for us is that the 'not so nice' bacteria cause a lot of nuisances in our lives when they cause infections. Diseases caused by bacteria and other microbes was the leading cause of death for centuries until the miraculous discovery of Penicillin by Alexander Fleming in 1928.

The discovery of the first antibiotic (penicillin) and subsequent antibiotics in the following decades in the 20th century led the way for antibiotics to emerge as the mainstay treatment modality against bacterial infections.

So, the doctors had a free 'get out of jail' card at their disposal and started prescribing antibiotics without thinking twice about any potential long-term consequences. Now nearly 100 years down the road, with over prescription and improper adherence to treatment regimens we have created perfect monsters that we don't yet have the complete knowledge of.

### WHAT ANTIBIOTICS ARE SUPERBUGS RESISTANT TO?

Superbugs are resistant to many commonly used antibiotics including penicillin, methicillin, cephalosporins and fluoroquinolones etc. It is now evident that superbugs have developed resistance to more potent and last resort antibiotics (the big guns) like vancomycin, imipenem, meropenem, tigecycline and colistin.

### WHY BACTERIA BECOME RESISTANT TO ANTIBIOTICS?

Of the many reasons for the increase in the antibiotic resistance (ABR) and MDR which led to the emergence of many resistant pathogens (including ESKAPE pathogens discussed later) is due to improper and rash overuse of antibiotics for treatment of infections caused by bacteria or even non-bacterial aetiologies. This is becoming common not only in healthcare, but also in the animal, and agricultural sector.

Another common cause of antibiotic resistance is due to incorrect dosing and inadequate adherence to proper treatment guidelines.

When a low therapeutic dose of antibiotics is prescribed, or a patient takes doses less than what they are prescribed, bacteria get the chance to adapt to the treatment regime. At lower doses, or when a course of antibiotics is not completed, certain strains of the bacteria have the ability to develop drug-resistant strains through different natural biological processes.

### HOW DOES BACTERIA DEVELOP RESISTANCE?

As mentioned earlier this can be attributed to different biological processes.

Random genetic mutations occurring in bacteria are a common mechanism in developing resistant strains.

Natural selection supports the strains of bacteria that have developed a certain mutation that allows them to survive.

Some strains are capable of inter-strain horizontal gene transfer, allowing them to pass resistance genes from one pathogen to another. There are few ways this can occur,

a) Transformation - Genetic change of a cell due to the direct intake and incorporation of genetic material from its exterior surroundings through the cell membrane.

b) Transduction - Foreign genetic materials are introduced into a cell by a virus or viral vector.

E.g. Via Bacteriophages

c) Conjugation - Transfer of genetic material between bacterial cells by direct cell-to-cell contact. This is achieved through a pilus

## ESKAPE

This is an acronym given to six of the most virulent and resistant bacterial pathogens.

They include;

- **E**nterococcus faecium,
- **S**taphylococcus aureus,
- **K**lebsiella pneumoniae,
- **A**cinetobacter baumannii,
- **P**seudomonas aeruginosa
- **E**nterobacter spp.

These Gram-positive and Gram-negative bacterial pathogens have developed ways to hide, evade and escape commonly used antibiotics that are thrown at them due to increasing multidrug resistance (MDR).

This makes ESKAPE pathogens the leading culprits of life-threatening hospital-acquired infections; especially in critically ill and immunocompromised patients.

## WHO GPP LIST

Due to the increase in the number of pathogens which are becoming resistant to commonly used antibiotics, the WHO introduced the Global Priority Pathogen (GPP) list in 2017. This list aims to prioritise research and efforts of finding effective treatment options for resistant bacteria.

The GPP list classifies pathogens into 3 categories; critical, high and medium. The graveness of ESKAPE pathogens is obvious when all six species are ranked in either critical (*A. baumannii*, *P. aeruginosa*, *K. Pneumonia* and *Enterobacteriaceae*) or high (*E. faecium*, *S. aureus*) categories.

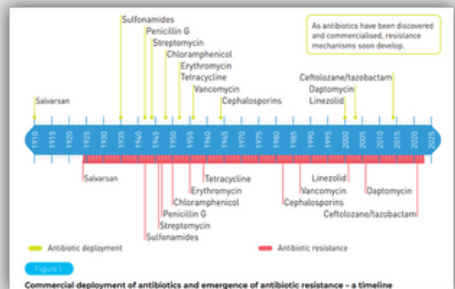
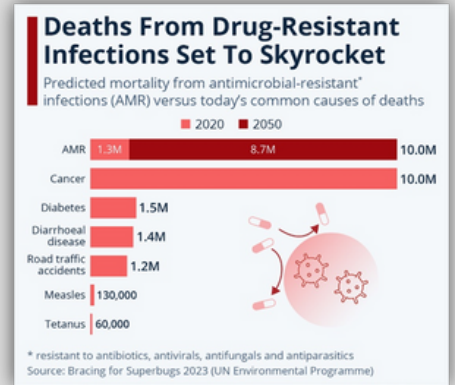
## WHERE ARE WE NOW?... AND WHERE ARE WE HEADED?

I mentioned that we wouldn't be able to neglect the thoughts on Superbugs in the near future, right? I'll tell you why that is using some data.

According to the new UN Environment report it is estimated that nearly 5 million global deaths were attributed to AMR annually. This surpasses the death due to major killers HIV/AIDS and malaria. But the most worrying news is that this number could go up to 10 million by the year 2050. To put into perspective that's the same as the number of deaths due to cancer today.

It is not only the loss of lives that will be on the line, but if left unchecked the economic burden that the world will eventually have to face is going to be unfathomable. According to the world bank estimation, the loss of Gross domestic product (GDP) will be in the range of US\$ 3.4 trillion annually and push more than 24 million people into extreme poverty.

So, the bottom line is that superbugs are emerging as a major threat to all of humanity... maybe sooner than any of us might want. It is therefore a responsibility of all of us to become aware of all the potential harm it will bring upon us and to fight together to keep them at bay.



## References:

1. <https://www.unep.org/resources/superbugs/environmental-action>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6505350/>
3. <https://www.statista.com/chart/3095/drug-resistant-infections/>
4. The perfect predator: A scientist's race to save her husband from a deadly superbug - Steffanie Strathdee, Thomas Patterson.

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