

MONTHLY MOLECULE

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Implications of poor diets on Non communicable diseases

Having a healthy and balanced diet is a key role in the maintenance of good health. Health advice changes with every new research conducted, so it can be difficult to separate certain foods into distinct groups based on their positive or negative effects on health. A study for the global burden of diseases in 2017 conducted research concerning implications of a suboptimal diet in up to 195 countries and found that in 2017, up to 11 million deaths were associated with dietary risk factors. Notable contributors to the global burden disease included a high intake of sodium, a low intake of grains and fruits. This study further found that 1 in 5 deaths globally has the potential to be prevented if diets are improved, although there are many risk factors that contribute to the development of a non-communicable disease (NCDs) such as genetics, if we try to reduce the impacts of modifiable risk factors, there's potential of reducing the 41 million deaths due to NCDs.

Some countries have acknowledged these devastating effects of malnutrition and policies have been put into place with the aim of reducing unhealthy diets related to NCDs, for instance in 2019 WHO reported that there were existing policies in the UK to reduce unhealthy diets. However, the poor diets have been blamed because of globalisation alongside the rapid urbanisation of some developing countries. This has allowed for marketing of processed foods and poor diets subsequently increasing sodium intake, which has been previously mentioned to contribute to a suboptimal diet that may have led to up to 11 million deaths. Essentially, the current food system has flaws, around 77% of all non-communicable disease's deaths were in low- and middle-income countries, indicating instances of poverty could be linked with the incidences of NCDs. To reduce this inequality between low, middle-income countries and high-income countries, the reformation of marketing processed foods should be considered on a global scale, with focus on low- and middle-income countries, this will be the initial steps to reduce such inequalities. This still might be proven to be difficult as many businesses and economies rely on this marketing, so removing the promotion of fast foods will have more impacts than one, perhaps reasons like this are why such actions may have not taken place already. Furthermore, availability of healthcare facilities and accessible alternatives to the processed food should be more readily available, thus could be an important key to reducing the prevalence dietary risks associated with some NCDs. In many lower-income countries, it is considered a privilege to have that knowledge of the effects of poor diets, something many high-income countries take advantage of, so introduction education policies should be implemented in countries that do not have them already.

Overall, dietary risks and suboptimal diets have been found to be a main contributor to the increasing incidences of non-communicable diseases globally and reducing such modifiable risk factors may have an involvement of reducing NCDs. The distributor of NCD deaths have been found to be concentrated in low, middle income countries indicating traces of inequality and perhaps implantation of certain policies can help reduce instances too.

Sources:

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(19\)30041-8/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)30041-8/fulltext)

<https://www.who.int/news-room/q-a-detail/malnutrition#:~:text=Malnutrition%20refers%20to%20deficiencies%2C%20excesses,of%20energy%20and%2For%20nutrients.>

<https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/world-health-statistics>

Antimatter, the matter-antimatter asymmetry problem, and antimatter stars

What is antimatter?

The matter we are used to is made up of atoms, these atoms are made up of three components: in the nucleus there are neutrons, and positively charged protons, and negatively charged electrons orbit the nucleus. In antimatter, however, the charges (and spins) are reversed. There are not many differences in the way matter interacts with matter, and antimatter interactions with antimatter.

When matter and its antimatter counterpart are in contact with each other, they undergo a reaction called annihilation. The particle and anti-particle produce other particles and electromagnetic radiation, such as gamma waves, the gamma waves produced from annihilation are specific and can be detected.

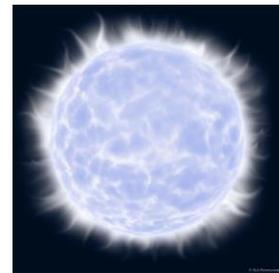
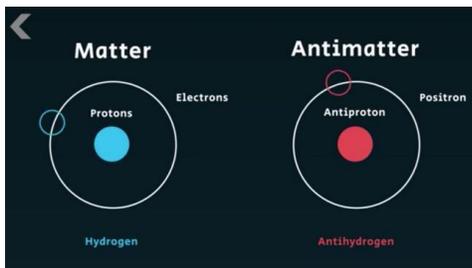


Figure 1 - diagram showing hydrogen and antihydrogen.

Matter-Antimatter asymmetry problem

The universe should not favor matter over antimatter or vice versa, and during the Big Bang there should have been an equal amount of matter and antimatter created, however we see almost no antimatter, we only see it from high-energy interactions from solar rays and other cosmic sources. The question scientists have been stuck on for a long time is, where is all the antimatter?



Figure 2 - *The Big Bang*

Antimatter stars could be present in the Milky Way

In a recent study from the sky in the Milky Way by Simon Dupourqué, Luigi Tibaldo and Peter von Ballmoos from the university of Toulouse using NASA's Fermi Large Area Telescope 5,800 gamma ray sources from stars, 14 showed the kind of gamma rays seen when antimatter collide with normal matter, annihilating each other, these gamma rays are different from any other source we know of, giving rise to the theory of stars made from antimatter, and these gamma rays could be from matter coming into contact with the surface of an antimatter star (antistar).

If scientist prove antimatter stars, it will completely change what we know about the start of the universe. Previously, we thought there was much more matter than antimatter, hence why no antimatter has been seen naturally, but this could disprove that.

If these antimatter stars are found in galaxies, 1 in 400,000 stars could be antimatter stars, However, if they lurk in the places in between galaxies, where they are much harder to detect due to little antimatter-matter collision, this number could be as high as 1 in 5.

Antihelium-3 and antihelium-4 were detected in cosmic rays in 2018, most scientists wrote this off as reactions from cosmic rays interacting with molecules in interstellar space, however, through simulations, antihelium-3 was seen 50 times more than due to cosmic rays, and antihelium-4 100,000 times more, further leaning towards the antistars theory.

It is extremely hard to prove these antistars exist, as, apart from the antimatter-matter annihilation, they produce the same type of radiation as normal stars. Even if we prove them, there would be much more matter than antimatter, not solving the mystery of matter dominance in the universe.



Sources - <https://www.sciencenews.org/article/antimatter-stars-antistars-milky-way-galaxy-space-astronomy>

<http://www.sci-news.com/astronomy/antimatter-stars-09617.html>

<https://physicsworld.com/a/are-antimatter-stars-firing-bullets-of-antihelium-at-earth/>

Figure 1 - <https://www.indiatoday.in/education-today/gk-current-affairs/story/where-is-all-the-antimatter-scientists-create-antihydrogen-atom-to-find-answers-html-1206368-2018-04-06>

Figure 2 - <http://www.sci-news.com/astronomy/antimatter-stars-09617.html>

FIND MY TRASH

Is it the end for waste land fields?

We all know that marine litter is a big problem for the Oceans, it causes harm to animals and makes the beautiful oceans and seas murky and perplexed. Plastics in the oceans traps animals in debris, suffocates them and also cause them their death. Scientists have found tiny pieces of plastic inside fish, turtles, and birds – the litter blocks digestive tracts and alters growth and reproduction, which can lead to a decrease in their population then unfortunately extinction. Most of the marine litter is mismanaged plastic waste, which is very concerning because plastics remain in the ocean for a long time as they take years and years decay. So how can this be solved?



Turtles surrounded by plastic

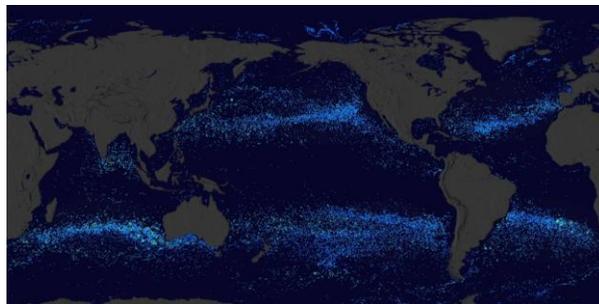
Understanding where marine litter goes once it is in the ocean is a big part of understanding the issue and helping individual countries and the international community to develop plans to deal with this problem. The United Nations (UN) has founded the work of 'Trash Tracking' – trying to mitigate the impact of mismanaged plastic waste. An example is the Great Pacific Garbage Patch, which is a cluster of marine debris and litter, the Trash Tracker can help answer questions about whether it is growing larger and questions about how much plastic is breaking down or sinking to the bottom of the ocean. This virtual tool will show how countries around the world are connected to the contribution of garbage patches.



The Great Pacific Garbage Patch

The director for the Centre for Ocean-Atmospheric Prediction Studies (COAPS) Eric Chassignet stated that "Knowing where the marine litter released into the ocean by a given country goes and the origin of the litter found on the coast-line of a given country are important pieces of information for policymakers". "For example, it can help policy makers determine where to focus their efforts for dealing with this problem."

The tracking tool uses worldwide mismanaged plastic waste data as inputs for its model. The model uses data about the ocean and air currents to track where the marine debris might end up by using information from 2010. There is a website where you can watch as colorful swirly lines across the Earth's oceans. It looks pretty – until you realise it is tracking litter. Researchers at the COAPS use sophisticated ocean models to map the ocean and predict currents that help scientists understand where marine litter released in the ocean is likely to travel and end its journey. "If you have data for the past 20 years, a lot can be done in terms of modelling and simulations" Chassignet said.



Tracking of garbage across the world

Sir David Attenborough: The world is waking up to plastic damage

Sir David Attenborough says that we are "shifting our behaviour" when it comes to plastic. In an interview with the BBC, he said "the world is waking up to what we have done to the planet. He described plastic as "vile" and "horrid" but there is a growing awareness of the kind of damage it can do. His documentary Blue Planet II depicts how many plastic items re-drifting in the world's oceans, and how its affecting animals who live there. Sir David concluded we still need techniques for handling plastic waste. He said: "We still need to know how to dispose of the wretched material, surely if we can invent it, somebody somewhere is going to be able to deal with it, to deal with these mountains of this appalling material."

Lots of people are getting involved in the fight against plastic, including asking businesses to cut down on plastic uses. Think about what you can do to reduce the amount of plastic you use in your everyday life.

<https://www.sciencedaily.com/releases/2021/04/210428162517.htm> :

Trash Tracker

<https://www.nationalgeographic.org/education/programs/debris-tracker/> :

Website



R21: the newest and most effective malaria vaccine yet

What is malaria?

Malaria, the disease that causes up to 400,000 deaths per year internationally, alongside 200 million yearly cases. So far there have been far less deaths from covid-19 than malaria, which has led to people wondering why there isn't more done against the disease which is one of the leading causes of deaths among children under 5 in sub-Saharan Africa, accounting for 80-90% of the overall yearly deaths. It is usually caught from a mosquito bite, typically from a female Anopheles mosquito, when it feeds off your blood before it lays its eggs.

The trials of the new vaccine

Malaria is currently treatable, yet an effective vaccine has been in the works for around 110 years, since the prevalence of the disease became a huge issue. The newest vaccine has been developed by a team of researchers led by Adrian Hill from the University of Oxford Jenner Institute. The team have exceeded the efficacy of previous malaria vaccines which was 56%, as well as the goal set by the WHO (World Health Organisation) to have a malaria vaccine of 75% efficacy by 2030. This current vaccine, although still in development, has undergone phase 1 and 2 of the trial and the third phase will be going ahead in the near future. The phase 2 trial was taken place in the African country of Burkina Faso, on a small group of 450 children of ages between 5 and 17 months. In this trial the children were split into 3 groups, two groups received the vaccine at either a low or high dosage, and the third group received a pre-existing rabies vaccine to make the trial fair. It was discovered that the vaccine was 71% effective at a lower dosage and 77% efficient at a higher dosage. So far, this is a promising discovery and had a far better efficacy than originally presumed, so this vaccine will be a huge step in the right direction.

The promising future with this development

The vaccine is made by Novavax, and when administered is accompanied with something called Matrix-B which boosts the immune response. The vaccine is made of yeast, has a hepatitis B surface protein as well as another protein which covers the parasite as it enters the human. This promising vaccine is also cheap to make and administer, which is also a big factor in the treatment of this disease as the countries which suffer the most cannot afford to treat the patients, which is the reason for the high death rates in developing countries. 200 million doses of the vaccine have been promised in the coming years, and the use of the vaccine is predicted to be within the next 2 years should the trial continue going as well as it currently is.

Currently, the vaccine trial has been focused in Burkina Faso, the third phase of the trial will be carried out in 4 West African countries, which is within the top 10 countries for the most malaria cases. The country has a population of roughly 20.32 million, and accounts for around 3% of all malaria deaths globally, alongside this statistic, 22% of the countries deaths are as a result of malaria, and 43% of all doctor's visits are because of malaria. Majority of these cases and deaths happen in the malaria season which falls between December and April, which this vaccine will drastically decrease.

Sources: <https://www.sciencedirect.com/topics/neuroscience/malaria-vaccine>
<https://www.sciencemag.org/news/2021/04/malaria-vaccine-has-striking-early-success-after-decades-disappointment> <https://www.newscientist.com/article/2275573-malaria-vaccine-from-oxford-covid-19-team-is-most-effective-ever-made/> <https://www.bbc.co.uk/news/health-56858158>

Fun Facts:



1. One species of Jelly fish are immortal.
2. Snails have up to 12,000 teeth.
3. 8 Sharks kill fewer than 10 people per year. Humans kill about 100 million sharks per year.
4. Dolphins can call each other by name.
5. Sea otters hold hands when they sleep so they do not drift apart.

Wordsearch:



NAME: _____ DATE: _____

Monthly Molecule Wordsearch

G B M D Z Q T I O N I H R Y S
F R O H M A E N I C C A V E E
T E M E Q I Y X R U T J G K S
H C P A H R Y L B B A O A D A
M N B L R A F T G O R C N M E
G A S T G L N Z P I R I T U S
E C J H Q A Z P L S T E I D I
T Q A Y H M I L U R R Y M P D
O E V P X H A K V B E A A S Z
E L E C T R O M A G N E T I C
B L B S Y F V B S P Q B T S G
E A M A J I K G L W B J E P W
E H F C U N I V E R S E R F G
U C E C Y X A L A G K U A M X
I S H V G N A B G I B H G R X

ANTIMATTER

STARS

ELECTROMAGNETIC

GALAXY

MALARIA

VACCINE

DISEASE

DIET

HEALTHY

CANCER

ELEPHANT

GORILLA

RHINO

BEAR

HIPPO

BIGBANG

UNIVERSE

Documentary and Book Recommendation:

Documentary: What the health (on Netflix)

It is about 3,000 people in the US die every year of salmonella which is more than the 9/11 terrorist attack but if the same terrorist attack were happening every year, we would be all over it. How come food related diseases do not get enough attention? It is because big organisations like the American Heart Association, American Cancer Society and Breast Cancer are sponsored by fast food companies and they promote them to patients even after there has already been hundreds of studies that prove dairy increases risk of breast cancer by 49% and eating meat causes diabetes, dementia, and heart problems. So why not change to a plant-based diet knowing you can avoid these diseases and stay strong and healthy, just like rhinos, hippos, elephants, gorillas, and bears all being the biggest and strongest animals in their kingdom yet all herbivores!

Seaspiracy (on Netflix)

It is a documentary film about the environmental impact of fishing. the film examines the impact of plastic marine debris and overfishing around the world, arguing that commercial fisheries are the main driver of marine ecosystem destruction.

Book: The big bang never happened by Eric J. Lerner

Here you will learn about the universe being flat, 14.5 billion years old and the end of the universe which could be tomorrow! But do not worry you would just blink and not even notice - it would just all be over. Who else is unconvinced of the big bang theory? How is it widely accepted without any observational support? This book describes alternative models to the creation of the universe including an infinite universe evolving over infinite time.