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Mini review section – An unfolding medical disaster worldwide – antimicrobial resistance. This occurs when viruses, bacteria, fungi, and parasites evolve to negate the effects of antimicrobial drugs. This leads to drugs becoming ineffective against common infections and the use of ever-more-powerful classes of drugs which can have negative side effects for the patient. With the rise of antimicrobial resistance, we risk entering the post-antibiotic era.

Current Trends section – The COVID-19 pandemic and other recent large disease outbreaks have highlighted the extent to which health care settings can contribute to the spread of infections, harming patients, health workers and visitors, if insufficient attention is paid to infection prevention and control (IPC). But a new report from the World Health Organization (WHO) shows that where good hand hygiene and other cost-effective practices are followed, 70% of those infections can be prevented.

In Profile Scientist – Suniti Solomon was an Indian physician and microbiologist who pioneered AIDS research and prevention in India after having diagnosed the first Indian AIDS cases among the Chennai sex workers in 1986. On 25 January 2017, the Government of India awarded her the Padma Shri for medicine for her contributions towards diagnosis and treatment of HIV.

Bug of the month – *Acinetobacter baumannii* is a typically short, almost round, rod-shaped (coccobacillus) Gram-negative bacterium. It is named after the bacteriologist Paul Baumann. It can be an opportunistic pathogen in humans, affecting people with compromised immune systems, and is becoming increasingly important as a hospital-derived (nosocomial) infection. While other species of the genus *Acinetobacter* are often found in soil samples (leading to the common misconception that *A. baumannii* is a soil organism, too), it is almost exclusively isolated from hospital environments. Although occasionally it has been found in environmental soil and water samples, its natural habitat is still not known.

Did You Know? – Fukuoka's natural farming practice rejected the use of modern technology, and after twenty-five years, his farm demonstrated consistently comparable yields to that of the most technologically advanced farms in Japan, doing so without the pollution, soil loss, energy consumption, and environmental degradation inherent in these modern types of farming. Such ideas radically challenged conventions that are core to modern agro-industries; instead of promoting importation of nutrients and chemicals, he suggested an approach that takes advantage of the local environment.

Best Practices – *Candida albicans* is an opportunistic fungus (or form of yeast) that causes various types of infections in humans. This microorganism belongs to the genus *Candida*. The *Candida albicans* yeast is a part of the normal gut flora, a group of microorganisms that live in your mouth and gastrointestinal tract and is present in up to 80% of the human population. Systemic fungal infections, including those by *C. albicans*, have emerged as important causes of morbidity and mortality in immunocompromised patients.

Tickle yourself enjoying the jokes in our **Relax Mood section**.

Our JHS team is thankful to all our readers for their ever increasing appreciation that has served as a reward & motivation for us. Looking forward for your continuous support.

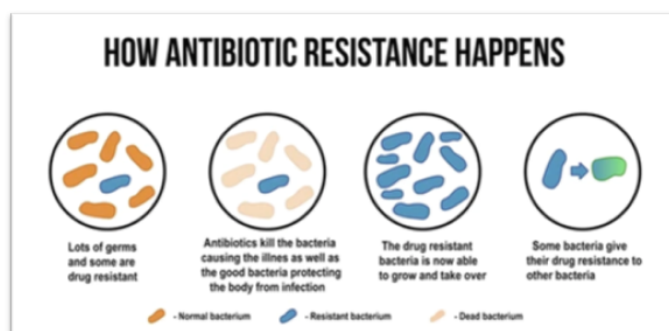
SUPERBUGS AMOUNG US!!



Infections caused by pathogenic microbes are historically one of the leading causes of death and have caused numerous epidemics and pandemics throughout human development. Even routine, minor infections which would these days be survivable killed scores of people every year. This period of history, which lasted largely until the mid-20th century, has come to be known as the “pre-antibiotic era”. Many other treatments did exist, but they could be more deadly than the infections they treated. However, there is now an unfolding medical disaster worldwide – antimicrobial resistance. This occurs when viruses, bacteria, fungi, and parasites evolve to negate the effects of antimicrobial drugs. This leads to drugs becoming ineffective against common infections and the use of ever-more-powerful classes of drugs which can have negative side effects for the patient. With the rise of antimicrobial resistance, we risk entering the post-antibiotic era. Several major factors cause the development and spread of drug-resistant microbes. These include misuse and overuse of antibiotics in agriculture and medicine, poor infection and disease control, lack of access to clean water and sanitation, industrial runoff, and lack of awareness and legislative enforcement. Resistance occurs naturally via multi-generational genetic adaptation and mutations in pathogens, some of which can arise spontaneously, as well as the passing of genetic information between strains. It is a natural defence mechanism of microbes.

Antibiotic resistance

Antibiotics are medicines used to kill bacteria. Over time, certain groups of these germs may adapt to these medicines. They may change in such a way that antibiotics can't kill them. The term for this is antibiotic resistance.



Bacteria are very small organisms. They can enter your body. Some of them are harmless and may be helpful. But some of these germs can be harmful. When these multiply inside your body, they can cause disease.

Causes antibiotic resistance

Antibiotic resistance can happen when bacteria are treated with an antibiotic. The medicine kills most of these germs. But a small group may survive. This might happen in a number of ways.

The bacteria may:

- Develop an ability to stop the medicine's effect
- Develop an ability to pump the medicine out of the cell
- Change (mutate) so that the medicine no longer works

When bacteria become resistant, the original antibiotic can no longer kill them. These germs can grow and spread. They can cause infections that are hard to treat and sometimes can even spread the resistance to other bacteria that they meet.

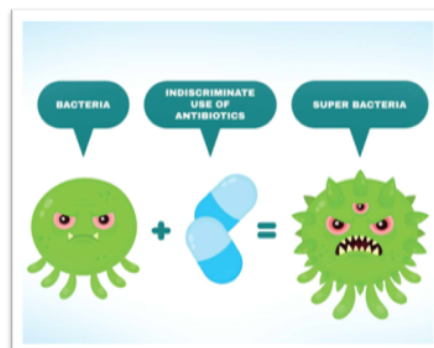
When you use an antibiotic, there is a risk that some of the bacteria will turn resistant. Using these medicines when they aren't needed is a major reason why that is becoming more common. So you should use these medicines only when needed.

Antibiotic resistance is often linked to a specific germ and antibiotic. For example, *Staphylococcus aureus* (or “staph”) is a type of bacteria that can cause illness. Methicillin-resistant *S. aureus* (MRSA) is a specific strain of staph bacteria. MRSA no longer responds to the antibiotic methicillin (and closely related medicines). As a result, it can cause many infections that are hard to treat.

What is a superbug?

Superbugs are strains of bacteria, viruses, parasites, and fungi that are resistant to most of the antibiotics and other medications commonly used to treat the infections that they cause. Since the inception of antibiotics, the bacteria they treat have been adapting and changing in order to build up resistance. These antibiotic-resistant bacteria are called superbugs, and they can cause severe bacterial infections that are extremely difficult to treat.

Drug resistance (antimicrobial resistance) is a naturally occurring phenomenon that can be slowed, but not stopped. Over time, germs such as bacteria, viruses, parasites and fungi adapt to the drugs that are designed to kill them and change to ensure their survival. This makes previously standard treatments for some infections less effective, and sometimes ineffective.



Several strains of bacterial superbugs exist and are in circulation in the population. The main strains include:

- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Carbapenem-resistant *Enterobacteriaceae* (CRE)
- Vancomycin-resistant *Enterococcus* (VRE)
- Multidrug-resistant **Acinetobacter**
- Extended-spectrum beta-lactamases (ESBLs)
- *E. coli* H30-RX

Methicillin-resistant *Staphylococcus aureus* (MRSA)

MRSA stands for Methicillin-resistant *Staphylococcus aureus*. It is a type of *Staphylococcus aureus* bacterium. These bacteria are resistant to common antibiotics, including methicillin. *Staphylococcus aureus* (staph) bacteria live in the nose or on skin. You can harbour staph bacteria, including MRSA, and not know it. A healthcare expert might refer to this as bacterial colonization. Colonized people (carriers) may one day develop an MRSA infection, or they might stay healthy.

MRSA infections are classified as either hospital-acquired (HA-MRSA) or community-acquired (CA-MRSA).

HA-MRSA

HA-MRSA is associated with infections that are contracted in medical facilities, such as hospitals or nursing homes. You can get this type of MRSA infection through direct contact with an infected wound or contaminated hands. You can also get the infection through contact with contaminated linens or poorly sanitized surgical instruments. HA-MRSA can cause severe problems, such as blood infections and pneumonia.

CA-MRSA

CA-MRSA is associated with infections transmitted through close personal contact with a person who has the infection or through direct contact with an infected wound. This type of MRSA infection may also develop because of poor hygiene, such as infrequent or improper handwashing.

Mechanism

Antimicrobial resistance is genetically based; resistance is mediated by the acquisition of extrachromosomal genetic elements containing genes that confer resistance to certain antibiotics. Examples of such elements include plasmids,

transposable genetic elements, and genomic islands, which can be transferred between bacteria through horizontal gene transfer. A defining characteristic of MRSA is its ability to thrive in the presence of penicillin-like antibiotics, which normally prevent bacterial growth by inhibiting synthesis of cell wall material. This is due to a resistance gene, *mecA*, which stops β -lactam antibiotics from inactivating the enzymes (transpeptidases) critical for cell wall synthesis.

Carbapenem-resistant *Enterobacteriaceae* (CRE)

Carbapenem-resistant *Enterobacteriaceae* are bacteria that are resistant to the carbapenem group of antibiotics (i.e. ertapenem, imipenem, meropenem and doripenem). These Gram-negative bacteria are usually from the genera called *Klebsiella*, *Enterobacter*, *Citrobacter*, *Salmonella*, *Escherichia*, *Shigella*, *Proteus* and *Serratia*. Other bacteria can also become resistant to carbapenems, for example, *Acinetobacter* and *Pseudomonas*. Bacteria are highly adaptive organisms. Carbapenem antibiotics are broad-spectrum beta-lactam-type antibiotics that are especially effective against Gram-negative bacteria.

Carbapenem antibiotics were introduced in the early 1980s and were considered the last line of defence against Gram-negative bacteria that had become resistant to many other antibiotics. Over time, these Gram-negative bacteria developed resistance to the carbapenem antibiotics by preventing antibiotic entry (by the reduction of transmembrane channels), by transporting the antibiotic out of the bacterial cell (by upregulating specific efflux pumps to pump the antibiotic out of the bacterial cell), or by breaking down the carbapenems with an enzyme (carbapenemases). Refer to Carbapenemase Producing *Enterobacteriaceae* (CPE). In this way, carbapenem antibiotics can no longer kill these bacteria. The problem is that now the treatment of infections with these Gram-negative bacteria is extremely challenging.

Antibiotic-resistant bacteria can cause infections including lung (pneumonia), urinary tract and skin infections. CRE superbugs can spread and share their antibiotic-resistant qualities with healthy bacteria in your body. These superbugs can cause infections if they get into your bladder, blood or other areas.

When found in clinical culture, CRE can represent an infection or colonization. Colonization means that the organism can be found in or on the body but it is not causing any symptoms or disease. Colonizing CRE strains can go on to cause infections or spread to other patients.

Current Trends in Infection Prevention and Control

WHO launches first ever global report on Infection Prevention and Control Reveals that good IPC programmes can reduce health care infections by 70%.

The COVID-19 pandemic and other recent large disease outbreaks have highlighted the extent to which health care settings can contribute to the spread of infections, harming patients, health workers and visitors, if insufficient attention is paid to infection prevention and control (IPC). But a new report from the World Health Organization (WHO) shows that where good hand hygiene and other cost-effective practices are followed, 70% of those infections can be prevented.

Today, out of every 100 patients in acute-care hospitals, seven patients in high-income countries and 15 patients in low- and middle-income countries will acquire at least one health care-associated infection (HAI) during their hospital stay. On average, 1 in every 10 affected patients will die from their HAI.

People in intensive care and newborns are particularly at risk. And the report reveals that approximately one in four hospital-treated sepsis cases and almost half of all cases of sepsis with organ dysfunction treated in adult intensive-care units are health care-associated.

Today, on the eve of World Hand Hygiene Day, WHO is previewing the first ever Global Report on Infection Prevention and Control which brings together evidence from scientific literature and various reports, and new data from WHO studies.

“The COVID-19 pandemic has exposed many challenges and gaps in IPC in all regions and countries, including those which had the most advanced IPC programmes,” said Dr Tedros Adhanom Ghebreyesus, WHO Director General. “It has also provided an unprecedented opportunity to take stock of the situation and rapidly scale up outbreak readiness and response through IPC practices, as well as strengthening IPC programmes across the health system. Our challenge now is to ensure that all countries are able to allocate the human resources, supplies and infrastructures this requires.”

The new WHO report provides the first-ever global situation analysis of how IPC programmes are being implemented in countries around the world, including regional and country focuses. While highlighting the harm to patients and healthcare workers caused by HAIs and antimicrobial resistance, the report also addresses the impact and cost-effectiveness of infection prevention and control programmes and the strategies and resources available to countries to improve them.

The impact of healthcare associated infections and antimicrobial resistance on people's lives is incalculable. Over 24% of patients

affected by health care-associated sepsis and 52.3% of those patients treated in an intensive care unit die each year. Deaths are increased two to threefold when infections are resistant to antimicrobials.

In the last five years, WHO has conducted global surveys and country joint evaluations to assess the implementation status of national IPC programmes. Comparing data from the 2017-18 and the 2021-22 surveys, the percentage of countries having a national IPC programme did not improve; furthermore in 2021-22 only four out of 106 assessed countries (3.8%) had all minimum requirements for IPC in place at the national level. This is reflected in inadequate implementation of IPC practices at the point of care, with only 15.2% of health care facilities meeting all of the IPC minimum requirements, according to a WHO survey in 2019.

However, encouraging progress has been made in some areas, with a significant increase being seen in the percentage of countries having an appointed IPC focal point, a dedicated budget for IPC and curriculum for front-line health care workers' training; developing national IPC guidelines and a national programme or plan for HAI surveillance; using multimodal strategies for IPC interventions; and establishing hand hygiene compliance as a key national indicator.

Many countries are demonstrating strong engagement and progress in scaling-up actions to put in place minimum requirements and core components of IPC programmes. Progress is being strongly supported by WHO and other key players. Sustaining and further expanding this progress in the long-term is a critical need that requires urgent attention and investments.

The report reveals that high-income countries are more likely to be progressing their IPC work, and are eight times more likely to have a more advanced IPC implementation status than low-income countries. Indeed, little improvement was seen between 2018 and 2021 in the implementation of IPC national programmes in low-income countries, despite increased attention being paid generally to IPC due to the COVID-19 pandemic. WHO will continue to support countries to ensure IPC programmes can be improved in every region.

WHO is calling on all countries around the globe to increase their investment in IPC programmes to ensure quality of care and patient and health workers' safety. This will not only protect their populations, increased investment in IPC has also demonstrated to improve health outcomes and reduce health-care costs and out-of-pocket expenses.

Reference:

<https://www.who.int/news/>

SUNITI SOLOMON

Suniti Solomon was an Indian physician and microbiologist who pioneered AIDS research and prevention in India after having diagnosed the first Indian AIDS cases among the Chennai sex workers in 1986 along with her student Sellappan Nirmala. She was the Founder of Y R Gaitonde Centre for AIDS Research and Education in Chennai. Suniti Solomon, was born in Maharashtrian Hindu family of the leather traders in Chennai. She was the seventh child in a family of eight and was the only daughter. In a 2009 interview she said she became interested in medicine from the yearly health officer visits to their home for vaccinations.

She studied medicine at Madras Medical College and then was trained in pathology in the UK, the U.S. and Australia until 1973 when she and her husband, Victor Solomon, returned to Chennai, because "she felt her services were more needed in India." She did her doctorate in microbiology and joined the faculty of the Institute of Microbiology in Madras Medical College afterwards.

In her earlier career life abroad, Solomon had worked as a junior physician at King's College Hospital, London. After returning to India, Solomon worked as a microbiologist at Madras Medical College and rose to the rank of professor. She followed the literature about the clinical descriptions of AIDS in 1981, discovery of HIV in 1983 and by 1986 decided to test 100 female sex workers, as India had no openly gay community. Six of the one hundred blood samples turned out to be HIV positive. Solomon later sent the samples to Johns Hopkins University in Baltimore for a retest which confirmed the result. This discovery became the first HIV documentation in India. Since then, Solomon decided to dedicate her life working on HIV/AIDS research, treatment, and awareness. She has described how people shunned HIV infected persons; even her husband did not want her "to work with HIV-positive patients," most of whom at that time were homosexuals, those who self-injected drugs and sex workers. Solomon replied by "you have to listen to their stories and you wouldn't say the same thing." Solomon was one of the first people who spoke openly about HIV and the stigma along it, she once stated "what is killing people with AIDS more is the stigma and discrimination."

From 1988 to 1993, Solomon set up the first AIDS Resource Group in India founded at the MMC and ran a variety of AIDS research and social services. The group was also the first comprehensive HIV/AIDS facility in India before any private and public sectors. In 1993, Solomon established the 'Y R Gaitonde Centre for AIDS Research and Education' (YRG CARE) after the name of her father. It was one of India's first places for voluntary HIV counselling and testing. As of 2015, 100 outpatients were seen there daily and 15 000 patients were on regular follow-up. The centre and her work there have been described as "significant factors in slowing the [HIV] epidemic". She also provide education to other doctors and students about HIV and its treatment. She obtained the name of "the AIDS doctor of Chennai" and served as the President of the AIDS Society of India.

Solomon also collaborated in international research studies, including a multi-country HIV/STD Prevention Trial at the US National Institute of Mental Health, the HIV Prevention Trials Network run by the US National Institute of Allergy and Infectious Diseases, an NIH study of the HIV stigma in health care settings in Southern India, and a Phase III study of 6% CS GEL, a candidate microbicide of CONRAD (organization).

In 2009, the Ministry of Science and Technology conferred the National Award for Women Bioscientists on Solomon. She was actively involved in the work of the YRG Centre and in HIV education to the end of her life, hosting a major conference in Chennai in January, 2014. In 25 January 2017, the Government of India awarded her the Padma Shri for medicine for her contributions towards diagnosis and treatment of HIV. Outside her work, she enjoyed reading and the company of her two golden retrievers. She died from pancreatic cancer and was predeceased by her husband, who died in 2006, but is survived by her son, Sunil Solomon, an epidemiologist at Johns Hopkins University in the USA. Solomon's commitment to her patients and her country is what is remembered by colleagues.



Jokes

TEACHER: Maria, go to the map and find North America...

MARIA: Here it is.

TEACHER: Correct. Now class, who discovered North America?

CLASS: Maria.

Officer: Soldier, do you have change for a dollar?

Soldier: Sure, buddy.

Officer: That's no way to address an officer. Now, let's try that again. Soldier, do you have change for a dollar?

Soldier: No, sir!

A man walking down the streets sees another man with a very big dog. One man says to the other, "Does your dog bite", the man replies "No my dog doesn't" The man pats the dog and has his hand bitten off, "I thought you said your dog didn't bite" said the injured man. "That's not my dog", replied the other.

Three vampires are sitting at a bar. Bartender asks the first one what he wants. "I think I'll have a glass of blood." "Okay, what'll you have?" he asks the second vampire. "That sounds good. I'll have a glass of blood too." "And what can I get for you?" he asks the third vampire. "I'll have a glass of plasma" said the third vampire. "Okay," said the bartender, "That's two bloods and a blood light, then."

A biology student had to write a computer program, but he had troubles to make it work. He asked his roommate, who was a computer science major, to look at his program and tell him where the error is. The computer guy looked through the code for some time, then glanced desperately at his friend and said: "In DNA".

Two drunks are sitting at a bar. The first one says, "What's this thing that they call a 'Breathalyzer'?" The second guy says, "It's a bag that can tell how much you drank." The first guy says, "I married one of those things years ago."

Dad to son: when I beat you how do you control your anger?

Son: I start cleaning toilet

Dad: How does that satisfy you?

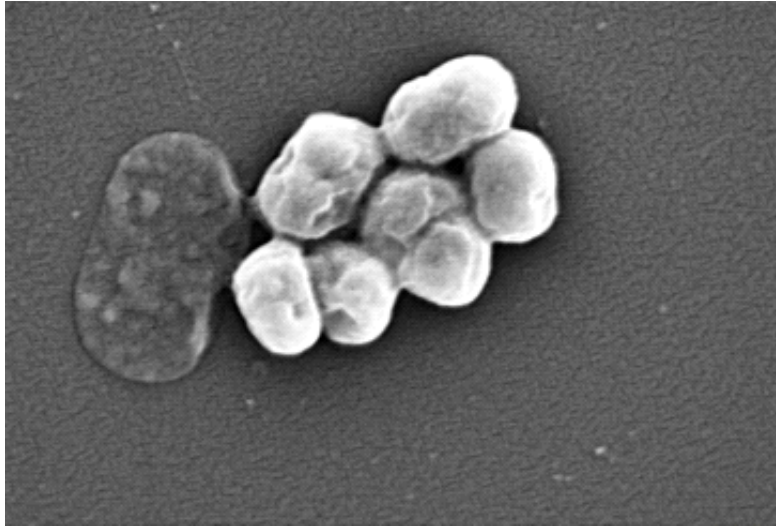
Son: I clean it with your toothbrush.

Husband asks, "Do u know the meaning of WIFE??"

"Without Information Fighting Everytime"

Wife replies, "No, It means,

"With Idiot For Ever!!!"

Acinetobacter baumannii

Acinetobacter baumannii is a typically short, almost round, rod-shaped (coccobacillus) Gram-negative bacterium. It is named after the bacteriologist Paul Baumann. It can be an opportunistic pathogen in humans, affecting people with compromised immune systems, and is becoming increasingly important as a hospital-derived (nosocomial) infection. While other species of the genus *Acinetobacter* are often found in soil samples (leading to the common misconception that *A. baumannii* is a soil organism, too), it is almost exclusively isolated from hospital environments. Although occasionally it has been found in environmental soil and water samples, its natural habitat is still not known.

Bacteria of this genus lack flagella, whip-like structures many bacteria use for locomotion, but exhibit twitching or swarming motility. This may be due to the activity of type IV pili, pole-like structures that can be extended and retracted. Motility in *A. baumannii* may also be due to the excretion of exopolysaccharide, creating a film of high-molecular-weight sugar chains behind the bacterium to move forward. Clinical microbiologists typically differentiate members of the genus *Acinetobacter* from other Moraxellaceae by performing an oxidase test, as *Acinetobacter* spp. are the only members of the Moraxellaceae to lack cytochrome c oxidases.

A. baumannii is part of the ACB complex (*A. baumannii*, *A. calcoaceticus*, and *Acinetobacter* genomic species 13TU). It is difficult to determine the specific species of members of the ACB complex and they comprise the most clinically relevant members of the genus. *A. baumannii* has also been identified as an ESKAPE pathogen (*Enterococcus faecium*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter* species), a group of pathogens with a high rate of antibiotic resistance that are responsible for the majority of nosocomial infections.

Colloquially, *A. baumannii* is referred to as "**Iraqibacter**" due to its seemingly sudden emergence in military treatment facilities during the Iraq War. It has continued to be an issue for veterans and soldiers who served in Iraq and Afghanistan. Multidrug-resistant *A. baumannii* has spread to civilian hospitals in part due to the transport of infected soldiers through multiple medical facilities. During the COVID-19 pandemic, coinfection with *A. baumannii* secondary to SARS-CoV-2 infections has been reported multiple times in medical publications.

Signs and symptoms of infection

A. baumannii is an opportunistic pathogen with a range of different diseases, each with their own symptoms. Some possible types of *A. baumannii* infections include

- Pneumonia
- Bloodstream infections
- Meningitis
- Wound and surgical site infections, including necrotizing fasciitis
- Urinary tract infections

Symptoms of *A. baumannii* infections are often indistinguishable from other opportunistic infections caused by other opportunistic bacteria - including *Klebsiella pneumoniae* and *Streptococcus pneumoniae*.

Symptoms of *A. baumannii* infections in turn range from fevers and chills, rash, confusion and/or altered mental states, pain or burning sensations when urinating, strong urge to urinate frequently, sensitivity to bright light, nausea (with or without vomiting), muscle and chest pains, breathing problems, and cough (with or without yellow, green, or bloody mucus). In some cases, *A. baumannii* may present no infection or symptoms, as with colonizing an open wound or tracheostomy site.

Treatment

Because most infections are now resistant to multiple drugs, determining what susceptibilities the particular strain has is necessary for treatment to be successful. Traditionally, infections were treated with imipenem or meropenem, but a steady rise in carbapenem-resistant *A. baumannii* has been noted. Consequently, treatment methods often fall back on polymyxins, particularly colistin although tetracyclines have shown promise in MDR *A. baumannii*. Colistin is considered a drug of last resort because it often causes kidney damage, among other side effects. Prevention methods in hospitals focus on increased hand-washing and more diligent sterilization procedures. An *A. baumannii* infection was recently treated using phage therapy. Phages are viruses that attack bacteria and have also been demonstrated to resensitize *A. baumannii* to antibiotics it normally resists.

Scientists at MIT, Harvard's Broad Institute and MIT's CSAIL found a compound named halicin using deep learning that can effectively kill *A. baumannii*. The compound is a repurposed drug.

Incidence in hospitals

Being referred to as an opportunistic infection, *A. baumannii* infections are highly prevalent in hospital settings. *A. baumannii* poses very little risk to healthy individuals, however, factors that

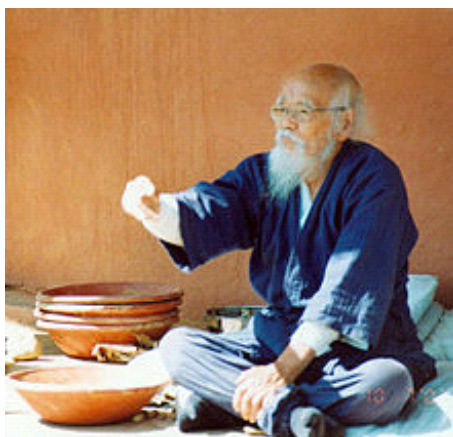
increase the risks for infection include:

- Having a weakened immune system
- Chronic lung disease
- Diabetes
- Lengthened hospital stays
- Illness that requires use of a hospital ventilator
- Having an open wound treated in a hospital
- Treatments requiring invasive devices like urinary catheters

A. baumannii can be spread through direct contact with surfaces, objects, and the skin of contaminated persons.

The importation of *A. baumannii* and subsequent presence in hospitals has been well documented. *A. baumannii* is usually introduced into a hospital by a colonized patient. Due to its ability to survive on artificial surfaces and resist desiccation, it can remain and possibly infect new patients for some time. *A. baumannii* growth is suspected to be favored in hospital settings due to the constant use of antibiotics by patients in the hospital. *Acinetobacter* can be spread by person-to-person contact or contact with contaminated surfaces. *Acinetobacter* can enter through open wounds, catheters and breathing tubes. In a study of European intensive care units in 2009, *A. baumannii* was found to be responsible for 19.1% of ventilator-associated pneumonia cases.

Natural farming



Masanobu Fukuoka, originator of the natural farming method

Natural farming also referred to as "the Fukuoka Method", "the natural way of farming" or "do-nothing farming", is an ecological farming approach established by Masanobu Fukuoka (1913–2008). Fukuoka, a Japanese farmer and philosopher, introduced the term in his 1975 book *The One-Straw Revolution*. The title refers not to lack of effort, but to the avoidance of manufactured inputs and equipment. Natural farming is related to fertility farming, organic farming, sustainable agriculture, agroecology, agroforestry, ecoagriculture and permaculture, but should be distinguished from biodynamic agriculture.

The system works along with the natural biodiversity of each farmed area, encouraging the complexity of living organisms, both plant and animal that shape each ecosystem to thrive along with food plants. Fukuoka saw farming both as a means of producing food and as an aesthetic or spiritual approach to life, the ultimate goal of which was, "the cultivation and perfection of human beings". He suggested that farmers could benefit from closely observing local conditions. Natural farming is a closed system, one that demands no human-supplied inputs and mimics nature.

Fukuoka's natural farming practice rejected the use of modern technology, and after twenty-five years, his farm demonstrated consistently comparable yields to that of the most technologically advanced farms in Japan, doing so without the pollution, soil loss, energy consumption, and environmental degradation inherent in these modern types of farming. One of the main prompts of natural farming, is to ask why we should apply modern technology to the process of growing food, if nature is capable of achieving similar yields without the negative side-effects of these technologies. Such ideas radically challenged conventions that are core to modern agro-industries; instead of promoting importation of nutrients and chemicals, he suggested an approach that takes advantage of the local environment. Although natural farming is sometimes considered a subset of organic farming, it differs greatly from conventional organic farming, which Fukuoka considered to be another modern technique that disturbs nature.

Fukuoka claimed that his approach prevents water pollution, biodiversity loss and soil erosion, while providing ample amounts of food, and there is a growing body of scientific work in fields like agroecology and regenerative agriculture, that lend support to these claims.

Masanobu Fukuoka's Principles

In principle, practitioners of natural farming maintain that it is not a *technique* but a *view*, or a way of seeing ourselves as a part of nature, rather than separate from or above it. Accordingly, the methods themselves vary widely depending on culture and local conditions.

Rather than offering a structured method, Fukuoka distilled the natural farming mindset into five principles.

1. No tillage
2. No fertilizer
3. No pesticides or herbicides
4. No weeding
5. No pruning

Though many of his plant varieties and practices relate specifically to Japan and even to local conditions in subtropical western Shikoku, his philosophy and the governing principles of his farming systems have been applied widely around the world, from Africa to the temperate northern hemisphere.

Principally, natural farming minimises human labour and adopts, as closely as practical, nature's production of foods such as rice, barley, daikon or citrus in biodiverse agricultural ecosystems. Without plowing, seeds germinate well on the surface if site conditions meet the needs of the seeds placed there. Fukuoka used the presence of spiders in his fields as a key performance indicator of sustainability.

Fukuoka specifies that the ground remain covered by weeds, white clover, alfalfa, herbaceous legumes, and sometimes deliberately sown herbaceous plants. Ground cover is present along with grain, vegetable crops and orchards. Chickens run free in orchards and ducks and carp populate rice fields.

Periodically ground layer plants including weeds may be cut and left on the surface, returning their nutrients to the soil, while suppressing weed growth. This also facilitates the sowing of seeds in the same area because the dense ground layer hides the seeds from animals such as birds.

For summer rice and winter barley grain crops, ground cover enhances nitrogen fixation. Straw from the previous crop mulches the topsoil. Each grain crop is sown before the previous one is harvested by broadcasting the seed among the standing crop. Later, this method was reduced to a single direct seeding of clover, barley and rice over the standing heads of rice. The result is a denser crop of smaller, but highly productive and stronger plants.

Fukuoka's practice and philosophy emphasised small scale operation and challenged the need for mechanised farming techniques for high productivity, efficiency and economies of scale. While his family's farm was larger than the Japanese average, he used one field of grain crops as a small-scale example of his system.

Natural farming recognizes soils as a fundamental natural asset. Ancient soils possess physical and chemical attributes that render them capable of generating and supporting life abundance. It can be argued that tilling degrades the delicate balance of a climax soil:

1. Tilling may destroy crucial physical characteristics of a soil such as *water suction*, its ability to send moisture upwards, even during dry spells. The effect is due to pressure differences between soil areas. Furthermore, tilling most certainly destroys soil horizons and hence disrupts the established flow of nutrients. A study suggests that reduced tillage preserves the crop residues

on the top of the soil, allowing organic matter to be formed more easily and hence increasing the total organic carbon and nitrogen when compared to conventional tillage. The increases in organic carbon and nitrogen increase aerobic, facultative anaerobic and anaerobic bacteria populations.

2. Tilling over-pumps oxygen to local soil residents, such as bacteria and fungi. As a result, the chemistry of the soil changes. Biological decomposition accelerates and the microbiota mass increases at the expense of other organic matter, adversely affecting most plants, including trees and vegetables. For plants to thrive a certain quantity of organic matter (around 5%) must be present in the soil.
3. Tilling uproots all the plants in the area, turning their roots into food for bacteria and fungi. This damages their ability to aerate the soil. Living roots drill millions of tiny holes in the soil and thus provide oxygen. They also create room for beneficial insects and annelids (the phylum of worms). Some types of roots contribute directly to soil fertility by funding a mutualistic relationship with certain kinds of bacteria (most famously the rhizobium) that can fix nitrogen.

Fukuoka advocated avoiding any change in the natural landscape. This idea differs significantly from some recent permaculture practice that focuses on permaculture design, which may involve the change in landscape. For example, Sepp Holzer, an Austrian permaculture farmer, advocates the creation of terraces on slopes to control soil erosion. Fukuoka avoided the creation of terraces in his farm, even though terraces were common in China and Japan in his time. Instead, he prevented soil erosion by simply growing trees and shrubs on slopes.

To Prevent Candidiasis in Healthcare



Candida albicans is an opportunistic fungus (or form of yeast) that causes various types of infections in humans. This microorganism belongs to the genus *Candida*. The *Candida albicans* yeast is a part of the normal gut flora, a group of microorganisms that live in your mouth and gastrointestinal tract and is present in up to 80% of the human population. It normally does not cause harmful effects; however overgrowth of the fungus can result in candidiasis (candidosis). Candidiasis is often observed in immunocompromised individuals, such as patients infected with HIV.

The most common infections caused by members of the *Candida* species include:

- 1) Thrush: a thick, white growth on the mucus membranes of the mouth and throat.
 - 2) Genital yeast infections: a painful inflammatory condition of the genital area that causes ulceration and a whitish discharge. Candidiasis in the vagina is commonly referred to as a “yeast infection.”
 - 3) Cutaneous candidiasis: occurs in moist areas of the skin due to rub and in neonates and burn patients.
- These infections are usually easily cured in people who are not immunocompromised.

Healthcare-associated candidemia:

Systemic fungal infections, including those by *C. albicans*, have emerged as important causes of morbidity and mortality in immunocompromised patients. Problems start when a person experiences some alteration in:

- Cellular immunity (i.e., chemotherapy or HIV)
- Normal body flora (i.e. the loss of normal bacterial flora due to antibiotics or steroid therapy)
- Normal physiology (i.e. cardiac surgery or indwelling catheters)
- *candida* yeasts normally live in and on the body without causing any symptoms. Invasive candidiasis is a fungal infection that can occur when *Candida* yeasts enter the blood stream. In people at risk, invasive candidiasis may occur when a person's own *Candida* yeasts enter their bloodstream, or it can also happen if medical equipment or devices, particularly intravenous (IV) catheters, become contaminated with *Candida*. The presence of *Candida* in the blood is a condition referred to as candidemia.
- *Candida* is one of the most common causes of central-line associated infections in healthcare settings; and although it is rare in people without risk factors, it is the fourth most

common cause of hospital-acquired blood stream infections in the United States. Once it's in the bloodstream, the infection may spread and infect various organs.

People at highest risk for developing candidemia include:

- Intensive care unit (ICU) patients
- Surgical patients
- Patient with central venous catheters
- Very low-birth-weight infants

Treatment should also include prompt removal of catheters.

Prevention

In some high-risk patients, anti-fungal agents may be used prophylactically to prevent infections. Good infection control practice including proper hand hygiene in addition to following the infection prevention guidelines published by the CDC, Health Canada, and professional associations (such as the Society of Healthcare Epidemiology of America (SHEA) and the Infectious Disease Society of America (IDSA) are the best method for preventing of these life-threatening infections.

Patients and their families should ask if a central line is really needed, and if so, they should speak up if the skin around the central line becomes sore or red, or if the dressing becomes wet or dirty.

Cleaning and Disinfection of Environmental Surfaces

Good general health and hygiene are very important for treating *Candida* infections of the skin. Keeping the skin dry and exposed to air is helpful. Drying powders may help prevent fungal infections.

Possible Complications

These complications may occur:

- Infections of the nails may cause the nails to become oddly shaped and may cause an infection around the nail.
- *Candida* skin infections may return.

Cutaneous candidiasis

When an overgrowth of *Candida* develops on the skin, an infection can occur. This condition is known as candidiasis of the skin, or cutaneous candidiasis.

Candidiasis of the skin often causes a red, itchy rash to form, most commonly in the folds of the skin. This rash may also spread to other areas of the body. While the symptoms are often bothersome, they can be treated with improved hygiene and antifungal creams or powders.

High standard of hygiene and good general health are vital in the prevention of an infection by this fungus.

An infection is more likely when a person has other skin problems or has become unhealthy for other reasons.

- Wash regularly and dry the skin carefully afterwards. Overweight people should be careful to dry all skin folds.
- Avoid using other people's towels.
- Wear clothes that are made of cotton or wool. These will allow the skin to breathe and rid itself of surplus moisture. Change clothes and socks regularly so that you are always wearing dry ones.
- Wear sandals or leather shoes instead of trainers.
- Wash the hands very carefully after touching an infected area and after applying an antifungal cream.

A combination study with two biocides (EtOH and H₂O₂) and fluconazole demonstrated that the combination had enhanced efficacy.

Antifungal medication. If you are at high risk for developing invasive candidiasis, your healthcare provider may prescribe antifungal medication to prevent the infection. This is called “antifungal prophylaxis,” and it is typically recommended for:

- Some organ transplant patients
- High-risk ICU patients
- Chemotherapy patients who have neutropenia
- Stem cell transplant patients who have neutropenia
- Some doctors may also consider giving antifungal prophylaxis to very low birth weight infants (less than 2.2 pounds) in nurseries with high rates of invasive candidiasis.
- **Be a safe patient.** There are some actions that you can take to help protect yourself from infections, including:
- **Speak up.** Patients and caregivers can ask how long a central venous catheter (central line) is needed, and if so, how long it should stay in place. Tell your doctor if the skin around the catheter becomes red or painful.
- Keep hands clean. Be sure everyone cleans their hands before touching you. Washing hands can prevent the spread of germs.
- **Healthcare providers** can follow CDC-recommended infection control practices every time they work with a central line.

Prevention of Recurrence

The majority of HIV specialists do not recommend secondary prophylaxis (chronic maintenance therapy) of recurrent oropharyngeal or vulvovaginal candidiasis because of the effectiveness of therapy for acute disease, the low mortality associated with mucosal candidiasis, the potential for resistant *Candida* organisms to develop, the possibility of drug interactions, and the cost of prophylaxis (DIII). However, if recurrences are frequent or severe, an oral azole, fluconazole (CI), or itraconazole solution (CI) (or for recurrent vulvovaginal candidiasis, daily prophylaxis with any topical azole [CII]) should be considered. Other factors that influence choices related to such therapy include impact of recurrences on the patient's well-being and quality of life need for prophylaxis for other fungal infections, cost, toxicities, drug interactions, nutritional status, and potential to induce drug resistance among *Candida* and other fungi.

Prolonged use of systemically absorbed azoles, specifically among patients with low CD4⁺ T lymphocyte counts (i.e., <100 cells/μL) increases the risk for developing azole resistance. Adults or adolescents who have a history of one or more episodes of documented esophageal candidiasis should be considered candidates for secondary prophylaxis. Fluconazole 100-200 mg daily is appropriate (BI). However, potential azole resistance should be considered when long-term azoles are considered.

Preventing Oral Candidiasis

Keep your mouth clean. Rinse your mouth frequently. Brush your teeth at least twice a day and floss daily or as often as your dentist recommends. If you have to use a corticosteroid inhaler, be sure to rinse your mouth with water or brush your teeth after taking your medication. If you are undergoing treatment for cancer, some studies suggest that using a chlorhexidine (CHX) mouthwash can help to prevent thrush.

If you dentures, clean them daily. Ask your dentist for the best way to clean your type of dentures.

See your dentist regularly. If you have diabetes, wear dentures, or have had oral Candidiasis before, you may need to visit more frequently. Ask your dentist how often you should come in. Ask your dentist if you need to change your diet or oral hygiene routine.

Eat more yogurts and less sugar. The bacteria in yoghurt may help you maintain a healthy bacteria balance in your mouth. It also might help to cut down on sweets and breads. It is possible that sugar and yeast encourage *Candida* overgrowth. Maintain good blood sugar control if you have diabetes. Well-controlled blood sugar can reduce the amount of sugar in your saliva, discouraging the growth of *Candida*.

Protect infants from thrush. Small children are at risk for oral Candidiasis. Clean pacifiers and bottle nipples with hot water after each use. Store milk and prepared bottles in the fridge to prevent yeast from growing. If you are nursing and have red or sore nipples, you may be passing a yeast infection back and forth with your child. Talk to your doctor about obtaining an antifungal ointment for your nipples.

Preventing Invasive Candidiasis

Know when you're at risk. Invasive Candidiasis occurs when excess *Candida* enters the bloodstream and causes an infection. Invasive Candidiasis is most likely to happen in hospital patients or residents of nursing homes. If you are in an intensive care unit or are using a catheter, you are at risk of invasive Candidiasis. Having a weakened immune system, low neutrophil, or diabetes can also put you at risk.

You may be at risk if you have taken broad-spectrum antibiotics, experienced kidney failure, or had surgery, especially gastrointestinal surgery.

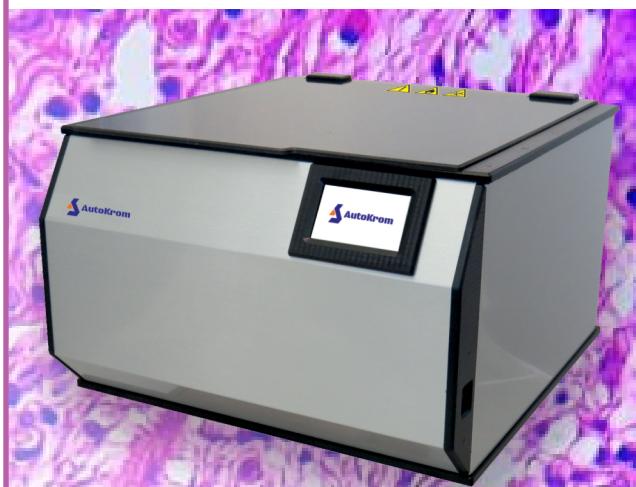
Take an antifungal medication. To prevent invasive Candidiasis, your doctor may prescribe an antifungal prophylaxis. If you have had an organ transplant or a stem cell transplant, you might be prescribed this. Ask about it as well if you are a high-risk ICU patient or a chemotherapy patient. If you have had an infant born at less than 2.2 pounds, ask about the rates of invasive Candidiasis at the hospital.

Your doctor may recommend that your infant be given an antifungal medication if the rates of infection are high.

Keep an eye on hospital hygiene. Medical equipment can carry traces of *Candida*. Workers in hospitals might carry traces of it on their hands. While staying in a hospital, make sure your hands are clean, and ask anyone who touches you to wash their hands first. If you are wearing a catheter, ask how long it should stay in, and speak up if it isn't changed on time. If the skin around the catheter becomes swollen, red, sensitive, or painful, tell a healthcare worker immediately.

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