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Editorial

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Current Trends section – Disinfection and Treatment of potable water.

In Profile Scientist – Camillo Golgi (1843–1926) was one of the most influential scientists in the history of medicine and neuroscience. His groundbreaking discoveries transformed the understanding of the nervous system and laid the foundation for modern neurobiology. Born on July 7, 1843, in Corteno, a small town in northern Italy, Golgi grew up in a family that valued education and medicine. His father, Alessandro Golgi, was a physician, and this early exposure to the medical profession inspired Camillo to pursue a career in science and medicine. He studied medicine at the University of Pavia, where he developed a keen interest in anatomy, pathology, and the microscopic study of tissues. After completing his medical degree in 1865, Golgi worked in several hospitals and research laboratories, gradually establishing himself as a dedicated investigator with an exceptional talent for observation.

Bug of the month – The Ebola virus belongs to the Filoviridae family and the Ebolavirus genus. It is a filamentous, enveloped virus containing a single-stranded, negative-sense RNA genome. There are six recognized species of Ebolavirus: Zaire ebolavirus, Sudan ebolavirus, Bundibugyo ebolavirus, Taï Forest ebolavirus, Reston ebolavirus, and Bombali ebolavirus. Among these, the Zaire species is the most virulent and has been responsible for the majority of large outbreaks, including the devastating West African epidemic from 2014 to 2016. Reston ebolavirus has been found in pigs and non-human primates but has not been shown to cause disease in humans.

Did You Know? -- It's easy to understand why bananas are often a main ingredient in hearty smoothies. They add both taste and texture, and they are dense enough to keep you satiated and stave off hunger until your next meal. Nutritionally, they're a good source of fiber, potassium, vitamin B6, and provide some magnesium, vitamin C and protein. But if you're going to use a banana to make a smoothie, be choosy about what you're pairing it with **Best Practices** – 10 Environmental practices to adopt in everyday life.

Tickle yourself to enjoy 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 to your continuous support.

Novel Technologies For The Diagnosis Of Urinary Tract Infections

Urinary tract infections (UTIs) are a significant health concern worldwide, leading to substantial health and economic burden and contributing to the rise of antimicrobial resistance (AMR). Traditional UTI diagnosis relies on symptoms, urinalysis, and culture which are interpreted based on historical guidelines. This approach, while foundational, presents limitations, particularly in complex cases. Low-level bacteriuria and the presence of fastidious organisms are often overlooked or entirely missed in standard urine culture, stressing the need for novel diagnostic methods and technologies.

In clinical practice, diagnosis is usually based on symptoms such as dysuria, frequency, urgency, suprapubic discomfort, and pyuria, with urine culture confirming the pathogen. However, this approach is limited in specific populations. Infants and young children often present with nonspecific systemic symptoms (fever, vomiting, poor feeding), while older adults may show confusion or appetite loss. Patients with catheters or underlying neurological/urological disorders frequently exhibit persistent bacteriuria and leukocyturia, complicating differentiation between infection and colonization. Such diagnostic challenges delay treatment, promote inappropriate antibiotic use, and aggravate antimicrobial resistance (AMR).

Urinary Tract Infections

The urinary system, comprising the kidneys, ureters, bladder, and urethra, is responsible for filtering the blood to eliminate waste and excess water from our body. It plays a crucial role in clearing metabolic byproducts from the bloodstream, ensuring the body's proper balance and function. The system also plays a vital role in maintaining the balance of ions and solutes in the blood while helping to regulate blood volume and pressure. Antibiotics should not be prescribed excessively, particularly in view of the increasing prevalence of antibiotic resistance. In healthy individuals, urine is typically sterile or contains only a minimal number of microorganisms capable of causing infection.

Urinary tract infections (UTIs), among the most common infectious diseases worldwide, affect approximately 150 million people annually, leading to significant health complications and high medical expenses. These infections can occur in the urethra (urethritis), bladder (cystitis), or kidneys (pyelonephritis), with symptoms varying depending on the site of infection. UTIs negatively affect patients' social and intimate relationships, reducing their overall quality of life.

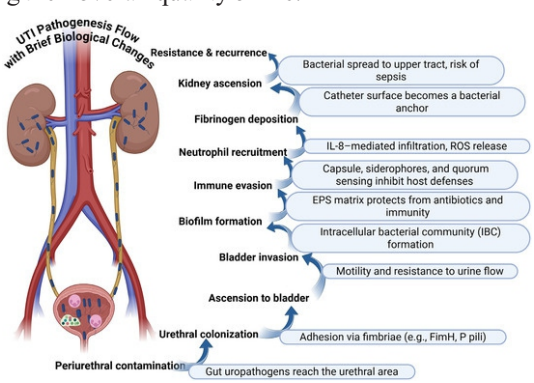


Fig. Stepwise pathogenesis of UTIs

Classification of urinary tract infections:

Urinary tract infections (UTIs) are broadly classified into two categories: uncomplicated (uUTIs) and complicated (cUTIs). uUTIs typically occur in healthy individuals without any structural or neurological abnormalities in the urinary tract. These infections are straightforward to manage and often involve the bladder (cystitis) or urethra (urethritis). In contrast, cUTIs is associated with conditions that increase the risk of infection, such as anatomical or functional abnormalities, catheter use, kidney stones, urinary retention, neurogenic bladder, renal failure, or pregnancy. In males, hence, UTIs are almost always complicated. cUTIs often require more intensive management due to the increased complexity of the underlying conditions. Additionally, UTIs can also be classified based on the site of infection, such as lower UTIs (affecting the urethra and bladder) and upper UTIs (involving the kidneys, such as pyelonephritis). This classification aids in tailoring appropriate diagnostic and treatment strategies.

Conventional Methods for UTI Diagnosis

a. **Suprapubic Aspiration (SPA)**
Suprapubic aspiration (SPA) is considered the gold standard for obtaining a sterile, uncontaminated urine sample, especially in infants and young children. Although invasive, it is a simple, safe, and reliable technique that minimizes contamination and improves diagnostic accuracy.

b. **Midstream Urine Culture on CLED Agar**
Microscopy and culture of midstream urine (MSU) remain the conventional gold standard for diagnosing UTIs. Urine is commonly cultured on Cystine Lactose Electrolyte Deficient (CLED) agar, which supports the growth of urinary pathogens while preventing the swarming of *Proteus* species. CLED medium was first described by Sandys and later modified by Mackey and Sandys.

c. **Dip-Slide Culture Method**
The dip-slide culture method is a simple and cost-effective alternative for UTI diagnosis. It uses a slide coated with MacConkey agar on one side and blood agar on the other to detect urinary pathogens. This method is particularly useful in outpatient and resource-limited settings.

Fig. Dip-slide technique for urine culture

d. **Rapid Diagnostic Tests and Gram Staining**
Rapid urease and nitrate reductase tests provide quick screening for UTI-causing bacteria. Gram staining has limited diagnostic value as its positivity threshold is similar to the significant bacteriuria cutoff of 10^5 CFU/mL.

Limitations of Conventional UTI Diagnosis

Current diagnostic methods have several drawbacks:

Method	Advantages	Limitations
Urine dipstick	Rapid, inexpensive	Low specificity and false positives
Microscopy	Detects pyuria and bacteriuria	Operator-dependent
Urine culture	Gold standard	Time-consuming (24-72 h)
Antibiotic susceptibility testing	Guides therapy	Additional 24-48 h after culture

These limitations have driven the development of innovative diagnostic platforms.

Novel Technologies for UTI Diagnosis

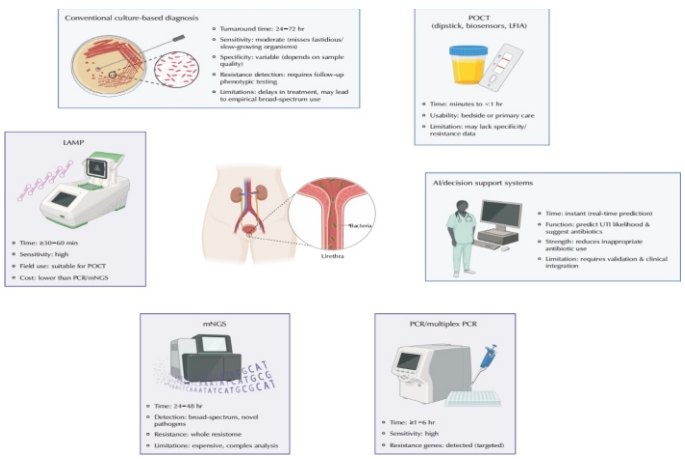


Fig. Comparison of conventional microbiological culture methods with emerging rapid diagnostic platforms for UTI detection, including point-of-care, immunoassay-based, isothermal amplification, PCR-based, and metagenomic sequencing technologies**.**

Molecular Diagnostics

Molecular diagnostic techniques have improved UTI diagnosis by offering higher sensitivity, specificity, and faster turnaround compared with conventional culture methods. These methods overcome limitations such as delayed results, false negatives, and failure to detect slow-growing or difficult-to-culture pathogens. Nucleic acid amplification tests, including **polymerase chain reaction (PCR)** and **loop-mediated isothermal amplification (LAMP)**, enable direct detection of bacterial DNA/RNA from urine samples without the need for bacterial growth.

1. **Polymerase Chain Reaction (PCR)**
   PCR provides rapid and sensitive detection of uropathogens, including low bacterial loads and polymicrobial infections. Multiplex PCR assays can simultaneously identify multiple pathogens and antimicrobial resistance (AMR) genes, making them valuable for complicated UTIs requiring targeted therapy. However, increased sensitivity may reduce specificity, and PCR cannot confirm bacterial viability.

2. **Metagenomic Next-Generation Sequencing (mNGS)**
   mNGS is a culture-independent approach that detects a broad range of microbial DNA/RNA, including rare and atypical pathogens. It also provides information on microbial diversity and resistance mechanisms. Despite its potential in recurrent and resistant UTIs, its clinical use is limited by high cost, complex data analysis, and technical requirements.

3. **Loop-Mediated Isothermal Amplification (LAMP)**
   LAMP is a rapid amplification technique that operates at a constant temperature, making it suitable for point-of-care testing. It has demonstrated high accuracy for detecting *Escherichia coli* in urine samples, with reported sensitivity and specificity above 95% in some studies. Its simplicity, portability, and low equipment requirements make it a promising alternative to PCR-based methods.

4. **Molecular Detection of Antimicrobial Resistance**
   PCR, LAMP, and NGS-based assays can identify important AMR genes, including **blaCTX-M**, **blaPER**, **mecA**, and carbapenemase genes, enabling faster selection of appropriate antibiotics. However, these methods detect resistance genes rather than actual resistance expression and may miss unknown or emerging resistance mechanisms.

Despite their advantages, molecular diagnostics face challenges including high cost, specialized equipment, and limited accessibility. Future approaches combining molecular detection with rapid phenotypic susceptibility testing may improve personalized treatment and antimicrobial stewardship in UTI management.

Point-of-Care Testing (POCT)

Point-of-care testing (POCT) enables rapid, on-site detection of UTI pathogens and biomarkers without the need for centralized laboratories. Conventional urine dipsticks are widely used due to their simplicity and low cost; however, their limited specificity and inability to identify pathogens or antimicrobial resistance (AMR) often require confirmatory laboratory testing.

1. **Alternative Rapid Tests**
   Lateral flow immunoassays have been developed as alternatives to traditional dipsticks by detecting bacterial antigens directly in urine. For example, **RapidBac** uses monoclonal antibodies to detect common urinary pathogens with rapid results. Enzyme-based tests such as **Uriscreen** detect bacterial catalase activity and provide results within minutes, although specificity may be affected by non-infectious inflammatory conditions.

2. **Dip-Slide Culture Kits**
   Dip-slide devices containing agar-coated paddles allow urine culture outside conventional laboratories. After incubation, they provide semi-quantitative bacterial counts and preliminary information on organism type and antibiotic susceptibility. However, clinical trials have shown limited benefits in routine primary care settings.

3. **Biosensors and Emerging Technologies**
   Advanced POCT platforms using biosensors, microfluidics, and nanotechnology enable rapid detection of bacterial metabolites, biomarkers, and resistance patterns. Novel devices such as the **fidget spinner-based diagnostic system (Dx-FS)** use centrifugal microfluidics for rapid bacterial detection and antimicrobial susceptibility testing without external equipment, providing results within hours. Wearable devices, including smart urine-monitoring patches and

incontinence pads, are also being explored for continuous UTI monitoring, particularly in high-risk populations.

Despite significant progress, challenges remain in improving specificity, distinguishing infection from colonization, and integrating rapid AMR detection into POCT platforms to support appropriate antibiotic therapy.

Artificial Intelligence in UTI Diagnosis

Artificial intelligence (AI) and machine learning (ML) are increasingly being applied to improve the diagnosis, prediction, and management of urinary tract infections (UTIs). By analyzing large datasets from electronic health records (EHRs), laboratory findings, and patient histories, AI models can identify individuals at high risk of UTI, support early diagnosis, optimize antibiotic selection, and help reduce inappropriate antimicrobial use.

A 2024 systematic review evaluating 14 AI/ML prediction models reported strong overall diagnostic performance, with a pooled area under the curve (AUC) of **0.89**, sensitivity of **78%**, and specificity of **89%**. However, the review also highlighted substantial heterogeneity among studies and limited external validation, restricting the generalizability of these models. More recently, AI-based prediction tools have been developed for specific patient populations, including individuals undergoing urinary tract instrumentation, nephrolithiasis treatment, or surgery.

One of the most promising clinical applications is the **UTI Smart-Set (UTIS)**, an AI-driven clinical decision-support system that integrates patient history, local antimicrobial resistance patterns, and EHR data to recommend guideline-based antibiotic therapy. In a large real-world study involving over **171,000 outpatient UTI cases**, clinicians accepted the AI recommendations in **66%** of cases. Adoption of the tool significantly reduced antibiotic mismatch rates (14.2% to 8.9%) and decreased ciprofloxacin prescriptions by over **80%**, supporting antimicrobial stewardship and personalized treatment.

Despite these encouraging results, several challenges remain. Many clinicians are hesitant to rely on AI because of concerns regarding algorithm transparency, accuracy, limited validation, and the potential loss of clinical autonomy. Moreover, AI systems require extensive clinical and laboratory data, which may limit their practicality in primary care settings where rapid decision-making is essential.

Overall, AI has significant potential to enhance UTI diagnosis and optimize antibiotic prescribing. However, broader clinical validation, transparent model development, and successful integration into routine workflows are necessary before these technologies can be widely adopted in everyday clinical practice.

Disinfection and Treatment of potable water

Potable water is classified by the World Health Organization (WHO) as water that is not contaminated with organic, inorganic, radiological, or microbiological pollutants and does not present any differences in taste, smell, or appearance.

What causes water to become contaminated?
Selected contaminants and their sources are divided into the five categories defined by the World Health Organization (WHO).

Organics
Carbon-based compounds such as benzene, carbon tetrachloride, vinyl chloride, trihalomethanes, styrene, and polychlorinated biphenyls among others. These chemicals are commonly used in plastics, synthetic fibres, pesticides, and solvents, so they tend to originate from agricultural runoff and industrial discharge.

Inorganics
Inorganic compounds include heavy metals, mineral acids, salts, cyanides, sulphates, phosphates, and nitrates. Many of these pollutants occur naturally and leach into freshwater sources. Others are used in fertilizers, metal processing, mining, refining, pesticides, and other industrial processes that can run off into surface waters or penetrate through to groundwater.

Radioactivity
There are naturally occurring radioactive elements that can enter water sources by absorption from soil or with help from mining operations, mineral sand processing, and fertilizer production. These include isotopes of radium and uranium. Man made radionuclides such as caesium, iodine, and plutonium are used in medical treatments, weapons testing, and energy production. They can be discharged into water sources from hospitals or power facilities.

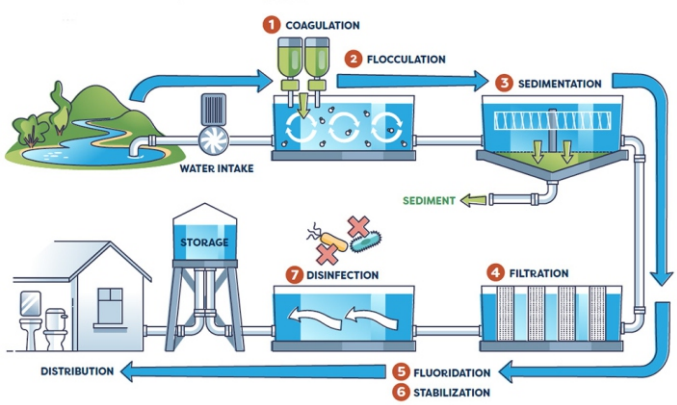
Pathogens
Bacteria, viruses, parasites, or protozoa typically find their way into the water supply via faecal matter. Wastes from human buildings not connected to sewage systems or untreated discharge from animal processing facilities can find its way into bodies of surface water.

Emerging Contaminants
Pharmaceuticals, personal care products, endocrine disrupting compounds, PFAS, and 1,4 dioxane are some such contaminants. These are either expelled from the body, discharged from production facilities, or leached from landfills.

How is water treated conventionally?

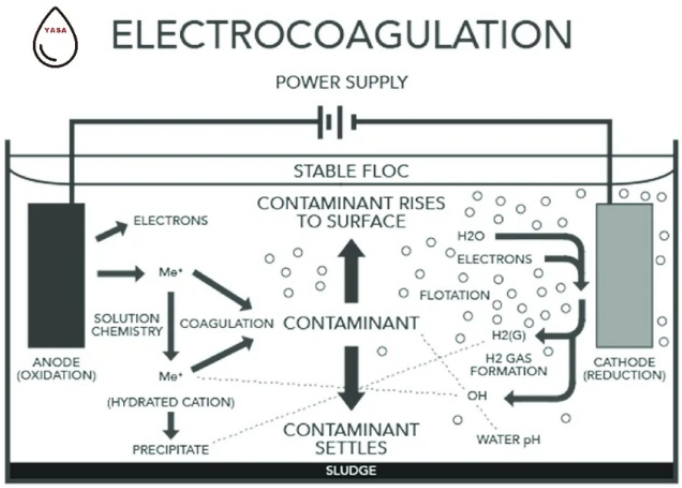
1. **Coagulation/Flocculation**
   Following pretreatment, chemicals are added to the influent to neutralize the overall positive or negative charge so that the particles no longer repel one another and will begin to coalesce. When gentle mixing is applied to the tank, those small particulates will clump to one another to form floc, some of which will float to the top of the solution. The problem with this is the production of sludge in large volumes due to the added chemicals. On occasion, this sludge can be rather toxic.
2. **Sedimentation/Clarification**
   The floc formed in the previous step is allowed to settle in the bottom of a tank and the less turbid water passes over a weir in the tank on to the next step.
3. **Filtration**
   The effluent from sedimentation is not yet free of particulate matter. To reduce it further, the solution is passed through a filtration system with pores that are small enough that they don't allow much more than water to pass through. There are a few filter medias that are used, namely sand or paper.
4. **Disinfection**
   The crucial final step for drinking water treatment is the disinfection of pathogens. Here, strong oxidizers, most commonly chlorine or chloramine, are introduced into the solution. They break down the cell wall of bacteria to kill them and prevent them from replicating. However, these two disinfectants can result in the formation of toxic byproducts that are harmful to people. They can also cause corrosion in pipes and chloramines, as they are formed with ammonia, can also increase nitrification levels.

Commonly used disinfectants: -
Chlorine: Added to the water supply as a gas or in the form of hypochlorite either as liquid or solid.
Chloramines: These are formed by a combination of chlorine (from gas or hypochlorite) and ammonia.
Chlorine dioxide (ClO_2): This compound is always produced on-site using sodium chlorite and either chlorine or hydrochloric acid.
Ozone (O_3): This compound is produced by an electrical discharge through air or oxygen.
Ultraviolet Radiation (UV): This is a non-chemical method of disinfection by using ultraviolet radiation at certain wavelengths.



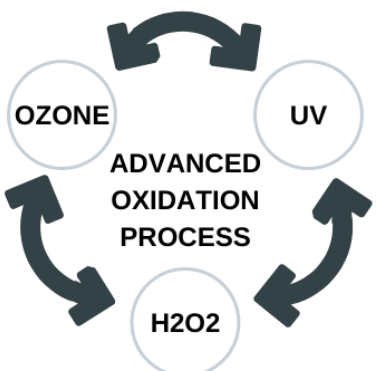
Advanced technologies for the treatment of water

Electro-coagulation/oxidation
Electrocoagulation is a process designed to replace chemical coagulation treatments while electrooxidation is a form of advanced oxidation. Neither of these methods requires chemicals for operation. They utilize electrical potential as the driving force behind their respective reactions.



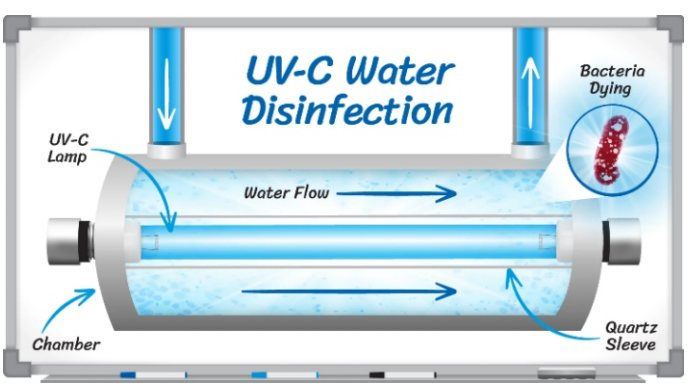
Advanced Oxidation Process

Advanced oxidation is a tertiary treatment that uses a powerful oxidizer, the hydroxyl radical, to break down micropollutants into non-harmful components. Such contaminants are very difficult to get rid of otherwise, because they are so small. To form the radicals, some combination of ozone, hydrogen peroxide, and ultraviolet light are typically used.



UV Disinfection

Instead of chlorine, ultraviolet light is used to oxidize the pathogens. The mass-less photons produced from the light source fuel the breakdown of metabolic processes instead of chemicals. UV disinfection does not create toxic byproducts because of this, and it is also more effective if the effluent is free of suspended matter.



Desalination

Freshwater sources are no longer the only place we can get drinking water from. Desalination systems can take seawater and remove up to 99% of its salts. One of the most popular systems uses reverse osmosis, drawing water through a membrane by way of a pressure difference.

Ultrafiltration

A more refined filtration unit. Using a membrane, these systems can have pore sizes of less than 0.1 microns and therefore, are able to remove some of the finest particles. They make an especially effective pretreatment for RO systems.

Camillo Golgi

Camillo Golgi (1843–1926) was one of the most influential scientists in the history of medicine and neuroscience. His groundbreaking discoveries transformed the understanding of the nervous system and laid the foundation for modern neurobiology. Born on July 7, 1843, in Corteno, a small town in northern Italy, Golgi grew up in a family that valued education and medicine. His father, Alessandro Golgi, was a physician, and this early exposure to the medical profession inspired Camillo to pursue a career in science and medicine. He studied medicine at the University of Pavia, where he developed a keen interest in anatomy, pathology, and the microscopic study of tissues. After completing his medical degree in 1865, Golgi worked in several hospitals and research laboratories, gradually establishing himself as a dedicated investigator with an exceptional talent for observation.

During the nineteenth century, scientists faced enormous challenges in studying the nervous system because nerve cells appeared as a dense, tangled network under the microscope. Conventional staining methods colored all the cells simultaneously, making it almost impossible to distinguish individual neurons or understand how they were organized. Golgi recognized that progress in neuroscience required a better way to visualize nerve cells. While working in a modest laboratory at the Hospital for Chronic Diseases in Abbiategrasso, Italy, he developed an innovative staining technique in 1873 that revolutionized microscopic anatomy. This method, known as the "Black Reaction" or *la reazione nera*, involved treating nervous tissue with potassium dichromate followed by silver nitrate. The reaction produced silver chromate deposits that stained only a small percentage of neurons but filled them completely, revealing their cell bodies, dendrites, and axons with remarkable clarity.

Golgi's staining method represented a major breakthrough because it allowed scientists to observe the complete structure of individual neurons for the first time. Instead of viewing an indistinct mass of overlapping cells, researchers could now trace the intricate branches and long projections of single nerve cells. This remarkable technique opened a new era in neuroscience by enabling detailed studies of brain organization, neural pathways, and cellular morphology. Even today, variations of the Golgi stain continue to be used in neuroscience laboratories around the world because of their ability to reveal neuronal architecture in extraordinary detail.

Although Golgi's staining method was revolutionary, his interpretation of the nervous system differed significantly from that of another famous scientist, the Spanish histologist Santiago Ramón y Cajal. Golgi believed in the "reticular theory," which proposed that the nervous system consisted of a continuous network of interconnected fibers through which nerve impulses flowed without interruption. According to this theory, nerve cells were physically fused together into a single interconnected web. Ramón y Cajal, using Golgi's own staining method, reached a different conclusion. He carefully observed that neurons were separate, individual cells that communicated through specialized contact points rather than direct continuity. This concept became known as the "neuron doctrine," which states that the nervous system is composed of discrete cells called neurons. Today, the neuron doctrine is recognized as one of the fundamental principles of neuroscience.

Ironically, Golgi's greatest invention provided the evidence that eventually disproved his own theory. Despite this disagreement, both Golgi and Ramón y Cajal made extraordinary contributions to science. In recognition of their pioneering work on the structure of the nervous system, they jointly received the Nobel Prize in Physiology or Medicine in 1906. During the Nobel ceremony, each scientist presented lectures defending his own interpretation of the nervous system. Although history ultimately validated Ramón y Cajal's neuron doctrine, Golgi's staining technique remained indispensable and continues to be regarded as one of the greatest methodological advances in biological research.

Golgi's scientific contributions extended far beyond neuroscience. He made important discoveries in pathology, microbiology, and cell biology. One of his most significant findings was the identification of a specialized structure within cells that is now known as the Golgi apparatus. In 1898, while studying nerve cells, Golgi observed a network of flattened sacs and membranes near the nucleus. Although the function of this structure was initially unclear, later research established that the Golgi apparatus plays a vital role in modifying, sorting, packaging, and transporting proteins and lipids within the cell. It acts as the cell's processing and distribution center, ensuring that newly synthesized molecules reach their appropriate destinations. Today, the Golgi apparatus is recognized as one of the essential organelles in virtually all eukaryotic cells.

Golgi also made valuable contributions to the study of infectious diseases. He conducted extensive research on malaria, which was a major public health problem during his lifetime. Through careful microscopic examination, he demonstrated the relationship between the life cycle of the malaria parasite and the

periodic episodes of fever experienced by infected patients. His observations helped improve scientific understanding of malaria and supported the development of more effective diagnostic and therapeutic approaches. In addition, Golgi investigated kidney diseases, brain pathology, and sensory organs, producing numerous scientific publications that advanced medical knowledge across multiple disciplines.

Throughout his career, Golgi served as a professor at the University of Pavia, where he taught generations of medical students and researchers. His laboratory became an internationally respected center for anatomical and neurological research. Despite limited resources during the early years of his career, Golgi demonstrated that careful observation, technical innovation, and scientific curiosity could overcome many obstacles. His dedication to research inspired numerous students who later became distinguished scientists in their own right.

Camillo Golgi's legacy remains profound more than a century after his discoveries. His staining technique fundamentally changed the study of the nervous system and enabled scientists to explore the microscopic organization of the brain with unprecedented precision. His identification of the Golgi apparatus expanded understanding of cellular organization and intracellular transport, influencing virtually every field of modern cell biology. Although his reticular theory was ultimately replaced by the neuron doctrine, his willingness to challenge existing ideas and develop innovative experimental methods exemplifies the spirit of scientific inquiry.

Today, Golgi's name is permanently associated with several important scientific concepts, including the Golgi stain, the Golgi apparatus, Golgi cells in the cerebellum, and various anatomical structures bearing his name. His work continues to influence neuroscience, histology, pathology, molecular biology, and medicine. Modern imaging technologies, electron microscopy, and molecular neuroscience all owe part of their success to the foundations established by Golgi's pioneering investigations. His discoveries demonstrated that technological innovation can revolutionize scientific understanding and open entirely new fields of research.

Camillo Golgi is remembered not only as an outstanding physician and scientist but also as one of the founders of modern neuroscience. His achievements illustrate the importance of persistence, creativity, and meticulous experimentation in advancing scientific knowledge. Although some of his theoretical interpretations were later revised, the tools and methods he developed transformed biological research forever. His remarkable contributions continue to educate, inspire, and guide scientists as they seek to understand the extraordinary complexity of the human brain and the intricate workings of living cells.

Jokes

Customer: "I want to buy a goldfish, do I need any accessories?"
Clerk: "Just a bowl of water, but keep him away from the sun."
Customer: "Why, will he get a sunburn?"
Clerk: "No, he will turn into a hot fish soup."

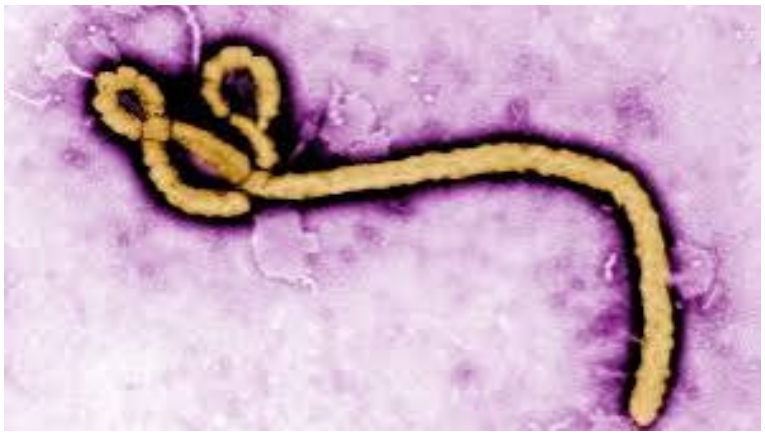
Manager: "You are late for the third time this week!"
Employee: "My alarm clock didn't go off this morning."
Manager: "That excuse is getting very old."
Employee: "So is my alarm clock, that's the whole problem."

Counselor: "Your wife says you never buy her flowers."
Husband: "To be perfectly honest, I didn't even know she sold flowers."
Counselor: "No, she means you don't bring them home as a gift!"
Husband: "Oh, thank goodness, I thought she was running a secret business."

Mom: "Why are you staring at your phone and laughing?"
Son: "I am looking at a funny meme online."
Mom: "Can you show me the joke?"
Son: "No, it is too hard to explain to your generation."

Friend 1: "Wow, I love your new sports shoes!"
Friend 2: "Thanks, they make me run much faster."
Friend 1: "Are you running in a big race soon?"
Friend 2: "No, I am just running away from my problems.

Ebola Virus



The Ebola virus is one of the most dangerous and deadly viruses known to infect humans. It causes **Ebola Virus Disease (EVD)**, formerly known as Ebola hemorrhagic fever, a severe and often fatal illness characterized by fever, weakness, gastrointestinal symptoms, and, in some cases, internal and external bleeding. Since its discovery in 1976, Ebola has caused several outbreaks, primarily in Central and West Africa, posing significant challenges to public health systems worldwide. Although outbreaks are relatively rare, the high mortality rate and rapid spread of the virus make Ebola a major global health concern. Advances in diagnostics, treatment, and vaccination have greatly improved the management of the disease, but preventing outbreaks remains a critical priority.

The Ebola virus belongs to the **Filoviridae** family and the **Ebolavirus** genus. It is a filamentous, enveloped virus containing a single-stranded, negative-sense RNA genome. There are six recognized species of Ebolavirus: **Zaire ebolavirus**, **Sudan ebolavirus**, **Bundibugyo ebolavirus**, **Taï Forest ebolavirus**, **Reston ebolavirus**, and **Bombali ebolavirus**. Among these, the Zaire species is the most virulent and has been responsible for the majority of large outbreaks, including the devastating West African epidemic from 2014 to 2016. Reston ebolavirus has been found in pigs and non-human primates but has not been shown to cause disease in humans.

The virus was first identified in 1976 during simultaneous outbreaks in what is now the Democratic Republic of the Congo and Sudan. The outbreak in the Democratic Republic of the Congo occurred near the Ebola River, from which the virus derived its name. Since then, multiple outbreaks have occurred across several African countries, with varying numbers of cases and fatalities. The largest recorded outbreak took place between 2014 and 2016 in Guinea, Liberia, and Sierra Leone, resulting in more than 28,000 reported cases and over 11,000 deaths. This epidemic highlighted the importance of rapid disease surveillance, international cooperation, and strong healthcare infrastructure in controlling infectious diseases.

Scientists believe that fruit bats belonging to the **Pteropodidae** family serve as the natural reservoir hosts of the Ebola virus. These bats carry the virus without becoming ill and may transmit it to other animals such as monkeys, chimpanzees, gorillas, forest antelopes, or porcupines. Humans usually become infected through direct contact with the blood, body fluids, or tissues of infected animals during hunting, butchering, or consumption of bushmeat. Once the virus enters the human population, it spreads from person to person through direct contact with infected blood, saliva, vomit, feces, urine, sweat, breast milk, semen, or other bodily fluids. It can also spread through contaminated needles, medical equipment, bedding, clothing, and surfaces that have been exposed to infectious fluids. Ebola is not transmitted through the air like influenza or COVID-19, nor is it spread through casual contact with healthy individuals.

The incubation period of Ebola ranges from **2 to 21 days**, with most patients developing symptoms within 8 to 10 days after exposure. During the incubation period, infected individuals do not transmit the virus because symptoms have not yet developed. Early symptoms resemble many other viral illnesses and include sudden onset of fever, chills, severe headache, muscle pain, fatigue, sore throat, and weakness. As the disease progresses, patients often develop nausea, vomiting, diarrhea, abdominal pain, and loss of appetite, leading to severe dehydration. In advanced stages, some individuals experience impaired liver and kidney function, skin rashes, confusion, and bleeding from the gums, nose, gastrointestinal tract, or injection sites. Although hemorrhage is a well-known feature of Ebola, not all infected patients develop severe bleeding. Without prompt supportive care, the disease can progress rapidly to shock, multiple organ failure, and death.

The Ebola virus infects various immune cells, including macrophages and dendritic cells, allowing it to spread rapidly throughout the body. It damages blood vessels, disrupts the immune response, and triggers an excessive inflammatory reaction known as a cytokine storm. This widespread inflammation contributes to vascular leakage, impaired blood clotting, and failure of vital organs such as the liver, kidneys, and lungs. The severity of disease depends on factors including the viral species, the amount of virus present, the patient's immune response, and the timing of medical intervention.

Early diagnosis is essential for controlling Ebola outbreaks and

improving patient outcomes. Because the initial symptoms are similar to those of malaria, typhoid fever, dengue, and other tropical diseases, laboratory confirmation is required. Diagnostic methods include **reverse transcription polymerase chain reaction (RT-PCR)**, which detects viral RNA, antigen detection tests, enzyme-linked immunosorbent assays (ELISA), and antibody tests used during later stages of infection or for surveillance. Specimens from suspected patients must be handled under strict biosafety precautions because of the high risk of laboratory-acquired infection.

There is no simple cure for Ebola, but advances in supportive care have significantly improved survival rates. Patients require intravenous fluids or oral rehydration solutions to prevent dehydration, correction of electrolyte imbalances, oxygen therapy when needed, nutritional support, and treatment of secondary bacterial infections. Careful monitoring of blood pressure, kidney function, and organ failure is essential. In recent years, monoclonal antibody therapies targeting the Ebola virus have demonstrated improved survival, particularly when administered early in the course of illness. These treatments have become an important component of Ebola management in specialized healthcare facilities.

Vaccination has become a powerful tool for preventing Ebola outbreaks. The **Ervebo** vaccine, developed against the Zaire ebolavirus species, has shown high effectiveness in preventing infection and is widely used during outbreak response through a strategy known as ring vaccination. In this approach, close contacts of infected individuals and frontline healthcare workers are vaccinated to interrupt chains of transmission. Continued research is focused on developing vaccines that provide broader protection against multiple Ebola virus species.

Preventing Ebola transmission relies heavily on public health measures. Rapid identification and isolation of infected patients, contact tracing, safe burial practices, proper use of personal protective equipment by healthcare workers, community education, and strict infection prevention protocols are essential for controlling outbreaks. Public awareness campaigns help dispel myths and encourage early reporting of symptoms, while international collaboration ensures timely delivery of medical supplies, laboratory support, and trained healthcare personnel.

The Ebola virus has had profound social and economic consequences in affected countries. Outbreaks overwhelm healthcare systems, disrupt education and agriculture, reduce economic productivity, and create fear and stigma within communities. Healthcare workers face particularly high risks due to frequent exposure to infected patients. Lessons learned from previous outbreaks have strengthened global preparedness and improved emergency response systems for emerging infectious diseases.

In conclusion, the Ebola virus remains one of the world's most serious infectious disease threats because of its high fatality rate and potential to cause large outbreaks. However, remarkable progress has been made in understanding its biology, improving diagnostic techniques, developing effective vaccines, and introducing targeted therapies. Continued surveillance, scientific research, public health preparedness, and international cooperation are essential to prevent future epidemics and protect vulnerable populations. The fight against Ebola demonstrates the importance of combining medical innovation with strong public health strategies to combat emerging infectious diseases and safeguard global health.

Surprising research reveals why you shouldn't add bananas to your smoothies

Bananas and berries are popular fruits to throw into smoothies, but are they really a good combination? According to a study in ***Food & Function***, not so much. In fact, blending a banana with berries can decrease that smoothie's nutritional value.

It's easy to understand why bananas are often a main ingredient in hearty smoothies. They add both taste and texture, and they are dense enough to keep you satiated and stave off hunger until your next meal. Nutritionally, they're a good source of fiber, potassium, vitamin B6, and provide some magnesium, vitamin C and protein.

But if you're going to use a banana to make a smoothie, be choosy about what you're pairing it with. **It turns out bananas contain an increased level of an enzyme called polyphenol oxidase, or PPO, which is responsible for its browning when they're cut or bruised. When a high-level PPO fruit is combined with one high in flavanols (natural healthy compounds), it can reduce the levels of the flavanols your body consumes.**

Why are flavanols so important?

First, it's helpful to know that flavanols are found in mangos, pineapple, pears, blueberries, blackberries, strawberries and cocoa, which are all common smoothie ingredients. They're also vital to our overall health.

"Research over the past 20 years has shown flavanols can help to maintain health as we age," says lead study author **Javier Ottaviani, Ph.D**., director of the Food & Nutrition Core Laboratory of Mars Edge (part of Mars, Incorporated), and an adjunct researcher in the department of nutrition at the **University of California, Davis**. "For example, one large and rigorous clinical trial in ***The American Journal of Clinical Nutrition*** showed that a daily intake of 500 mg of flavanols reduced cardiovascular deaths, including heart attacks and stroke, by 27%."

Additionally, the **Academy of Nutrition and Dietetics (AND)** recommends people should consume **400 to 600mg of flavanols** daily to support cardiometabolic health. "Cardiometabolic health contributes to a healthy lifespan by reducing risk factors for cardiac and metabolic diseases, including obesity, hypertension, and diabetes," Ottaviani says.

Other research has found flavanols exhibit antibacterial, antiviral, anti-inflammatory and neuroprotective properties. **Studies** also suggest that they have prebiotic potential, which is important for maintaining a healthy gut.

What happened in this study?

The study, led by Ottaviani and his fellow researchers at the University of California, Davis in collaboration with the **University of Reading** in the UK, came about because "we wanted to understand, on a very practical level, how common foods and food preparations, such as smoothies, could affect the availability of flavanols to be absorbed by the body after intake," says Ottaviani.

The scientists knew from **previous studies** that flavanols can be broken down by polyphenol oxidase. However, "there were no previous studies investigating if bananas could affect the absorption of flavanols," Ottaviani explains.

For this study, the researchers looked at a small group of eight healthy men aged 25 to 60. To control the levels of flavanols in their diet, the subjects were asked to follow a low-flavanol diet the day before and during the study days.

All of the study participants were given a smoothie with high PPO activity consisting of banana and almond milk, as well as another with low PPO activity, (a mix of strawberries, blueberries, blackberries, raspberries, water, almond milk and yogurt). The subjects also took a flavanol capsule (containing cocoa extract) as a control. A small amount of cocoa extract was also added to the different smoothies.

What did the researchers find?

After analyzing the participants' blood and urine samples to measure the amount of flavanols in their bodies, researchers discovered that after drinking the mixed-berry smoothie, the

subjects had similar flavanol levels to the control, but consuming the banana smoothie resulted in having 84% lower levels of flavanols in their body. **Plain and simple, the high PPO content of the banana destroyed the flavanols, practically making the idea of consuming a banana-berry smoothie a moot point.**

If you're wondering if the effects would be the same for women as men, Ottaviani says the answer is most likely yes. "The results showed that the effects of PPO on flavanol availability occurred during smoothie preparation, before consumption," he explains. "Because of this, sex differences are less relevant for this study, and we consider that the findings are generalizable to both men and women."

Should you avoid bananas in all smoothies?

No, you can certainly have bananas in your smoothie, but based on the study's findings, you may want to reconsider using berries in the same recipe. "Bananas remain a great fruit and a great option for smoothie preparation, but not if you're aiming at maintaining the flavanols in your smoothie," says Ottaviani.

Bananas go great in a smoothie with peanut, or another nut butter, or you can pair it with another high PPO fruit such as **papaya**, **avocado or pear**. If you want a fruity banana blend with less PPO, you can try combining it with pineapple, oranges or mangos.

But if you're craving a berry smoothie, and you're only adding the banana for sweetness or texture, there are some viable alternatives, according to **Carolyn Williams, Ph.D., R.D**., a professor of culinary arts and nutrition at Shelton State Community College in Tuscaloosa, Alabama, author of ***Meals that Heal*** and host of the *Happy Eating* podcast.

Thinking about why you're using the banana in the first place can help you figure out what to swap it out for, says Williams. **"If the banana is adding sweetness and/or creaminess, you may want to replace it with ingredients that add those same qualities. For instance, I like including a little honey for sweetness, and for texture, you can add some mango and Greek yogurt, which has a higher protein content compared to regular yogurt."**

10 Environmental practices to adopt in everyday life

1 - Reduce energy consumption

Energy consumption represents a significant portion of our carbon footprint. Choosing LED light bulbs and energy-efficient appliances is also an excellent initiative. These consume less energy, and LED bulbs have a longer lifespan, making them both an economical and environmentally friendly choice.

Furthermore, heating and air conditioning are among the largest sources of energy consumption in our homes. To reduce their environmental impact, installing proper thermal insulation will help retain heat in winter and keep homes cool in summer, thus reducing the need for heating in winter and air conditioning in summer. Less consumption also means less carbon released into the atmosphere.

2 - Optimize your water consumption

Water is a precious resource, which must be used sparingly, even more so with the scarcity of freshwater sources due to the phenomena of global warming and heat waves. Avoiding baths, taking shorter showers, and installing flow restrictors on faucets and showerheads all contribute to significant water savings. Similarly, not leaving the water running while washing dishes or brushing teeth, washing clothes at low temperatures can make a big difference to our water consumption.

3 - Reduce your consumption of meat and animal products.

The consumption of meat products represents a particularly high carbon footprint, because raising animals, especially cattle farming, through their feeding, transport, and digestion, emits significant quantities of greenhouse gases (CO_2, methane). Reducing your consumption of meat and animal products like dairy, in favour of vegetarian or vegan alternatives a few times a week, is also an excellent way to lessen your environmental impact. Furthermore, a primarily plant-based and balanced diet has the advantage of being lower in saturated fats, which is a significant benefit for your health.

4 - Consume organic, seasonal and locally grown products for a sustainable diet.

Eating local food decreases the environmental impact due to transportation, and consuming seasonal foods reduces the need for watering and emissions associated with artificial growing methods, such as the need to heat or light greenhouses.

Finally, eating organic products reduces soil pollution and pollution of the watercourse, consequences of pesticide and other treatment product releases, harmful to the planet, biodiversity and health.

5 - Use environmentally friendly transport and limit the use of motorized vehicles.

Internal combustion engine vehicles, particularly cars, represent the primary source of greenhouse gas emissions in the average CO_2 emitted per person in the world. To reduce these emissions and the pollution they generate (fine particulate matter, metallurgical waste, plastic waste), it is preferable to prioritize the use of public transport, trains, bicycles or walking, rather than using a car.

When doing without a car is not an option, carpooling, or turning to a light electric vehicle, or a hybrid car, remains a more ecological alternative, with a lower carbon impact than using vehicles running on fossil fuels (gasoline, diesel).

6 - Reduce your digital footprint.

The digital footprint nevertheless has a significant impact on the environment.

Heat dissipation from mega servers, overexploitation of minerals for the manufacture of digital objects, etc. Many actions can help reduce these sources of pollution, such as limiting streaming consumption by downloading instead, or watching in lower quality. Turning off electronic devices and unplugging chargers when not in use also prevents unnecessary energy consumption.

Emptying your hard drives, sorting your emails and files stored for a long time in the cloud, saves storage space and prevents overloading servers.

Similarly, cleaning, maintaining and repairing computer equipment in case of failure has the effect of extending the lifespan of digital devices and spacing out their replacement.
Finally, resisting the temptation to buy every new version of a product that comes on sale helps to reduce one's material footprint, and if a purchase is necessary, replacing one's devices with refurbished products avoids overconsumption and overproduction of equipment.

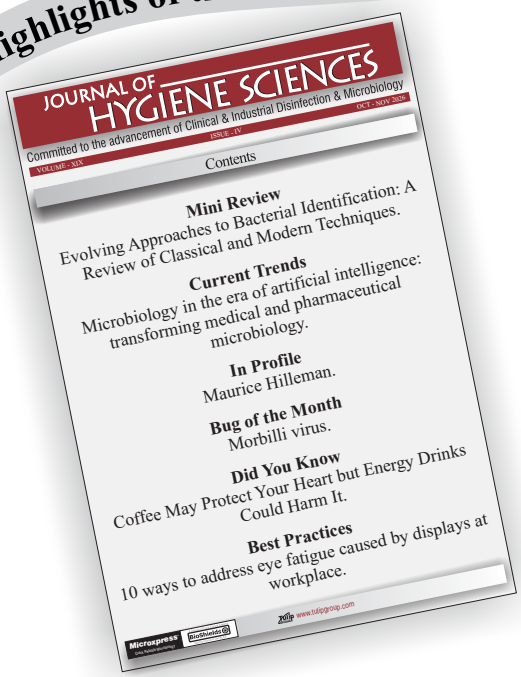
7 - Buy durable and quality products.
Prioritizing the purchase of clothing that supports sustainable fashion, acquiring second-hand items and furniture, and opting for quality appliances that last longer, helps to reduce waste and the need to buy new. This helps support a production method based on slow fashion. It also reduces the visibility of mainstream fashion brands, whose production practices are comparable to those of fast fashion, and all the environmental damage they cause.
Buy cosmetic products vegan, eco-labelled cleaning products, or manufacturing its own cleaning products. Using natural ingredients like white vinegar, baking soda etc. is also an excellent way to reduce your environmental impact.

8 - Reduce the use of single-use plastics and favour bulk buying.
The enormous quantities of single-use plastics used to package all types of food and objects represent a major threat to health and the environment. Reducing consumption of bottled drinks, drinking tap water, even if it's filtered and choosing reusable wooden bottles and utensils, as well as metal or bamboo straws, significantly reduces single-use plastic consumption. Reusing plastic bags or using reusable textile bags has the same positive impact on the environment and fragile ecosystems. Finally, buying food and household products in bulk is an effective solution for reduce environmental damage caused by plastics.

9 - Repair and recycle instead of replacing and buying new.
While mending clothes, repairing electronic devices or giving a second life to furniture, instead of getting rid of it, may seem obvious, these practices remain rather marginal, and the phenomenon of overconsumption, combined with very low selling prices, does not encourage the adoption of these eco-responsible actions.
However, these activities have the advantage of being not only environmentally friendly, but also economical and good for our wallets. What's more, they can be both entertaining and educational, encouraging us to use our hands and our brains.
Just as it is important that companies produce responsibly, using recycled materials innovative processes like upcycling, aimed at reducing the use of virgin raw materials, make it essential that our consumption patterns incorporate recycling as a principle. Recycling cardboard and paper, plastic waste, glass, and metal is now within everyone's reach, representing a tangible and effective commitment to protecting nature.

10 - Raise awareness and share best practices
Undoubtedly not the least important of the eco-responsible actions to adopt to protect the planet: raising awareness among those around you about environmental issues and informing them of the positive impact of eco-virtuous actions is fundamental. Participating in collective initiatives to promote sustainable consumption, and communicating the shared benefits of eco-responsibility, is certainly the best way to contribute to the fight against climate change. the protection of biotopes and living species.

Highlights of the coming issue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