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Editorial

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Mini review section – Conjunctivitis, commonly called “pink eye”, refers to inflammation or infection of the conjunctiva. The conjunctiva is the thin mucous membrane that lines the inside of the eyelids and the surface of the globe up to the limbus, where the sclera and cornea meet. It is characterized by inflammation and swelling of the conjunctival tissue, accompanied by engorgement of the blood vessels, ocular discharge, and pain. Among the types of conjunctivitis, Viral conjunctivitis remains to be the most common overall cause of conjunctivitis. Bacterial conjunctivitis is encountered less frequently, and it is the second most common cause of infectious conjunctivitis. Allergic conjunctivitis is encountered in nearly half of the population and the findings include itching, mucoid discharge, chemosis, and eyelid edema. Therefore, Effective management of conjunctivitis includes timely diagnosis, appropriate treatment, and prevention.

Current Trends section – Studies shows that, Plasma can efficiently inactivate microbial pathogens such as bacteria, fungi, and viruses in addition to degrading toxins. This technology is effective at inactivating pathogens on the surface of medical and dental devices, as well as agricultural products. The current practical applications of plasma technology range from sterilizing therapeutic medical devices to improving crop yields, as well as the area of food preservation.

In Profile Scientist – Charles-Jules-Henri Nicolle a physician, microbiologist, novelist, philosopher, and historian. From 1903 until his death in 1936, he was Director of the Institut Pasteur in Tunis, Tunisia. Nicolle's many accomplishments include the discovery that epidemic typhus is transmitted by body lice (*Pediculus humanis corporis*), discovery of the phenomenon of inapparent infection, and possibly the first isolation of human influenza virus after experimental transmission. Nicolle made many other fundamental contributions to knowledge of infectious diseases. This year is the centenary of his discovery about typhus transmission, made in the summer of 1909, for which he was awarded the 1928 Nobel Prize in Physiology or Medicine.

Bug of the month – *Orientia tsutsugamushi* (from Japanese tsutsuga meaning "illness", and mushi meaning "insect") is a mite-borne bacterium belonging to the family Rickettsiaceae and is responsible for a disease called scrub typhus in humans. It is a natural and an obligate intracellular parasite of mites belonging to the family Trombiculidae. With a genome of only 2.0–2.7 Mb, it has the most repeated DNA sequences among bacterial genomes sequenced so far. The disease, scrub typhus, occurs when infected mite larvae accidentally bite humans. Primarily indicated by undifferentiated febrile illnesses, the infection can be complicated and often fatal.

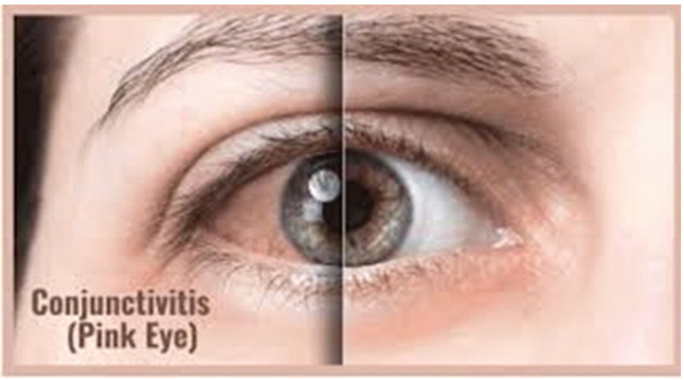
Did You Know? – Scientists have successfully grown kidneys made of mostly human cells inside pig embryos — taking researchers yet another step down the long road toward generating viable human organs for transplant. The results, reported September 7 in *Cell Stem Cell*, mark the first time a solid humanized organ, one with both human and animal cells, has been grown inside another species.

Best Practices – Pests control is the process of controlling, managing, minimizing, or removing undesirable insects and other pests, from spaces occupied by people. It should be handled by a licensed pest professional, who is a true expert on the pests they treat. Be educational, this goes both ways with the professional sharing information about the problem pests, and the person in need of pest control service educating them about their situation. Lastly, include a plan of action to deal with the issue and prevent it from happening again. There are many things people could and should be doing to help minimize and prevent pests from invading and infestations from resulting. A good pest control company will help make sure that you know and understand the role that you play in the solution.

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.

Conjunctivitis on rise II



Conjunctivitis, commonly called "pink eye", refers to inflammation or infection of the conjunctiva. The conjunctiva is the thin mucous membrane that lines the inside of the eyelids and the surface of the globe up to the limbus, where the sclera and cornea meet. It is characterized by inflammation and swelling of the conjunctival tissue, accompanied by engorgement of the blood vessels, ocular discharge, and pain. Among the types of conjunctivitis, Viral conjunctivitis remains to be the most common overall cause of conjunctivitis. Bacterial conjunctivitis is encountered less frequently, and it is the second most common cause of infectious conjunctivitis. Allergic conjunctivitis is encountered in nearly half of the population and the findings include itching, mucoid discharge, chemosis, and eyelid edema. Therefore, Effective management of conjunctivitis includes timely diagnosis, appropriate treatment, and prevention.

How it spreads

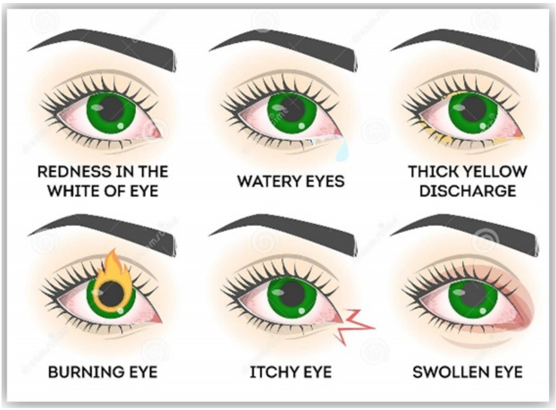
Several viruses and bacteria can cause conjunctivitis (pink eye), some of which are very contagious. Each of these types of germs can spread from person to person in different ways.

Usually spread from an infected person to others takes place through:

- Close personal contact, such as touching or shaking hands.
- The air by coughing and sneezing.
- Touching an object or surface with germs on it, then touching your eyes before washing your hands.

What are the symptoms of Conjunctivitis?

- Redness in the white of your eye or inner eyelid.
- Increased tearing.
- Thick yellow discharge that crusts over your eyelashes, especially after sleep.
- Green or white discharge from your eye.
- Gritty feeling in one or both eyes.
- Itchy eyes (especially in pink eye caused by allergies).
- Burning eyes (especially in pink eye caused by chemicals and irritants).
- Blurred vision.
- Increased sensitivity to light.
- Swollen eyelids.



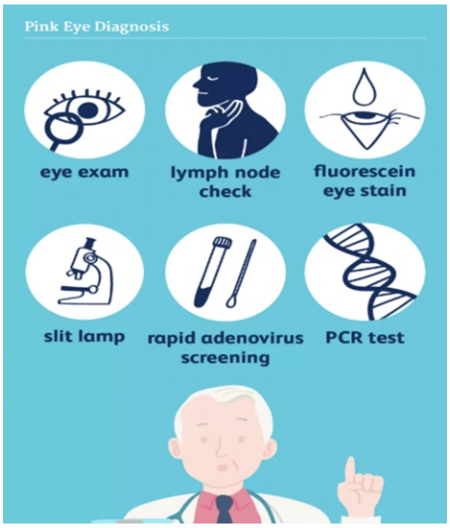
Diagnosis

Conjunctivitis can be diagnosed through a **comprehensive eye examination**.

Testing, with special emphasis on the conjunctiva and surrounding tissues, may include:

- Patient history to determine the symptoms, when the symptoms began, and whether any general health or environmental conditions are contributing to the problem.
- Visual acuity measurements to determine whether vision has been affected.
- Evaluation of the conjunctiva and external eye tissue using bright light and magnification.
- Evaluation of the inner structures of the eye to ensure that no other tissues are affected by the condition.
- Supplemental testing, which may include taking cultures or smears of conjunctival tissue. This is particularly important in cases of chronic conjunctivitis or when the condition is not responding to treatment.

Using the information obtained from these tests, a Doctor of Optometry can determine if you have conjunctivitis and provide treatment options.



Treatment

The treatment options for allergic conjunctivitis include **lubricating eye drops, antihistamines,** and **mast cell stabilizers**. It has been demonstrated that antihistamines are more beneficial than mast cell stabilizers for providing short-term relief.

Oral antihistamines are commonly used for alleviating the ocular symptoms in patients with allergic conjunctivitis.

Steroids should be used judiciously and only in selected cases. **Non-steroidal** anti-inflammatory drugs such as ketorolac and diclofenac can also be added to the treatment regimen to provide additional benefits. Other **steroid-sparing agents** such as cyclosporine-A and tacrolimus are effective in treating severe and chronic forms of ocular allergies.

Allergen-specific immunotherapy works by inducing clinical tolerance to a specific allergen. This appears to be an effective treatment options for those with allergic rhino conjunctivitis, who demonstrates specific IgE antibodies.

Artificial tears provide a barrier function, dilute various allergens, and flush the ocular surface clean from many inflammatory mediators.

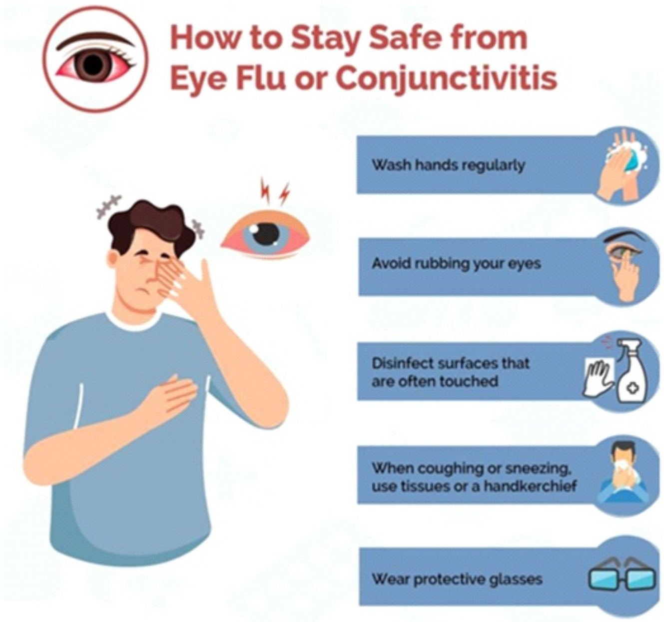
Avoidance of the allergens is the main stay of treatment for many forms of allergies including allergic conjunctivitis.

Precautions and Preventions of Conjunctivitis:

Bacterial and viral conjunctivitis are both highly contagious and spread by direct contact with secretions or contact with contaminated objects.

Simple hygiene measures can help minimize transmission to others:

1. Adults or children with bacterial or viral conjunctivitis **should not share** handkerchiefs, tissues, towels, cosmetics, or bedsheets/pillows with uninfected family or friends.



2. **Hand washing** is an essential and highly effective way to prevent the spread of infection. Hands should be wet with water and plain soap and rubbed together for 15 to 30 seconds. Younger children, who may not remember to wash their hands or avoid touching their eyes, teach them to wash their hands before and after eating and after touching the eyes, coughing, or sneezing.
3. **Alcohol-based hand rubs** are a good alternative for disinfecting hands. Hand rubs should be spread over the entire surface of hands, fingers, and wrists until dry, and they may be used several times.
4. **Do not use** the same eye drop dispenser/bottle for your infected and non-infected eyes.
5. **Wear protective eyeglasses** as well as clean the eyeglasses, being careful not to contaminate items (like hand towels) that might be shared by other people.
6. **Always disinfect** surfaces that are touched by the infected person to avoid spread.
7. **Return to work/school** — The safest approach to avoid spreading viral and bacterial conjunctivitis to others is to stay home until there is no longer any discharge from the eye(s).
8. In addition, adults who have contact with the very old, the very young, or people with a weakened immune system **should avoid** these susceptible individuals for the spread.

Disinfection and Sterilization using Plasma Technology Future Prospects

Studies shows that, Plasma can efficiently inactivate microbial pathogens such as bacteria, fungi, and viruses in addition to degrading toxins. This technology is effective at inactivating pathogens on the surface of medical and dental devices, as well as agricultural products. The current practical applications of plasma technology range from sterilizing therapeutic medical devices to improving crop yields, as well as the area of food preservation.

Basics of Plasma

Plasma is defined as an ionized gas containing both charged and neutral species, including free electrons, positive and/or negative ions, atoms, and molecules. Plasma is a gaseous state of matter that contains excited species such as ions, free electrons, and large amounts of visible, UV and IR radiations.

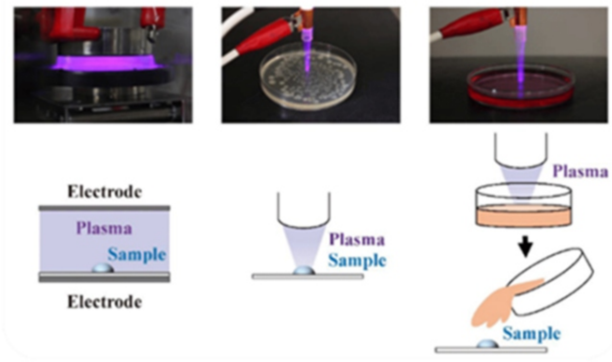
Plasma state can be generated by:

- electrical energy (electric discharges)
- nuclear energy (fission and fusion)
- thermal energy (intense redox reactions e.g., flames)
- mechanical energy (shock waves)
- radiant energy (electromagnetic radiation and particle radiation)

Plasmas differ in many respects that include pressure, charged particle density, temperature, and the presence of external electric and/or magnetic fields. The overall state of plasma is considered neutral with the density of electrons and negative ions being equal to the density of the positively charged ions.

Advantage of Plasma Sterilization

The plasma state is most divided into two main categories such as hot and cold. Hot plasmas are associated with electric arcs, thermonuclear reactions, and laser-induced reactions. Cold plasmas are associated with low pressure electrical discharges that permit chemical synthesis and surface modifications of materials.

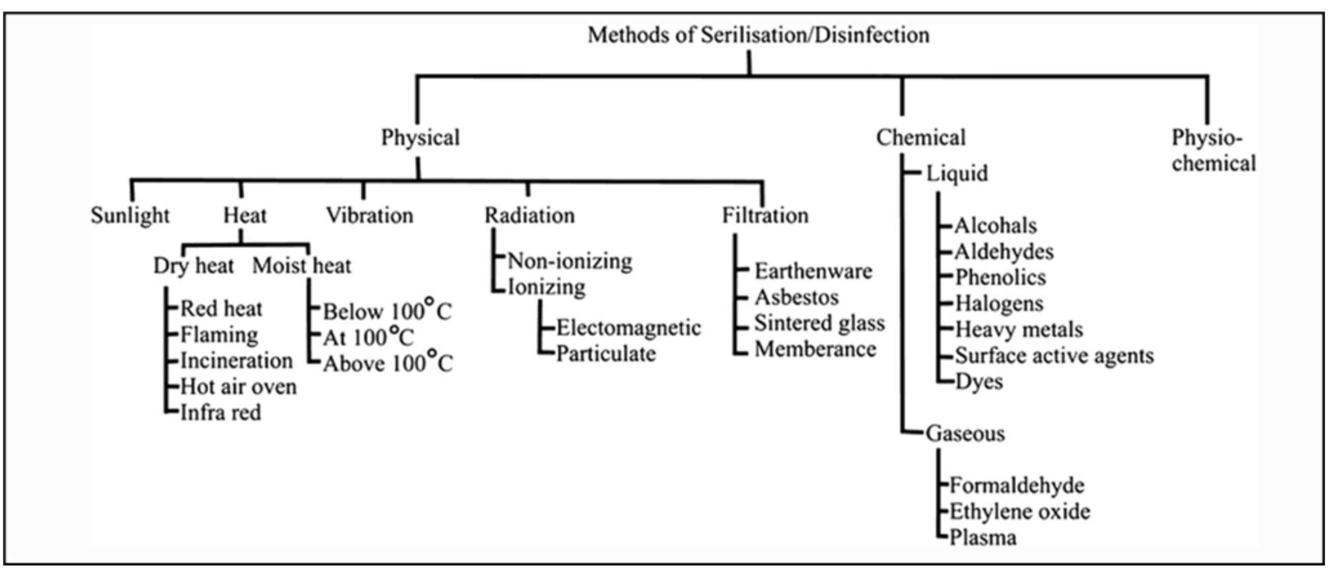


Plasma sterilization is the alternative method, which is friendlier and more effective on the wide spectrum of prokaryotic and eukaryotic microorganisms. Plasma sterilization operates differently because of its specific active agents, which are ultraviolet (UV) photons and radicals (atoms or assembly of atoms with unpaired electrons, therefore chemically reactive.

Basically, the main inactivation factors for cells exposed to plasma are heat, UV radiation and various reactive species. Plasma exposure can kill micro-organisms on a surface in addition to removing adsorbed monolayer of surface contaminants.

Plasma Sterilization: New Era in Medical Textiles

Clothing is perceived to be second skin to the human body since it is in close contact with the human skin most of the times. In hospitals, use of textile materials in different forms and sterilization of these materials is an essential requirement for preventing spread of germs. The need for appropriate disinfection and sterilization techniques is of utmost importance. Sterilization is an act or process, physical or chemical that destroys or eliminates all forms of life, especially microorganisms. Various methods of sterilization/disinfection are shown in Fig. 1.

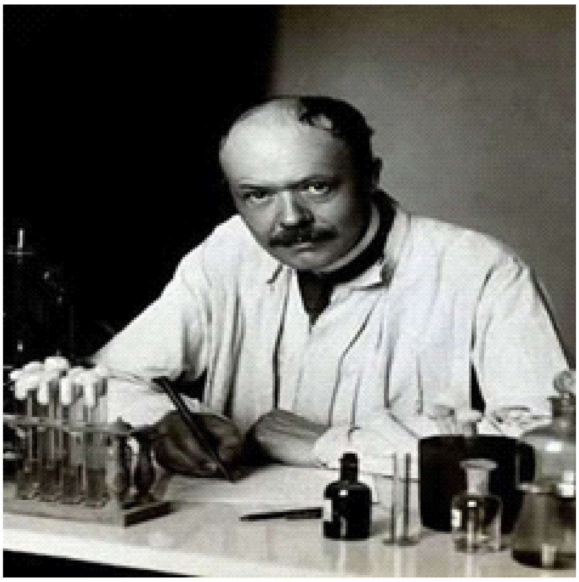


There has been a continuous demand for novel sterilization techniques appropriate for use on various textile materials as the existing sterilization techniques suffer from various technical and economical drawbacks. Conventional sterilization techniques, such as those using autoclaves, ovens, and chemicals like ethylene oxide, rely on irreversible metabolic inactivation or on breakdown of vital structural components of the microorganism. Merits, demerits, and applications of different methods of sterilization are shown in the below table.

Methods	Merits	Demerits	Application
Heat sterilization	Destroys bacterial endotoxins	Most widely used and reliable method of sterilization, involving destruction of enzymes and other essential cell constituents	Can be applied only on the thermostable products
Gaseous sterilization	Alkylation	Penetrating ability of gases	Gases being alkylating agents are potentially mutagenic and carcinogenic
Radiation sterilization	Ionization of nucleic acids	Useful method for the industrial sterilization of heat sensitive products	Undesirable changes occur in irradiated products e.g., aqueous solution where radiolysis of water occurs
Filtration sterilization	Does not destroy but removes the micro-organisms	Used for both the clarification and sterilization of liquids and gases as it can prevent the passage of both viable and non-viable particles	Does not differentiate between viable and non-viable particles

To overcome the merits and demerits of basic sterilization, other sterilization technologies have been introduced. Since heat and steam are not suitable for use on heat-sensitive materials, hydrogen peroxide and ethylene oxide are commonly used as low-temperature sterilization techniques. The carcinogenic property of ethylene oxide residues requires that the time needed for complete ventilation be longer than the actual time taken to sterilize the materials. Another sterilization technology is gamma irradiation for heat-sensitive materials, but it is costly, and its safe operation requires an isolated site. Various limitations of the existing sterilization techniques have stimulated the development of alternative techniques that are cheap, effective, and do not generate toxic residues. However, the efficiencies of these new sterilization systems were guaranteed only at high treatment temperatures. In addition to these sterilization systems, substantial amount of research works has been focused on sterilization using plasma in recent years.

Charles-Jules-Henri Nicolle (1866–1936)



Charles-Jules-Henri Nicolle a physician, microbiologist, novelist, philosopher, and historian. From 1903 until his death in 1936, he was Director of the Institut Pasteur in Tunis, Tunisia. Nicolle's many accomplishments include the discovery that epidemic typhus is transmitted by body lice (*Pediculus humanis corporis*), discovery of the phenomenon of inapparent infection, and possibly the first isolation of human influenza virus after experimental transmission. Nicolle made many other fundamental contributions to knowledge of infectious diseases. This year is the centenary of his discovery about typhus transmission, made in the summer of 1909, for which he was awarded the 1928 Nobel Prize in Physiology or Medicine.

Nicolle was born on September 21, 1866, in Rouen, the ancient capital of Normandy, France. He obtained a classical education and was greatly attracted to literature, history, and the arts, interests he nurtured throughout his life. Bowing to the wish of his physician father, however, Nicolle studied medicine. After 3 years at the medical school in Rouen, he proceeded to Paris for further training and received a medical degree from the Institut Pasteur in 1893. At 27 years of age, Nicolle returned to his hometown, where he served as a member of the medical faculty and as Director of the Bacteriological Laboratory at L'École préparatoire de médecine et pharmacie de Rouen. His 8 years in Rouen were difficult: his position was untenured, his colleagues were reluctant to accept his modern ideas about bacteriology, and he experienced a hearing loss that prevented him from effectively using a stethoscope. These challenges may have motivated him to take a leap that he might otherwise not have taken when the post of directorship of the Institut Pasteur in Tunis became open. It was offered to his elder brother, Maurice (1862–1932), an established experimental scientist, who refused it. Charles then applied and obtained the position.

Nicolle arrived in Tunis in 1902, when he was 36 years old. North Africa was a good place to study infectious diseases, including brucellosis, diphtheria, leishmaniasis, leprosy, malaria, measles, Mediterranean spotted fever, relapsing fever, scarlet fever, tuberculosis, and typhus. Of all the problems Nicolle faced in Tunis, however, epidemic typhus was, in his words, “the most important and the least explored.” He studied it for the next 7 years. He was well aware of the clinical presentation of typhus—its triad of fever, rash, and stupor—and of its link to poverty. Throughout history, typhus had been a highly communicable and frequently fatal disease. Before it began to be understood as a single infectious disease distinguished epidemiologically from typhoid (in the mid to late 19th century), typhus had been considered a collection of distinctive diseases that affected specific populations. It devastated armies during wars (“war typhus”) and prisoners living under unsanitary conditions (“jail typhus” or “jail fever”); it affected displaced populations suffering from famine, floods, and other natural disasters; and in general, it was a disease of poverty.

In Tunis, typhus struck in seasonal waves during the cooler months and disappeared during the summer. It spread through overcrowded prisons, asylums, and tent villages, taking a heavy toll in hospitals among admissions personnel and sometimes even among examining physicians. Most of the doctors in the Tunisian health system, especially those in rural districts, had contracted typhus; approximately one third of them died from it. Nicolle's first encounter with typhus could have potentially been his last. In 1903, he escaped death when at the last moment he cancelled a trip to investigate a prison outbreak. His 2 colleagues went on to the prison without him and spent the night there; both became ill with typhus and died.

Nicolle's discovery of how typhus is transmitted came from observations at the entrance and waiting room of the Sadiki Hospital, which primarily served indigent patients. He often had to step over the bodies of typhus-infected patients who had fallen and died at the doorway. Nicolle observed that typhus patients who were admitted spread their infections to others up to the point at which they entered the hospital waiting room. Included among these secondary cases were persons who took charge of their clothing. However, patients became completely noninfectious as soon as they were bathed and dressed in a hospital uniform. They could then enter the general wards without posing a risk to others. Once Nicolle realized this, he reasoned that lice on patients' clothes were most likely the vectors.

To test his hypothesis about lice, Nicolle requested and promptly received a chimpanzee (*Pan troglodytes*) from his mentor, Pierre-Paul-Émile Roux (1853–1933), at the Paris Institut Pasteur. Nicolle injected the chimpanzee with blood from a typhus patient. Twenty-four hours later, the chimpanzee was febrile, had new skin eruptions, and was prostrate. Because chimpanzees were costly, Nicolle then injected a toque macaque (*Macaca sinica*) with blood from the ill chimpanzee. Thirteen days later the macaque became febrile. Nicolle fed 29 lice on the ill macaque, and over the next few days transferred the lice to feed on other macaques. Eventually, macaques in this latter group became ill as well.

Thus, in June 1909, Nicolle reproduced typhus in a chimpanzee; in August 1909, he demonstrated that lice are the carriers of typhus; and in September 1909, he communicated his discovery to the French Académie des sciences. In these simple experiments, Charles Nicolle had solved the mystery surrounding the transmission of one of humankind's most dreaded scourges, a disease that had been a major force in shaping world history. Later research showed that the principal transmission method was not the bites of lice but the excrement of lice rubbed into the skin or eyes.

Hans Zinsser (1878–1940), an American microbiologist and historian, dedicated his classical work, Rats, Lice and History, to Charles Nicolle "with affectionate friendship." In his autobiography, Zinsser speaks of Nicolle's qualities as a scientist: Indeed, in the year after Nicolle's typhus discovery, Howard Taylor Ricketts (1871–1910) and Russell Morse Wilder (1885–1959), working in Mexico, confirmed louse transmission of typhus. In 1916, Henrique da Rocha-Lima (1879–1956) identified the causative organism and named it *Rickettsia prowazeki* in memory of Ricketts and Stanislaus Joseph Matthias von Prowazek (1875–1915), both of whom had died of typhus contracted during their scientific investigations.

Although Nicolle is not credited with discovering the cause of human influenza, his contributions were seminal. In 1903, when he had just joined the Institut Pasteur in Tunisia, his mentor Émile Roux reviewed the literature on "filter-passing" agents (hypothetical subbacterial agents that passed through Berkfeld and Chamberland filters). Roux identified 10 of them that he believed to be scientifically proven as causative agents of disease, among them what we now know to be viruses and mycoplasmas. Working at Turkey's Imperial Institute of Bacteriology, Nicolle's brother Maurice and colleagues had isolated the filter-passing agent of rinderpest (later characterized as a paramyxovirus). Charles Nicolle, who had also worked with rinderpest, was familiar with these new techniques.

When the deadly influenza pandemic struck in 1918, Nicolle was among the few scientists in the world prepared to study its etiology. At the time, the cause of influenza was unknown, but many doubted the conventional explanation that it was a bacterial disease. Beginning on September 1, 1918, Nicolle injected Chamberland-filtered and unfiltered sputum samples from ill patients into human volunteers and into monkeys, reproducing in some experiments a febrile influenza-like illness. However, the scarcity of clinical material and the rapidity with which the epidemic advanced precluded large-scale controlled studies. Within a few months, a Japanese group appeared to reproduce and extend the results of the 2 French scientists, but other investigators had trouble doing so. As the pandemic faded into endemicity, further experimentation became difficult for all researchers. When influenza viruses were eventually isolated and characterized in mice and in ferrets more than a decade later, Nicolle was finally acknowledged as having made the first isolation and as having taken the first important steps toward finding influenza's cause.

In addition to increasing knowledge about typhus and influenza, Nicolle made important contributions to the understanding of brucellosis, leishmaniasis, measles, rinderpest, scarlet fever, Mediterranean spotted fever, toxoplasmosis, trachoma, and tuberculosis. Perhaps his greatest discovery, a critical key to understanding the epidemiology of many infectious diseases, was characterization of the phenomenon of inapparent infection, the acquisition and transmission of infection without signs of illness. This line of work began with Nicolle's observations on experimental typhus. He learned that guinea pigs were good hosts for the typhus organism and showed that certain guinea pigs could have apyretic typhus after a primary infection of pyretic typhus. Nicolle extended his observation to other infections—viral, bacterial, and parasitic—finding similar phenomena in each. As Charles-Edward Amory Winslow (1877–1957) emphasized in his classical work, The Conquest of Epidemic Diseases: A Chapter in the History of Ideas (1943), inapparent infection is one of the most important concepts in infectious disease epidemiology, and it had for centuries been one of the key missing links, which prevented full understanding of the principles of disease transmission. Inapparent infection of symptomless carriers is now generally accepted as the source for dissemination of many communicable diseases. Nicolle considered it his most important discovery.

Nicolle's discovery of the means of transmission of typhus can be viewed as both a beginning and an end. It ended a 20-year epoch in which arthropods were found to be the vectors of major diseases of animals and humans, including not only typhus but also African trypanosomiasis, American trypanosomiasis, dengue, filariasis, malaria, relapsing fever, Texas cattle fever, and yellow fever. This epoch was as successful in the history of medicine as had been the phenomenal development of bacteriology in the decades immediately preceding it. Nicolle's discovery was also the beginning of the end of epidemic typhus. In the late 1930s, Paul Müller (1899–1965) discovered that dichlorodiphenyltrichloroethane (DDT) was highly effective for killing lice and other insects. During World War II, several potentially severe epidemics of typhus, especially the epidemic in Naples, Italy, in 1943–1944, were averted by dusting at-risk populations with DDT. Epidemic typhus had reigned for centuries, extinguishing millions of lives prematurely. Now it is an uncommon epidemic disease. The combined discoveries of Nicolle and Müller are compelling proof of the melioristic notion that the world becomes a better place through sustained human effort. Charles Nicolle, a modest Renaissance man who toiled in Africa, far from the scientific limelight of Berlin, New York, and Paris, is remembered for forever changing biomedical science and for having contributed to saving the lives of millions.

Jokes

1st son : Degree in Economics.
2nd son: MBA.
3rd son : PhD
4th son : Thief

Neighbour: Why can't you throw the 4th son out of your house?

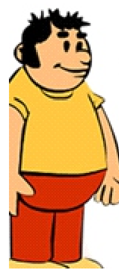
Father : He is the only one earning money. The rest are unemployed.

😂😂😂😂😂😂

Peter: "papa, do you fear the dark?"

Father: "no son!"

Peter: "thunder, lightning and blast?"



Father: "of course not!"

Peter: "It means you don't fear anything except mom!!"

My therapist told me "Time heals all wounds", So I stabbed him. Now we wait...

The other day, my wife asked me to pass her lipstick, but I accidentally passed her a glue stick. She still isn't talking to me.

"Teacher: 'What is the longest word in the English language?' Student: 'Smiles.' Teacher: 'Why?' Student: 'Because there is a 'mile' before the first and the last letter.'"

Son came late...

Mom: Beta, kaha gaya tha...?

Son: Mom movie dekhne gaya tha...

Mom: Beta Kaunsi...?

Son: "MAA KI MAMTA..."

Mom: Jaa beta upar jaa,
Nayi film lagi hai....

Son: Kaunsi Maa...?

Mom: "PITAJI KA GUSSA...!"

Orientia tsutsugamushi

Orientia tsutsugamushi (from Japanese tsutsuga meaning "illness", and mushi meaning "insect") is a mite-borne bacterium belonging to the family Rickettsiaceae and is responsible for a disease called scrub typhus in humans. It is a natural and an obligate intracellular parasite of mites belonging to the family Trombiculidae. With a genome of only 2.0–2.7 Mb, it has the most repeated DNA sequences among bacterial genomes sequenced so far. The disease, scrub typhus, occurs when infected mite larvae accidentally bite humans. Primarily indicated by undifferentiated febrile illnesses, the infection can be complicated and often fatal.

Orientia tsutsugamushi is naturally maintained in the mite population by transmission from female to its eggs (transovarial transmission), and from the eggs to larvae and then to adults (transtadial transmission). The mite larvae, called chiggers, are natural ectoparasites of rodents. Humans get infected upon accidental contact with infected chiggers. A scar-like scab called eschar is a good indicator of infection, but is not ubiquitous.

Orientia tsutsugamushi is a Gram-negative bacterium and is a permanent (obligate) parasite in mites. Within a single host cell, *O. tsutsugamushi* rapidly divides into many individuals.

Orientia tsutsugamushi causes a complex and potentially life-threatening disease known as scrub typhus. Infection starts when chiggers bite on the skin during their feeding. The bacteria are deposited at the site of feeding (inoculation), where they multiply. They cause progressive tissue damage (necrosis), which leads to formation of an eschar on the skin. Necrosis progresses to inflammation of the blood vessels, called vasculitis. This in turn causes inflammation of the lymph nodes, called lymphadenopathy. Within a few days, vasculitis extends to various organs including the liver, brain, kidney, meninges and lungs. The disease is responsible for nearly a quarter of all the febrile (high fever) illness in endemic areas. Mortality in severe cases or due to improper treatment or misdiagnosis may be as high as 30–70%. About 6% of infected people die untreated, and 1.4% of the patients die even with medical treatment. Moreover, the death rate can be as high as 14% with neurological problems and 24% with multi-organ dysfunction among treated patients. In cases of misdiagnosis and failure of treatment, systemic complications rapidly develop including acute respiratory distress syndrome, acute kidney failure, encephalitis, gastrointestinal bleeding, hepatitis, meningitis, myocarditis, pancreatitis, pneumonia, septic shock, subacute thyroiditis, and multiple organ dysfunction syndrome. Harmful effects involving multiple organ failure and neurological impairment are difficult to treat, and can cause lifelong debilitation or be directly fatal. The central nervous system is often affected and results in various complications including cerebellitis, cranial nerve palsies, meningoencephalitis, plexopathy, transverse myelitis, and Guillan-Barré syndrome. Death rates due to complications can be up to 14% in brain infections, and 24% with multiple organ failure. In India, scrub typhus has become the major cause of acute encephalitis syndrome, which was earlier caused mainly by a viral infection, Japanese encephalitis.

The World Health Organization in 1999 stated that: Scrub typhus is probably one of the most underdiagnosed and underreported febrile illnesses requiring hospitalization in the region. The absence of definitive signs and symptoms combined with a general dependence upon serological tests make the differentiation of scrub typhus from other common febrile diseases such as murine typhus, typhoid fever and leptospirosis quite difficult.

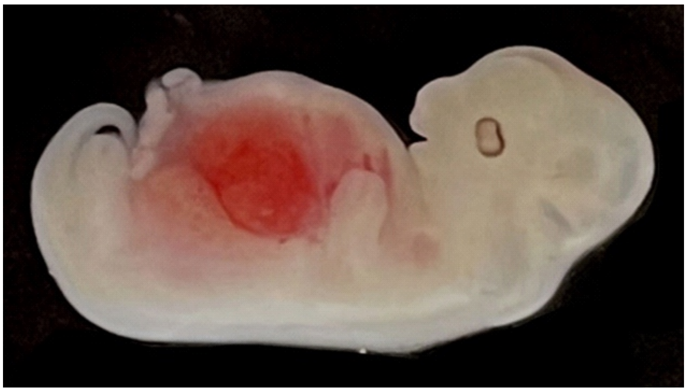
The main symptom of *O. tsutsugamushi* infection is high (febrile) fever; however, the symptom is similar to other vector-borne tropical diseases such as malaria, leptospirosis, typhoid, murine typhus, chikungunya, and dengue fever. This makes precise clinical diagnosis difficult, which often leads to misdiagnosis. The initial indications are fever with chills, associated with headache, muscle pain (myalgia), sweating and vomiting. The appearance of symptoms (the incubation period) takes between 6 and 21 days. A simple visual diagnosis is the presence of an inflamed scar-like scab called eschar, which is regarded as "the most useful diagnostic clue in patients with acute febrile illness". Eschar is formed on the skin where an infected mite bit, usually seen in the armpit, groin or any abdominal area. In rare cases, it can be seen on the cheek, ear lobe and dorsum of the feet. But, the problem is that eschar is not always present; at the highest record, only 55% of scrub typhus patients had eschar during an outbreak in south India. Also, eschar is not specific to scrub typhus, occurring in other rickettsial diseases such as Rocky Mountain spotted fever, Brazilian spotted fever, and Indian tick typhus. Using DNA analysis by advanced polymerase chain reaction, different rickettsial infections can be identified from eschars.

Orientia tsutsugamushi infection can be treated with antibiotics such as azithromycin, chloramphenicol, doxycycline, rifampicin, roxithromycin, and tetracyclin. Doxycycline is the most commonly used and is considered as the drug of choice because of its high efficacy and quick action. But, in pregnant women and babies, it is contraindicated, and azithromycin is the drug of choice. In Southeast Asia, where doxycycline and chloramphenicol resistance have been experienced, azithromycin is recommended for all patients. A randomized controlled trial and systematic review showed that azithromycin is the safest medication.

There is no lasting immunity to *O. tsutsugamushi* infection. Antigenic variation prevents the development of cross immunity to the various strains of *O. tsutsugamushi*. An infected individual may develop a short-term immunity but that disappears after a few months, and immunity to one strain does not confer immunity to another. An immunisation experiment was done in 1950 in which 16 volunteers still developed the infection after 11–25 months of primary infection. It is now known that the longevity of immunity depends on the strains of the bacterium. When reinfection occurs with the same strain as the previous infection, there can be immunity for 5–6 years in monkeys. But in humans, immunity declines after one year, and disappears within two years.

No licensed *O. tsutsugamushi* vaccines are currently available. The first vaccines were developed in the late 1940s, but failed in clinical trials. Considered an ideal target, the unique TSA56 itself is highly variable in its chemical composition in different strains. An effective vaccine for one strain is not useful for another. An ideal vaccine should give protection to all the strains present locally. This complexity makes it difficult to produce a usable vaccine. A vaccine targeting the 47-kDa outer membrane protein (OMP) is a promising candidate with experimental success in mice against the Boryong strain. Combined targeting of TSA56 and ScaA is also a good candidate for mixed-strain infection.

Scientists grow humanized kidneys in pig embryos



Scientists have successfully grown kidneys made of mostly human cells inside pig embryos — taking researchers yet another step down the long road toward generating viable human organs for transplant.

The results, reported September 7 in *Cell Stem Cell*, mark the first time a solid humanized organ, one with both human and animal cells, has been grown inside another species.

"This is a considerable progress in human-animal chimerism," says Tao Tan, a cell biologist at the Kunming University of Science and Technology in China, who helped create the first chimeric human-monkey embryo in 2021 but was not involved in the current study.

In the United States alone, more than 100,000 people currently sit on an organ transplant waiting list. A vast majority of those people need a kidney transplant. To meet this demand for life-saving organ transplants, scientists have been pursuing new methods to grow organs and tissues in animals

Advances in the last few years include growing rat organs in mice (and vice versa) and humanized skeletal muscle and endothelial tissue in pigs. But significant hurdles remain, due in part to how challenging it is for human cells to thrive inside a foreign host. Human induced pluripotent stem cells, or iPSCs, which function as a sort of "starter kit" for growing many kinds of human tissue, often die when introduced into animals because the species' cells have different physiological needs.

Stem cell biologist Liangxue Lai, of the Guangzhou Institutes of Biomedicine and Health in China, and his team spent more than five years refining their methods to enhance the human stem cells' survivability.

While the pig embryos were still just single cells, the team used the gene-editing tool CRISPR/Cas9 to edit out two genes necessary for kidney development. That created a niche in which the human iPSCs, once injected into the space, could develop into kidney cells. The human stem cells were also tweaked to have especially active genes that dampen apoptosis, or cell death, to keep the cells alive long enough to gain a foothold and begin forming the kidney.

More than 1,800 embryos were then transferred into surrogate sows, of which five were harvested for study within the first 28 days. All five had normal kidneys consistent with their level of development, and the organs contained 50 percent to 60 percent human-derived cells. That's the highest percentage of human cells yet observed in any organ grown inside a pig, Tan says. Given more time, there's no indication that the kidneys wouldn't continue to grow and develop normally, possibly with the human cells increasingly edging out the pig cells, the researchers say.

The study is "an important and interesting step," says Massimo Mangiola, a transplant immunologist at New York University Langone Health who was not involved in the research. But it's still many years out from fully functional xenotransplants, he notes.

While the stem cells did differentiate into several cell types, including kidney tubular cells and developmental tissue, the human kidney has more than 70 unique cell types that scientists will need to recapitulate. And until researchers can create an organ that is 100 percent human, it's likely that such transplants will prompt rejection.

In addition, a few iPSCs erroneously differentiated into neural cells in the brains and spinal cords of the embryos. Mangiola says that the cells appear to be random, unlike the kidney cells, making him think they're not likely to result in animals with human brains — which would create an ethical quandary.

To avoid such ethical issues, Lai says that moving forward the team will knock out genes that orchestrate the stem cells' differentiation into neurons — as well as into germline cells, eggs and sperm, which pass genetic information on to offspring. The team is also pursuing growing other human organ precursors in pigs as well, including the heart and pancreas.

"We feel that we have accomplished a milestone in the field, but this is only the first step, and many challenges remain," Lai says. "We are optimistic that with time and effort we may be able to overcome these challenges too.

Best practices in Pest Control

A pest is any organism that spreads disease, causes destruction or is otherwise a nuisance. Some examples of pests are insects, rodents, and weeds. Not all insects are pests. Many kinds of insects eat other insects and are beneficial species. Examples of beneficial insects are dragonflies (which feed mainly on mosquitoes) and lady beetles (which eat aphids, scale insects, mites, and other insects). Pests control is the process of controlling, managing, minimizing, or removing undesirable insects and other pests, from spaces occupied by people. It should be handled by a licensed pest professional, who is a true expert on the pests they treat. Be educational, this goes both ways with the professional sharing information about the problem pests, and the person in need of pest control service educating them about their situation. Lastly, include a plan of action to deal with the issue and prevent it from happening again. There are many things people could and should be doing to help minimize and prevent pests from invading and infestations from resulting. A good pest control company will help make sure that you know and understand the role that you play in the solution.

Different types of Pests

1. Rats & Mice
2. Cockroaches
3. Spiders
4. Ants
5. Moths
6. Termites
7. Flies and Mosquitoes
8. Bedbugs & Lice
9. Birds

Different methods used in controlling Pests

There are many types of pests control that work in a variety of ways,

These include:

- **Physical Pest Control Methods –** Physical pest control relies on the use of equipment and pest proofing. Most physical pest control methods should be carried out by an experienced and qualified pest controller. Some physical methods exterminate pests or remove them; other methods focus more on prevention. Examples of physical pest control include: **Pest proofing** which involves keeping pests out of your home, business, or garden by creating a barrier to entry. It can also include eliminating their nests. By taking away a pest's breeding ground, it can stop infestations from developing.

  Traps and bait stations are the most common of all the physical pest control methods. Traps are a great method for capturing small animals like rodents and insects.

  Temperature Control. Extremes of temperature, both hot and cold, can control pests. For example, heat treatment will kill bedbug adults, eggs, and larvae at certain temperatures. At the other end of the scale, placing grown produce in cold storage containers slows down or eliminates the growth of insects.

  The most natural types of pest control would involve going down the biological route. This type of pest control doesn't use any sort of pesticides or chemicals. Instead, it uses nature to fight off pest infestations. The usual way of practising this type of pest control is to **introduce natural predators** into the environment.
- **Chemical Pest Control Methods** – The most well-known way of controlling pests is by using pesticides and rodenticides. Chemical types of pest control have been seen as reliable and tackle a large portion of the pest population. Pesticides are usually used in certain circumstances where no other method will work. Examples of chemical pest control include:

  Poison baits are mainly used in conjunction with some physical methods of controlling pests, such as traps. Many poisons used in pest control are in the form of gel or in pellets. Poisons are intended to be eaten by the pest, and whatever isn't eaten gets taken back to the nest to cull the population at source.

  Insecticides specifically target and kill insects. They come in the form of sprays and granules, and should, ideally, be handled with care. The granule form of insecticides is aimed at treating garden pests such as slugs and snails. The spray form can help control aphids, and sprays are also still used on non-organic crops.

  Rodenticides are a very lethal type of pesticide. They are incredibly strong and are used in the treatment of rodents. They should be handled by a qualified pest technician. A lot of pest controllers don't use rodenticides any longer because of the danger level involved to wildlife.

Pest Control Goals

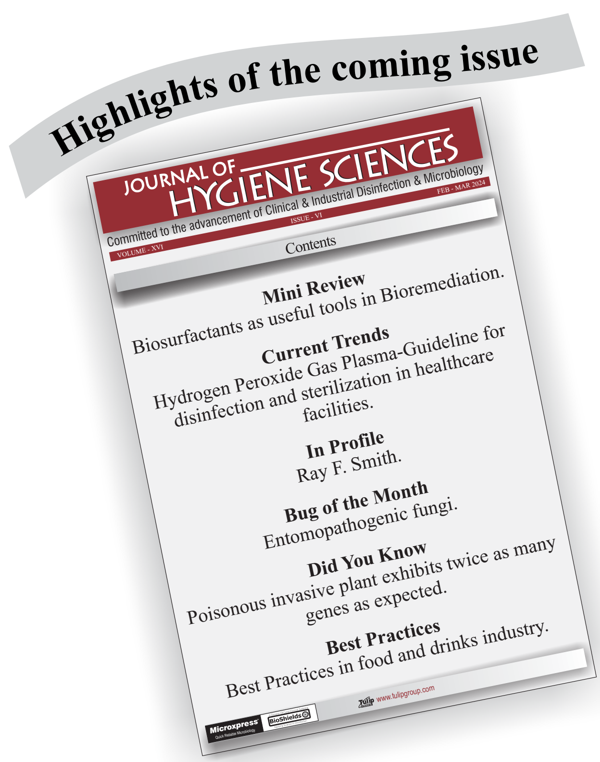
Whenever you try to control a pest, you will want to achieve one of these three goals or some combination of them:

- **prevention** - keeping a pest from becoming a problem.
- **suppression** - reducing pest numbers or damage to an acceptable level, and
- **eradication** - destroying an entire pest population.

Prevention may be a goal when the pest's presence or abundance can be predicted in advance. Continuous pests are usually very predictable. Sporadic and potential pests may be predictable if you know the circumstances or conditions that will favour their presence as pests. For example, some plant diseases occur only under certain environmental conditions. If such conditions are present, you can take steps to prevent the plant disease organisms from harming the desirable plants.

Suppression is a common goal in many pest situations. The intent is to reduce the number of pests to a level where the harm they are causing is acceptable. Once a pest's presence is detected and the decision is made that control is necessary, suppression and prevention often are joint goals. The right combination of control measures can often suppress the pests already present and prevent them from building up again to a level where they are causing unacceptable harm.

Eradication is a rare goal in outdoor pest situations because it is difficult to achieve. Usually the goal is prevention and/or suppression. Eradication is occasionally attempted when a foreign pest has been accidentally introduced but is not yet established in an area. Such eradication strategies often are supported by the Government. Mediterranean fruit fly, gypsy moth, and fire ant control programs are examples.


Highlights of the coming issue

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