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Editorial

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In Profile Scientist – The son of Margaret and Samuel Edwards, Edwards was born on 27 September 1925 in Leeds, England, and grew up in Manchester. He graduated from Manchester Central High School, but World War II delayed further academic pursuits. Edwards served in the British army in Palestine, Jordan, Egypt, and Iraq from 1944 to 1948. After returning to England in 1949, Edwards entered the University of Wales in Cardiff, Wales, and he studied for a degree in agriculture. Before long, however, he switched his focus to zoology, and in 1951 he earned an undergraduate degree in that subject. His subsequent studies under Alan Beatty at the Institute of Animal Genetics at Edinburgh University in Edinburgh, Scotland inluenced the rest of Edwards's career. There he worked on altering chromosomal complements, the whole set of chromosomes in a species, in mouse embryos. He also studied fertilization, embryos, artificial insemination, infertility, and reproductive physiology.

Bug of the month – ***Pseudomonas aeruginosa*** is a common encapsulated, Gram-negative, aerobic–facultatively anaerobic, rod-shaped bacterium that can cause disease in plants and animals, including humans. A species of considerable medical importance, *P. aeruginosa* is a multidrug resistant pathogen recognized for its ubiquity, its intrinsically advanced antibiotic resistance mechanisms, and its association with serious illnesses – hospital-acquired infections such as ventilator-associated pneumonia and various sepsis syndromes. *P. aeruginosa* can selectively inhibit various antibiotics from penetrating its outer membrane - and has high resistance to several antibiotics, according to the World Health Organization *P. aeruginosa* poses one of the greatest threats to humans in terms of antibiotic resistance.

Did You Know? – Blood-feeding is an incredibly important part of the mosquito's reproductive cycle. Because of this, a tremendous amount of evolutionary pressure has been placed on female mosquitoes to identify potential sources of blood, quickly and efficiently get a full blood meal, and then stealthily depart the unlucky victim. If you check some, or all, of the mosquito's search boxes, then you may find that you are a mosquito magnet

Best Practices – The cosmetics industry is a highly competitive and ever-evolving field, with an emphasis on quality management practices to ensure that products are safe for consumers. Quality management in the cosmetics industry involves monitoring the production of cosmetic items from start to finish, making sure they meet strict standards set by regulatory agencies. This can include testing raw materials used in the manufacture of cosmetic items, ensuring product safety throughout all stages of manufacturing and distribution, assessing potential health risks associated with ingredients used in cosmetics, and developing efficient methods for recalls or withdrawal procedures when necessary.

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.

Role of biosurfactant in bioremediation II

Biosurfactants are nonhomogeneous substances produced by a wide range of microorganisms. Because of their less toxicity; high selectivity; good environmental compatibility; and high activity under extreme conditions such as salinity, temperature, pH, and salinity, they have more advantages than chemical surfactants. The biosurfactants are produced from low-cost substrates like agro-industrial wastes which reduce the cost of production. **Biosurfactants** and bio emulsifiers are amphiphilic compounds and are also produced as extracellular or a part of the cell membrane by bacteria.

Biosurfactant-producing microorganisms

After microbial growth reaches a high cellular density, biosurfactants are usually produced in the exponential or stationary phase. They might be found inside cells (intracellular) or secreted outside of cells (extracellular). Microbial biosurfactants play a key functional role in the uptake of hydrophobic substrates by microorganisms; they are also involved in each phase of the biofilm formation by enhancing motility to avoid cell adherence to the substrates.

Additionally, the fluid channels that allow oxygen and nutrient circulation inside the biofilm and the breakdown product elimination are maintained by biosurfactants. The ability of biosurfactants to reduce the surface tension of the surfaces promotes different types of motilities of bacteria such as swarming and twitching.

Many biosurfactants have been produced by bacteria from many different genera, including *Pseudomonas, Bacillus, Mycobacterium,* and *Acinetobacter*, which can produce biosurfactants naturally or during stress response. *Actinomycetes* and fungi, in addition to bacteria, produce biosurfactants, such as yeast *Candida* production of sophorolipid, and among the best-described biosurfactants produced within the class *Actinobacteria* are glucose-based glycolipids, the majority of which have a hydrophilic backbone made up of glycosidic-linked glucose units that create a trehalose moiety.

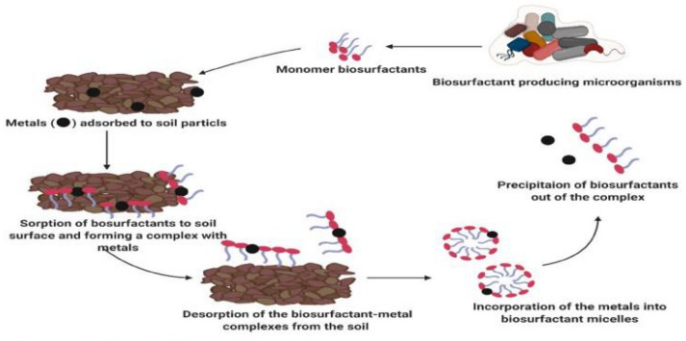
Microbial origin	Biosurfactant type	Environnemental application
Rhodotorula sp.YBR	Glycolipoprotein	Hydrocarbon removal from contaminated soils. Enhanced microbial oil recovery from polluted sand
Halomonas pacifica	Lipopeptide	Hydrocarbons remobilization and naphthalene degradation. Removal of used motor oil from contaminated soils
Pseudomonas aeruginosa	Rhamnolipid	Microbial-enhanced oil recovery. Enhancing solubilization and biodegradation of slowly desorbing polyaromatic hydrocarbons
Pseudomonas aeruginosa S5	Rhamnolipid	In situ remediation of polycyclic aromatic hydrocarbons
Bacillus licheniformis	Lichenysin	Microbial enhanced oil recovery
Streptomyces spp.	Unkown	Naphthalene and crude oil degradation. Petroleum degradation ability
Paenibacillus dendritiformis	Lipopeptide	Pyrene biodegradation enhancement
Bacillus amyloliquefaciens and Bacillus subtilis	Surfactin	Engine oil degradation. Microbial enhanced oil recovery
Pseudomonas aeruginosa	Rhamnolipid	Remediation of zinc and cadmium polluted soi
Burkholderia cenocepacia	Glycolipid	Enhanced pesticide solubility

Applications of biosurfactants in environmental biotechnology

The Biosurfactants are products with vast industrial potential (bioremediation, cosmetics, production of food) and pharmaceutical applications. In different aspects of environmental biotechnology, oil residue recovery biosurfactants can be applied in storage tanks, other oil recovery processes, oil spill cleanup, and bioremediation for soil and water. *Pseudomonas* and *Bacillus* species are most reported as biosurfactant producers and can be effectively applied in different bioremediation technologies.

Removal of heavy metals

In the chemical galaxy, the two major environmental pollutants are heavy metals and polycyclic aromatic hydrocarbons. The problem of heavy metal pollution is highly associated with its toxicity to plants, animals, and people and its lack of biodegradability. Also, heavy metals cause multiple types of biological system malfunctions and can cause deaths. Arsenic, cadmium, chromium, lead, and mercury are among the priority metals of public health importance due to their high toxicity. A range of bacterial-mediated processes may improve the mobility of heavy metals in sediments, including interactions of metals with bacterial membrane components (e.g., pigments, polymers, cell-free organic compound complexes) and sulfide production by sulfate-reducing bacteria. Many studies have proved the significant role of biosurfactants in heavy metal removal from the environment by facilitating their solubilization, dispersion, and desorption. These metabolites can form complexes with heavy metals at the interface between soils, desorb soil matrix metals,

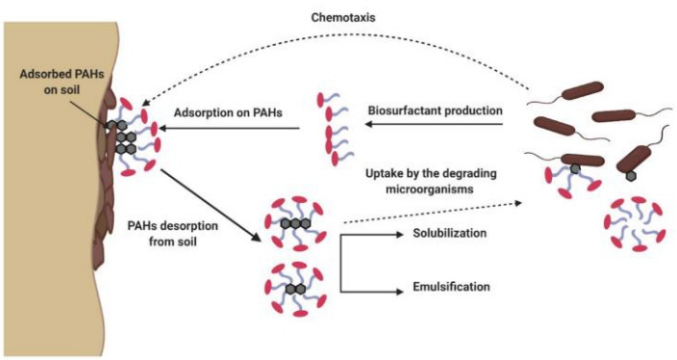


incorporate metals into biosurfactant micelles, and thereby increase metal solubility and soil bioavailability.

Depending on the biosurfactants' electrical charge, and through ionic bonds, anionic biosurfactants can form non-ionic complexes with metals leading to their detachment from the soil. Ion exchange allows the cationic biosurfactants to compete and replace similarly charged metal ions for negatively charged surfaces. Also, microbial biosurfactants can be involved in other heavy metal removal mechanisms such as plant microbe-modulated phytoremediation and biofilm mediated heavy metal bioremediation, which have been proved as essential ways to enhance heavy metal remediation, detoxification, and mediate sustainable plant nutrient dynamics.

Removal of polycyclic aromatic hydrocarbons

Polycyclic aromatic hydrocarbons (PAHs) are widespread soil contaminants and are considered priority pollutants due to their carcinogenicity. Microorganisms play an essential role in the degradation of PAHs in the soil. There are two main types of microorganisms participating in the biodegradation of PAHs – aerobic and anaerobic bacteria/degradation metabolism. The aerobic mechanisms rely on the oxidation of the aromatic ring, followed by the systematic breakdown of the compound to PAH metabolites and/or carbon dioxide, whereas anaerobic metabolism of PAHs is thought to occur via the hydrogenation of the aromatic ring. Another way to enhance the bioremediation of PAHs is the production of biosurfactants, which can increase the apparent solubility of PAHs, increasing their mobility and biodegradability.



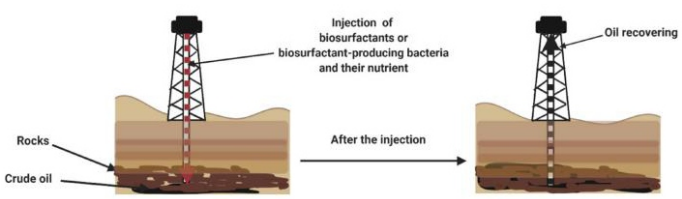
These biobased molecules are probably preferable when produced by the degrading microorganisms themselves.

In addition to the increased bioavailability of contaminants, biosurfactants act to improve biodegradation by changing the bacterial cell surface properties or involving the solubilization and emulsification of these hydrophobic hydrocarbons, leading to reduced surface tension around the bacterium as well as interfacial tension between the bacterial cell wall and hydrocarbon.

Two mechanisms exist to improve the desorption rate of polyaromatic hydrocarbons from soil: micellar solubility and direct modification of the contaminant matrix. **Micellar solubilization** involves dividing polyaromatic hydrocarbons into surfactant micelles when surfactant concentrations exceed the critical micellar concentration (CMC), leading to an increase in the desorption rate by maximizing the concentration gradient between sorbent and aqueous phase. The mobilization process takes place below the biosurfactant CMC. Once the microorganisms are brought into close contact with polluted soil, and through chemotaxis mechanisms, pollutant-degrading microorganisms move toward polyaromatic hydrocarbons and commence to produce monomer biosurfactants that will adsorb and surround these pollutants, allowing to their desorption from soil by micellar formation. The PAHs-surrounded micelles facilitate the solubilization, emulsification and the biodegradation of hydrocarbons.

Microbial-Enhanced Oil Recovery

Microbial-enhanced oil recovery (MEOR) is among the most prominent application field for biosurfactants in the oil industry. This method is an essential tertiary recovery technology, which utilizes microorganisms and their metabolites for residual oil. These metabolites, which can be used as surface agents (amphiphilic molecules), offer to replace chemical surfactants, and enhance the life spans of mature reservoir soil. Biosurfactants are effective through reduction in surface and interfacial tension, wettability alteration, and oil/water or water/oil emulsion formation. These characteristics allow the biosurfactant to be an appropriate microbial-enhanced oil recovery candidate. Emulsification of the oil depends on the surface tension.



Microbial-enhanced oil recovery (MEOR) is based on the injection of pressing water containing microorganisms, nutrients, and/or biosurfactants that will enhance the emulsification and mobility of oil by reducing surface and interfacial tension; these biosurfactant properties allow to recover important oil amounts from wells. Microbial-enhanced oil recovery mediated by biosurfactant can be applied in situ or ex situ. In situ, biosurfactant-producing bacteria and nutrients are injected into oil reservoirs, and then the produced biosurfactants increase the recovery of oil. In the ex-situ system, biosurfactants are first produced by aerobic fermentation in a bioreactor and then injected into oil reservoirs; this method suffers from complex bioprocessing techniques and high transport and product purification costs. Thus, in situ production of biosurfactants in oil reservoirs is more suitable for microbial-enhanced oil recovery applications due to the cost-effective and straightforward implementation.

Bioremediation of pesticides

Pesticides are chemical substances that are used to prevent and control various harmful organisms, including bacteria, viruses, fungi, insects, nematodes, weeds, and unwanted f lora and fauna. However, pesticide pollution has become a severe environmental concern. Pesticides can accumulate in plants, soil, and organisms and occur in water and food. In addition to heavy metals and polycyclic aromatic hydrocarbons, biosurfactants may be a potential bioremediation candidate for a wide range of pesticide residues. One of the mechanisms of action of biosurfactants is based on the formation of complex biosurfactant-pesticide micelles that interact with the hydrogen bonds of water molecules leading to achieving better solubilization of pesticides. There have been several reports on the possible properties of many bacteria such as *Pseudomonas* spp., *Bacillus* spp., and *Acinetobacter* spp. as biosurfactant producers, which remove heavy metals from contaminated soil and even accelerate pesticide biodegradability. Numerous reports highlight the success of the use of biosurfactants in improving Pb and Cd recovery and removing the lindane pesticide. Also, biosurfactants produced by *Pseudomonas aeruginosa* showed a high biodegradation rate of quinalphos as organophosphorus pesticides. In another recent study, a glycolipid and glycopeptide produced by *Pseudomonas rhodesiae* and *Pseudomonas marginalis,* respectively presented a significant ability to increase the degradation of the insecticide chlorpyrifos. In a patent, it was noted that arachnids, eggs, larva, grasshoppers, and box-elder bugs were all successfully controlled with glycolipid biosurfactants. Also, microscopic observation of rhamnolipid treated aphids identified the insecticidal mechanism as cuticle membrane.

New Disinfection and Sterilization Methods

New sterilization methods:

Ortho-phthalaldehyde: A New Chemical Sterilant

Ortho-phthalaldehyde (OPA) solution is a clear, pale-blue liquid (pH 7.5), which typically contains 0.55% OPA. It has shown superior mycobactericidal activity (5-log^{10} reduction in 5 minutes) compared with glutaraldehyde. The mean time required to affect a 6-log^{10} reduction for *M. bovis* using 0.21% OPA was 6 minutes, compared with 32 minutes using 1.5% glutaraldehyde. When tested against a wide range of microorganisms, including glutaraldehyde-resistant *Mycobacteria* and *Bacillus subtilis* spores, OPA showed good activity against the *Mycobacteria* tested, including the glutaraldehyde-resistant strains, but 0.5% OPA was not sporicidal within 270 minutes of exposure. Increasing the pH from its unadjusted level (about 6.5) to pH 8 improved sporicidal activity. OPA has several potential advantages compared with glutaraldehyde. It requires no activation, is not a known irritant to the eyes and nasal passages, has excellent stability over a wide range of pH (pH 3-9), does not require exposure monitoring, and has a barely perceptible odor. OPA has excellent material compatibility.

Disinfectant	Time for 6-log^{10} reduction
1.5% glutaraldehyde	28-36 minutes
2.5% glutaraldehyde	14-18 minutes
0.21% ortho-phthalaldehyde	4.8-6.3 minutes

* Range of values from two different laboratories

A New Low-Temperature Sterilization Technology

Hydrogen Peroxide Plasma Alternative technologies to sterilize temperature sensitive equipment is being developed. A new hydrogen peroxide plasma sterilizer, the Sterrad 50 is a smaller version (44-L sterilization chamber) of the Sterrad 100 (73-L sterilization chamber). The Sterrad 50 contains a single shelf for placement of instruments to be sterilized within a rectangular chamber, whereas the Sterrad 100 has two shelves and a cylindrical chamber. The operational design of the two sterilizers is similar except that the Sterrad 50 consists of two hydrogen peroxide vapor-diffusion stage plasma cycles. The sterilization cycles of the Sterrad 50 and Sterrad 100 are 45 minutes and 72 minutes, respectively. The Sterrad 50 was equally as effective as EO in killing approximately 10^6 *B. stearothermophilus* spores present in the centre of narrow-lumen stainless steel tubes.

New sterilization technology for endoscopes

Because gastrointestinal (GI) endoscopes and bronchoscopes contact intact mucous membranes but frequently have contact with nonintact mucous membranes and sterile tissue (eg, when biopsies are obtained, endoscopic retrograde cholangiopancreatography-ERCP) there is a risk of patient-to-patient transmission of potential pathogens with a subsequent risk of infection. A new endoscope sterilizer has been developed. This unique, low temperature sterilization technology is developed for the safe, effective, and rapid terminal sterilization of endoscopic devices. It is capable of terminally sterilizing a broad range of endoscopes with as many as 7 channels, a lumen inner diameter of 0.8 mm or larger x 1600 mm and 1.2 mm or larger x 4 m. The new sterilization technology will use the well-established hydrogen peroxide gas plasma technology (eg, Sterrad) that directs vaporized hydrogen peroxide (VHP) into the internal lumen channels. It utilizes a pressure differential in each internal endoscope channel to rapidly diffuse vaporized hydrogen peroxide and achieves the required efficacy concentration in all internal channels (up to 4 m) in less than 20 seconds. A lower overall hydrogen peroxide (HP) concentration and shorter exposure times, minimizes potential damage to the endoscope. The new sterilization technology has the footprint of an automated endoscope reprocess. The technology incorporates a proprietary single-use channel connector that is pressure activated. During vaporized HP transfer, the channel connector seals to provide a fluidic path for the VHP to f low through the internal channels of the endoscope, while also allowing VHP to contact and sterilize the mated connector interface.

New disinfection methods:

Electrostatic spraying

Most disinfection in health care facilities is done using a moistened, disposable wipe or via the application of a disinfectant with a cloth (eg, cotton, microfiber). One "no touch" strategy that may improve thorough application to surfaces is the use of a disinfectant as a spray. Electrostatic sprayer device, which delivers electrostatically charged droplets with an average size of 40-80 m that are attracted to the surface to improve thoroughness of surface coverage. The disinfectant used contained 0.25% sodium hypochlorite. This concentration of chlorine (ie, 2500 ppm) reduced *Clostridioides difficile* spores by ≥6 log^{10} colony-forming units with a 5-minute contact time and bacteriophage MS2 by ≥6-log^{10} plaque forming units with a 2-minute contact time. The use of the sprayer was conducted with minimal precleaning/disinfection to remove visible soil and provided rapid and effective means to reduce microbial contamination on irregular surfaces such as wheelchairs, portable equipment and waiting room chairs. This technology has been found effective against several healthcare pathogens and used to decontaminate surfaces (eg, toys, desks) in various settings such as schools, airplanes, and hospitals.

New Sporicide

C. difficile, is a Gram-positive, anaerobic bacteria, which was first isolated from stool in1935. It colonizes the human intestinal tract after the normal gut microbiota has been disrupted by exposure to antibiotics and is a major cause of antibiotic-associated colitis. *C. difficile* infection (CDI)is one of the most common healthcare-associated infections. Transmission of *C. difficile* occurs via the faecal-oral route. Like other healthcare pathogens (eg,methicillin-resistant *Staphylococcus aureus* [MRSA], vancomycin-resistant *Enterococcus* [VRE]), epidemiologic evidence strongly supports an important role for environmental contamination in the acquisition of CDI in healthcare facilities.

Key preventive measures include reducing the use of medications that are known to precipitate CDI, placing patients with CDI on contact isolation with use of gloves and appropriate hand hygiene, and improved room disinfection with sporicidal agents. Prevention of *C. difficile* transmission is challenging because the *C. difficile* spores are inactivated by hypochlorites and other sporicides but they are not susceptible to the commonly used hospital disinfectants (eg, quaternary ammonium compounds,

alcohol, phenolics) or alcohol-based handrubs. Sporicidal disinfectants are commonly used in rooms of patients with *C. difficile* infection, while non sporicidal disinfectants are commonly used in all other patient rooms.

Continuously active disinfectant (CAD)

Continuously active disinfectant (CAD), which has a polymer that retains the Quat to the surface, demonstrated superior reduction of microbial load over 24 hours compared to a dilutable quaternary ammonium compound or a disinfectant with ethanol and a quaternary ammonium. A 4-5log^{10} reduction of epidemiologically - important pathogens (eg, *S. aureus*, VRE, *E. coli*, *Enterobacter* sp, *Candida auris*, CRE *Enterobacter*, CRE *E. coli*, CRE *K. pneumoniae*) in 5 minutes over 24 hours using a new CAD are promising. CAD may reduce or eliminate the problem of recontamination of environmental surfaces and the role of contaminated environmental surfaces and equipment in transmission of non-spore forming health care pathogens including SAS-CoV2. The continuously active disinfectant can be removed from the surface by chlorine, accelerated hydrogen peroxide and a detergent. One limitation of this technology is that it requires the application of the product to the surface to work so thoroughness of application is essential.

Robert Geoffrey Edwards

Robert Geoffrey Edwards worked with Patrick Christopher Steptoe to develop *in-vitro* fertilization (IVF) techniques during the 1960s and 1970s in the United Kingdom. In 1978, Louise Brown, sometimes called the world's first test-tube baby, was born as a result of Edwards and Steptoe's IVF techniques, and since then more than four million children have been born using IVF techniques. Publicity and controversy accompanied Edwards and Steptoe's work, as religious institutions criticized the morality of the IVF procedure. Edwards received numerous awards for his work, including the 2010 Nobel Prize in Physiology or Medicine.

The son of Margaret and Samuel Edwards, Edwards was born on 27 September 1925 in Leeds, England, and grew up in Manchester. He graduated from Manchester Central High School, but World War II delayed further academic pursuits. Edwards served in the British army in Palestine, Jordan, Egypt, and Iraq from 1944 to 1948.

After returning to England in 1949, Edwards entered the University of Wales in Cardiff, Wales, and he studied for a degree in agriculture. Before long, however, he switched his focus to zoology, and in 1951 he earned an undergraduate degree in that subject. His subsequent studies under Alan Beatty at the Institute of Animal Genetics at Edinburgh University in Edinburgh, Scotland inluenced the rest of Edwards's career. There he worked on altering chromosomal complements, the whole set of chromosomes in a species, in mouse embryos. He also studied fertilization, embryos, artificial insemination, infertility, and reproductive physiology.

However, studying mouse embryos proved an inconvenient task. The female mice ovulated at approximately midnight, which forced him to spend many hours in the lab in the middle of the night. He worked with this schedule for years until another student named Alan Gates began taking the graveyard shift. Edwards and another PhD student, who later married him—Ruth Fowler, found a way to avoid the insomnia-inducing inconvenience of gamete gathering. Developing what would later be termed the Fowler-Edwards method, the pair found that by giving the mice doses of various hormones they could control not only how many eggs would mature, but also the time of ovulation.

Edwards earned his PhD in physiology in 1957 at Edinburgh University. He went to Pasadena, California, and spent year working with Albert Tyler at the California Institute of Technology. Edwards then returned to England to take a five-year position at the National Institute of Medical Research, where his research focused on biomedicine.

At the National Institute of Medical Research in London, he developed an idea that he could take human eggs and fertilize them *in vitro*. He later wrote that even then he had hoped to transfer the resulting embryos into infertile women to help them conceive. Most gynecologists were unwilling to help him get access to eggs; however, Molly Rose, an obstetrician, occasionally sent him sections of human ovaries.

Previous research had indicated that oocytes removed from their follicles would mature in twelve hours. Edwards experimented with numerous animal oocytes and found the estimate correct. However, human oocytes did not mature in this time frame, and he spent two years of research without producing any mature human eggs *in vitro*. Eventually, he decided to try waiting for a longer period of time for the eggs to mature. He found that human eggs take twenty-five hours to begin maturing, and thirty-seven hours before they are ready to be fertilized. However, he found obtaining human eggs to be difficult, so he put aside this research for a year.

In 1962 Edwards assumed a teaching position at the University of Glasgow in Glasgow, Scotland, and researched mammalian stem cells. He remained for just one year before moving to University of Cambridge in Cambridge, England, where he worked until 1989.

There Edwards worked with PhD student Richard Gardner conducting experiments that would enable pre-implantation genetic diagnosis (PGD). Edwards also resumed his research on oocytes and *in vitro* fertilization. In 1968 he partnered with Patrick Christopher Steptoe. Steptoe was a gynecologist, and an expert in laparoscopy, a minimally invasive procedure that offered a minimally invasive way to access patients' ovaries. Edwards needed eggs that had grown to maturity *in vivo* because eggs that matured *in vitro*, even if they could be successfully fertilized, died soon after embryogenesis. Edwards later recalled that he and Steptoe had agreed to work as equals, to stop if their work appeared to harm patients or children, and not to stop because of political and religious naysayers.

In 1969 Edwards and Steptoe found that sperm fresh from ejaculate could fertilize a mature egg *in vitro*, which surprised them, as previous theories had held that substances from a woman's reproductive tract was also necessary for fertilization. Anticipating the ethical controversy his research would generate, Edwards co-published a paper that addressed ethics and IVF, "Social Values and Research in Human Embryology" in *Nature* with lawyer David Sharpe. However, in the same year the British

Medical Council also rejected an application put forward by Edwards and Steptoe for IVF research funding.

However, Oldham and District General Hospital in Oldham, England and the University of Cambridge sponsored their efforts, giving ethical consent and funding. In 1972, Steptoe and Edwards began trying to help infertile couples conceive. At first, they gave women doses of hormones to induce ovulation, then removed matured eggs via laparoscopy, and fertilized and tried to transfer the eggs. This work was unsuccessful for years. They later realized that the hormones or synthetic hormones that they gave to the patients were interfering with patients' natural menstrual cycles and causing the uteruses to shed their linings right when Edwards and Steptoe needed to implant the embryos. Edwards and Steptoe stopped using hormone therapy altogether, and tracked patients' urine for a rise in luteinizing hormone to find out when patients were ovulating.

On 9 November 1977, Edwards and Steptoe removed an egg from Lesley Brown with laparoscopic surgery. With *in vitro* methods, they successfully fertilized the egg and implanted it. On 26 July 1978, Louise Brown was born and described by many as the world's first "test-tube baby." Edwards and Steptoe stopped their work for two and a half years until they could secure private funding to open the Bourn Hall Clinic in Bourn, UK in 1980.

Steptoe and Edwards published a book, titled *A Matter of Life: The Story of a Medical Breakthrough*, in 1980. Edwards continued his research related to human embryonic stem cells (HESCs) as well, and in 1984 he co-authored "Human Chorionic Gonadotropic Secreted by Preimplantation Embryos Cultured *in vitro*". However, this research proved controversial, and Edwards did not pursue it. Instead, he continued to write about IVF, and in 1993 his edited book, *Preconception and Preimplantation Diagnosis of Human Genetic Disease* was published. A decade later, he co-edited *Modern Assisted Conception*.

As a result of his research, Edwards received numerous awards; in 1988 Queen Elizabeth II granted him the title of Commander of the British Empire (CBE). In 2001 he received the Albert Lasker Basic Medical Research Award, and in 2002 he received the Grand Hamdan Award for Clinical Science.

Edwards won the Nobel Prize in Physiology or Medicine in 2010 for helping to develop IVF techniques. Because the award is not given posthumously, Steptoe, who died in 1988 after working with Edwards for 20 years, could not share the award. The Vatican criticized the award, calling it "completely out of order," and stating that without IVF research, there would be no market for human eggs or freezers full of human embryos.

With more than 10,000 babies born at Bourn Hall Clinic, and greater than four million babies born worldwide, Edwards influenced scientific research and society. Furthermore, the human embryonic stem cells that he studied were successfully cultured by James Thomson in the US in 1998. Thomson's discoveries helped inspire researchers like Shinya Yamanaka in Japan to further advance the field of human stem cell research. In 2007, Yamanaka showed how to induce human pluripotent stem cells from adult cells, work that contributed to his sharing of the 2012 Nobel Prize in Physiology or Medicine. Edwards died in Cambridge, England, on 10 April 2013.

Jokes

The little boy had just started school. When he returned home the first day, his mother asked,
Billy, what did you learn today?
I learned to write.
Oh, what did you write?
I don't know. I haven't learned to read yet.

Mom: Sam, why are you standing in front of the mirror with your eyes closed?
Sam: Well, I want to see what I look like when I'm asleep.

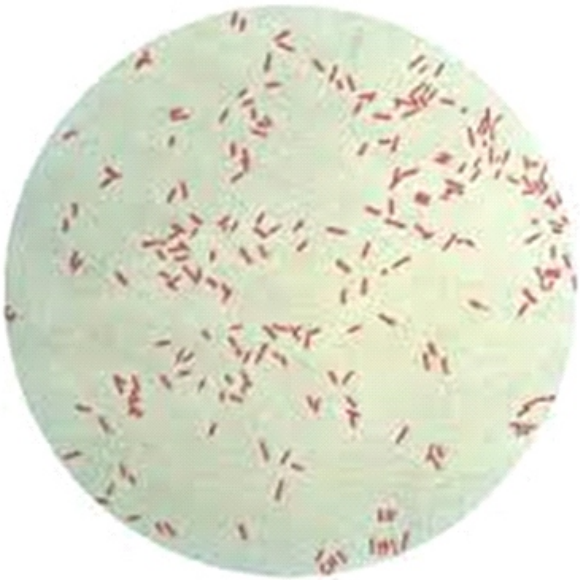
Officer: Soldier, do you have change for a dollar?
Soldier: Sure, buddy.
Officer: That's no way to address an officer. Now, let's try that again. Soldier, do you have change for a dollar?
Soldier: No, sir!

Customer (twice nicked by the barber's razor): Hey, barber, gimme a glass of water.
Barber: What's wrong, sir? Hair in your mouth?
Customer: No, I want to see if my neck leaks.

A teenage girl had been talking on the phone for about half an hour, and then she hung up.
"Wow!," said her father, "That was short. You usually talk for two hours. What happened?"
"Wrong number," replied the girl.

A: When I stand on my head the blood rushes to my head, but when I stand on my feet the blood doesn't rush to my feet. Why is this?
B: It's because your feet aren't empty.

Pseudomonas aeruginosa



Pseudomonas aeruginosa is a common encapsulated, Gram-negative, aerobic–facultatively anaerobic, rod-shaped bacterium that can cause disease in plants and animals, including humans. A species of considerable medical importance, *P. aeruginosa* is a multidrug resistant pathogen recognized for its ubiquity, its intrinsically advanced antibiotic resistance mechanisms, and its association with serious illnesses – hospital-acquired infections such as ventilator-associated pneumonia and various sepsis syndromes. *P. aeruginosa* can selectively inhibit various antibiotics from penetrating its outer membrane - and has high resistance to several antibiotics, according to the World Health Organization *P. aeruginosa* poses one of the greatest threats to humans in terms of antibiotic resistance.

The organism is considered opportunistic insofar as serious infection often occurs during existing diseases or conditions – most notably cystic fibrosis and traumatic burns. It generally affects the immunocompromised but can also infect the immunocompetent as in hot tub folliculitis. Treatment of *P. aeruginosa* infections can be difficult due to its natural resistance to antibiotics. When more advanced antibiotic drug regimens are needed adverse effects may result.

It is citrate, catalase, and oxidase positive. It is found in soil, water, skin flora, and most human-made environments throughout the world. It thrives not only in normal atmospheres, but also in low-oxygen atmospheres, thus has colonized many natural and artificial environments. It uses a wide range of organic material for food; in animals, its versatility enables the organism to infect damaged tissues or those with reduced immunity. The symptoms of such infections are generalized inflammation and sepsis. If such colonizations occur in critical body organs, such as the lungs, the urinary tract, and kidneys, the results can be fatal. Because it thrives on moist surfaces, this bacterium is also found on and in medical equipment, including catheters, causing cross-infections in hospitals and clinics. It is also able to decompose hydrocarbons and has been used to break down tarballs and oil from oil spills. *P. aeruginosa* is not extremely virulent in comparison with other major species of pathogenic bacteria such as Gram-positive *Staphylococcus aureus* and *Streptococcus pyogenes* – though *P. aeruginosa* is capable of extensive colonization and can aggregate into enduring biofilms.

P. aeruginosa is a facultative anaerobe, as it is well adapted to proliferate in conditions of partial or total oxygen depletion. This organism can achieve anaerobic growth with nitrate or nitrite as a terminal electron acceptor. When oxygen, nitrate, and nitrite are absent, it can ferment arginine and pyruvate by substrate-level phosphorylation. Adaptation to microaerobic or anaerobic environments is essential for certain lifestyles of *P. aeruginosa*, for example, during lung infection in cystic fibrosis and primary ciliary dyskinesia, where thick layers of lung mucus and bacterially produced alginate surrounding mucoid bacterial cells can limit the diffusion of oxygen. *P. aeruginosa* growth within the human body can be asymptomatic until the bacteria form a biofilm, which overwhelms the immune system. These biofilms are found in the lungs of people with cystic fibrosis and primary ciliary dyskinesia, and can prove fatal.

These bacteria are constantly finding new ways to avoid the effects of the antibiotics used to treat the infections they cause. Antibiotic resistance occurs when the germs no longer respond to the antibiotics designed to kill them. If they develop resistance to several types of antibiotics, these germs can become multidrug-resistant. In 2017, multidrug-resistant *Pseudomonas aeruginosa* caused an estimated 32,600 infections among hospitalized patients and 2,700 estimated deaths in the United States

Those most at risk include patients in hospitals, especially those:

- on breathing machines (ventilators)
- with devices such as catheters
- with wounds from surgery or burns

Pseudomonas aeruginosa lives in the environment and can be spread to people in healthcare settings when they are exposed to water or soil that is contaminated with these germs. Resistant strains of the germ can also spread in healthcare settings from one person to another through contaminated hands, equipment, or surfaces.

Patients and caregivers should:

- keep their hands clean to avoid getting sick and spreading germs that can cause infections
  - wash their hands with soap and water or use alcohol-based hand sanitizer, particularly before and after caring for wounds or touching a medical device
- remind healthcare providers and caregivers to clean their hands before touching the patient or handling medical devices
- allow healthcare staff to clean their room daily when in a healthcare setting

Healthcare providers should pay careful attention to recommended infection control practices, including hand hygiene and environmental cleaning (e.g., cleaning of patient rooms and shared equipment) to reduce the risk of spreading these germs to patients.

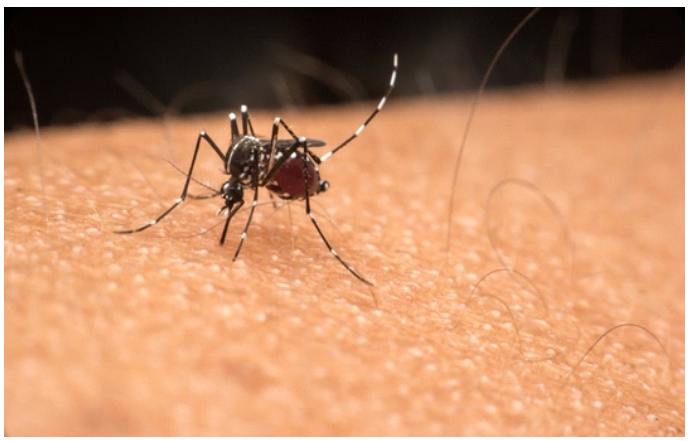
Healthcare facilities should have water management plans that help ensure water quality and reduce the risk of exposure to potentially harmful germs like Pseudomonas aeruginosa.

Pseudomonas aeruginosa infections are generally treated with antibiotics. Unfortunately, in people exposed to healthcare settings like hospitals or nursing homes, *Pseudomonas aeruginosa* infections are becoming more difficult to treat because of increasing antibiotic resistance.

To identify the best antibiotic to treat a specific infection, healthcare providers will send a specimen. Depending on the nature of infection, an appropriate specimen is collected and sent to a bacteriology laboratory for identification. As with most bacteriological specimens, a Gram stain is performed, which may show Gram-negative rods and/or white blood cells. P. aeruginosa produces colonies with a characteristic "grape-like" or "fresh-tortilla" odor on bacteriological media. In mixed cultures, it can be isolated as clear colonies on MacConkey agar (as it does not ferment lactose) which will test positive for oxidase. Confirmatory tests include production of the blue-green pigment pyocyanin on cetrimide agar and growth at 42 °C. A TSI slant is often used to distinguish nonfermenting Pseudomonas species from enteric pathogens in faecal specimens.

When P. aeruginosa is isolated from a normally sterile site (blood, bone, deep collections), it is generally considered dangerous, and almost always requires treatment. However, P. aeruginosa is frequently isolated from nonsterile sites (mouth swabs, sputum, etc.), and, under these circumstances, it may represent colonization and not infection. The isolation of P. aeruginosa from nonsterile specimens should, therefore, be interpreted cautiously, and the advice of a microbiologist or infectious diseases physician/pharmacist should be sought prior to starting treatment. Often, no treatment is needed.

Why are some people mosquito magnets and others unbothered?



It's rare to attend an outdoor party in warm weather without hearing people complain about mosquitoes. They swat away, sit in campfire smoke, cover up with blankets and eventually just give up and go indoors. On the other end of the spectrum, there are plenty of people who don't seem bothered by mosquitoes in the slightest.

Most mosquito species, along with a host of other arthropods – including ticks, fleas, bedbugs, blackflies, horseflies and biting midges – require the protein in blood to develop a batch of eggs. Only the female mosquito feeds on blood. Males feed on plant nectar, which they convert to energy for flight.

Blood-feeding is an incredibly important part of the mosquito's reproductive cycle. Because of this, a tremendous amount of evolutionary pressure has been placed on female mosquitoes to identify potential sources of blood, quickly and efficiently get a full blood meal, and then stealthily depart the unlucky victim. If you check some, or all, of the mosquito's search boxes, then you may find that you are a mosquito magnet.

Sensing CO2 and scent signals

Depending on when during the day they are active, mosquitoes use sight, sound and olfactory cues to identify a potential source of blood. Most night-active species rely on olfactory or receptor cues. The most important chemical cue is the carbon dioxide that all vertebrates, including humans, release with each breath and through their skin.

Mosquitoes are very sensitive to CO2 and can sense a CO2 source that is many meters away. Receptor cells on the mosquito's antennae and legs bind CO2 molecules and send an electrical signal to the brain. When more molecules hit their receptors, the higher the CO2 concentration and the closer they are to the host.

However, there are many nonliving carbon dioxide sources such as cars, boats, planes and trains. To separate living from nonliving sources of CO2, mosquitoes rely on the secondary olfactory cues that living animals produce. Metabolic processes like breathing and moving generate these scent cues, including lactic acid, ammonia and fatty acids that act as additional olfactory clues that help female mosquitoes zero in on their next blood meal.

So, carbon dioxide production is the first mark of a mosquito magnet. Because the production of CO2 and secondary attractants is linked to metabolic rate, the higher the metabolic rate, the more attractants are produced. Metabolic rate can be genetically determined, but it also increases as the result of physical activity.

The human mosquito magnets you can spot at summer parties may have a genetically high metabolic rate or may be more physically active than other attendees. They may also be undertaking other activities that increase their metabolic rate, such as the consumption of alcohol. Increased metabolic rate is why runners attract more mosquitoes during their cooldown stretching exercises. Pregnant women, perhaps due to their increased metabolic rate, attract a disproportionately large number of mosquitoes as well.

Natural body odors are also important cues used by mosquitoes to select a host. For example, some species of Anopheles mosquitoes are attracted to specific components of foot odor. These mosquitoes transmit human malaria and feed indoors in the middle of the night. By feeding on a sleeping person's feet, the mosquitoes avoid the head, where most of the CO2 is produced, and reduce the chance of waking the victim.

Visual cues

Mosquitoes active during the day and at dawn and dusk also use visual signals to identify a host. Mosquitoes usually fly close to the ground. From this vantage point they view their potential hosts against the horizon. Dark colors stand out and light colors blend in, so the way a person is dressed will determine the number of mosquitoes they attract. Wearing lighter colors may not just help keep you cool, but will help you evade a mosquito's notice.

Mosquitoes can visually detect motion, again by contrasting a silhouette against the horizon. This is why people who walk near a saltmarsh in the middle of the day after a large emergence of saltmarsh mosquitoes are inundated by mosquitoes that visually detect their presence.

Psychological factors

There is also a psychological component to mosquito activity. Some people simply do not notice the mosquitoes around them. A single mosquito flying around some people will elicit a strong response – you've probably seen someone go nuts trying to track down the droning sound of one mosquito in order to finish off the tiny bloodsucker.

Other individuals are not bothered and do not notice the mosquitoes that are attracted to them, even when the insects are feasting on their blood. Some mosquitoes specialize on feeding on parts of the body that are difficult to see and difficult to swat. For example, Aedes aegypti is a mosquito species that prefers to feed on humans, mostly around the ankles.

Whether or not you're a mosquito magnet, their bites feel just as itchy!

Best Practices for quality management in the Cosmetics Industry

The cosmetics industry is a highly competitive and ever-evolving field, with an emphasis on quality management practices to ensure that products are safe for consumers. Quality management in the cosmetics industry involves monitoring the production of cosmetic items from start to finish, making sure they meet strict standards set by regulatory agencies. This can include testing raw materials used in the manufacture of cosmetic items, ensuring product safety throughout all stages of manufacturing and distribution, assessing potential health risks associated with ingredients used in cosmetics, and developing efficient methods for recalls or withdrawal procedures when necessary.

With increasing consumer demand for natural and organic options as well as new regulations being implemented across the globe regarding labelling requirements, companies must take even greater steps to ensure their products' safety before they reach store shelves.

Ensuring product safety through quality management

1)Compliance with industry regulations and standards

Companies must perform in-depth safety testing and document their findings, as well as be aware of the ever-changing regulations and standards to remain compliant with industry norms. Additionally, cosmetic companies are held accountable for any adverse effects that may occur due to their products or the ingredients used in them. Thus, it's important for these businesses to make sure they have comprehensive policies in place that allow them to assess potential risks before launching a product into the market. This includes examining ingredient lists from suppliers thoroughly and looking out for potentially hazardous materials or chemicals. Moreover, cosmetics companies should also pay close attention to packaging requirements since labelling can often be confusing for consumers when evaluating whether a product meets certain safety criteria.

2)Product testing and analysis

This testing process has become increasingly important over the years, as consumers demand safe products that live up to their claims of performance. Product testing involves a variety of methods, including laboratory analysis, clinical trials, user surveys, and focus groups. Companies may use this data to assess product safety and develop strategies for improvement. The

results of these tests are also used to create marketing campaigns that accurately reflect the true performance of a product. By engaging in rigorous product testing, companies can ensure that all cosmetics on the market meet industry standards for safety and effectiveness—allowing customers to have confidence in their purchases.

3)Risk management and product recall procedures

Companies must ensure that all ingredients used in their products are safe for use and comply with industry standards, as well as assess potential risks associated with their product before it reaches the consumer. To reduce the risk of an adverse reaction, companies should implement strict quality control protocols to test each batch of the product prior to its release into the market. Additionally, they should also have a process in place to recall any batches that may be defective or contaminated to minimize the harm caused by using these products. Proper communication channels between customers and manufacturers should also be established so consumers can easily report issues or concerns regarding a particular cosmetic item. Finally, regulatory bodies such as the FDA should regularly audit manufacturers and suppliers to ensure compliance with safety regulations.

Best practices for quality management in the cosmetics industry

Quality control measures

Good quality management begins with sourcing reliable ingredients and materials from trusted suppliers, testing those ingredients to ensure their safety, adhering to strict manufacturing and storage processes, documenting all procedures thoroughly, and monitoring product quality throughout its lifespan. Quality control teams should also conduct regular audits on products at various points in their development cycle including during formulation, packaging, distribution, and customer use.

Implementation of quality management processes

Quality management processes help companies to ensure that their products meet all safety and quality standards, as well as customer expectations. Quality management processes in the cosmetics industry should include both preventative and corrective measures, such as identifying potential hazards related to the production process, training personnel on the proper

handling of ingredients, testing for product consistency and stability, verifying labelling accuracy, and proper packaging practices. Additionally, it's important for companies to track consumer feedback about their products to identify potential areas of improvement or issues with a given product line.

Implementing quality assurance in the cosmetics industry

Quality assurance involves controlling the quality of raw materials, process control and testing, inspections and audits, packaging reviews, label control, and compliance with government regulations. It also includes ensuring manufacturing processes are safe for employees to work in without any harm to their health or safety.

The goal of quality assurance is to ensure that cosmetics meet industry standards for aesthetic appeal, performance, consistency, and safety for consumers. Quality Assurance ensures each product meets its intended purpose before it reaches the customer's hands. Companies must take proper steps to make sure they are producing high-quality products while still meeting regulatory requirements set forth by the FDA or other governing bodies.

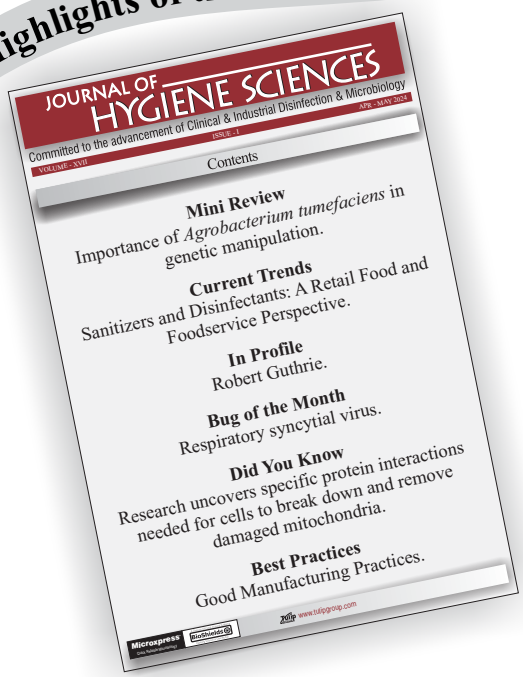
Challenges and solutions for implementing quality management in the cosmetics industry:

The cosmetics industry is a highly competitive sector with stringent regulatory requirements related to product safety and efficacy. Quality management is essential in ensuring that the products meet all these standards, as well as providing customers with an excellent experience when using the product. The implementation of quality management systems within the cosmetics industry can be challenging due to the complex nature of production processes and ingredients used.

Additionally, there are different regulations for each country or region which must be adhered to. To ensure the successful implementation of quality management practices, companies should focus on developing strong relationships with suppliers and setting clear expectations on compliance standards prior to beginning production runs.

Companies should also prioritize training staff members responsible for managing quality control across their supply chain, so they have knowledge about both company policies and external regulations that are applicable.

Highlights of the coming issue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Respiratory syncytial virus.

Did You Know
Research uncovers specific protein interactions needed for cells to break down and remove damaged mitochondria.

Best Practices
Good Manufacturing Practices.

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