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Editorial

Contents

Mini review section – The energy resources mainly petroleum and petroleum hydrocarbons are major pollutants of the environment. The oil and oil products contamination may cause severe harm and hence, the attention has been remunerated in the development of alternative technologies for elimination of these contaminants. Biosurfactants were used in the remediation of oil pollution due to advantages such as biodegradability and low toxicity. Biosurfactants are nonhomogeneous substances produced by a wide range of microorganisms.

Current Trends section – **Gas plasmas** have been referred to as the fourth state of matter (i.e., liquids, solids, gases, and gas plasmas). Gas plasmas are generated in an enclosed chamber under deep vacuum using radio frequency or microwave energy to excite the gas molecules and produce charged particles, many of which are in the form of free radicals. A free radical is an atom with an unpaired electron and is a highly reactive species.The proposed mechanism of action of this device is the production of free radicals within a plasma field that can interact with essential cell components (e.g., enzymes, nucleic acids) and thereby disrupt the metabolism of microorganisms. The type of seed gas used, and the depth of the vacuum are two important variables that can determine the effectiveness of this process.

In Profile Scientist – RAY F. SMITH, emeritus professor of entomology at the University of California at Berkeley, died August 23, 1999, at his home in Lafayette, California. He was 80 years old. Ray was born on January 20, 1919, in Los Angeles, California. He grew up in Monterey, where his father was a pharmacist, and after graduating from high school, Ray entered the University of California at Berkeley; he completed his B.S., M.S., and Ph.D. degrees there. Ray joined the Berkeley faculty in 1941 and became not only a significant builder of its entomology program but also an internationally recognized champion of ecological pest control.

Bug of the month – An **entomopathogenic fungus** is a fungus that can kill or seriously disable insects. These fungi usually attach to the external body surface of insects in the form of microscopic spores (usually asexual, mitosporic spores also called conidia). Under the right conditions of temperature and (usually high) humidity, these spores germinate, grow as hyphae and colonize the insect's cuticle; which they bore through by way of enzymatic hydrolysis, reaching the insects' body cavity (hemocoel). Then, the fungal cells proliferate in the host body cavity, usually as walled hyphae or in the form of wall-less protoplasts (depending on the fungus involved). After some time, the insect is usually killed (sometimes by fungal toxins), and new propagules (spores) are formed in or on the insect if environmental conditions are again right. High humidity is usually required for sporulation.

Did You Know? – For the first time ever, scientists have studied the genome of Sosnowsky's hogweed, a poisonous invasive plant whose juice causes skin burns. They found that its genome has nearly twice as many genes as most other plants. The study is published in The Plant Journal. The research findings open the door to practical applications in medicine and pharmacology, thanks to hogweed's unique bioactive molecules, which can be used to create new drugs.

Best Practices – Personal hygiene is an essential aspect of food and beverage services, as it helps ensure the food's safety. All employees in the food and drinks industry must follow good personal hygiene practices to prevent the spread of illness and disease through food handling.

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.

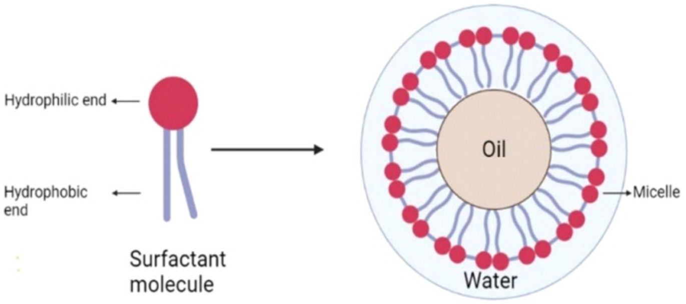
Biosurfactants as useful tools in bioremediation

The energy resources mainly petroleum and petroleum hydrocarbons are major pollutants of the environment. The oil and oil products contamination may cause severe harm and hence, the attention has been remunerated in the development of alternative technologies for elimination of these contaminants. Biosurfactants were used in the remediation of oil pollution due to advantages such as biodegradability and low toxicity. 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.

Biosurfactants: chemical structure and classification

Biosurfactants are amphiphilic molecules with a hydrophilic head and a hydrophobic tail.

Regarding the biosurfactant structure, mono-, oligo-, or polysaccharides, peptides, or proteins make up the hydrophilic moiety, while saturated, unsaturated, and hydroxylated fatty alcohols or fatty acids make up the hydrophobic group.



Biosurfactant classification is mostly based on the biosurfactants' chemical composition and origin.

They are divided into two categories:

(a) surfactants derived from microorganisms, such as glycolipids (rhamnolipids, trehalolipids, and sorpholorolipids), lipopeptides, surfactins, lichenysin, and phospholipids.

(b) surfactants derived from plants such as saponin.

Biosurfactants are low-molecular-weight surface-active agents that efficiently lower surface and interfacial tension; this group includes glycolipids, lipopeptides, and phospholipids; bio emulsifiers are high-molecular-weight polymers that are more effective as emulsion-stabilizing agents.

Glycolipids:

Regarding their high surface activity, glycolipid biosurfactants, produced mainly by *Pseudomonas aeruginosa* as rhamnolipids. **Rhamnolipids** are mainly composed of a carbohydrate group linked to fatty acids. The carbohydrate portion consists of mono-rhamnolipid or di-rhamnolipid, and the rhamnose moieties are linked together by an α-1,2-glycosidic linkage. The non-glycosidic part consists mostly of one or two (in rare cases three) β-hydroxy fatty acid chains (saturated, mono-, or polyunsaturated with chain length ranging from C8 to C16) attached via an ester bond between the β-hydroxyl group of the distal (relative to the glycosidic bond) chain and the carboxyl group of the proximal chain. Rhamnolipid production is necessary for metabolic pathways and gene regulation and contribute to the diversity of microbial species.

Sophorolipids are another type of glycolipids mostly synthesized by yeasts such as *Candida* species and consist of a dimeric sugar attached by a glycosidic bond to a hydroxyl fatty acid where the fatty acid configuration and carbon chain length of a given sophorolipid can differ depending on the source of carbon used to produce it. Depending on the organization of the fatty acid chain, there are two major sophorolipid subtypes: open-chain characterizes the acidic sophorolipids that terminate in a carboxylic acid group, whereas a closed-ring structure characterizes the lactonic sophorolipids where the chain is reattached to the sophorose molecule. In addition to the above two mentioned glycolipids, trehalolipides are a class of glycolipids synthesized by *Rhodococcus*, *Corynebacterium*, *Mycobacterium*, and *Nocardia*, containing a non-reducing disaccharide with two glucose molecules linked together via an α, α-1,1-glycosidic link, and long-chain fatty acids of mycolic acid esterified to the C6 position of each glucose.

Lipopeptides:

Lipopeptides are among the best-known biosurfactants and are primarily produced by *Bacillus* species. Their structure consists of a peptide moiety linked to fatty acid. **Surfactin** remains the most well-reported lipopeptide, which consists of a heptapeptide conjugated with a β-hydroxy fatty acid of chain length 12 to 16 carbon atoms generating a cyclic lactone ring structure. Furthermore, there are other described families of lipopeptides, including fengycins, iturins, kurstakins, bacillomycins, and mycosubtilin.

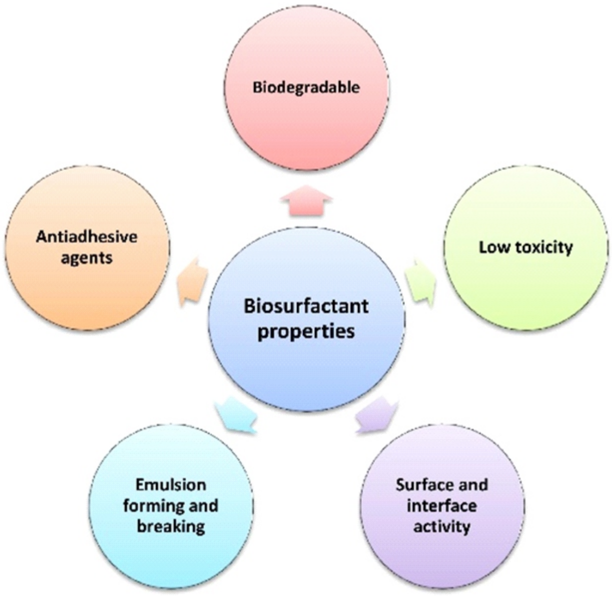
Fatty acids, phospholipids, and neutral lipids:

Fatty acids, phospholipids, and neutral lipids, which are considered biosurfactants, are produced as extracellular metabolites by the microbial oxidation of alkanes, which allows uptake of hydrophobic substrates by microorganisms. The most common fatty acids are Coryn mycolic acids and other hydroxy fatty acids that have been demonstrated to be far more efficient biosurfactants than simple fatty acids. Lipophilic compounds such as triacylglycerol, diacylglycerol, wax esters, and polyhydroxyalkanoates are part of extracellular neutral lipids produced by degrading marine bacteria. Most phospholipids are phosphatidylethanolamines.

Polymeric biosurfactants:

The polymeric biosurfactants emulsan, biodispesan, alasan, and liposan are widely recognized as emulsifiers. Of these, emulsan is the best reported and is primarily made up of a heteropolysaccharide backbone to which fatty acids are covalently attached via o-ester linkages. The polysaccharide part has different sugar forms including D-galactosamine, D-galactosaminuronic acid, D-glucose, L-rhamnose, D-mannose, and D-glucuronic acid, whereas liposan consists of a mixture of carbohydrate and protein.

Properties of Biosurfactants: -



1) Biodegradability

Biosurfactants are non-toxic and non-hazardous material, making them suitable for application in various industries such as cosmetic, food, and pharmaceutical. A study showed that the LC50 of emulsan against *Photobacterium phosphoreum* is significantly lesser than against *Pseudomonas* rhamnolipids.

2)Anti-adhesive Property

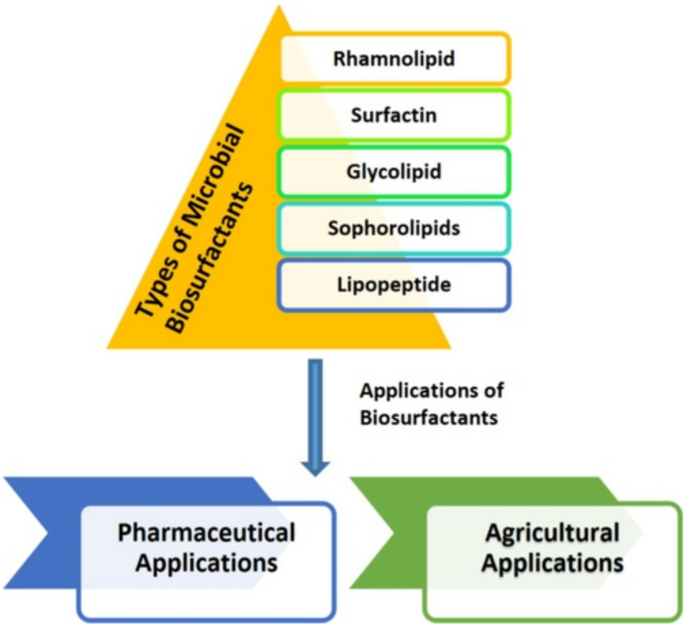
Pre-adhesion of biosurfactants to solid surfaces provides a new and effective means of combating colonization by pathogenic microorganisms, as biosurfactants inhibit the attachment of pathogenic organisms to solid surfaces or sites of infection. The biosurfactants can also be used in modifying the hydrophobicity of the surface that directly affects the adhered microbial population forming a biofilm. A report showed that biosurfactants *from Pseudomonas fluorescens inhibited the attachment of Listeria monocytogenes* onto steel surfaces.

3)Surface and Interface Activity

The systematic force between liquid molecules is known as surface tension. The indistinguishable condition also applies to the interface between two immiscible liquids, such as oil in water, which is identified as interfacial tension (IFT). The tendency of a microbial surfactant is determined by its stability to downregulate the surface tension of the media. An efficient biosurfactant can lower the surface tension of water. Some reports clearly showed that *Bacillus subtilis* produces surfactin that effectively reduces the surface tension under harsh conditions. Another study showed that rhamnolipid, a biosurfactant produced by *Pseudomonas aeruginosa*, significantly decreases water surface tension as compared to the other surfactants.

4)Emulsion Forming and Emulsion Breaking

Biosurfactants may act as emulsifiers or de-emulsifiers. An emulsion can be a heterogeneous system, comprising one immiscible liquid dispersed in another in the form of droplets. There are two types of emulsions: oil-in-water (o/w) or water-in-oil (w/o) emulsions. These emulsions are not stable and were thus stabilized with the addition of biosurfactants. *Candida lipolytica* produce water-soluble liposan, which was used to emulsify edible oils by coating droplets of oil, thus forming stable emulsions.



Hydrogen Peroxide Gas Plasma -Guideline for Disinfection and Sterilization in Healthcare Facilities

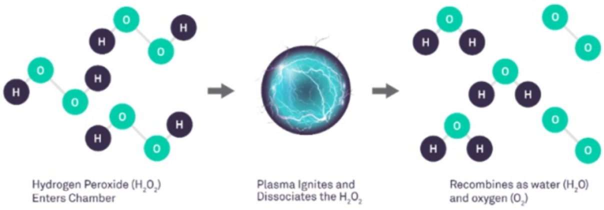
Gas plasmas have been referred to as the fourth state of matter (i.e., liquids, solids, gases, and gas plasmas).

Gas plasmas are generated in an enclosed chamber under deep vacuum using radio frequency or microwave energy to excite the gas molecules and produce charged particles, many of which are in the form of free radicals. A free radical is an atom with an unpaired electron and is a highly reactive species.

The proposed mechanism of action of this device is the production of free radicals within a plasma field that can interact with essential cell components (e.g., enzymes, nucleic acids) and thereby disrupt the metabolism of microorganisms. The type of seed gas used, and the depth of the vacuum are two important variables that can determine the effectiveness of this process.

Hydrogen Peroxide Gas Plasma System:

In hydrogen peroxide gas plasma system for sterilization of medical and surgical devices, the sterilization chamber is evacuated, and hydrogen peroxide solution is injected from a cassette and is vaporized in the sterilization chamber to a concentration of 6 mg/l. The hydrogen peroxide vapor diffuses through the chamber (50 minutes), exposes all surfaces of the load to the sterilant, and initiates the inactivation of microorganisms. An electrical field created by a radio frequency is applied to the chamber to create a gas plasma. Microbicidal free radicals (e.g., hydroxyl and hydroperoxyl) are generated in the plasma. The excess gas is removed and in the final stage (i.e., vent) of the process the sterilization chamber is returned to atmospheric pressure by introduction of high efficiency filtered air. The by-products of the cycle (e.g., water vapor, oxygen) are nontoxic and eliminate the need for aeration. Thus, the sterilized materials can be handled safely, either for immediate use or storage. The process operates in the range of 37-44°C and has a cycle time of 75 minutes. If any moisture is present on the objects the vacuum will not be achieved and the cycle aborts.



A newer version of the unit improves sterilizer efficacy by using two cycles with a hydrogen peroxide diffusion stage and a plasma stage per sterilization cycle. This revision, which is achieved by a software modification, reduces total processing time from 73 to 52 minutes. The biological indicator used with this system is *Bacillus atrophaeus* spores. The newest version of the unit, which employs a new vaporization system that removes most of the water from the hydrogen peroxide, has a cycle time from 28-38 minutes. This is a small, breakable glass ampoule of concentrated hydrogen peroxide (50%) with an elastic connector that is inserted into the device lumen and crushed immediately before sterilization. The diffusion enhancer has been shown to sterilize bronchoscopes contaminated with *Mycobacterium tuberculosis.*

Bacillus atrophaeus

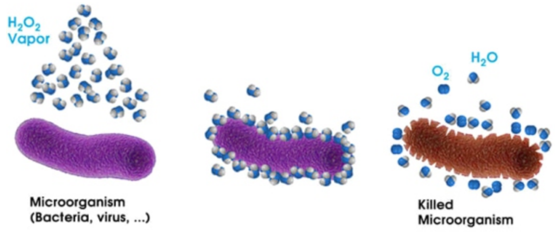
Another gas plasma system, which differs from the above in several important ways, including the use of peracetic acid-acetic acid-hydrogen peroxide vapor, was removed from the marketplace because of reports of corneal destruction to patients when ophthalmic surgery instruments had been processed in the sterilizer. In this investigation, exposure of potentially wet ophthalmologic surgical instruments with small bores and brass components to the plasma gas led to degradation of the brass to copper and zinc. The experimenters showed that when rabbit eyes were exposed to the rinsates of the gas plasma-sterilized instruments, corneal decompensation was documented. This toxicity is highly unlikely with the hydrogen peroxide gas plasma process since a toxic, soluble form of copper would not form.

Mode of Action

This process inactivates microorganisms primarily by the combined use of hydrogen peroxide gas and the generation of free radicals (hydroxyl and hydroproxyl free radicals) during the plasma phase of the cycle.

Microbicidal Activity

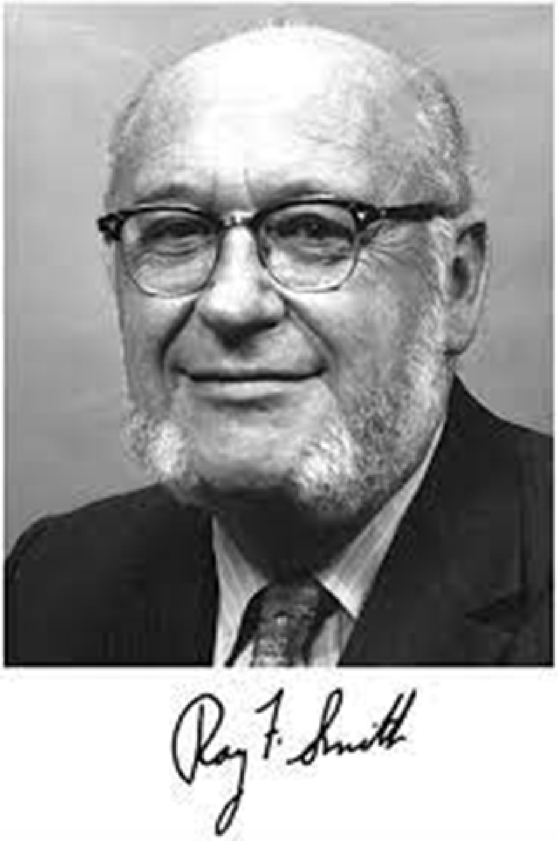
This process can inactivate a broad range of microorganisms, including resistant bacterial spores. Studies have been conducted against vegetative bacteria (including mycobacteria), yeasts, fungi, viruses, and bacterial spores. Like all sterilization processes, the effectiveness can be altered by lumen length, lumen diameter, inorganic salts, and organic materials.



Uses

Materials and devices that cannot tolerate high temperatures and humidity, such as some plastics, electrical devices, and corrosion-susceptible metal alloys, can be sterilized by hydrogen peroxide gas plasma. This method has been compatible with most (>95%) medical devices and materials tested.

RAY F. SMITH



RAY F. SMITH, emeritus professor of entomology at the University of California at Berkeley, died August 23, 1999, at his home in Lafayette, California. He was 80 years old. Ray was born on January 20, 1919, in Los Angeles, California. He grew up in Monterey, where his father was a pharmacist, and after graduating from high school, Ray entered the University of California at Berkeley; he completed his B.S., M.S., and Ph.D. degrees there. Ray joined the Berkeley faculty in 1941 and became not only a significant builder of its entomology program but also an internationally recognized champion of ecological pest control.

From each of his distinguished Berkeley faculty mentors he garnered a lifetime appreciation of history, books, and collecting (E. 0. Essig); field ecology and service to agricultural entomology (A. E. Michelbacher), and a deep respect for and interest in systematic entomology and evolution (E. G. Linsley). From the beginning of his academic and experiment station career it was apparent that the hallmark of his teaching, research, and advocacy was to be centered on an ecological approach to analysis and management of the economic ravages of arthropod pests. He enthusiastically adopted the strong Berkeley tradition in agricultural and medical entomology and fully appreciated the 4 BIOGRAPHICAL MEMOIRS university's historical accomplishment in biological pest control.

Ray accepted the dictum that pesticides must be considered in the context of existing natural factors of population regulation and, if pesticides are to be used, such use should be minimal and precise in time and target. Shortly after the end of World War II he began a period during which he attracted, stimulated, and trained a formidable group of future leaders in ecological pest management. Building on his early collaborative work with Michelbacher, he pushed the concept of supervised control and for a period of 10 years put it into practice for the management of key pests of alfalfa. The demonstrated success of his approach, one that was solidly based upon pest population assessment and an impressive array of ecological and biological data, gradually evolved into the concept of integrated pest management. His administrative potential was soon recognized, and in 1959 he was appointed chair of the Department of Entomology and Parasitology, a position he held until 1973. During his tenure the combined leadership of Ray and his dean, E. G. Linsley, saw the department grow, diversify, and consolidate its place on the Berkeley campus. The 1960- 1975 Master Plan for Higher Education in California and the policy of the university's president, Clark Kerr, to decentralize administrative authority and establish campus autonomy provided additional organization opportunities. The department was reformed into one of entomological sciences, with an academic instructional unit of the Department of Entomology and Parasitology and four autonomous research divisions, viz., agricultural entomology, biological control, invertebrate pathology, and parasitology and medical entomology. With a faculty of 46 and a vigorous broadbased program in research and teaching, its academic ranking became first in the United States.

RAY FRED SMITH 5 On a more personal level, Ray's tolerance, encouragement, and willingness to discuss diverse problems and ideas characterized his stewardship as department chair. No matter the hour or how pressing the work, his door was open to colleagues and students alike—to anyone in need of advice or merely an ear to bend. His energy, patience, and eagerness to be of help were amazing. After resigning as chair Ray felt there was much more to be done with the concept of integrated pest management. Although Rachel Carson's Silent Spring had exposed the ecological hazards associated with wide and indiscriminate use of persistent broad-spectrum pesticides, agriculture, forestry, and public health remained beset with serious pest problems that needed resolution. Professor Smith increasingly began to apply his knowledge and administrative talent to build what was to become a second career at national and international levels. Before stepping down as chair, he was an associate project director (1970-77) of the International Biological Program, a National Science Foundation project entitled “Principles, Strategies and Tactics of Pest Population Regulation and Control in Major Crop Ecosystems,” directed by Carl B. Huffaker, later known as the Huffaker project. Ray also was director for the University of California for Pest Management and Related Environmental Protection Project with the U. S. Agency for International Development (UC/AID), and from 1979 until his retirement in 1982 executive director of the Consortium for International Crop Protection (CICP), which assumed supervision of the UC/AID project.

Professor Smith took a lead in forming the Panel of Experts on Integrated Pest Control of the United Nations Food and Agricultural Organizations (UN/FAO) and the Environmental Program (UN/EP), organized to advise both agencies on the scientific, technical, and education issues 6 BIOGRAPHICAL MEMOIRS involved in integrated pest management. He headed this panel from 1967 to 1982 and during his tenure both as chair of the FAO panel and as director of CICP he became more deeply involved in promoting integrated pest management globally. Under his leadership the two groups jointly worked to publish materials on the philosophy, principles, strategies, and tactics of integrated pest control, guidelines for implementing integrated pest management systems on major food crops and agromedical approaches to pesticide management, and also established several technical assistance programs in many developing countries. An enlightened policy of the University of California allows distinguished faculty to accept, with a reduction in programmatic time commitment, leadership positions in affiliated undertakings.

Thus, it was within the framework of a multi-university Intersociety Consortium for International Plant Protection (CICP) (Entomological Society of America, Weed Science Society of America, Society of Nematologists, American Phytopathological Society) that Professor Smith put his major effort in the final years of his career as executive director of CICP. He did not use that position simply for administration but for a personal effort, continuous and exhausting, to take the concept, philosophy, and practice of integrated pest management to those responsible for policy in agriculture production and agromedical practices around the world. In particular, he focused on needs of underdeveloped areas of the Americas (Mexico, El Salvador, Guatemala, Nicaragua, Brazil, Colombia, and Peru), Asia (Ceylon, Korea, Thailand, Philippines, and Pakistan) and Africa (Egypt, Kenya, and Senegal).

His bibliography, in which some citations were translated and published in German, French, Italian, and Spanish, became filled with references to invitations to speak and participate in symposia, conferences, RAY FRED SMITH 7 seminars, workshops, panels, advisory committees, and consultations. Professor Smith's tireless effort and relentless travel through the world's times zones took their physical toll and eventually led in 1982 to a decision to retire from leadership of the consortium and from the university. This was early for the latter. We are certain that he fully intended to remain active in the international field of integrated pest management, but a debilitating health event, while on a consulting trip in South America, necessitated a professional hiatus. Unfortunately, subsequent health problems continued to restrict his potential for further professional activity.

His final illness with throat cancer, prolonged and painful, was spent in the security of home and family. We lost an academic colleague, teacher, friend, and champion of more rationality in the management of arthropod pests, and we are not alone. He is survived by his wife of 59 years, Elizabeth J. Smith; two children, Kathrine Stark of Lafayette and Donald Smith of McKinleyville, California; a sister, Betty Webler, in Alaska; and seven grandchildren.

Jokes

TEACHER: Millie, give me a sentence starting with 'I'.
MILLIE: I is…
TEACHER: No, Millie..... Always say, 'I am.'
MILLIE: All right... 'I am the ninth letter of the alphabet.'

Sardar to Salesman: I Need Pink curtains for my computer.
Salesman: Sardarji Computer Doesn't Need Curtains.
Sardarji: Oye i have windows installed.

Maid: What do you want, sir?
Visitor: I want to see your master.
Maid: What's your business, please?
Visitor: There is a bill...
Maid: Ah! He left yesterday for his village...
Visitor: Which I have to pay him...
Maid: And he returned this morning.

A small Indian boy appeared in the class of a London schoolteacher for the first time, and she asked him his name. Venkataratnam Narasimha Rattaiah, he said. When she asked, How do you spell it? he replied, My mother helps me.

My father wants me to have everything he did not have when he was a boy.
What didn't he have?
All A's on his report card.

Teacher: Who were the first human beings?
Pupil: Adam and Eve.
Teacher: And what nationality were they?
Pupil: Indian, of course.
Teacher: And how ho you know they were Indian?
Pupil: Easy. They had no roof over their heads, no clothes to wear and only one apple between them - and they called it Paradise.

Entomopathogenic fungi

An **entomopathogenic fungus** is a fungus that can kill or seriously disable insects.

These fungi usually attach to the external body surface of insects in the form of microscopic spores (usually asexual, mitosporic spores also called conidia). Under the right conditions of temperature and (usually high) humidity, these spores germinate, grow as hyphae and colonize the insect's cuticle; which they bore through by way of enzymatic hydrolysis, reaching the insects' body cavity (hemocoel). Then, the fungal cells proliferate in the host body cavity, usually as walled hyphae or in the form of wall-less protoplasts (depending on the fungus involved). After some time, the insect is usually killed (sometimes by fungal toxins), and new propagules (spores) are formed in or on the insect if environmental conditions are again right. High humidity is usually required for sporulation.

The entomopathogenic fungi include taxa from several of the main fungal groups and do not form a monophyletic group. Many common and/or important entomopathogenic fungi are in the order Hypocreales of the Ascomycota: the asexual (anamorph) phases *Beauveria*, *Isaria* (was *Paecilomyces*), *Hirsutella*, *Metarhizium*, *Nomuraea* and the sexual (teleomorph) state *Cordyceps*; others (*Entomophthora*, *Zoophthora*, *Pandora*, *Entomophaga*) belong in the order Entomophthorales of the Zygomycota. Related fungi attack and kill other invertebrates (e.g. nematodes).

Since they are considered natural mortality agents and environmentally safe, entomopathogenic fungi for biological control of insects have been studied for more than 100 years. In particular, the asexual phases of Ascomycota (*Beauveria* spp., *Isaria* spp., *Lecanicillium* spp., *Metarhizium* spp., *Purpureocillium* spp., and others) are under scrutiny due to traits favouring their use as biopesticides. The development of entomopathogens as pesticides depends on research into their host specificity, stability, formulation, and methods of application.

Most entomopathogenic fungi can be grown on artificial media. Some require complex media, while others, like *Beauveria bassiana* and exploitable species in the genus *Metarhizium*, can be grown on starch-rich substrates such as rice or wheat grains.

Entomophthorales are often reported as causing epizootics (outbreaks with many deaths) in nature. These fungi are virulent. The anamorphic Ascomycota (*Metarhizium*, *Beauveria* etc.) are reported as causing epizootics less frequently in nature.

Entomopathogenic fungi such as *Beauveria bassiana* and *Metarhizium anisopliae* successfully infect susceptible host populations through *conidia*. The signaling cues between these fungi and their host targets are under investigation. The ability to sense these parasites can increase fitness for the host targets. Evidence suggests that signal recognition occurs within some hosts, but not others. For example, the ectoparasite *Cephalonomia tarsalis* is susceptible to *B. bassiana* but it cannot detect the presence of free conidia of this fungus or infected hosts. Because they cannot detect these parasites, either the host or the host's offspring become infected and/or die. In contrast, termites detect and avoid some lethal conidia strains. Other soil-dwelling insects have evolved the ability to detect and avoid certain entomopathogenic fungi.

Poisonous invasive plant exhibits twice as many genes as expected

For the first time ever, scientists have studied the genome of Sosnowsky's hogweed, a poisonous invasive plant whose juice causes skin burns. They found that its genome has nearly twice as many genes as most other plants. The study is published in The Plant Journal. The research findings open the door to practical applications in medicine and pharmacology, thanks to hogweed's unique bioactive molecules, which can be used to create new drugs.

Sosnowsky's hogweed (Heracleum sosnowskyi) is an invasive plant that has spread far beyond its natural habitat in the North Caucasus, posing a major threat to ecosystems and human health. After World War II, the plant was regarded as a promising fodder crop and was widely cultivated in the northwest of European Russia. From there, it started to spread, quickly invading larger areas and reducing biodiversity by forcing out other plant species. Moreover, its juice contains natural toxins that make the human body, mostly the skin and mucous membranes, highly sensitive to ultraviolet radiation and can cause skin burns and irritation through physical contact.

Researchers from Skoltech and their colleagues from A. A. Kharkevich Institute for Information Transmission Problems of RAS investigated the complete genome of Sosnowsky's hogweed and assembled it up to the chromosome level. Using a DNA sequencer, the team obtained data on the plant's genome and marked individual genes, which, unexpectedly, turned out to be too many: 55,000 as opposed to 25,000–35,000 in most other plants. Having proposed and verified several possible hypotheses, the researchers discovered that numerous gene duplications (copies) are responsible for this phenomenon. 2/4 "This is rather unusual, since plants typically have duplications all over their genome and not just in its individual parts.

Many gene families with a sharp increase in the number of genes in Sosnowsky's hogweed appear as a result of the synthesis of secondary metabolites, including linear furanocoumarins (psoralen and its derivatives), which make hogweed highly dangerous," Maria Logacheva, an assistant professor from the Bio Center and a project team member, explains. The researchers thoroughly analyzed the genes that may be involved in the synthesis of toxins that cause skin burns in daylight and experimentally determined the function of one of the genes that converts marmesin into psoralen. The research findings could be useful for medicine and pharmacology.

Understanding the specific features of Sosnowsky's hogweed's genome will help identify and study its unique bioactive molecules, which could be used to create new drugs and treatment approaches to skin problems. They can also help researchers to develop biological control and monitoring methods for this noxious plant. "We plan to continue our research into the hogweed genome and study the genetic diversity of this species in its original habitat and 'invaded' areas.

Logacheva concluded that they are collecting and analyzing samples from all over Russia—from Kaliningrad to the Far East—in order to figure out the hogweed's spread patterns and strategies, as well as to learn more about the relationships between Sosnowsky's hogweed and related species, such as Mantegazzi's hogweed, which is spreading like wildfire in Western Europe,"

Best Practices in Food and Drinks Industries

Personal hygiene is an essential aspect of food and beverage services, as it helps ensure the food's safety. All employees in the food and drinks industry must follow good personal hygiene practices to prevent the spread of illness and disease through food handling.

This includes washing hands frequently, especially after using the restroom and before handling food. Employees should also keep their work areas clean and free of clutter and wear appropriate protective clothing, such as hairnets and gloves. It is also essential for employees to avoid contaminating food by not touching their face, hair, or body while working.

By following good personal hygiene practices, employees in the food and beverage industry can help prevent food and beverage contamination and ensure the safety of the food they are serving.

In addition to personal hygiene, it is also vital for food and beverage establishments to maintain high standards of hygiene and sanitation in their facilities and equipment to prevent the spread of illness and protect the health of their customers.

Some of the steps to evaluate the sanitation practices regularly are as follow: -

1. PROVIDE SUBSTANTIAL TRAINING

Without adequately trained employees, mistakes are more likely, leading to serious health, sanitation, and safety issues. Training should encompass how to do each job, handle the equipment, dress codes, safety procedures, hygiene, and proper cleaning and sanitation. All employees should get thorough training before starting, and training should be reinforced regularly to ensure that employees are up-to-date and learn any new information that may be applicable to their jobs.

2. IMPLEMENT BETTER CLEANING PRACTICES

Regularly cleaning and sanitizing your facility is the easiest way to maintain an appropriate level of sanitation. A regular cleaning schedule will significantly reduce and eliminate the risk of bacteria growth and contamination.

3. REQUIRE THE USE OF PPE EQUIPMENT

Ensuring that all employees wear the proper attire is also critical to maintaining sanitation levels within the facility. Wearing the wrong clothing can lead to safety issues and can even potentially lead to contamination, with employee shoes tracking in outside germs and bacteria that can get lifted into the air. To protect your employees and prevent the introduction of outside bacteria, you should implement personal protective equipment (PPE). It protects employees while they work and ensures there is no chance of them unintentionally introducing bacteria into the sanitary production area.

4. MAINTENANCE

Pests such as rats and mice can affect the way in which machines perform, gnawing at the power cables and contaminating the components that have direct contact with the products.

5. WASTE MANAGEMENT

Provide appropriate containers and suitable waste storage areas. Establish adequate procedures for the storage and removal of waste. This prevents build-up of waste and pests and reduces risk of contamination of ingredients, equipment, and products.

6. PEST CONTROL

Pests like rodents and insects can cause a lot of issues within a beverage facility. The biggest issue with potential infestations is the risk of spreading bacteria and contamination. Wastewater, other fluids, and different drink ingredients can all attract pests if left unattended. Once pests infiltrate, it is nearly impossible to stop–which makes bacteria like *E. coli* and *Listeria* even more likely to occur. As they move through the facility, they carry the bacteria with them, spreading it to different surfaces and products.


Highlights of the coming issue

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Contents

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