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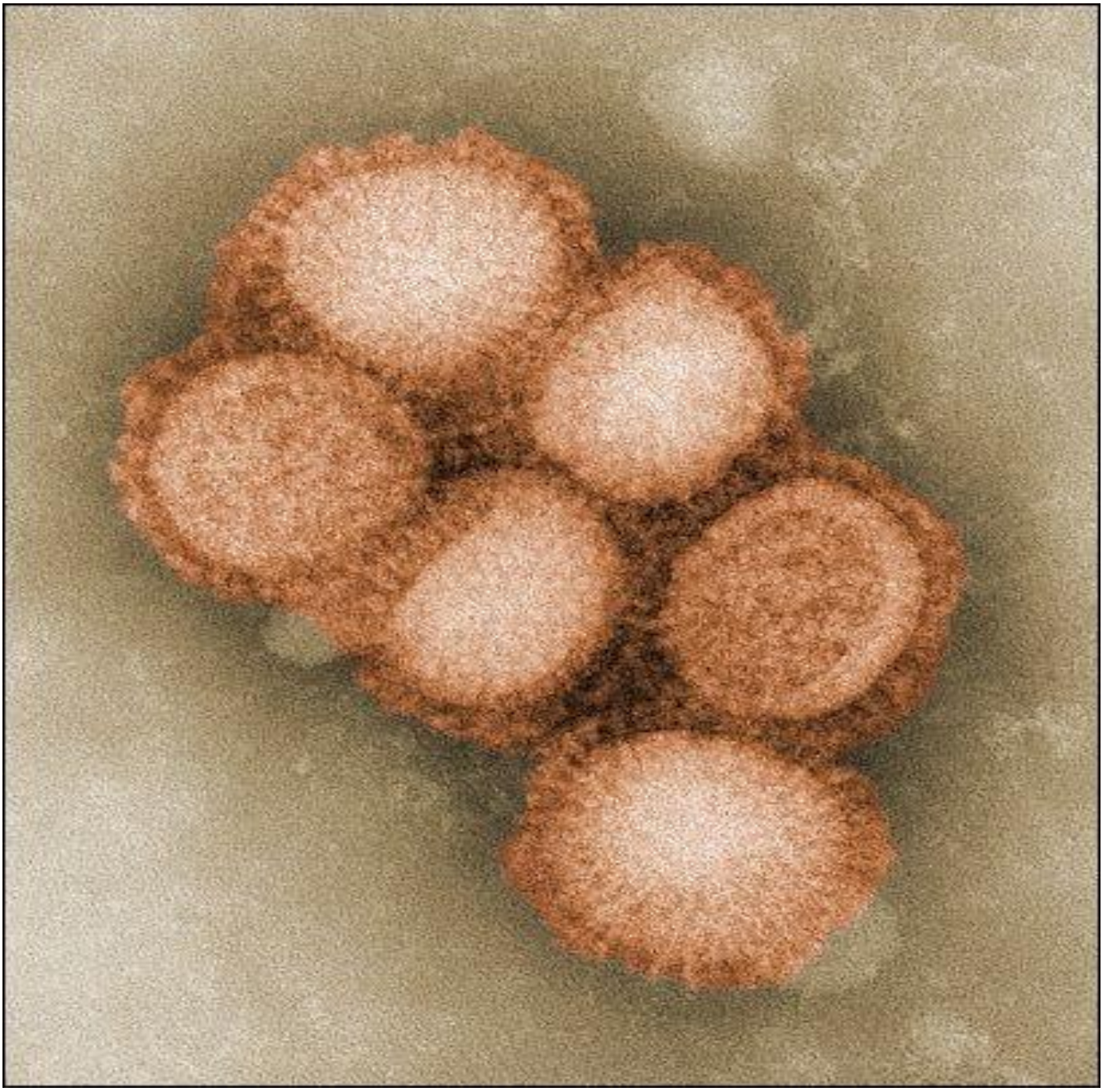

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Cover page : *Colorized negative stained transmission electron micrograph (TEM) of the swine flu virus. © C. S. Goldsmith and A. Balish, CDC.*

ENVIS Newsletter
on
Microorganisms and Environment Management

Contents

Dear Readers,

New Year Greetings - 2015!

Afforestation is the planting of commercially important trees, usually on waste lands. This differs from reafforestation which is the restocking of depleted forests and woodlands. In India, controlling of Carbon emission is very much challenging for the policy makers and considering the need of afforestation in India, many governmental, private and NGOs are engaged to create new forests through afforestation method to maximize the carbon capture or control the soil erosion. The importance of mycorrhizal colonization can also be extended for the plantation in eroded lands, afforestation and reclamation of soils in waste lands. A proper understanding of energy dynamics, in terms of organic matter turnover and bioavailability for heterotrophic microbial communities in soil, is fundamental for remediation of terrestrial ecosystem.

Carbon balance in terrestrial ecosystem is highly dependent on microbial populations, which are responsible for substantial amount of the carbon flux from terrestrial to atmospheric system. Microbial growth in soil depends on combination of limiting factors interacting at the soil microsites, where microbes are found. The structure of a soil microbial community is therefore determined by many variables, but primarily by energy supply.

In this context, the present issue includes an article on the presence of beneficial microbes in the rhizophere of different tree species planted in the afforded sites. Other interesting information on how bacteria connect each other, facts about the deadly disease, swine flu are also included.

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Prof. N. Munuswamy

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SCIENTIFIC ARTICLE

Study on the status of beneficial microbes from afforested textile and urban waste water polluted sites in Tirupur district, Tamil Nadu, South India

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Abstract

Utilization of efficient microbes and suitable plant species may provide an alternative method for bioremediation of polluted sites. Attempt was made to investigate the status of beneficial microbes *viz.*, Plant Growth Promoting Rhizobacteria (PGPR) and Arbuscular Mycorrhizal (AM) fungi from the rhizosphere soil and root samples of six different tree species *viz.*, *Acacia nilotica*, *Azadirachta indica*, *Casuarina equisetifolia*, *Eucalyptus tereticornis*, *Pongamia pinnata* and *Thespecia populnea* in afforested sewage effluent sites in Tirupur, Tamil Nadu. It was found that all the tree species had AM fungal colonization in the roots and soil spore population of AM fungi and PGPR population in the rhizosphere soils but variation among different samples screened. Maximum population density of PGPR was found from the rhizosphere of *Azadirachta indica* and *Casuarina equisetifolia*. Similarly, maximum number of AM fungal spores was observed from the rhizosphere of *Azadirachta indica*, followed by *Eucalyptus tereticornis* and *Casuarina equsetifolia*. The physico-chemical parameters of the afforested sewage effluent sites were studied and the nutrient status was improved after afforestation.

Keywords: Phosphate solublizing bacteria, *Azotobacter* spp., *Azospirillum* spp., Arbuscular Mycorrhizal fungi

Introduction

Rapidly increasing urban population and industries had lead to the production of contaminated waste water. Discharge of untreated waste water from industries and urban waste water add 30,000 million liter per day of pollution into Indian rivers. This has lead to the pollution of soil, water and ground water sources used for agriculture and human consumption. Irrigation of untreated waste water in agriculture fields cause contamination of land, surface water and ground water with heavy metals like nitrates, fluorides etc.

Environmental pollution is an extremely important issue today, affecting all of us in one way or the other. In the past few decades, the disposal of sewage and industrial effluents to water bodies from uncontrolled urbanization has caused serious pollution problem. The textile industry plays an important role in the world economy as well as in our daily life, but at the same time, it consumes large quantities of water and generates huge amounts of waste water (Hai *et al.*, 2006). More than 700 industries including dyeing units are discharging large amounts of industrial effluents regularly in Tirupur and surrounding areas (Jayashree *et al.*, 2011). The industrial effluents discharged from the textile dyeing units contain higher amount of heavy metals especially chromium, copper and lead which ultimately leaches to ground water and lead to contamination due to accumulation of toxic metallic components and resulted in a series of well documented problems in living beings because they cannot be completely degraded (Malarkodi *et al*., 2007). Hence, industrial effluents create lot of environmental problems and health hazards and are becoming more complex and critical not only in developing countries like India but also in developed countries. The Indian textile industry is the world's second largest after China. In the present study, attempts were made to determine the physico-chemical property of afforested soil and also to isolate and identify the status of beneficial microbes present in the rhizosphere of different tree species available in the afforested sites.

Materials and Methods

Sample collection

The Tamil Nadu Forest Department (TNFD) has done afforestation of textile industry waste water and urban sewage effluent polluted areas in Sarkarperiyapalayam and Kasipalayam, Tirupur district, Tamil Nadu, Southern India, by planting trees such as *Azadirachta indica*, *Casuarina equisetifolia*, *Eucalyptus tereticornis*, *Pongamia pinnata* and *Thespecia populnea*. The roots and rhizosphere soil samples were collected from the root zone of the above mentioned trees in zib lock poly bags and brought to the laboratory for further analysis. All the root samples were washed gently with tap water and immediately fixed in formalin- acetic acid- alcohol (FAA-50% 100 ml ethyl alcohol + 5ml glacial acetic acid + 13 ml formalin) and the soil samples were kept under refrigerator until the spores of AM fungi were processed.

Two sample locations where the TNFD had done afforestation works in textile industry waste water and urban sewage effluent polluted water areas *viz*., Sarkarperiapalayam (S1) and Kasipalayam (S2) respectively in Tirupur were chosen for the present study.

Physico-chemical analysis

Physico-chemical parameters like pH, Electrical Conductivity (EC), Presence of Phosphorus, Potassium, Calcium, Magnesium, Manganese, Iron and heavy metals such as Copper and Zinc were analyzed from the collected soil samples based on APHA, 1992.

Isolation and identification of beneficial microbes from rhizosphere soil sample

Serial dilution and plating techniques as described by Subba Rao (2007) was adopted for enumerating the population of beneficial bacteria. These isolates were further identified up to genera level according to Martin *et al*. (2006).

Isolation and Identification of AM spores

Rhizosphere soil (100g) was thoroughly mixed and dispersed in one liter water and the suspension was left undisturbed for 15 minutes to allow the heavier particles to settle. Then the suspension was decanted through 710, 250 and 45 µm sieves and remains on the sieves were washed into beakers (Gerdemann and Nicolson, 1963). After settlement of heavier particles, the supernatant was filtered through girded filter papers. Each filter paper was spread on the petri dish and observed under a dissecting microscope. The intact AM spores were counted and picked up with a wet needle and mounted in polyvinyl glycerol-lactophenol with or without Melzer's reagent on a micro slide for identification. The intact and the crushed spores were examined under a compound microscope and identified as per Trappe, (1982) and Schenck and Perez, (1987) methods.

Estimation of percent root colonization of AM fungi

Root samples were washed gently with tap water to remove FAA solution completely and then processed for estimation of percent root colonization of AM fungi. The root segments were cleared and stained in Trypan blue solution (Phillips and Hayman, 1970). The stained roots were examined with a Nikon compound microscope and the per cent root colonization was estimated according to magnified intersection method (McGonigle *et al.*, 1990).

Results and Discussion

Physico-chemical parameters of soil samples

The soil samples were analyzed for various physico-chemical properties and the data are furnished in Table 1. Both the soil samples (S1 and S2) displayed slightly alkaline pH (8.2 and 8.3). Malarkodi *et al.* (2007) reported that the highest pH values were noticed in the areas nearer to textile and dyeing industries in Tamil Nadu such as Karamadai (8.96), Thenthirupathi (8.96), Ponnaiyarajapuram (9.24) and Thelungupalayam (9.30). This might be attributed to the addition of alkaline earth metals, like Ca, Mg and alkali metals like Na, present in the effluent water in higher proportion. Electrical conductivity which represents total ions concentration ranged from (0.19 dSm^{-1} in S1 and 1.36 dSm^{-1} in S2). The measurement of electrical conductivity can be used as a quick way to locate potential soil and water quality problems. It is commonly used as a measure of salinity of soil (Ishaya *et al*., 2011). A concentration of 26.1 ppm and 22.2 ppm (mean +/- values) of Phosphorus in S1 and S2 was recorded in S1 and S2 respectively. The available potassium was found to be high in both S1 and S2 (241.6 ppm and 281.6 ppm). Available potassium content of soil increased significantly by the waste water application. Calcium and magnesium are very important elements for plant life. In the present study, the concentration of Calcium and Magnesium was found to be 0.40 meq/100g and 0.32 meq/100g calcium; and 0.05 ppm and 0.04 ppm magnesium respectively in both S1 and S2 samples respectively. The range of presence of heavy metals such as Iron, Copper, and Zinc in S1 and S2 was found to be in the concentration of 14.2 ppm and 12.6 ppm; 0.8 ppm and 0.6 ppm; 1.1 ppm and 0.5 ppm respectively.

Table 1: Physico-chemical parameters of soil samples

S. No.	Physico-chemical parameters	Sample locations	
		S1	S2
1.	pH	8.2	8.1
2.	Electrical Conductivity (dSm^{-1})	0.19	1.36
4.	Available Phosphorus($Kg\,ha^{-1}$)	26.1	22.2
5.	Available Potassium (ppm)	241.6	281.6
6.	Calcium (meq/100g)	0.40	0.32
7.	Manganese (ppm)	3.4	4.4
8.	Iron (ppm)	14.2	12.6
9.	Magnesium (ppm)	0.05	0.04
10.	Copper(ppm)	0.8	0.6
11.	Zinc(ppm)	1.1	0.5

S1- Sarkarperiyapalayam soil, S2- Kasipalayam soil

Population density of beneficial microbes

The population density of beneficial bacterial isolates are presented in Table 2 and Fig. 1. The bacterial colonies isolated from soil samples, gave countable colonies, but the growth of the colonies decreased when the dilution factor increased. The rhizosphere soil of *Azadirachta indica* of both S1 and S2 had shown the maximum population density of Phosphate solublising bacteria (PSB), *Azotobacter* sp. and *Azospirillum* sp., followed by *Casuarina equsetifolia.* It is interesting to note that the population density of bacterial isolates was found to be low in other rhizosphere soil samples compared to *Azadirachta indica* and *Casuarina equsetifolia*. The reason for these comparative increase and decrease in population may be due to the phytoremediation of textile sewage contaminated soil by specifies tree species along with beneficial microbes. Comparative studies by Fliessbaach *et al.* (1994) and McGrath *et al.* (1995) had shown reductions in microbial biomass or soil enzyme activities for agricultural soils amended with metal-containing sewage sludge.

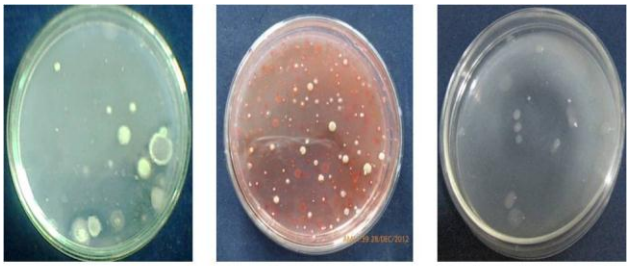
Table 2: Population density of PGPR from various sampling locations*

Sl. No.	Name of the host plant under samples collected	Sample location	Population density of beneficial bacteria (CFU/g)		
			PSB	*Azotobacter* sp.	*Azospirillum* sp.
1.	*Casuarina equsetifolia*	Sarkar Periyapalayam	25×10^5	24×10^5	26×10^5
2.	*Pongamia pinnata,*	Sarkar Periyapalayam	11×10^5	16×10^5	7×10^5
3.	*Thespecia populnea*	Sarkar Periyapalayam	10×10^5	8×10^5	5×10^5
4.	*Azadirachtaindica*	Sarkar Periyapalayam	22×10^5	33×10^5	44×10^5
5.	*Acacia nilotica,*	Kasipalayam	6×10^5	20×10^5	14×10^5
6.	*Casuarina equsetifolia*	Kasipalayam	33×10^5	7×10^5	14×10^5
7.	*Azadirachta indica*	Kasipalayam	44×10^5	22×10^5	52×10^5
8.	*Pongamia pinnata*	Kasipalayam	5×10^5	6×10^5	12×10^5
9.	*Eucalyptus tereticornis*	Kasipalayam	7×10^5	11×10^5	13×10^5

*Mean of 3 replications

Population density of AM fungal spores and percentage root colonization

Attempt was made to investigate the population density of AM fungal spores and percentage of root colonization in different rhizosphere soil and root samples respectively and it is presented in Table 3 and Fig. 2. It found that AM fungal spores were present in rhizosphere soil of all the samples screened. Maximum number of AM fungal spores was observed in the soil sample collected from the rhizosphere soil of *Azadirachta indica* (180/100gm soil) followed by *Eucalyptus tereticornis* (140/100 gm soil) and *Casuarina equsetifolia* (135/100gm soil). Minimum numbers of spores were seen in the rhizosphere soil samples of *Thespecia populnea* (90/100 gm soil). These studies correlate the work done by Mohan *et al.* (1995) and Mohan and Singh (1996).



PSB *Azospirillum* sp *Azotobacter* sp

Fig. 1: Population density of beneficial PGPR

Percentage root colonization of AM fungi

Data on percent root colonization of AM fungi were recorded in different tree species and shown in (Table 3 & Fig. 3). The persistence of AM fungal colonization was found in root samples of all the tree species screened. Significant per cent root colonization was found in *Azadirachta indica*, (97%) followed by *Casuarina equsetifolia* (91%). The lowest per cent root colonization was observed in *Eucalyptus tereticornis* (35%). A study done by Mohan and Neelam verma (1995) and Mohan *et al.* (1995), the AM fungal association with different tree seedlings in arid zone of Rajasthan and found that the roots of *Azadirachta indica* had greater percent of root colonization.

Table 3: Status of AM fungal spore population and percent root colonization in different samples*.

S. No.	Host plant	Location Name			
		Sarkarperiapalayam		Kasipalayam	
		AM spore population/ 100 g soil	% root colonization	AM spore population/ 100 g soil	% root colonization
1	*Acacia nilotica*	—	—	128	56
2	*Azadirachta indica*	180	60	150	97
3	*Casuarina equisetifolia*	135	90	110	67
4	*Eucalyptus tereticornis*	–	–	140	35
5	*Pongamia pinnata*	100	39	120	45
6	*Thespecia populnea*	90	40	—	—

•Mean of 3 replications

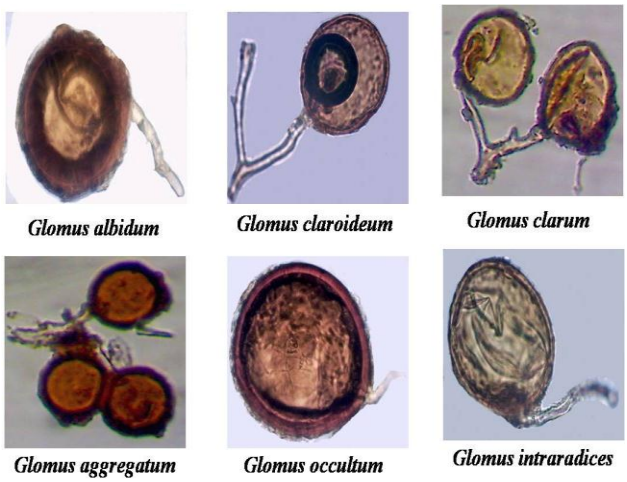
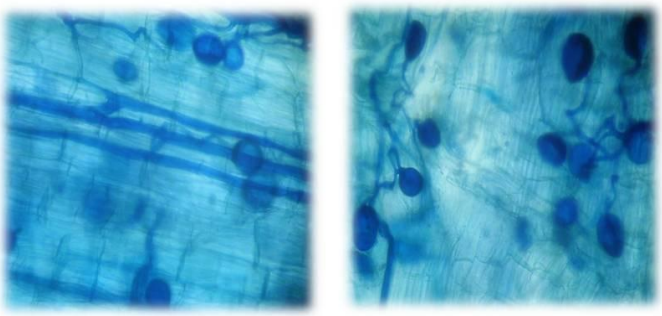


Fig. 2. Diversity of different AM fungal spores



Vesicular and hyphal structures in root segments of *Azadirachta indica* (x 100)

Fig. 3. Root colonization of AM spores in different tree species

Conclusion

The present investigation highlights the presence of different beneficial microbes from the rhizosphere soil analyzed from afforested area in Tirupur district, Tamil Nadu, India. It is found that *Azadirachta indica* and *Casuarina equsetifolia* supported the maximum growth of beneficial microbes including PSB, *Azotobacter* sp., *Azospirillum* sp. and AM fungi in rhizosphere soil. Difference in microbial population is a reflection of many factors such as nutrient, oxygen levels, temperature, pollution, and availability of minerals etc. Further study about the plant and microbial interaction in rhizosphere soil is essential to reveal the fact of diversity status of microbes. These species, therefore, can be used as a potential phytoremediator for polluted sewage contaminated soils and to mitigate soil pollution and can be recommended for afforestation in different polluted areas.

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RESEARCH REPORTS

Bacteria connect to each other and exchange nutrients

It is well-known that bacteria can support each others' growth and exchange nutrients. Scientists at the Max Planck Institute for Chemical Ecology in Jena, Germany, and their colleagues at the universities of Jena, Kaiserslautern, and Heidelberg, however, have now discovered a new way of how bacteria can achieve this nutritional exchange. They found that some bacteria can form nanotubular structures between single cells that enable a direct exchange of nutrients.

Bacteria usually live in species-rich communities and frequently exchange nutrients and other metabolites. Until now, it was unclear whether microorganisms exchange metabolites exclusively by releasing them into the surrounding environment or whether they also use direct connections between cells for this purpose. Scientists from the Research Group Experimental Ecology and Evolution at the Max Planck Institute for Chemical Ecology in Jena, Germany addressed this question using the soil bacterium *Acinetobacter baylyi*and the gut microbe *Escherichia coli*. By experimentally deleting bacterial genes from the genome of both species, the scientists generated mutants that were no longer able to produce certain amino acids, yet produced increased amounts of others.

In co-culture, both bacterial strains were able to cross-feed each other, thereby compensating the experimentally induced deficiencies. However, separating the two bacterial strains with a filter that allowed free passage of amino acids, yet prevented a direct contact between cells, abolished growth of both strains. "This experiment showed that a direct contact between cells was required for the nutrient exchange to occur," explains Samay Pande, who recently obtained his PhD at the Max Planck Institute in Jena on this research project and now started a postdoc at the ETH Zürich.

Observing the co-culture under the electron microscope revealed structures that formed between bacterial strains, which functioned as nanotubes and enabled the exchange of nutrients between cells. Especially remarkable, however, was the fact that only the gut microbe *Escherichia coli* was capable of forming these structures and connecting to *Acinetobacter baylyi* or other *E. coli* cells. "The major difference between both species is certainly that *E. coli* is able to actively move in liquid media, whereas *A. baylyi* is immotile. It may thus be possible that swimming is required for *E. coli* to find suitable partners and connect to them via nanotubes," explains Christian Kost, head of the Research Group Experimental Ecology and Evolution, which is funded by the Volkswagen Foundation.

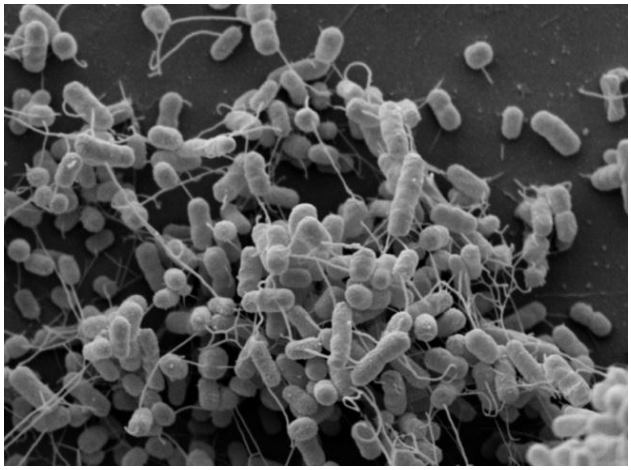
KNOW A SCIENTIST

Dr. Jonas Salk was an American physician and medical researcher. In 1955 Salk's years of research paid off. Human trials of the polio vaccine effectively protected the subject from the polio virus. When news of the discovery was made public on April 12, 1955, Salk was hailed as a miracle worker. He further endeared himself to the public by refusing to patent the vaccine. He had no desire to profit personally from the discovery, but merely wished to see the vaccine disseminated as widely as possible. Salk's vaccine was composed of "killed" polio virus, which retained the ability to immunize without running the risk of infecting the patient. A few years later, a vaccine made from live polio virus was developed, which could be administered orally, while Salk's vaccine required injection.

Dr. Salk's last years were spent searching for a vaccine against AIDS. Jonas Salk died on June 23, 1995. He was 80 years old. The 100th anniversary of his birth in 2014 was the occasion for renewed appreciation and celebration of Dr. Salk's contribution to humanity.

"A lack of amino acids triggered the formation of nanotubes. Deleting a gene, which is involved in the production of a certain amino acid, caused the resulting bacteria to connect to other bacterial cells and − in this way − compensate their nutritional deficiency. However, nanotubes did not form when the required amino acids were supplemented to the growth medium, indicating that the formation of these structures obviously depends on how 'hungry' a cell is," the scientist summarizes the results.

Cells that specialize on particular biochemical processes and thereby divide their labour can be advantageous for bacterial communities: Resources can be used more economically, thus enhancing growth and efficiency. Whether the formation of nanotubes exclusively serves the mutual exchange of nutrients or whether some bacterial species also parasitize other bacterial cells in this way will be subject to further investigation. Moreover, it remains unclear whether bacteria can actively choose the cells to which they attach. After all, such tubular connections also pose a potential risk, because the partner on the other side of the tube could also provide harmful substances.



Electron micrograph of genetically modified *Acinetobacter baylyi* and *Escherichia coli* strains. The bacteria exchange amino acids via nanotubes (i.e. tube-like connections between cells).

"To me, the most exciting question that remains to be answered is whether bacteria are in fact unicellular and relatively simply structured organisms or whether we are actually looking at some other type of multicellularity, in which bacteria increase their complexity by attaching to each other and combining their biochemical abilities," Christian Kost summarizes. His research focuses mainly on the question why organisms cooperate with each other. Using bacterial communities as experimentally tractable model systems will help to explain why so many organisms have developed a cooperative lifestyle in the course of their evolution.

Source: www.mpg.de

Nanobombs Terminate Foodborne Microbes

Researchers engineer water nanostructures to wipe out pathogens that can spoil food and pose health risks.

Peppering charged water nanoparticles onto fruits and vegetables can eliminate potentially harmful foodborne microbes, researchers from Harvard and their colleagues report in *Environmental Science & Technology*. The new method offers an alternative to chlorine-based sprays, which can tarnish foods and are banned for organic produce.

"Using nanoscale water droplets to inactivate pathogenic bacteria is an innovative approach, and these early results show its effectiveness and great potential for improving the microbial safety of food supply as well as the sanitation of food processing surfaces," Hongda Chen, acting deputy director at the US Department of Agriculture's National Institute of Food and Agriculture, wrote in an e-mail.

Following a harvest, farmers have a handful of options to sterilize produce. The popular choices are chemical spritzes laced with chlorine- or quaternary ammonium compounds, which can eliminate bacteria in seconds. These sprays, however, can leave behind residues that ruin the food's taste or cause skin irritation for handlers. Some food suppliers opt instead for ultraviolet (UV) irradiation, but that can retard ripening and alter food color. These disinfection techniques are often applied only once and don't necessarily safeguard against microbes picked up during transport.

So nanoengineer Philip Demokritou of the Harvard School of Public Health and his colleagues devised a device for turning water vapor into nanoparticles that tear bacteria apart. The gadget sports a gold-plated electrode, which is cooled to condense water on its microsized tip. A second concentric electrode hovers 5 millimeters below. When activated, electric charges build in the water, drawing liquid toward the circular electrode. Surface tension, however, grips the droplets to the gold tip, until the strain becomes too much, and an aerosolized mist of water nanoparticles spews forth. During the process, some water reacts with air molecules to produce reactive oxygen species (ROS).

"We take the water and restructure it," Demokritou told *The Scientist*. "And [the resulting] ions are then encapsulated by the water nanostructures." The team previously found that the charged coatings of water nanoparticles adhere to bacteria, and that subsequent exposure to ROS shatters the microbes' membranes.

For this latest study, the team placed cherry tomatoes and stainless steel cutting boards inside a chamber, exposing both to three typical foodborne bacteria—*Escherichia coli*, *Salmonella enterica*, and *Listeria innocua*. The team then filled the boxes with their nanobombs, and in each scenario, disinfected the fruits and steel surfaces.

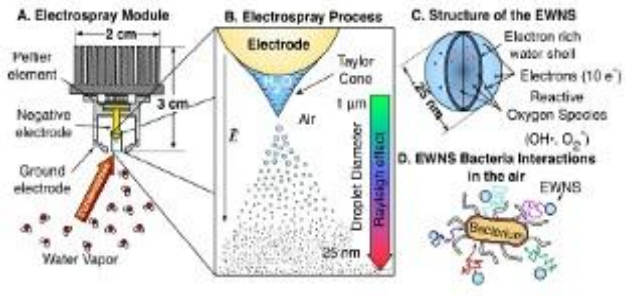
The disinfection results, noted Chen, are comparable to those achieved using existing technologies. "This is exciting and promising," he said.

"Consumers want more chemical-free, biofriendly approaches for their food. With this method, there are no residues to worry about, and in three to four hours, everything becomes water vapor again," said Demokritou. Two years ago, a preliminary investigation showed that mice could inhale much higher doses of these water nanobombs without adverse health effects.

While promising, the approach does have its limitations, explained food scientist Donald Schaffner of Rutgers University in New Jersey, who was not involved in the study.

"The food industry does not have the money to spend on interventions that take significant time, and the amount needed for (bacterial) reduction here is quite significant—on the order of one hour or more," Schaffner said.

To boost disinfection rates, Demokritou and his colleagues will continue to tweak how they apply the nanoparticles. In this study, for instance, the team tried two types of dispersal: one passive approach—filling the chamber with nanobombs—and a more targeted method—using a charged metal plate underneath tomatoes to attract the nanoparticles. The latter resulted in a higher rate of disinfection.



Engineered water nanostructures (EWNS) schematicG. PYRGIOTAKIS ET AL.

Because the setup simply uses water vapor, Demokritou explained it could be applied at several places along the food production chain—at the farm, on a transport truck, or even as an invisible mist in the grocery aisle.

Source: www.the-scientist.com

ONLINE REPORTS ON MICROORGANISMS

Key Facts about Swine Influenza

Get all of your questions answered about the swine flu, from common symptoms to treatment options.

What is swine influenza?

Swine influenza (swine flu) is a respiratory disease of pigs caused by type A influenza virus that regularly causes outbreaks of influenza in pigs. Swine flu viruses cause high levels of illness and low death rates in pigs. Swine influenza viruses may circulate among swine throughout the year, but most outbreaks occur during the late fall and winter months similar to outbreaks in humans. The classical swine flu virus (an influenza type A H_1N_1 virus) was first isolated from a pig in 1930.

How many swine flu viruses are there?

Like all influenza viruses, swine flu viruses change constantly. Pigs can be infected by avian influenza and human influenza viruses as well as swine influenza viruses. When influenza viruses from different species infect pigs, the viruses can reassort (i.e. swap genes) and new viruses that are a mix of swine, human and/or avian influenza viruses can emerge. Over the years, different variations of swine flu viruses have emerged. At this time, there are four main influenza type A virus subtypes that have been isolated in pigs: H_1N_1, H_1N_2, H_3N_2, and H_3N_1. However, most of the recently isolated influenza viruses from pigs have been H_1N_1 viruses.

Swine Flu in Humans

Can humans catch swine flu?

Swine flu viruses do not normally infect humans. However, sporadic human infections with swine flu have occurred. Most commonly, these cases occur in persons with direct exposure to pigs (e.g. children near pigs at a fair or workers in the swine industry). In addition, there have been documented cases of

one person spreading swine flu to others. For example, an outbreak of apparent swine flu infection in pigs in Wisconsin in 1988 resulted in multiple human infections, and, although no community outbreak resulted, there was antibody evidence of virus transmission from the patient to health care workers who had close contact with the patient.

How common is swine flu infection in humans?

In the past, CDC received reports of approximately one human swine influenza virus infection every one to two years in the United States.

What are the symptoms of swine flu in humans?

The symptoms of swine flu in people are similar to the symptoms of regular human seasonal influenza and include fever, lethargy, lack of appetite and coughing. Some people with swine flu also have reported running nose, sore throat, nausea, vomiting and diarrhea.

Can people catch swine flu from eating pork?

No. Swine influenza viruses are not transmitted by food. You cannot get swine influenza from eating pork or pork products. Eating properly handled and cooked pork and a pork product is safe. Cooking pork to an internal temperature of 160°F kills the swine flu virus, as it does other bacteria and viruses.

How does swine flu spread?

Influenza viruses can be directly transmitted from pigs to people and from people to pigs. Human infection with flu viruses from pigs are most likely to occur when people are in close proximity to infected pigs, such as in pig barns and livestock exhibits housing pigs at fairs. Human-to-human transmission of swine flu can also occur. This is thought to occur in the same way as seasonal flu occurs in people, which is mainly person-to-person transmission through coughing or sneezing of people infected with the influenza virus. People may become infected by touching something with flu viruses on it and then touching their mouth or nose.

What do we know about human-to-human spread of swine flu?

In September 1988, a previously healthy 32-year-old pregnant woman was hospitalized for pneumonia and died eight days later. A swine H_1N_1 flu virus was detected.

Four days before getting sick, the patient visited a county fair swine exhibition where there was widespread influenza-like illness among the swine.

In follow-up studies, 76% of swine exhibitors tested had antibody evidence of swine flu infection but no serious illnesses were detected among this group. Additional studies suggest that one to three health care personnel who had contact with the patient developed mild influenza-like illnesses with antibody evidence of swine flu infection.

How can human infections with swine influenza be diagnosed?

To diagnose swine influenza A infection, a respiratory specimen would generally need to be collected within the

Researchers connect climate change to food safety

Climate change can affect our food safety in a number of ways. In a European study, researchers at Wageningen University and Ghent University (Belgium) state that there is often a relationship between long-term changes in temperature and rainfall and vegetable and fruit contamination. For example, flooding may result in increased concentrations of harmful bacteria that can be quickly broken down again by UV light. Similarly, in one region fungi that produce toxins may increase due to global warming, while they decrease in other regions. The researchers have published their findings in a special issue of the scientific journal Food Research International that they edited.

In the future, in a changing climate, will we be able to continue eating safe vegetables and fruit or will this come under pressure? This is the question asked by the Ghent and Wageningen researchers. They have brought together the latest information and scientific findings on the impact of climate change on food safety in the special issue. The special issue was initiated by researchers and includes several papers from the Veg-i-Trade project financed by the European Union.

These are the first studies into the relationship between climate change and food safety. The researchers find that there is every reason to expand this research. They believe that more scenario analyses, which have been used for years in climate study in general, should also be included in food safety research. One of the first scenario analyses was included in the Veg-i-Trade study.

Field studies and statistical analyses within the Veg-i-Trade project show that there is in fact often a relationship between vegetable and fruit contamination and climate variables such as temperature and rainfall. A preliminary study into toxic substances from fungi shows, for example, that an increased risk of contamination of tomatoes may be expected at the end of the 21st century in Poland. In Spain, however, it will be too hot then for this kind of fungi, so the risk of contamination will be lower. Another study shows that in a flooded lettuce field the likelihood of flooding is increased by climate change, resulting in higher concentrations of harmful bacteria. UV light will then cause these concentrations to decrease again rapidly.

One of the conclusions from a study into possible forms of adaptation to climate change is that adaptation to future climate change will have to be very different for different countries, sectors and companies. According to this research the focus here will have to be on increasing the adaptive capacity.

Veg-i-Trade The Ghent-Wageningen overview research forms parts of the European project Veg-i-Trade. From May 2010 to April 2014, 22 partners (universities, research centres, SMEs and major industrial partners) from ten countries carried out research into viruses such as the norovirus, bacteria such as Salmonella and E. coli, and fungal and pesticide residues on fresh vegetables and fruit. Veg-i-Trade studies the possible effects of globalisation and climate change on the food safety of these fresh products.

Source: www.sciencedaily.com

first four to five days of illness (when an infected person is most likely to be shedding virus). However, some people, especially children, may shed virus for 10 days or longer. Identification as a swine flu influenza A virus requires sending the specimen to CDC for laboratory testing.

What medications are available to treat swine flu infections in humans?

There are four antiviral drugs that are licensed for use in the United States for the treatment of influenza: amantadine, rimantadine, oseltamivir and zanamivir. While most swine influenza viruses have been susceptible to all four drugs, the most recent swine influenza viruses isolated from humans are resistant to amantadine and rimantadine. At this time, CDC recommends the use of oseltamivir or zanamivir for the treatment and/or prevention of infection with swine influenza viruses.

What other examples of swine flu outbreaks are there?

Probably the most well known is an outbreak of swine flu among soldiers in Fort Dix, N.J. in 1976. The virus caused disease with X-ray evidence of pneumonia in at least four soldiers and one death; all of these patients had previously been healthy. The virus was transmitted to close contacts in a basic training environment, with limited transmission outside the basic training group. The virus is thought to have circulated for a month and disappeared. The source of the virus, the exact time of its introduction into Fort Dix, and factors limiting its spread and duration are unknown. The Fort Dix outbreak may have been caused by introduction of an animal virus into a stressed human population in close contact in crowded facilities during the winter. The swine influenza A virus collected from a Fort Dix soldier was named A/New Jersey/76 ($Hsw_1\mathbf{N_1}$).

Is the H_1N_1 swine flu virus the same as human H_1N_1 viruses?

No. The H_1N_1 swine flu viruses are antigenically very different from human H_1N_1 viruses and, therefore, vaccines for human seasonal flu would not provide protection from H_1N_1 swine flu viruses.

Swine Flu in Pigs

How does swine flu spread among pigs?

Swine flu viruses are thought to be spread mostly through close contact among pigs and possibly from contaminated objects moving between infected and uninfected pigs. Herds with continuous swine flu infections and herds that are vaccinated against swine flu may have sporadic disease, or may show only mild or no symptoms of infection.

What are signs of swine flu in pigs?

Signs of swine flu in pigs can include sudden onset of fever, depression, coughing (barking), discharge from the nose or eyes, sneezing, breathing difficulties, eye redness or inflammation, and going off feed.

How common is swine flu among pigs?

H_1N_1 and H_3N_2 swine flu viruses are endemic among pig populations in the United States and something that the industry deals with routinely. Outbreaks among pigs normally occur in colder weather months (late fall and winter) and sometimes with the introduction of new pigs into susceptible herds. Studies have shown that the swine flu H_1N_1 is common throughout pig populations worldwide, with 25 percent of animals showing antibody evidence of infection. In the United States studies have shown that 30 percent of the pig population has antibody evidence of having had H_1N_1 infection. More specifically, 51 percent of pigs in the north-central United States have been shown to have antibody evidence of infection with swine H_1N_1. Human infections with swine flu H_1N_1 viruses are rare. There is currently no way to differentiate antibody produced in response to flu vaccination in pigs from antibody made in response to pig infections with swine H_1N_1 influenza.

While H_1N_1 swine viruses have been known to circulate among pig populations since at least 1930, H3N2 influenza viruses did not begin circulating among U.S. pigs until 1998. The H_3N_2 viruses initially were introduced into the pig population from humans. The current swine flu H_3N_2 viruses are closely related to human H_3N_2 viruses.

Is there a vaccine for swine flu?

Vaccines are available to be given to pigs to prevent swine influenza. There is no vaccine to protect humans from swine flu. The seasonal influenza vaccine probably will help provide partial protection against swine H_3N_2, but not swine H_1N_1 viruses.

Source: www.everydayhealth.com

Gut bacteria byproduct linked to chronic kidney disease for the first time

TMAO has been linked to heart disease already, with blood levels shown to be a powerful tool for predicting future heart attacks, stroke and death. TMAO forms in the gut during digestion of choline and carnitine, nutrients that are abundant in animal products such as red meat and liver. Choline is also abundant in egg yolk and high-fat dairy products.

The research team was led by Stanley Hazen, M.D., Ph.D., Chair of the Department of Cellular & Molecular Medicine for the Lerner Research Institute and section head of Preventive Cardiology & Rehabilitation in the Miller Family Heart and Vascular Institute at Cleveland Clinic, and W.H. Wilson Tang, M.D., Department of Cardiovascular Medicine in the Miller Family Heart and Vascular Institute and Lerner Research Institute. The research was published online on January 29th and in the January 30th print edition of *Circulation Research*.

According to the Centers for Disease Control and Prevention, more that 20 million Americans are estimated to have chronic kidney disease, many of whom are undiagnosed. It is caused by a gradual loss of kidney function over time. As the disease worsens, waste products can accumulate in the blood and can be fatal without interventions. It has long been known that patients with chronic kidney disease are at an increased risk for cardiovascular disease, but the exact mechanisms linking the two diseases are not known. This newly discovered TMAO link offers further insight into the relationship between cardiovascular disease and chronic kidney disease.

"It's a triple whammy" said Dr Hazen. "Elevated plasma TMAO levels in subjects are linked to future cardiac risks, and in subjects with normal renal function, elevated levels predict long-term future risk for development of chronic kidney disease; animal model studies show that long-term exposure to higher levels of TMAO promotes renal functional impairment and atherosclerosis; and as the kidneys lose function, TMAO isn't eliminated as easily, and levels further rise, increasing cardiovascular and kidney disease risks further."

Drs. Hazen and Tang measured fasting TMAO levels in 521 patients with chronic kidney disease and in 3,166 subjects without chronic kidney disease, following all subjects over five years. They found that TMAO levels were higher in patients with chronic kidney disease, and elevated TMAO levels were associated with greater mortality risk in both subject groups. In animal models, the researchers also found that chronic dietary exposures to choline and TMAO were associated with development and progression of chronic kidney disease. Further studies are needed to determine if dietary interventions can delay disease progression of both chronic kidney disease and associated cardiovascular disease.

"Our studies raise the exciting prospects of nutritional interventions to help retard development and progression of chronic kidney disease. Regrettably, very little is known about diet and renal disease progression," said Dr. Tang.

This research strongly implies the need to focus preventive efforts on dietary interventions and therapeutic targeting of gut microbiota-dependent TMAO pathways, potentially to halt development and progression of chronic kidney disease, as well as cardiovascular disease risks.

Source: www.sciencedaily.com

Release of Newsletter in Vernacular Language (TAMIL)
by
Shri. M. Kannan, IES, Economic Advisor, MoEF, New Delhi.

Regional Evaluation & Training Workshop (Southern region) held at Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore | 05 - 06, February, 2015.ENVIS Co-ordinator Dr. N. Munuswamy is seen at the extreme right.

Abstracts of Recent Publications

01. Journal of Arid Environments, 2015, **112**, Page: 127 – 133.

Desert crust microorganisms their environment and human health. James T. Powell, Aspassia D. Chatziefthimiou, Sandra Anne Banack, Paul Alan Cox, James S. Metcalf.

Institute for Ethnomedicine, P. O. Box 3464, Jackson, WY 83001, USA.

This article reviews current knowledge on cyanobacteria, the dominant primary producers, and other microorganisms in arid desert environments. These microorganisms have developed an array of adaptations to hot, arid climates with intense UV radiation, extreme diurnal temperature fluctuations, and high soil salinity. Crust microorganisms positively contribute to their harsh ecosystems, by preventing evapotranspiration, fixing nitrogen, and blocking solar radiation. In doing so, desert crust prevents soil erosion and facilitates the establishment of plant species. However, like aquatic cyanobacteria, desert cyanobacteria have the potential to produce toxins linked to human and animal illness. Furthermore, the impact of terrestrial cyanobacterial toxins on human health in desert regions is poorly understood. A largely ignored, but potentially important human exposure route for cyanotoxins in desert environments is through the inhalation of desert crusts during dust storms and anthropogenic activity. Future work in this field should include the characterization of toxins produced in desert regions as well as the presence of toxins in clinical and environmental materials.

Keywords: Arid climates; Biological soil crust; Cyanobacteria; Desert environment; Inhalation; Review; Toxins

02. International Journal of Astrobiology, 2015, **14**, Page: 137 – 142.

Study of the effects of the outer space environment on dormant forms of microorganisms, fungi and plants in the 'Expose-R' experiment. N. Novikova, E. Deshevaya, M. Levinskikh, N. Polikarpov, S. Poddubko, O. Gusev and V. Sychev.

RF SRC – Institute of Biomedical Problems, Russian Academy of Sciences, Moscow, Russia.

Investigations of the effects of solar radiation combined with the spaceflight factors on biological objects were performed in the «EXPOSE-R» experiment on the outer surface of ISS. After more than 1 year of outer space exposure, the spores of microorganisms and fungi, as well as two species of plant seeds were analysed for viability and the set of biological properties. The experiment provided evidence that not only bacterial and fungal spores but also dormant forms of plants had the capability to survive a long-term exposure to outer space.

Keywords: air-dried seeds; dormant forms of various microorganisms; outer space; planetary quarantine

03. Environmental Microbiology: Fundamentals and Applications, 2015, Page: 619 – 658.

Environmental and Human Pathogenic Microorganisms. Philippe Lebaron, Benoit Cournoyer, Karine Lemarchand, Sylvie Nazaret, Pierre Servais.

Université de Toulon, Aix-Marseille Université, Institut Méditerranéen d'Océanologie (MIO), UM 110, CNRS 7294 IRD 235, Cedex 9.

As the study of interactions between pathogenic microorganisms and their environment is part of microbial ecology, this chapter reviews the different types of human pathogens found in the environment, the different types of fecal indicators used in water quality monitoring, the biotic and abiotic factors affecting the survival and the infectivity of pathogenic microorganisms during their transportation in the environment, and the methods presently available to detect rare microorganisms in environmental samples. This chapter exclusively focuses on human pathogens.

Keywords: Pathogens; Wastewater treatment plant; Dissemination; Antibiotic resistance; Environmental reservoirs; Toxins; Sanitary microbiology; Biological pollution.

E - Resources on Microorganisms

NATIONAL

Microbes for Primary Schools
http://www.nationalstemcentre.org.uk/elibrary/collection/1188/microbes-for-primary-schools

Springer protocol
http://www.springerprotocols.com/BookToc/doi/10.1007/978-1-60327-999-4

NCBI Taxonomy
http://www.ncbi.nlm.nih.gov/taxonomy

National Bureau of agriculturally important microorganisms
http://nbaim.org.in/pages/facilities-akmu

INTERNATIONAL

BCCM/LMG Bacteria Collection
http://bccm.belspo.be/about-us/bccm-lmg

International Collection of Microorganisms from Plants (ICMP)
http://www.landcareresearch.co.nz/resources/collections/icmp

NITE Patent Microorganisms Depositary (NPMD)
http://www.nite.go.jp/en/nbrc/patent/npmd/index.html

Brazilian Microbial Resource Centre (BMRC)
http://www.bmrc.Incc.br/

EVENTS
Conferences / Seminars / Meetings 2015

2015 International Conference on Biotechnology and Agriculture Engineering (ICBAE 2015). April 06 - 07, 2015. **Venue:** Kyoto, **Japan. Website:** http://www.icbae.org/

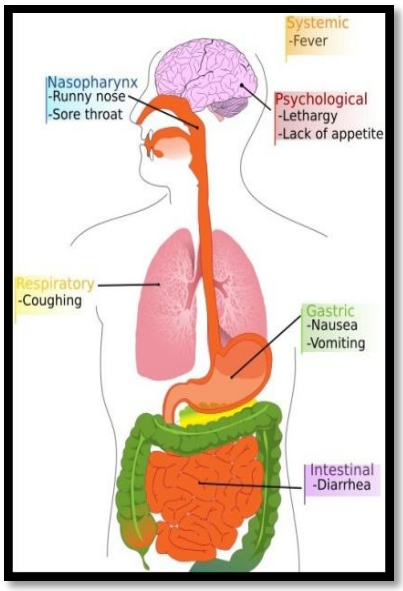
2015 International Conference on Food and Agricultural Engineering (ICFAE 2015). May 12 - 13, 2015. **Venue:** Warsaw, **Poland. Website:** http://www.icfae.org/

Agriculture & Food 2015, 3rd International Conference. June 01 - 05, 2015. **Venue:** Elenite, Burgas, **Bulgaria. Website:** http://www.sciencebg.net/en/conferences/agriculture-and-food/

2015 International Conference on Food, Ecological and Life Sciences (FELS-2015) June 15-16, 2015 Bangkok, Thailand. June 15 - 16, 2015. **Venue:** Bangkok, **Thailand.**
Website: http://fels.eacbee.org/

The 8th Asian Conference on Lactic Acid Bacteria. July 08 - 10, 2015. **Venue:** Bangkok, **Thailand.**
Website: http://www.aclab8.kasetsart.org/index2.php

Facts About Swine Flu



Symptoms of swine flu.

H_1N_1 or swine flu can be very dangerous to get a hold of. While the normal flu season usually happens during the winter months as well as early spring, this type of flu can be spread during much warmer temperatures. It is still unknown as to whether or not the colder weather will make this flu much more prevalent. Research for a suitable vaccination is still ongoing. If you want to know more about swine flu, take a look at these interesting facts.

Three strains of swine flu

At present, there are three different strains of the swine flu. It can affect humans, birds and pigs equally. Pigs had the predecessor to the swine flu over ten years ago. The genetic makeup has now gotten the genes that make it very dangerous to humans. It can cross species from pig to human and back.

Occurrence of swine flu

According to the CDC, the occurrences of Swine Flu in a human being are less than one percent every one to two years. However, as of March 26th, 2011 the total pediatric deaths from this were reported at four. One hundred fourteen cases were reported as positive, which is 21.7 percent of the positive specimens during week twelve.

Symptoms of swine flu

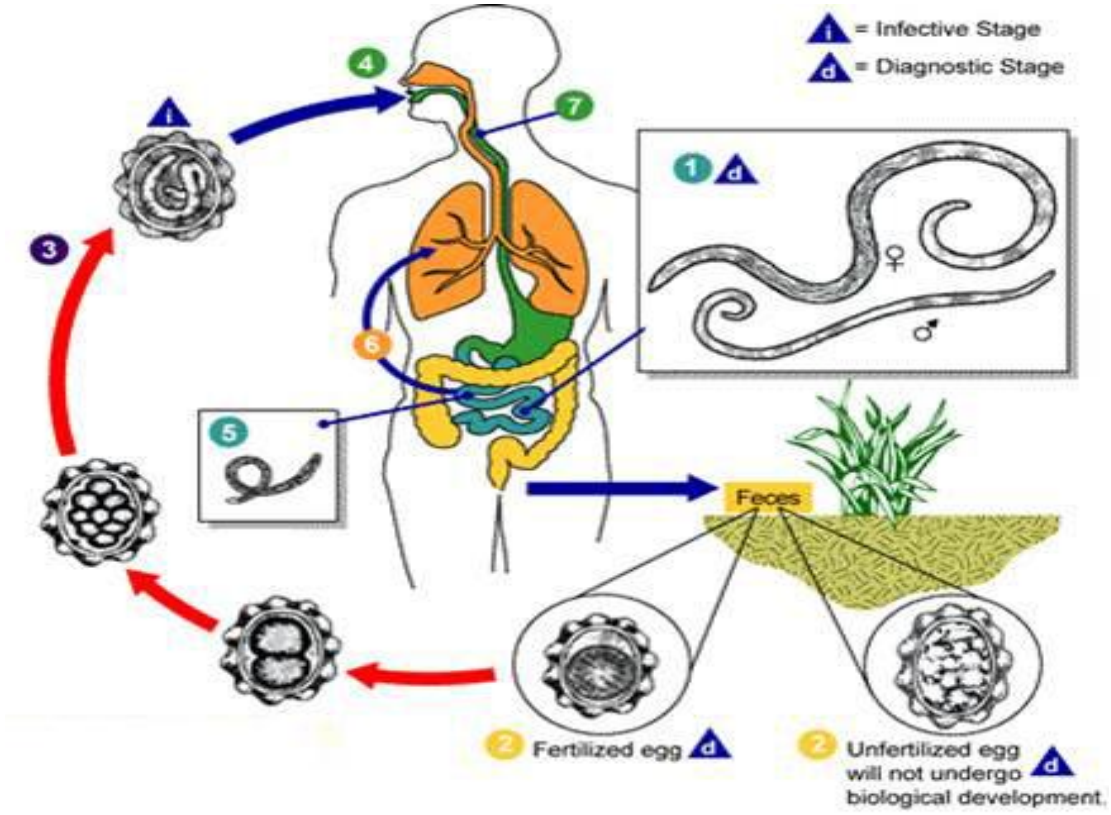
Symptoms of this type of flu closely mimic those of regular flu such as coughing, lethargy, nausea, vomiting, fever, runny nose and sore throat. It takes a doctor to truly diagnose someone with the swine flu. This can be spread one of two ways, human to human contact or pig to human contact.

Treatments for swine flu

At present, there are four different medications that can help with a swine flu infection and those are of the antiviral category namely Zanamivir, Amantadine, Oseltamivir and Rimantadine. However, two of those are resistant to the human strain of the virus and those are Rimantadine and Amantadine. The other two are recommended for use in persons having the swine flu. This is the official advice from CDC when it comes to treating swine flu.

Source: fun.yukozimo.com/facts-about-swine-flu

Ascariasis
(*Ascaris lumbricoides*)



Happy New Year

International Year of Soils 2015

Environmental Calendar

World Wetlands Day	February 2
World Sparrow Day	March 20
World Forestry Day	March 21
World Water Day	March 22
Earth Day	April 22
World Biodiversity Day	May 22
World Environment Day	June 5
World Oceans Day	June 8
Global Wind Day	June 15
World Population Day	July 11
International Tiger Day	July 29
World Elephant Day	August 12
International Day for the Preservation of the Ozone Layer	September 16
Clean Up the World	September 16-18
World Environmental Health Day	September 26
World Tourism Day	September 27
World Habitat Day	October 6
International Day of Climate Action	October 24
World Soil Day	December 5
International Mountain Day	December 11