JOURNAL OF
HYGIENE SCIENCES
Committed to the advancement of Clinical & Industrial Disinfection & Microbiology
VOLUME - XI ISSUE - V DEC 2018 - JAN 2019

Editorial

Contents

Mini Review Section: Enterobacteriaceae are a large family of Gram-negative, non-spore-forming bacilli found in soil and water, as well as in plants and in animals, both vertebrates and invertebrates. In diagnostic clinical microbiology laboratories, it is usual to attempt identification by use of biochemical tests. This article describes the identification of members of the family Enterobacteriaceae.

Current Trends: Environmental monitoring describes the microbiological testing undertaken in order to detect changing trends of microbial counts and micro-flora growth within clean rooms or controlled environments. Environmental monitoring represents an important means by which the effectiveness of contamination control measures can be assessed and the specific threats to the purity of products being manufactured can be identified. The results of environmental monitoring must be considered when making the decision whether a production batch can be released.

In Profile: Khem Shahani (1923–2001) was a microbiologist who conducted pioneer research on probiotics (live microorganisms). Khem Shahani is best known for his discovery of the DDS-1 strain of *Lactobacillus acidophilus* in 1959, at the University of Nebraska-Lincoln. One of his many contributions to biology in the years to come, in this landmark discovery, Shahani observed the high level of stability and nutritional viability of the DDS-1 strain. This unique feature meant that the probiotics were able to pass through the stomach acid and implant in the intestine where it could multiply over 200-fold.

Bug of the Month: Your body contains trillions of bacteria. The majority of these bacteria are located in your intestines. Gut bacteria play several important roles in your health, such as communicating with your immune system and producing certain vitamins. Your gut bacteria can also affect how different foods are digested and produce chemicals that help make you feel full. As a result, they can affect your weight. This article explains how your gut bacteria affect your weight.

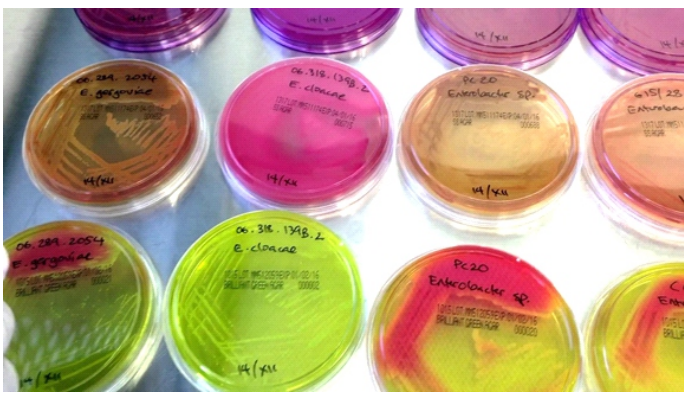
Best Practices: Burn care is conducted by members of a multidisciplinary burn team which include medical, surgical, intensive care, nursing, physiotherapy, occupational therapy, dietetics, social work, psychiatry, psychology, speech therapy, pharmacy and technicians. A multidisciplinary approach to burn management is essential for optimal functional and cosmetic outcome.

Scratch your minds to solve the Brain Teasers & also enjoy the light humour in our **Relaxed Mood** section…….

We thank you for appreciating the contents, format and presentation of this Journal & we strive towards continuously improving our efforts. Looking forward for your feedback & suggestions.

Bacteriology - Elementary Identification of Enterobacteriaceae (Issue 1)

This article describes the identification of members of the family Enterobacteriaceae. There are a large number of species included in the family. In diagnostic clinical microbiology laboratories, it is usual to attempt identification by use of biochemical tests. The level of identification depends on the site of infection, the immune status of the host and the need for epidemiological surveillance.



Because of the large number of species involved, this article will focus on the most common genera and species isolated from clinical specimens. The identification of Enterobacteriaceae can be simplified by taking advantage of the fact that three species comprise 80-95% of all isolates in the clinical setting. These are *Escherichia coli, Klebsiella pneumoniae* and *Proteus mirabilis*. The other species can be easily identified using biochemical tests.

Introduction

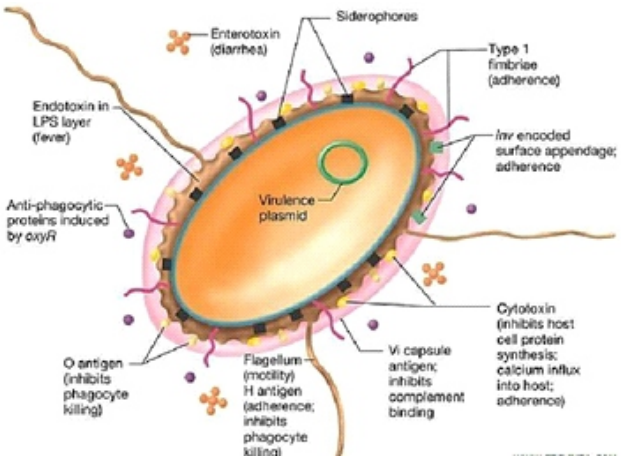
The Enterobacteriaceae are a large family of Gram-negative, non-spore-forming bacilli found in soil and water, as well as in plants and in animals, both vertebrates and invertebrates.

Taxonomy

Taxonomically, the bacterial family Enterobacteriaceae currently has 53 genera (and over 170 named species) and they include *Arsenophonus, Biostraticola, Brenneria, Buchnera, Budvicia, Buttiauxella, Calymmatobacterium, Cedecea, Citrobacter, Cosenzaea, Cronobacter, Dickeya, Edwardsiella, Enterobacter, Erwinia, Escherichia, Ewingella, Gibbsiella, Hafnia, Klebsiella, Kluyvera, Leclercia, Leminorella, Levinea, Lonsdalea, Mangrovibacter, Moellerella, Morganella, Obesumbacterium, Pantoea, Pectobacterium, Phaseolibacter, Photorhabdus, Plesiomonas, Pragia, Proteus, Providencia, Rahnella, Raoultella, Saccharobacter, Salmonella, Samsonia, Serratia, Shigella, Shimwellia, Sodalis, Tatumella, Thorsellia, Trabulsiella, Wigglesworthia, Xenorhabdus, Yersinia* and *Yokenella*.

Of these, 26 genera are known to be associated with infections in humans.

The nomenclature of the Enterobacteriaceae is complicated and has been based on biochemical and antigenic characteristics. Recently, the application of new technologies such as DNA hybridization has resulted in numerous changes in classification of the Enterobacteriaceae. Many new genera and species have been discovered, some unusual and rare, and many species have also been reclassified to other genera e.g. the transfer of *Enterobacter sakazakiito* the *Cronobactersakazakii*.



Characteristics

Members of the Enterobacteriaceae are small Gram negative, non-sporing straight rods. Some genera are motile by means of peritrichous flagella except *Tatumella, Shigella* and *Klebsiella* species which are non-motile. They are facultatively anaerobic and most species grow well at 37°C, although some species grow better at 25°C -30°C. They grow well on peptone and meat extract media. Some strains grow on D-glucose as the sole source of carbon and energy, but other strains require vitamins and or amino acids. Acid is produced during the fermentation of D-glucose and other carbohydrates.

They are oxidase negative and catalase reactions vary among Enterobacteriaceae. Nitrates are reduced to nitrites except by some strains of *Erwinia*. They are distributed worldwide and may be found in soil, water, plants, humans and animals.

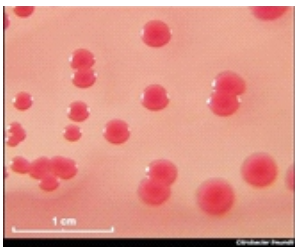
Medically Important Genera of the Family Enterobacteriaceae are discussed below:

Currently, Enterobacteriaceae are known to be responsible for major health problems worldwide. A limited number of species, including *E. coli, K. pneumoniae, Enterobacter aerogenes, Enterobacter cloacae, S.marcescens* and *P. mirabilis*, are responsible for most infections produced by this group of organisms. The increasing incidence of the coliforms, *Proteus*, and other Gram-negative organisms in diseases reflects in part a better understanding of their pathogenic potential but more importantly the changing ecology of bacterial disease. The widespread and often indiscriminate use of antibiotics has created drug-resistant Gram-negative bacilli that readily acquire multiple resistances through transmission of drug resistance plasmids (R factors). Also, development of new surgical procedures, health support technology, and therapeutic regimens has provided new portals of entry and compromised many host defenses.

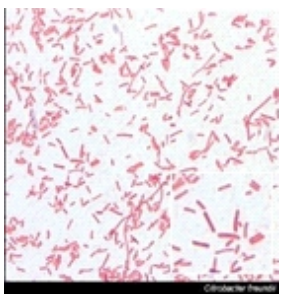
Citrobacter species

There are 11 species of which 10 have been recovered from

clinical material. They may be found in the faeces of humans and animals as part of the normal flora and grow readily on ordinary media.

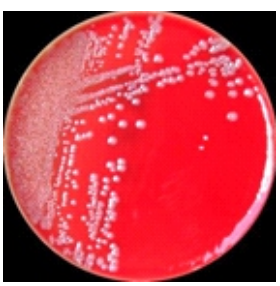


Cells are short rods arranged singly, in pairs, or in short chains with rounded ends. They are motile with peritrichous flagella. Colonies are generally grey, smooth and moist although mucoid or rough strains occur. Some strains of *Citrobacter* resemble *Salmonella* species biochemically and agglutinate with *Salmonella* polyvalent antisera, which may lead to misidentification.

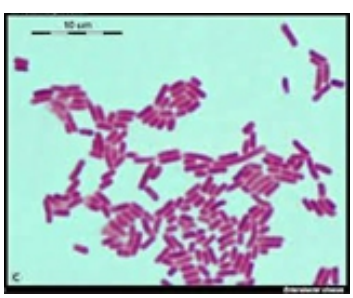


They are positive for indole, catalase and nitrate reduction tests. Acid and gas is produced from aesculin, arabinose, glucose, galactose, glycerol, inositol, lactose, levulose, maltose, mannitol, mannose, raffinose, rhamnose, salicin, sorbitol, starch, sucrose, trehalose, and xylose.

Enterobacter species



There are 26 species and two subspecies, of which recently, six have been reclassified to other genera. Only 10 have been isolated from clinical material8. They grow readily on ordinary media, ferment glucose with the production of acid and gas, and are motile by peritrichous flagella. Some strains with a K antigen possess a capsule. Colonies of *Enterobacter* strains may be slightly mucoid. They are catalase positive and oxidase negative. Nitrates are also reduced. They also ferment glucose and lactose with the production of acid and gas.

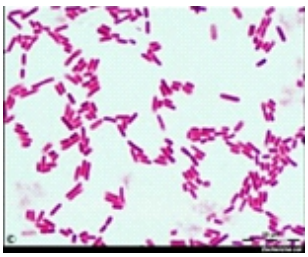


Enterobacter has the general characteristics of *Klebsiella* species but can be differentiated because they are motile and ornithine positive.

Enterobacter species are widely distributed in nature. They are found in the soil, water, dairy products, and in the intestines of animals as well as humans.

Escherichia species

There are five species and all are known to cause human disease. Cells are typically rod-shaped, non-spore forming, motile with peritrichous flagella or non-motile, and are about 2.0µm long and 0.25 - 1.0µm in diameter. They are able to grow under aerobic and anaerobic conditions. Optimal growth occurs at 37°C. On MacConkey agar, colonies are either red or colourless and about 2 - 3mm in diameter. They are catalase positive and oxidase negative. Nitrates are also reduced.

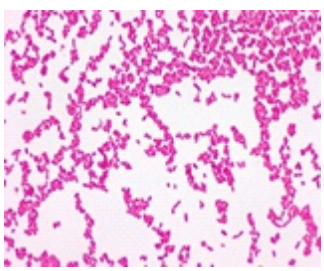


The most commonly isolated is *Escherichia coli*, which contains numerous serotypes, some of which are associated with specific diseases. A number of strains of *E. coli* may produce enterotoxins or other virulence factors, including those associated with invasiveness. Some strains are capsulated with a K antigen.

Hafnia species

The genus *Hafnia* currently has two species. The optimum temperature for growth is 35°C. It grows readily on ordinary media and is generally motile. Motility is more pronounced at 30°C than 37°C. *H. alvei* can resemble non-motile *Salmonella* biochemically, and can agglutinate in polyvalent salmonella antisera.

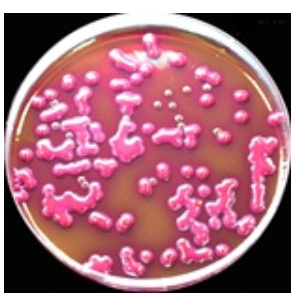
On moderately selective agars, they typically appear as large, smooth, convex, translucent colonies of 2 - 3 mm in diameter with an entire edge; some may exhibit an irregular border. Some strains of *Hafnia* also produce red or pink colonies on xylose-lysine-desoxycholate agar.



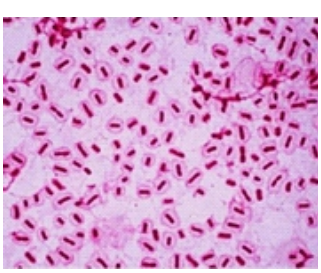
They are oxidase and indole negative and are positive for nitrate reduction and for enterobacterial common antigen.

They also produce acid with or without gas from the metabolism of D-glucose and other carbohydrate or carbohydrate-like compounds.

Klebsiella species



The genus *Klebsiella* contains six species and three sub-species. There are four species related to humans and they include *K. pneumoniae* subspecies *pneumoniae, ozaenae,* and *rhinoscleromatis; K. oxytoca; K. granulomatis* and *K. variicola*. The other two species, *K. singaporensis* and *K. michiganensis* have been isolated from the soil and from a tooth brush holder respectively. The genus consists of over 77 capsular antigens (K antigens), leading to different serogroups.



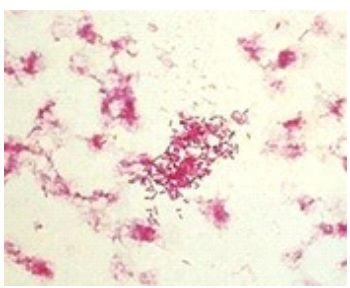
These well-developed polysaccharide capsules give the colonies their characteristic mucoid appearance.

Klebsiella species are non-motile, usually encapsulated rod-shaped bacteria, belonging to the family Enterobacteriaceae. These bacteria produce lysine decarboxylase but not ornithine decarboxylase and are generally positive in the Voges-Proskauer test as well as indole and urease tests. They are generally facultatively anaerobic, and range from 0.3 - 1.0mm in width and

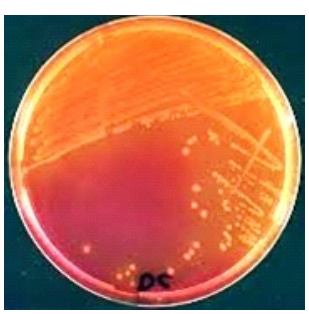
0.6 - 6.0mm in length. All strains grow readily on ordinary media. On MacConkey agar, the colonies typically appear large, mucoid, and red, with red pigment usually diffusing into the surrounding agar, indicating fermentation of lactose and acid production.
They can cause bacteremia and hepatic infections, and have been isolated from a number of unusual infections, including endocarditis, primary gas-containing mediastinal abscess, peritonitis, acute cholecystitis, crepitantmyonecrosis, pyomyositis, necrotizing fasciitis, psoas muscle abscess, fascial space infections of the head and neck, and septic arthritis.

Morganella species

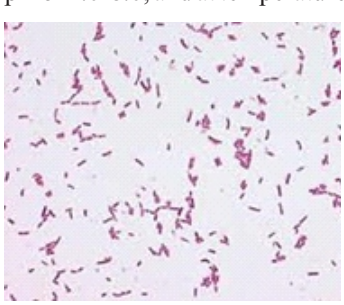
The genus *Morganella* contains two species, and only one is known to cause infections in humans, *Morganella morganii. M. morganii* is divided into two sub species on the basis of their abilities to ferment trehalose. On nutrient agar, colonies are 1 – 2mm in diameter, greyish, and opaque, circular, convex, and smooth with entire edges after 24hr at 35°C. Good growth also occurs at 22°C. They are motile with peritrichous flagella, but some strains do not form flagella above 30°C. *M. morganii* can resemble non-motile *Salmonella* biochemically, and can agglutinate in polyvalent salmonella antisera. They are urease and indole positive as well as oxidase negative. Acid and gas are produced from utilizing glucose. Acid is also produced from mannose, galactose and trehalose. They have been isolated from human clinical specimens (stool, wound, sputum, eye, bile, gastric ulcer, urine).



Plesiomonas shigelloides



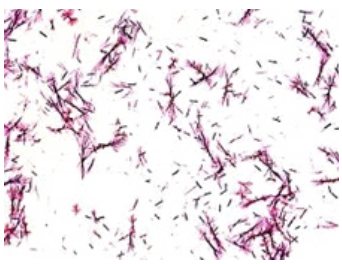
The genus *Plesiomonas* contains one specie, *Plesiomonas shigelloides*. Cells are short Gram negative rods. They are generally 0.3 - 1.0µm in width, 0.6-6.0µm in length, motile with lophotrichous polar flagella, non-spore-producing, and facultatively anaerobic. They are able to grow at salt concentrations of 0-5%, at a pH of 4.0-8.0, and at temperatures of 8 - 44°C.



Plesiomonas shigelloides will grow on most enteric media where they produce non-lactose, non-sucrose fermenting colonies. On Inositol Brilliant Green Bile Agar, they have pink colonies and on blood agar, colonies are 2 - 3mm in diameter, large grey, opaque, and convex, β-haemolytic colonies after incubation at 35-37°C for 16 - 24 hours.
They are also oxidase-positive and catalase-positive and can be distinguished from other Enterobacteriaceae as it is the only oxidase positive genus in this family.
Plesiomonas is negative for DNAse; this and other biochemical tests (Moeller's lysine, ornithine, and arginine tests and fermentation of meso-inositol) distinguish it from *Aeromonas* species.
Some *Plesiomonas* strains share antigens with *Shigella sonnei*, and cross-reactions with *Shigella* antisera occur.
The have been isolated from human clinical specimens - faeces, blood, CSF, wounds, respiratory tract and urine. It has also been isolated from fresh water, freshwater fish, and shellfish and from many types of animals.

Proteus species

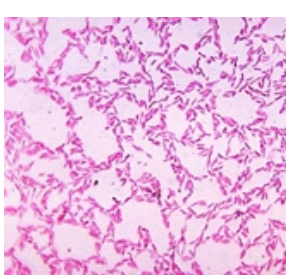
There are four species of *Proteus*, of which three cause disease. Since it belongs to the family of Enterobacteriaceae, general characteristics are applied on this genus. All strains are motile. They may swarm on blood agar, producing concentric zones or an even film. On MacConkey agar, colonies are colourless, flat, often swarm slightly and are 2-3mm in diameter (this is specific to *Proteus vulgaris* and *Proteus mirabilis*). Other species do not swarm. They are resistant to polymyxin B and colistin. *Proteus* species can resemble non-motile *Salmonella* biochemically, and can agglutinate in polyvalent salmonella antisera. *Proteus* species do not ferment lactose, but have shown to be capable lactose fermenters depending on the species in a triple sugar iron (TSI) test. They are also oxidase negative but catalase and nitrate positive. Other specific tests are the urease (which is an essential test to differentiate *Proteus* from *Salmonella*) and phenylalanine deaminase tests. All strains are urease positive.



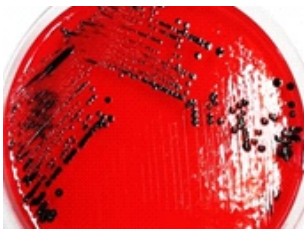
They have been isolated from human faeces, urine, abdominal, neck, groin, and hip wounds, infected conjunctiva, sacral decubitus, and sputum.

Providencia species

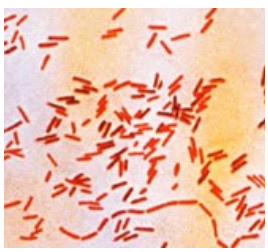
The genus *Providencia* was originally established for organisms similar to *Proteus* species that were urease negative. There are eight species within the genus, of which three cause disease. All species are motile. On blood agar and MacConkey agar, colonies are colourless, flat, 2 - 3mm in diameter and do not swarm. They do not ferment lactose and little gas is produced from fermentable carbohydrates. They do not produce hydrogen sulphide and urea is not hydrolysed. They are resistant to polymyxin B and colistin. Human isolates of *Providencia* species have been recovered from urine, throat, perineum, axilla, stool, blood, and wound specimens.



Salmonella species



Salmonella is a genus of rod-shaped (bacillus). The two species of *Salmonella* are *Salmonella enterica* and *Salmonella bongori*. *S. enterica* is the type species and is further divided into six sub-species that include over 2,600 serotypes. Most sub-species of *Salmonella* produce hydrogen sulfide, which can readily be detected by growing them on media containing ferrous



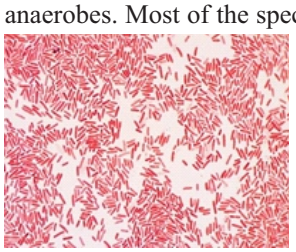
sulfate, such as is used in the triple sugar iron test and XLD Agar. Rappaport Vassiliadis Soya Peptone Broth (RVS broth) can be used to enrich for *Salmonella* species for detection in a clinical sample.

Most infections are due to ingestion of food contaminated by animal feces, or by human feces. *Salmonella* serotypes can be divided into two main groups—typhoidal and non-typhoidal. Non-typhoidal serotypes are more common, and usually cause self-limiting gastrointestinal disease.

For identification of *Salmonella* species, many rapid confirmation and identification methods have been developed. Biochemical confirmation can be accomplished using commercial identification systems. Rapid immunological identification and confirmation tests based on latex agglutination, enzyme immunoassay (EIA) and enzyme-linked immunosorbent assay (ELISA) have been developed for *Salmonella*, and simple-to-use lateral flow test strips using immune-chromatographic technology have also been developed into commercial products by a number of manufacturers. Laboratories should follow manufacturer's instructions and rapid tests and kits should be validated and be shown to be fit for purpose prior to use.

Serratia species

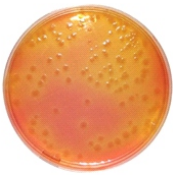
The genus *Serratia* contains 15 species and three subspecies (but only two are commonly isolated from clinical material). They are *Serratia liquefaciens* and *Serratia marcescens*, the latter often producing a pigment called prodigiosin, which ranges in colour from dark red to pale pink, depending on the age of the colonies when grown at 20°C. Pigment production is highly variable among species and is dependent on many factors such as species type and incubation time. Non-pigmented colonies resemble other members of Enterobacteriaceae. The optimal growth temperature is 37°C but they can also grow in temperatures that range from 5 – 40°C. They are facultative anaerobes. Most of the species are motile and have peritrichous



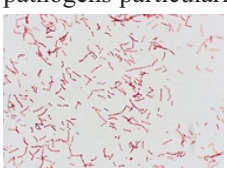
flagella. Cells are rod shaped and 0.5 - 0.8µm x 1.0 - 5.0µm in diameter. Members of the genus characteristically produce three enzymes lipase, DNase and gelatinase. They are also resistant to polymyxin B and colistin and this resistance may be heterogeneous, leading to a target-zone appearance. They are positive for glucose and sucrose (with gas production) fermentation and nitrate test; and negative for indole, urease and oxidase.

Rare reports have described disease resulting from infection with *Serratia plymuthica, Serratia liquefaciens, Serratia rubidaea, Serratia odorifera,* and *Serratia fonticola*. *Serratia* species are found in faeces, wound exudates, respiratory specimen, blood, eye culture, and urine. *Serratia marcescensis* the type species.

Shigella species



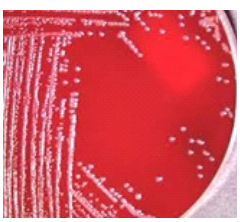
Shigella is a genus of Gram-negative, facultative aerobic, non-spore-forming, non-motile, rod-shaped bacteria genetically closely related to *E. coli*. The causative agent of human shigellosis, *Shigella* causes disease in primates, but not in other mammals. It is only naturally found in humans and gorillas. During infection, it typically causes dysentery. *Shigella* is one of the leading bacterial causes of diarrhea worldwide, causing an estimated 80–165 million cases. A selective medium is recommended for the isolation of enteric pathogens particularly *Salmonella* and *Shigella* species such as



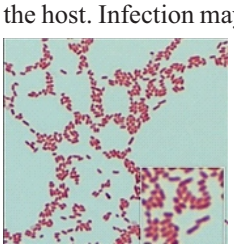
Salmonella–Shigella agar (SSAgar) medium, Desoxycholate citrate agar (DCA) or MacConkey agar (MA).

Shigella infection is typically by ingestion. *Shigella* species generally invade the epithelial lining of the colon, causing severe inflammation and death of the cells lining the colon. This inflammation results in the diarrhea and even dysentery that are the hallmarks of *Shigella* infection. The most common symptoms are diarrhea, fever, nausea, vomiting, stomach cramps, and flatulence. It is also commonly known to cause large and painful bowel movements. The stool may contain blood, mucus, or pus. Hence, *Shigella* cells may cause dysentery.

Yersinia species



Yersinia is a genus of bacteria in the family Yersiniaceae. *Yersinia* species are Gram-negative, coccobacilli bacteria, a few micrometers long and fractions of a micrometer in diameter, and are facultative anaerobes. *Yersinia* is usually urease-positive and motile at 25°C but not at 35°C. It is relatively sensitive to acidic conditions; therefore acid foods and fermented products should be analyzed promptly. A variety of enrichment methods have been described for recovery of *Yersinia enterocolitica* from foods. Highly selective enteric plating media, such as SS Agar have been used for isolation of *Yersinia*. Some members of *Yersinia* are pathogenic in humans; in particular, *Y. pestis* is the causative agent of the plague. Rodents are the natural reservoirs of *Yersinia*; less frequently, other mammals serve as the host. Infection may occur either through blood (in the case of

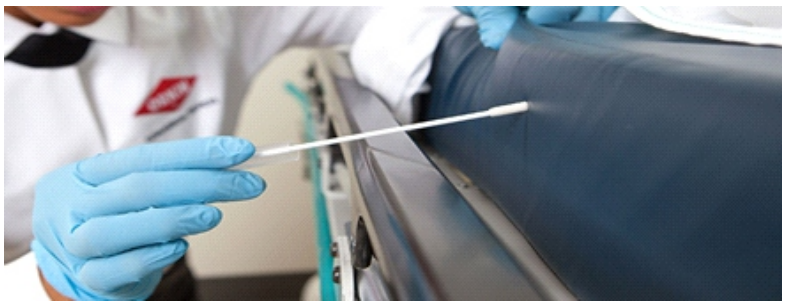


Y. pestis) or in an alimentary fashion, occasionally via consumption of food products (especially vegetables, milk-derived products, and meat) contaminated with infected urine or feces. An interesting feature peculiar to some of the *Yersinia* bacteria is the ability to not only survives, but also to actively proliferate at temperatures as low as 1–4°C (e.g., on cut salads and other food products in a refrigerator). *Yersinia* bacteria are relatively quickly inactivated by oxidizing agents such as hydrogenperoxide and potassium permanganate solutions.

This article compiles briefly the identification of clinically important Enterobacteriaceae, in next issue will discuss the principle and the technical information of the elementary identification of Enterobacteriaceae.

To be continued……

ISO standards for environmental monitoring



Environmental monitoring (EM) represents an important means by which the effectiveness of contamination control measures can be assessed and the specific threats to the purity of products being manufactured can be identified. The results of environmental monitoring must be considered when making the decision whether a production batch can be released.

EM describes the microbiological testing undertaken in order to detect changing trends of microbial counts and micro-flora growth within clean rooms or controlled environments. The results obtained provide information about the physical construction of the room, the performance of the Heating, Ventilation, and Air-Conditioning (HVAC) system, personnel cleanliness, gowning practices, the equipment, and cleaning operations.

Two recent events are changing the way clean rooms are to be designed and monitored. The first is the adoption of the ISO clean room definitions by the US, EU, and subsequently, WHO.

A growing number of hospital environmental services teams are using fluorescent marking gel systems to measure cleaning thoroughness

As soon as a patient is discharged from the hospital, an Environmental Services team swings into action, making certain the room is clean and safe for the next patient."The Environmental Services staff are our partners in both patient flow and patient safety,". They play a critical role in reducing infections, including hospital-acquired infections."

ISO 14000 is a family of standards related to environmental management that exists to help organizations (a) minimize how their operations (processes, etc.) negatively affect the environment (i.e. cause adverse changes to air, water, or land); (b) comply with applicable laws, regulations, and other environmentally oriented requirements; and (c) continually improve in the above.

ISO 14000 is similar to ISO 9000 quality management in that both pertain to the process of how a product is produced, rather than to the product itself. As with ISO 9001, certification is performed by third-party organizations rather than being awarded by ISO directly. The ISO 19011 and ISO 17021 audit standards apply when audits are being performed.

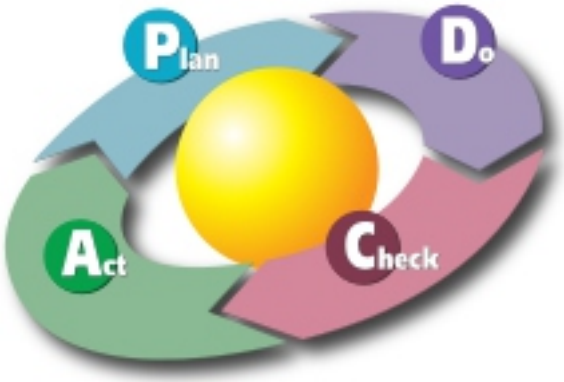
The requirements of ISO 14001 are an integral part of the European Union's Eco-Management and Audit Scheme (EMAS). EMAS's structure and material are more demanding, mainly concerning performance improvement, legal compliance, and reporting duties. The current version of ISO 14001 is ISO 14001:2015, which was published in September 2015.

Development of the ISO 14000 series

The ISO 14000 family includes most notably the ISO 14001 standard, which represents the core set of standards used by organizations for designing and implementing an effective environmental management system (EMS). Other standards in this series include ISO 14004, which gives additional guidelines for a good EMS, and more specialized standards dealing with specific aspects of environmental management. The major objective of the ISO 14000 series of norms is to provide "practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities."

The ISO 14000 series is based on a voluntary approach to environmental regulation. The series includes the ISO 14001 standard, which provides guidelines for the establishment or improvement of an EMS. The standard shares many common traits with its predecessor, ISO 9000, the international standard of quality management, which served as a model for its internal structure, and both can be implemented side by side. As with ISO 9000, ISO 14000 acts both as an internal management tool and as a way of demonstrating a company's environmental commitment to its customers and clients.

Basic principles and methodology



The PDCA cycle

The basic principles of ISO 14001 are based on the well-known Plan-Do-Check-Act (PDCA) cycle.

Plan: Establish objectives and processes required

Prior to implementing ISO 14001, an initial review or gap analysis of the organization's processes and products is recommended, to assist in identifying all elements of the current operation and, if possible, future operations, that may interact with the environment, termed "environmental aspects." Environmental aspects can include both direct, such as those used during manufacturing, and indirect, such as raw materials. This review assists the organization in establishing their environmental objectives, goals, and targets (which should ideally be measurable); helps with the development of control and management procedures and processes; and serves to highlight any relevant legal requirement, which can then be built into the policy.

Do: Implement the processes

During this stage, the organization identifies the resources required and works out those members of the organization responsible for the EMS' implementation and control. This includes establishing procedures and processes, although only one documented procedure is specifically related to operational control. Other procedures are required to foster better management control over elements such as documentation control, emergency preparedness and response, and the education of employees, to ensure that they can competently implement the necessary processes and record results. Communication and participation across all levels of the organization, especially top management, is a vital part of the implementation phase, with the effectiveness of the EMS being dependent on active involvement from all employees.

Check: Measure and monitor the processes and report results

During the "check" stage, performance is monitored and periodically measured to ensure that the organization's environmental targets and objectives are being met. In addition, internal audits are conducted at planned intervals to ascertain whether the EMS meets the user's expectations and whether the processes and procedures are being adequately maintained and monitored.

Act: Take action to improve performance of EMS based on results

After the checking stage, a management review is conducted to ensure that the objectives of the EMS are being met, the extent to which they are being met, and that communications are being appropriately managed. Additionally, the review evaluates changing circumstances, such as legal requirements, in order to make recommendations for further improvement of the system. These recommendations are incorporated through continual improvement: plans are renewed or new plans are made, and the EMS moves forward.

Continual Improvement Process (CI)

ISO 14001 encourages a company to continually improve its environmental performance. Apart from the obvious – the reduction in actual and possible negative environmental impacts – this is achieved in three ways:

- Expansion: Business areas increasingly get covered by the implemented EMS.
- Enrichment: Activities, products, processes, emissions, resources, etc. increasingly get managed by the implemented EMS.
- Upgrading: The structural and organizational framework of the EMS, as well as an accumulation of knowledge in dealing with business-environmental issues, is improved.

Overall, the CI concept expects the organization to gradually move away from merely operational environmental measures towards a more strategic approach on how to deal with environmental challenges.

Classification and environmental monitoring (EM) of clean rooms and laminar flow workstations

Clean room classification schemes

A number of different schemes have existed to define clean rooms. In the past WHO has harmonized its classification and EM requirements to those of the European Union (EU) and more recently with ISO standard 14644-1. Some countries have established their own norms for clean rooms, and others have harmonized to norms established by WHO, the US FDA, the EU, or adopted those set by non governmental organizations such as ISO or PIC/S. As such, manufacturers are often confronted with a large number of conflicting norms to which their facility must conform.

Due to this heterogeneity in national requirements, WHO employs its own GMP code as the basis for assessments of vaccines to be procured for global use. However, it is recognized that certain national standards are similar to those of WHO, and when the manufacturer can demonstrate that such standards provide essentially the same clean room and EM procedures as WHO, this is acceptable as a basis for prequalification.

Clean room classification based on airborne particulates WHO requirements

Maximum permitted airborne particulate concentration per air grade2

Grade	At rest		In operation	
	Max. permitted particles / m3		Max. permitted particles / m3	
	≥5.0 µm	≥5.0 µm	≥5.0 µm	≥5.0 µm
A	3,520	20	3,520	20
B	3,520	29	352,000	2,900
C	352,000	2,900	3,520,000	29,000
D	3,520,000	29,000	Not defined	Not defined

Particulate sampling methods

1. Sampling procedures may be conducted by quality control, quality assurance, production personnel, or other designated personnel or contractors with specialized training and skills to conduct the activity.

2. Particles should be measured by a light-scattering instrument designed to detect airborne particles of defined sizes in a clean room environment. The instrument should have a valid calibration certificate, with the frequency of calibration dependent on the type of instrument and its use; the manufacturer's instructions for calibration and set-up provide valuable information in this regard. Particles of the two size ranges stated in the WHO requirements must be analysed. Isokinetic sample heads should be used in unidirectional airflow systems.
3. Samples should be taken at approximately working levels (guidance value: within 30 cm from operations); where HEPA filters are located distant from operations, or where objects are likely to generate turbulent flow, qualification of HEPA filters may not be representative of the grade of the clean room area. In such cases, additional sampling must be conducted.
4. The connection of the sampling probe to the particle counters should not result in loss of larger particles on tubing surfaces. Where long (> 2 m) connection hoses or hoses with bends are needed, specific sampling devices validated for both particle sizes to be measured should be used.
5. When portable counters are transported between areas, companies must demonstrate the effectiveness of measures taken to avoid cross-contamination. Specially segregated areas, such as for spore-forming microorganisms or microorganisms handled in biosafety facilities, must have dedicated particle counters.

ISO 14001 and EMAS

The latest EMAS Regulation (EMAS III) entered into force; the scheme is now globally applicable, and includes key performance indicators and a range of further improvements

Complementarities and differences

ISO 14001's EMS requirements are similar to those of EMAS. Additional requirements for EMAS include:

- stricter requirements on the measurement and evaluation of environmental performance against objectives and targets
- government supervision of the environmental verifiers
- strong employee involvement; EMAS organizations acknowledge that active employee involvement is a driving force and a prerequisite for continuous and successful environmental improvements.
- **environmental core indicators** creating multi-annual comparability within and between organizations
- mandatory provision of information to the general public
- registration by a public authority

Airlocks are clean room areas to be monitored. The grade of the airlock should correspond to that of the adjoining area with the highest grade. For specialized material airlocks (pass-through boxes), qualification results indicating the number of air changes necessary to reduce particulate and microbial counts to below the regulatory limit (and a strict observance of the time required for such changes during operations) may substitute for routine static and dynamic monitoring. For passthrough boxes too small to admit sampling devices, qualification sampling should be conducted through specially fitted probes. Unqualified, unmonitored material airlocks without HEPA air supply or fumigation capabilities that are connected to grade C or higher clean rooms should not be used.

List of ISO 14000 series standards

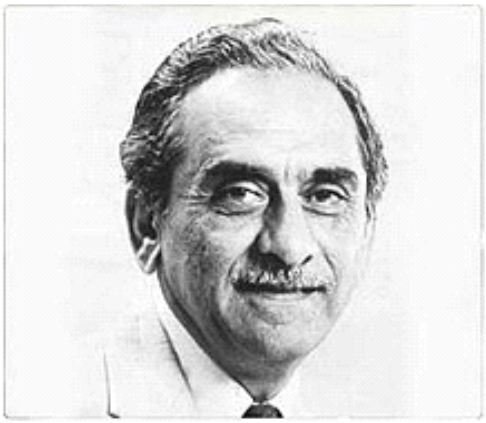
- **ISO 14001** Environmental management systems - Requirements with guidance for use
- **ISO 14004** Environmental management systems - General guidelines on implementation
- **ISO 14006** Environmental management systems - Guidelines for incorporating ecodesign
- **ISO 14015** Environmental management - Environmental assessment of sites and organizations (EASO)
- **ISO 14020 to 14025** Environmental labels and declarations
- **ISO/NP 14030** Green bonds -- Environmental performance of nominated projects and assets; discusses post-production environmental assessment
- **ISO 14031** Environmental management - Environmental performance evaluation - Guidelines
- **ISO 14040 to 14049** Environmental management - Life cycle assessment; discusses pre-production planning and environment goal setting
- **ISO 14046** Environmental management - Water footprint - Principles, requirements and guidelines
- **ISO 14050** Environmental management - Vocabulary; terms and definitions
- **ISO/TR 14062** Environmental management - Integrating environmental aspects into product design and development
- **ISO 14063** Environmental management - Environmental communication - Guidelines and examples
- **ISO 14064** Greenhouse gases; measuring, quantifying, and reducing greenhouse gas emissions
- **ISO 19011** Guidelines for auditing management systems; specifies one audit protocol for both 14000 and 9000 series standards together

Readers are cautioned that views provided here are non-binding and subject to change over time; the official WHO requirements continue to be those approved by the WHO Expert Committee on Biological Standardization and by the WHO Expert Committee on Specifications for Pharmaceutical Products published in the respective WHO Technical Report Series.

REFERENCES:

http://www.who.int/immunization_standards/vaccine_quality/env_monitoring_cleanrooms_final.pdf
https://www.bsigroup.com/en-IN/ISO-14001-Environmental-Management/
https://en.wikipedia.org/wiki/ISO_14000
http://www.inem.org/default.asp?Menue=6
https://www.hfmmagazine.com/articles/1434-hospitals-turn-to-automation-to-aid-in-cleaning
https://news.christianacare.org/2016/06/the-art-and-science-of-ensuring-a-clean-safe-hospital-room/

Khem Sahani



Born: 1 March 1923, India

Died: 6 July 2001, Sicily, Italy

Field: Microbiology

Books: Cultivate Health from Within: Dr.Shahani's Guide to Probiotics

Education: University of Mumbai, University of Wisconsin-Madison

Khem Shahani (1923–2001) was a microbiologist who conducted pioneer research on probiotics (live microorganisms).

CAREER

KhemShahani is best known for his discovery of the DDS-1 strain of *Lactobacillus acidophilus* in 1959, at the University of Nebraska-Lincoln. One of his many contributions to biology in the years to come, in this landmark discovery, Shahani observed the high level of stability and nutritional viability of the DDS-1 strain. This unique feature meant that the probiotics were able to pass through the stomach acid and implant in the intestine where it could multiply over 200-fold. Shahani would later name the strain DDS-1 for the Department of Dairy Science Number One strain and spend the rest of his career unlocking its potential for improving overall health.

During his lengthy career, Shahani published over 200 articles in peer reviewed scientific journals and was a consultant for international agencies such as the World Health Organization.[1] Among these, 80 publications were about Probiotics and Lactic Cultures.[2]

In 1981, Shahani founded Nebraska Cultures, a probiotics manufacturing and research company. Today, Nebraska Cultures is one of the largest international probiotic supplement manufacturers and suppliers. He served as a consultant for several food and feed supplements and nutrients manufacturing and marketing companies, including Klaire Laboratories, National Enzyme Company, Nutraceutical Corporation, Kovac, TwinLab, Arise & Shine, American Biologics, Cell Tech (now Simplexity), Infinity2, Nutratec SAS, and others.

KhemShahani died on 6 July 2001 while on a speaking tour in Sicily (Italy).[3] In 2005, a professorship was established at the University of Nebraska-Lincoln (UNL) in his name, honouring his work as scientist and professor.

ACADEMIC BACKGROUND

KhemShahani earned the BS (1943, Major: Dairy and Food Technology; and Nutritional Microbiology) and the MS (1947, Major: Dairy Chemistry; Minor: Microbiology) degrees at the University of Bombay, then the PhD (1950, Major: Food and Dairy Science; Minor: Biochemistry) at the University of Wisconsin.

RESEARCH AND TEACHING

Khem Shahani taught at the University of Illinois at Urbana-Champaign from 1950–1952 and Ohio State University at Columbus from 1953–1957.

In 1957 Shahani accepted a post at the University of Nebraska at Lincoln in the department of Dairy Science, later changed to the Department of Food Science and Technology in 1961. He retired from full-time teaching in 1994, but continued some teaching and research until 2000.

Shahani conducted basic research and developmental work as related to the science and technology of dairy foods – bioprocessed and cultured foods; lactic cultures, especially *Lactobacillus acidophilus*, food safety, food fermentation, human and animal nutrition, food and feed supplements, bioprocessed and cultured foods, significance and role of proteins and enzymes in milk and other foods, whey utilisation, water quality, vitamins, antibiotics and toxins in foods, human milk, infant foods, and biotechnology.

The professorial activity of Shahani consisted in teaching several multidisciplinary courses in Food Science and Technology, Biotechnology, Fermentation technology, for graduate students. He also supervised 16 postdoctoral fellows, 16 PhD candidates, and 22 MS candidates.

RESEARCH AND MANAGEMENT

In his lifetime, Shahani administered and supervised a large number of research projects with several graduate students and postdoctoral fellows actively engaged in biochemicaland nutritional research work. Supervised three research projects. Worked with several national and international students and postdoctorals from USA, Middle East, China, India, Korea, Africa, South America and Romania. Served as a member and Chairman of the Academic Planning Committee of the University of Nebraska-Lincoln pertaining to academic affairs and budget allocations.

AWARDS AND HONORS

- Borden Award of the American Dairy Science Association for Excellence in Research in Dairy Manufacturing (Dairy Microbiology and Dairy Chemistry) – 1964
- Gamma Sigma Delta International Award for Distinguished Service to Agriculture – 1966. Dr.Shahani was the youngest scientist ever to receive this award.
- Sigma Xi Outstanding Scientist Award, University of Nebraska – 1977
- Pfizer Award of the American Dairy Science Association for excellence in research and development in the areas of lactic cultures and cultured products – 1977

- Nordica International Award of the American Cultured Dairy Products Institute for excellence in research and development in the area of lactic cultures, yogurt and other cultured products – 1977. Dr.Shahani was the recipient of the First Nordica Award.
- Elected as a Fellow of the Institute of Food Technologists – 1983
- Dairy Research Foundation Award of the American Dairy Science Association for distinguished service and research in the area of lactic cultures, cheese and other cultured products – 1983. Dr.Shahani was the first recipient of the three major awards of the ADSA.

BOOKS

Shahani, K.M., Meshbesher, B, and Mangampalli, V. Cultivate Health From Within: Dr.Shahani's Guide to Probiotics. Vital Health Publishers, Danbury, 2005.

Cultivate Health from Within is the definitive guide to antibiotics, probiotics, and natural human microecology. Dr.Shahani, who has explored the topic during four decades of scientific research, explains how probiotics prevent the onset and progression of disease, enhance the immune system, and reduce the likelihood of menopausal symptoms and osteoporosis. He then provides treatments for such common problems as anxiety, high cholesterol, rheumatoid arthritis, food allergies, skin conditions, and yeast infections. In a straightforward manner, this eye-opening book also discusses the current overuse of antibiotics in America. A comprehensive Resource list guides you to recommended probiotic supplements, as well as to good food sources of probiotics.

With Cultivate Health from Within, you will be able to better overcome current health problems and ensure a healthier future for you and your family.

Jokes

Question: In India, why do the bride's parents generally bear all marriage expenses?
CA student's Brilliant answer.....
"Because as per Indian law, excise duty on production is payable by the manufacturer at the time of dispatch of goods."

Manager told a joke. Everyone in the team laughed except one guy...
Manager asks him - "Didn't you understand my joke????"
The guy replied - "I resigned yesterday"

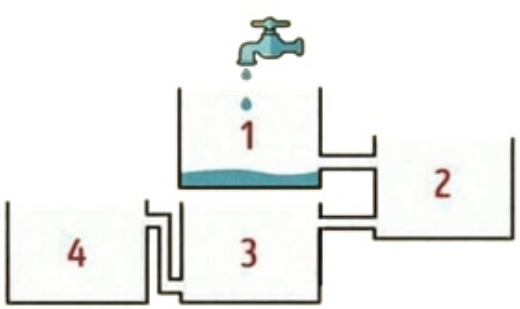
Employer to applicant: 'In this job, we need someone who is responsible.'
Applicant: 'I'm the one you want. On my last job, every time anything went wrong, they said I was responsible.'

Brain Teasers

1. Four years ago, Meg put a nail on a tree in order to mark her height. If the tree grows 10 inches per year, and currently the nail is 5 inches lower than Meg, how much has Meg grown over these four years?

2. You have a glass of water and an ice cube floating in it. When the ice cube melts, will the water level increase, decrease or remain the same?

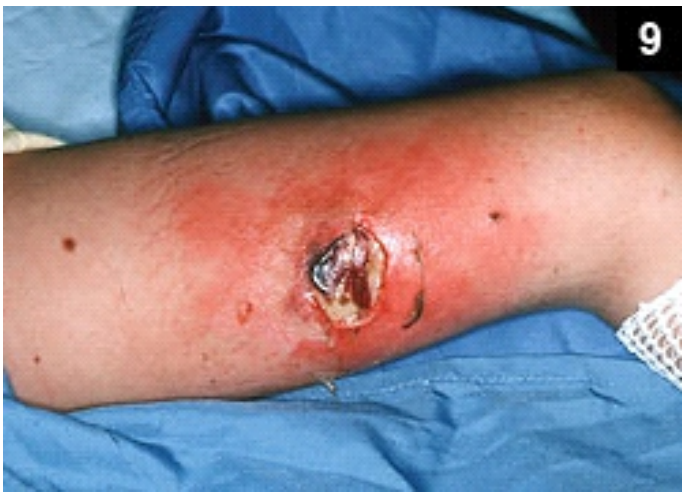
3. Assuming the water from the tap is pouring slower than it is flowing through the connecting tubes, which tank will get full first?



4.

Answers: (1) Five inches. Trees grow at their tops. (2) It will remain the same. The amount of water which the ice cube displaces is equal to its mass. Since the mass does not change and the density of water is equal to 1, the extra water after melting will be the same amount as the displaced water before that. (3)This is a system of communicating vessels. First, tanks 3 and 4 will get full simultaneously, then tank 2 will get filled, and finally tank 1. (4) 062.

Necrotizing Fasciitis



Tissue decomposition caused by Necrotizing fasciitis.

Necrotizing Fasciitisis a rare infection that's often described in media reports as a condition involving "flesh-eating bacteria." It can be fatal if not treated promptly.

Necrotizing fasciitis spreads quickly and aggressively in an infected person. It causes tissue death at the infection site and beyond.

Every year, between 600 and 700 cases are diagnosed in the U.S. About 25% to 30% of those cases result in death. It rarely occurs in children.

How Do You Get Necrotizing Fasciitis?

The bacteria that cause necrotizing fasciitis can enter the body following surgery or injury. They can also enter the body through:

- minor cuts
- insect bites
- abrasions

In some cases, it is unknown how the infection began. Once it takes hold, the infection rapidly destroys muscle, skin, and fat tissue.

Causes of Necrotizing Fasciitis

Necrotizing fasciitis is commonly caused by group A *Streptococcus* (GAS) bacteria. That's the same type of bacteria that causes strep throat. However, several types of bacteria, such as staphylococcus and others, have also been associated with the disease. Necrotizing fasciitis occurs when such bacteria infect the superficial fascia, a layer of connective tissue below the skin.

Symptoms of Necrotizing Fasciitis

The symptoms of necrotizing fasciitis usually occur within the first 24 hours of infection. They often include a combination of the following:

- Increasing pain in the general area of a minor cut, abrasion, or other skin opening.
- Pain that is worse than would be expected from the appearance of the cut or abrasion.
- Redness and warmth around the wound, though symptoms can begin at other areas of the body.
- Flu-like symptoms such as diarrhea, nausea, fever, dizziness, weakness, and general malaise.
- Intense thirst due to dehydration.

More advanced symptoms occur around the painful infection site within three to four days of infection. They include:

- Swelling, possibly accompanied by a purplish rash.
- Large, violet-colored marks that transform into blisters filled with dark, foul-smelling fluid.
- Discoloration, peeling, and flakiness as tissue death (gangrene) occurs.

Critical symptoms, which often occur within four to five days of infection, include:

- severe drop in blood pressure
- toxic shock
- unconsciousness

Diagnosis of Necrotizing Fasciitis

Necrotizing fasciitis progresses very rapidly, making early diagnosis crucial.

Unfortunately, that does not always occur. The early symptoms of an infection with flesh-eating bacteria are similar to other conditions like the flu or a less serious skin infection. The early symptoms are also similar to common post-surgical complaints, such as:

- severe pain
- inflammation
- fever
- nausea

Diagnosis is often based on advanced symptoms, such as the presence of gas bubbles under the skin. Laboratory analysis of fluid and tissue samples is done to identify the particular bacteria that are causing the infection. Treatment, however, begins before the bacteria are identified.

Household members and others who have had close contact with someone with necrotizing fasciitis should be evaluated if they develop symptoms of an infection.

What if you have been near someone who has the disease?

Necrotizing fasciitis is very rare. Bacteria that cause the disease usually don't cause infection unless they enter the body through a cut or other break in the skin.

If you have been in close contact with someone who has necrotizing fasciitis, your doctor may give you an antibiotic to help reduce your chances of getting the infection. If you notice any symptoms of infection (such as pain, swelling, redness, or fever) after you've been in close contact with someone who has necrotizing fasciitis, see your doctor right away.

To help prevent any kind of infection, wash your hands often. And always keep cuts, scrapes, burns, sores, and bites clean.

Necrotizing Fasciitis Treatment

Patients infected with flesh-eating bacteria will undergo several types of treatment. The extent of treatment depends on the stage

of the disease when treatment is started. The treatment includes:

- Intravenous antibiotic therapy.
- Surgery to remove damaged or dead tissue in order to stop the spread of infection.
- Medications to raise blood pressure.
- Amputations of affected limbs, in some cases.
- Hyperbaric oxygen therapy may be recommended to preserve healthy tissue.
- Cardiac monitoring and breathing aids.
- Blood transfusions.
- Intravenous immunoglobulin. This supports the body's ability to fight infection.

What is the prognosis (outcome) for patients with necrotizing fasciitis? What are complications of necrotizing fasciitis?

Untreated necrotizing fasciitis has a poor prognosis; death or severe morbidity (for example, limb loss) is the frequent outcome. Even with appropriate treatment, the mortality (death) rate can be as high as 25%. Infection with MRSA and other multidrug-resistant organisms tends to have higher morbidity and mortality rates. Combined mortality and morbidity (for example, limb loss, scar formation, renal (kidney) failure, and sepsis) for all cases of necrotizing fasciitis has been reported as 70%-80%. Cases of Fournier's gangrene have reported as high as 75% mortality rates, while cases of *Vibrio vulnificus*-associated necrotizing fasciitis have about a 50% mortality rate. Fortunately, *Vibrio vulnificus* infection is relatively uncommon, but the incidence seems to be increasing. The U.S. Centers for Disease Control and Prevention (CDC), in 2007, made *Vibrio vulnificus* infection a reportable disease so the statistics on the incidence (frequency of occurrence) should be more easily obtained in the future.

The worst complication of this disease is rapid advancement that results in death. Other serious complications include tissue loss requiring surgical removal and amputation to limit disease, as well as sepsis, kidney failure, and extensive scarring.

6 Ways to get your Gut Bacteria on your side for weight loss

Weight loss is easier with a friend…so how about a few trillion of them?

Granted, these particular friends aren't very sociable, and they probably won't like any of your meal photos on Instagram. But they sure can help you lose weight in the least painful way possible.

If you haven't figured it out by now, the "friends" are the bacteria (and other wee beasties, but they're mostly bacteria) that live in your gut. They're also called the gut microbiota, the gut flora, or "gut bugs." You can learn all about them at our gut portal here.

Gut bacteria affect your weight in a couple ways. This review is free to read and runs through all of them exhaustively if you want to really get into it, but here's the short version:

- They change how much energy you get from your food. Some people "waste" a lot of calories from their food because they have gut bacteria that are really inefficient.
- They affect inflammation. Inflammation drives fat accumulation in ways that are too complicated to go into detail about here, but ' here's a whole paper on it if you're interested.
- They affect feelings of hunger and fullness.
- They affect insulin sensitivity and metabolic health.

So if you're trying to lose weight, you really want all these guys on your side. Here are 6 ways to make that happen:

1. **Go to Bed**

   Sleep deprivation is one of the worst things you can do for your gut bacteria. In this study, researchers took normal-weight men and let them sleep only from 2:45 to 7 AM (that's about 4 hours) for two nights in a row. **After just two nights of partial sleep deprivation, the men had a bunch of changes in their gut bacteria that are associated with different metabolic problems.** They also had lower insulin sensitivity.

   This study was in mice but still interesting. The researchers subjected the poor mice to chronic "sleep fragmentation," otherwise known as "having a really terrible night of sleep where you kept waking up." At the end of 2 weeks, their gut bacteria looked bad. And to go with their gut problems, they had more inflammation in their fat tissue, more fat tissue, lower insulin sensitivity, and significant gut barrier disruption. Ouch. Don't be these mice: get enough sleep!

   This study took another approach: it linked shift work to obesity through the gut bacteria. It's well-known that shift work is associated with obesity, and this study offers some evidence that the reason has to do with the gut bacteria. **Because shift workers sleep for less time on average, their gut bacteria are disturbed, making them more susceptible to weight gain and metabolic disease.**

   Long story short: if you want your gut on your side for weight loss, go to bed.

2. **Consider Intermittent Fasting**

   The bacteria that live in your gut have a circadian cycle – different species are more prominent at different types of day. In obesity, that cycle is blunted. (If that sounds familiar, it might be because the circadian rhythm of the hormone cortisol is also often blunted in obesity). But it turns out you might be able to get the circadian gut cycle up and running normally again with some clever food timing.

   In this study, the researchers first took a bunch of mice and made them really fat by feeding them junk food. Then they tried a time-restricted diet, where the mice were only allowed to eat during their natural feeding periods (for mice, that's night time, but for humans, the equivalent would be only eating during the day – no midnight snacking). **The time-restricted feeding partly restored the normal circadian cycle of gut bacteria, especially species involved in metabolism. And it helped reduce body fat percentage in the time-restricted mice.**

   It's one mouse study. It's not conclusive proof of anything – but there are also all kinds of other benefits to intermittent fasting, or at least not eating a lot of junk food at night. It might be worth considering as an addition to your weight-loss plan.

3. **Eat a Variety of Vegetables**

   When they first start out with Paleo, some people like to make the same meals all the time. It's easy, it's pretty mindless, it saves time on prep and shopping, and it builds a healthy routine. But meals based on this template tend to revolve around a limited set of vegetables. And that can be less than ideal, because it means that you're getting a pretty repetitive diet where fiber is concerned.

   Fiber is food for your gut bacteria. **Whatever types of bacteria you feed, those are the types that will grow.** So if you're always eating the same type of fiber, you'll get a fairly limited range of gut bacteria. Unfortunately, **bacterial diversity is probably best for weight loss,** and one of the best ways to get there is to eat a wide variety of fiber types.

   Here's a way to do that without adding a lot of difficulty to your cooking routine: group vegetables by how you like to cook them. For example:

   - Roasting vegetables: beets, squash, cauliflower, eggplant…
   - Pan-frying vegetables: onions, mushrooms, spinach, kale…
   - Raw vegetables: carrots, salad greens…

   You can adjust the categories as necessary or put one vegetable in more than one category. But the idea is to **plan your meals based on category, not on a specific vegetable type**. For example, Thursday dinner could be "chicken thighs + roasting vegetable," not specifically chicken thighs with beets. That way you can get more diversity in vegetables

without changing much about your cooking routine or adding any difficulty.
(The obvious caveat to this: some people have sensitivities to certain carbohydrates, like FODMAPs carbohydrates. In that case, it may be better to hold off on those until your gut can handle them.)

4. **Be Consistent About Your Diet**
As this review discusses, short-term dietary interventions do change gut bacterial composition…in the short term. You can put people on any kind of extreme diet and watch their gut bacterial composition go crazy. But the short-term changes don't last. Gut bacteria are remarkably resilient and always happy to go back to "normal" – which in this case is based on whatever you usually eat.
This means that **cultivating healthy gut bacteria takes consistency**. Whatever diet works for your gut, eat that way consistently and regularly. It takes a while to get your gut bacteria to recognize something as the "new normal."

5. **Go to the Gym**
There are all kinds of reasons why exercise is good for you. 'Its great for weight loss even though it doesn't burn a lot of calories – burning calories isn't the point. But one of the many reasons why exercise is helpful is that it makes your gut bacteria happy. There's not a lot of research studying this in humans – mostly just this study finding that **exercise is associated with greater microbial diversity in the gut**, which is great, but it's one study and it's just proving an association. There's a lot more evidence from rat studies and mouse studies showing that exercise alters the composition of the gut microbiome in ways that help the rats and mice stay lean (or lose weight, if they're already obese).
But the reason that exercise makes it onto this list is this study. It was in mice, but the results suggested that **the benefits of exercise are totally different from the benefits of changing your diet.** So there's at least some evidence that exercise and diet aren't just interchangeable in this regard, which is a pretty good argument for doing both.

6. **Take a Probiotic with Lactobacillus Strains**
N.B. all the usual caveats about supplements apply to probiotics – there's a huge amount of fraud out there, so don't waste your precious money on junk and fakes.
Probioticsbasically add some healthy bacteria to your gut. There's an enormous range of probiotic species available in supplement form, but this review suggests that Lactobacillus strains are probably the ones to look for. Those are the probiotics that get results like reductions in body weight, and more importantly, body fat. Or better cholesterol profiles in people with Type 2 diabetes.
As the name suggests, Lactobacilli are mostly associated with fermented dairy products, but you can get them in dairy-free probiotic supplements, too.

Best practices to manage burn patients

To promote wound healing and ease patient discomfort observe the following principles: ● Ensure adequate perfusion ● Minimise bacterial contamination ● Minimize negative effects of inflammation ● Provide optimal wound environment ● Promote adequate nutrition and fluid management ● Provide adequate pain management ● Promoting re-epithelialisation ● Provide pressure management

To ensure the above principles are observed utilise the following concepts for burn wound management:

- Cleansing – wound surface should be free of slough, exudate, haematoma and creams
- Debridement – removal of loose, devitalised tissue and non-surgical removal of eschar
- Dressing
  - choose appropriate primary dressing to maintain optimal moisture level and promote wound healing
  - Exudate management - appropriate absorbency level of dressing must be considered on application
  - consider pain and trauma on dressing removal, consider long-term dressing wherever possible, aim for prevention of trauma on dressing removal
  - application - protect against alteration to distal perfusion due to constrictive dressings, protect against wound bed colonisation
- Pressure – to manage oedema and minimise the effects of scarring

Burns Unit Admission Criteria

- Define the difference between severe and minor burns
- Define SBIS(Severe Burn Injury Service) burn transfer criteria

Severe burns

These are burns which require referral to a specialised tertiary burns unit. These units include adult units and the paediatric unit. Acute period - first 24-48 hours - may be longer in severe burns. NSW Burn Units will admit patients who meet the criteria for a severe burn. They will also admit patients who have major skin loss due to trauma or disease, or require post burn reconstructive surgery. Additionally Burns Units will admit patients requiring pain management, physical or psychosocial support.

Special Considerations:

- Burn Unit staff are available for consultation on any burn patient as required.
- If the patient requires admission, referring staff must liaise with Burns Unit staff prior to sending the patient to the unit.
- Patients with respiratory involvement and/or large %TBSA are generally managed in the Intensive Care until they can be cared for in the ward setting.
- Child Protection Unit (CPU) involvement required for all suspected non-accidental injuries in children. Psychiatry involvement required for adult suspected non accidental injuries.

Minor Burns

A minor burn is defined as a burn which does not meet any of the above criteria for referral to specialist burn unit and there are no adverse physical or social circumstances to outpatient management.

These are burns which can be managed in outlying hospitals/medical centres, or via the ambulatory care units within the referral hospitals named above or co managed with the burns units. It is recommended that there is at least some discussion with burn unit to aid planning for appropriate management

Dressing Procedure

- To apply most appropriate dressing using correct technique
- To apply dressing in timely manner to avoid hypothermia, excess pain or trauma
- To maintain an aseptic technique at all times

Dressing notes

- Healed areas of skin need moisturising with appropriate moisturiser; a small amount is rubbed in until absorbed.
- Secondary dressings must not come in contact with the wound as they may adhere and cause trauma on removal.
- Care must be taken not to tightly wrap primary dressings circumferentially around the burns.
- Post procedure pain relief may be required for some patients.
- Occlusive dressings should not be applied to infected wounds

Dressing Specialised Areas

Specialised areas include face, head, neck, ears, hands, perineum and genitals. These areas require the application of complex dressings which should only be carried out by experienced clinicians. If attending these types of dressings in areas other than a burn unit please seek advice from Burns Unit staff and access resources available on the SBIS

Face, Head, Neck

- Tracheostomy tape may be used to secure a naso-gastric tube when adhesive tape is unsuitable due to burns around the nose.

Ears

- The area behind the ear should be padded to avoid burnt surfaces coming into contact with each other and the area incorporated into the head dressing if appropriate.
- Bactigras or Jelonet are often the dressings of choice on ears.
- Doughnuts made of a soft foam such as Lyofoam can be made to fit around the ear to help prevent pressure on the ear.
- To protect the helix (cartilage) of the ear, the ear must lie in a natural position and the padding must be high enough so that any pressure from the bandaging is borne by the padding.

Hands & Fingers

- In the first 24-48 hours if the fingers are swollen, it is sometimes recommended to dress each finger separately by applying an appropriate primary dressing. The whole hand is then bandaged. This method inhibits normal functioning and mobility and should only be used when necessitated.

- At all other times, and once oedema has subsided, the fingers should be individually bandaged. These bandages allow better mobility and enhance functional ability.

Feet
- The web spaces between the toes should be separated but it is often difficult to bandage toes separately due to their size.
- A large supportive dressing allows for mobilisation and helps keep the toes in a normal position. Foam padding can be used to protect burnt soles.

Perineum
- Males: If the penis and/or scrotum are burnt, apply appropriate primary dressing with outer supportive dressings. A scrotal support may be necessary.
- Females: Dressing the female perineum is more difficult but the type of dressing is the same as for males.
- Children: When still in nappies, dressings such as Bactigras can be cut to size and placed in the nappy.
- Patients with perineal burns are generally catheterised to decrease pain and allow for the area to be kept as clean as possible.

Tips:
- It is important to separate burnt surfaces
- Occlusive dressings should not be applied to infected wounds
- Care must be taken not to tightly wrap primary dressings circumferentially around the burns.
- Secondary dressings must not come in contact with the wound as they may adhere and cause trauma on removal.
- When bandaging start distally and work proximally, from feet or hands. It may be necessary to incorporate feet or hands, even if they are not burnt to avoid oedema formation.
- Elevate the arms and legs, especially in the acute period to reduce oedema.
- Legs should be bandaged straight and splints may be necessary.
- Healed areas of skin need moisturising with appropriate moisturiser; a small amount is rubbed in until absorbed.
- Post procedure pain relief may be required for some patients

Digital Photograph of the Burn Wound
- Allow ease of communication between Burn Units and external hospitals or healthcare facilities
- Assist with monitoring of wounds progress
- Minimises prolonged or multiple exposure of patients
- Reduces issue of infection control by reducing attending staff numbers

Preparation
- The patient should be given adequate explanation of the procedure and sign a consent prior to any photographs being taken.
- Taking of photos should not delay the dressing procedure for extended periods due to the risk of hypothermia and distress to the patient.
- Turn off overhead heat light whilst taking photographs as they can lead to discolouration.
- Consider colouring. Dark skin on stark white background can give illusion of greater severity of burn. Very pale skin on white background will not give enough contrast.
- Aim for neutral colour background such as green sterile sheet.

Procedure
- Patient should be made comfortable on clean dry sheet.
- Take a photo of the patient's hospital sticker for identification.
- If patient has extensive burns take global photograph to show where burn occurs on body.
- For small burns lay a measure rule next to the wound to display wound size.
- Consider patient's dignity especially if burns around perineum or genitalia. Use small cloth to cover non-involved areas.

Tips:
- Take numerous pictures, with and without flash if necessary, extras can be deleted when downloading.
- Label photos stating date photo taken, days post burn injury, patient identification, anatomical position and orientation

Storage
- To preserve confidentiality all images must be stored in a limited access area, such as password protected.
- For ease of access to appropriate images each should be stored in an easily recognisable pattern such as under medical record number and date taken.

Emailing pictures

It is possible to email digital photographs of burn wound to burn units. Contact must be made between referring and accepting medical/nursing staff. Photographs must be taken in accordance with above guidelines and must be accompanied by injury history and consent.

The Multidisciplinary team

Burn care is conducted by members of a multidisciplinary burn team which include medical, surgical, intensive care, nursing, physiotherapy, occupational therapy, dietetics, social work, psychiatry, psychology, speech therapy, pharmacy and technicians. A multidisciplinary approach to burn management is essential for optimal functional and cosmetic outcome. Serious long term physical and psychosocial morbidity may be associated with a burn injury. All members of the burn management team interact throughout the patient's management, from admission to discharge and beyond to support the patient and family in reintegration. All team members contribute to patient care throughout the early management, ongoing clinical intervention periods during all phases of care, and continuous educative support to the patient, family and staff.

REFERENCES

https://www.aci.health.nsw.gov.au/__data/assets/pdf_file/0009/250020/Burn_Patient_Management_-_Clinical_Practice_Guidelines.pdf

https://www.google.co.in/search?q=best+practices+to+manage+burns&tbm=isch&tbs=rimg:CQ9IfI5X4QiAIjgRRSbG6lbmu30MTdu-w4O3wBVPsL49Mic9QDBR72zR7uns NUXvwXvESO6gdPJIIN-Ue5GA0J2V-yoSCRFFJsbqVua7EbyWP1jmZdpjKhIJfQxN277Dg7cRLjcWofNrwXwqEgnAFU-wvj0yJxFvSjDcSLfpayoSCT1AMFHvbNHuETOGwfp8mghQKhIJ6ew1Re_1Be8QRVNOLJpBNcKoqEglI7qB08kgg3xHH9YiLjeh20yoSCZR7kYDQnZX7Ecz4-XmM6MML&tbo=u&sa=X&ved=2ahUKEwjQsfi59MbeAhUNOSsKHe2DDxsQ9C96BAgBEBg&biw=1280&bih=913&dpr=1#imgrc=p5sxuILV16_CWM:

Highlights of the coming issue


JOURNAL OF HYGIENE SCIENCES
Committed to the advancement of Clinical & Industrial Disinfection & Microbiology
Contents

Mini Review
Bacteriology - Elementary Identification of Enterobacteriaceae (Issue 2).

Current Trends
Waterless scrubs.

In Profile
Venkatraman Ramakrishnan.

Bug of the Month
Yersinia pestis.

Did You Know
Bioreactor Device helps frogs regenerate their limbs.

Best Practices
Best practices to manage burn patients-part 2.

Printed and published by D.G. Tripathi, Edited by Akshaya Tendulkar for and on behalf of Tulip Diagnostics (P) Ltd., Tulip House, Dr. Antonio Do Rego Bagh, Alto Santacruz, Bambolim Complex, Post Office Goa - 403 202, India. Fax: 0832 2458544, **Website: www.tulipgroup.com.**