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Editorial

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Mini Review Section – Anaerobic organisms are widespread and very important. Anaerobic bacteria culture is a method used to grow anaerobes from a clinical specimen. Anaerobic bacterial cultures are performed to identify bacteria that grow only in the absence of oxygen and which may cause human infection. If overlooked or killed by exposure to oxygen, anaerobic infections result in such serious consequences as organ failure, sepsis, meningitis, and death. Culture is required to correctly identify anaerobic pathogens and institute effective antibiotic treatment.

Current Trends Section – The clean bedding and clean clothes installs psychological confidence in the patients and the public and enhances their faith in the services rendered by the hospital. The current study found that in spite of certain deficiencies in the equipment, manpower and process, the linen and laundry service is providing a satisfactory service to its users.

In Profile – Swapan Kumar Datta (born 28 January 1953) is a well known scientist (Professor) of rice biotechnology. He is well known for his pioneering research on genetic engineering of Indica rice. Dr. Datta has demonstrated the development of genetically engineered Indica rice from protoplast derived from haploid embryogenic cell suspension culture. Golden Indica Rice with enriched Provitamin A and Ferritin rice with high iron content were developed by his group with a vision to meet the challenges of malnutrition in developing countries.

Bug of the Month - *Bacillus anthracis* is a Gram-positive, rod-shaped bacterium, 1 - 1.2µm in width and 3 - 5µm in length. It lives in soils worldwide at mesophilic temperatures. *Bacillus anthracis* is an important organism to study genome sequence because it's used as a biological weapon. Genome sequencing can also be useful for the development of vaccines. The interactions between the host's immune system cells and the spores are an important area of research that will give us a better understanding of the anthrax disease. Development of better spore detectors will also be helpful.

Did You Know? – We can say that the strawberries and lemons are the world's healthiest foods. Both these fruits contain low amount of sugar that is helpful, as our body needs a certain amount of sugar. A lemon contains 70% sugar and strawberry contains only 40% of sugar. Most varieties of lemons contain higher percentage of sugar than contained by strawberry fruits. But still a lemon cannot be eaten as a dessert like strawberry as it is sour than a strawberry.

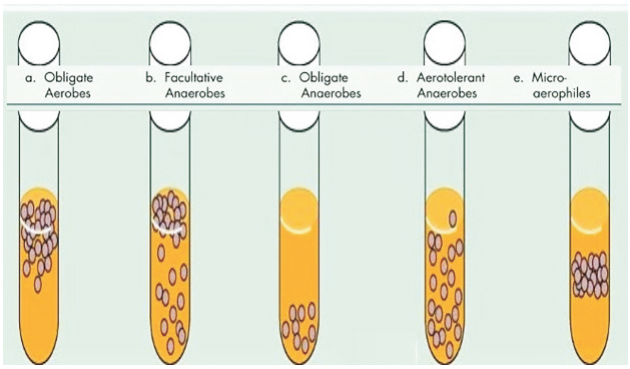
Best Practices - Although endoscopic equipment has been implicated in transmitting infection, it appears as if virtually all transmissions have been due to errors in the process of cleaning and disinfecting the equipment or in breakdown of general infection control practices with the exception of newer duodenoscopes. This topic review will discuss infectious agents that can potentially be transmitted during gastrointestinal endoscopy and outline the recommendations from various societies for the cleaning and disinfection of gastrointestinal endoscopes.

Relax & unwind yourself with our **Relax Mood** section

Our JHS team is thankful to all our readers for their ever increasing appreciation that has served as a reward & motivation for us. Looking forward towards your valuable inputs & suggestions.

Anaerobic Culture Systems

Anaerobic organisms are widespread and very important. Anaerobic bacteria culture is a method used to grow anaerobes from a clinical specimen. Obligate anaerobes are bacteria that can live only in the absence of oxygen. Obligate anaerobes are destroyed when exposed to the atmosphere for as briefly as 10 minutes. Some anaerobes are tolerant to small amounts of oxygen. Facultative anaerobes are those organisms that will grow with or without oxygen. The methods of obtaining specimens for anaerobic culture and the culturing procedure are performed to ensure that the organisms are protected from oxygen.



Anaerobic bacterial cultures are performed to identify bacteria that grow only in the absence of oxygen and which may cause human infection. If overlooked or killed by exposure to oxygen, anaerobic infections result in such serious consequences as organ failure, sepsis, meningitis, and death. Culture is required to correctly identify anaerobic pathogens and institute effective antibiotic treatment.

Gram-positive anaerobes

- *Actinomyces* (head, neck, pelvic infections; aspiration pneumonia)
- *Bifid bacterium* (ear infections, abdominal infections)
- *Clostridium* (gas, gangrene, food poisoning, tetanus, pseudomembranous colitis)
- *Peptostreptococcus* (oral, respiratory, and intra-abdominal infections)
- *Propionibacterium* (shunt infections)

Gram-negative anaerobes

- *Bactericides* (the most commonly found anaerobes in cultures; intra-abdominal infections, rectal abscesses, soft tissue infections, liver infection)
- *Fusobacterium* (abscesses, wound infections, pulmonary and intracranial infections)
- *Porphyromonas* (aspiration pneumonia, periodontitis)
- *Prevotella* (intra-abdominal infections, soft tissue infections)

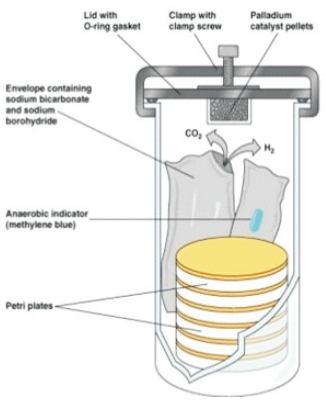
Anaerobic jar is an instrument used in Microbiology laboratory, for the generation of anaerobic condition (Anaerobiosis).

There are two methods for achieving an aerobic atmosphere for the culture of strict anaerobes are

1. Anaerobic jar with a catalyst, an anaerobic indicator strip and an atmosphere free of oxygen.
2. Anaerobic Jar without vents.

- **Anaerobic jar with a catalyst, an anaerobic indicator strip and an atmosphere free of oxygen.**
  Anaerobic jar with vents can be evacuated and flushed and CO_2 is filled in the jar through CO_2 gas cylinder to generate anaerobic conducting in the jar.
- **Anaerobic jar without vents**
  These are used with commercially available pouches that deliver an H_2-CO_2 atmosphere.

- Production of a vacuum
- •Displacement of Oxygen with other gases
- •Absorption of Oxygen by chemical or biological methods
- •By using reducing agents



Accessories

- **Gas Pack**
  A disposable pack contains chemicals which generate hydrogen and carbon dioxide gases on addition of water.
- **Catalyst**
  Stimulates reaction of Hydrogen and Oxygen to form water and produce complete anaerobic conditions.
- **Indicator strip**
  Monitors anaerobic conditions.

Anaerobic jar works on the principle of evacuation and replacement, where the air inside the chamber is evacuated and replaced with mixture of gases (consisting of 5%CO_2, 10%H_2 and 85%N_2).It is practically impossible to evacuate all the air so some amount of oxygen will still be left behind. The residual oxygen left behind is converted to water using Spongy palladium or platinum catalyst. The catalyst acts as a catalyzing agent causing slow combination of hydrogen and oxygen to form water. Reduced methylene blue is generally used as indicator (mixture of NaOH, methylene blue, and glucose). It becomes colorless anaerobically but regains blue color on exposure to oxygen.

The commonly used mediums for anaerobic culture are Robertson cooked meat medium, Thioglycollate broth, Blood agar base, Willis & Hobbs media.

Linen Disinfection

Introduction:

The clean bedding and clean clothes installs psychological confidence in the patients and the public and enhances their faith in the services rendered by the hospital. Being an important Component in the management of the patients, a study was carried out to find out the current quality status and its conformity with the known standards and identify the areas of intervention in order to further increase the patient and staff satisfaction regarding the services provided by linen and laundry department

The current study found that in spite of certain deficiencies in the equipment, manpower and process, the linen and laundry service is providing a satisfactory service to its users. However the services can be further improved by removing the present deficiencies both at structure and process level.

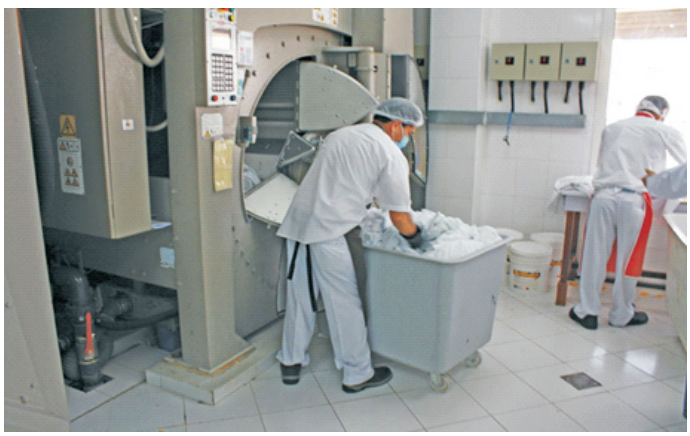
Textiles contaminated with body substances can contain large numbers of microorganisms (10^6–10^8 cfu/100 cm2 fabric)

Structure

Linen and laundry service must located in the ground floor (in the services core area of the hospital). The location of the department provides easy access to user area i.e. Emergency Service, Operation Theatre, Wards, etc. Linen and Laundry service area has a separate entrance and exit with unidirectional flow of linen which reduces the chances of dirty linen contaminating the clean product. Linen and Laundry service has rectangle shape. The layout allows unidirectional flow of the product with least chances of contamination. The laundry layout is broadly divided into four basic areas: Reception and Sorting Area, Processing Area, Clean Linen Store and Tailoring Section.

Trained Manpower

For the effective and efficient functioning of the Linen and Laundry Service relevant training and qualification are essential and we should have right person for the right job, thus academic and professional training and right experience is very important aspect of manpower. The Chief Manager of the Linen and Laundry Service is a qualified chemical Engineer. Laundry Superintendent is B. Sc. in laundry Technology. Most of the technical staff (Operators/Tailors) is under 10^{th} class. However; all of them have received in-service training.



Process

Ideally there should be written policy manual on various aspects of operation of linen and laundry services, which will help in ensuring effective and efficient working of the department and even could be used to monitor and evaluate the laundry process. The policy statements regarding laundry process according to Damani N are:

- All personnel involved in collection, transport sorting and washing of soiled linen should be adequately trained to wear appropriate protective clothing and have access to hand washing facilities.
- Used linen must be put into the appropriate colour coded containers as soon as possible after removal and must be handled with care at all times, as agitation of fabrics can markedly increase the number of airborne bacteria.
- Delivery and collection of linen from the user departments is done by the laundry staff using same mobile trolleys, this leaves scope for the contamination of the washed linen.
- However educating the staff regarding separate trolleys for collection and distribution is necessary to prevent contamination.
- Hospital Centre London also recommends the use of separate mobile covered trolleys for collection and distribution for reducing the chances of cross infection.
- The dirty linen from the wards is kept in the dirty utility room of the ward till its transportation to the laundry and linen service.
- There is no practice of removing or washing the blood / vomit as soaked linen in the ward as it increases spread of infection.
- The workers handling dirty linen practice Universal Precautions. U.S department of Labour Occupational Safety and Health Administration recommends the use of Personal

Protective Equipment such as gloves, gowns, and masks while handling and sorting contaminated linen.

- Infected or fouled linen after weighing then should be processed first in sluicing machine as per the standard recommendations.
- Cunliffe in his manual, Hospital Laundry Arrangements recommends that hand sluicing in wards should be replaced by machine sluicing in the hospital.
- Damini NN in his manual of infection control procedures recommends Colour coding for dirty linen.
- Soiled linen should be put into white fabric bags, fouled linen should be first put into a clear white (or off-white plastic) bag and then placed into the white fabric bags.
- Infected linen should be placed in double bag using an inner water-soluble bag (or bag with water soluble membrane) and then out into a red plastic bag. Additionally it should carry a prominent yellow label marked "infected linen".
- Heat liable linen should be put into a white bag with prominent orange strips.
- For removal of dirt from clothes combined action of detergent and mechanical movements of clothes through water is required and applied in mechanical washers. The standard input for this operation is steam for heating.
- Other operational aspects of the washing i.e. Breaking, Sluicing, Bleaching, Rinsing, Starching, Soursing, Blueing, Ironing are followed as per the standards set by American Hospital Association Chicago. Hydro-extraction, Drying, Calendaring/Hot ironing, Pressing or Hand ironing, Inspection, Mending/Rewashing, Folding/Packing/Storage and Issue procedure were also on similar lines as have been recommended by American Hospital Association.

Current recommended treatments to ensure cleaning and disinfection of used (soiled and foul) linen

- A 65°C temperature hold for a minimum of 10 minutes within the wash cycle; or71°C for not less than 3 minutes.
- Mixing time must be allowed to ensure heat penetration and assured disinfection. A sluice cycle must be added in to the cycle when dealing with foul linen.
- Recommended treatment to ensure disinfection of infected linen (mainly applicable to the healthcare setting):
- Linen in this category should not be sorted, other than in a red, water-soluble bag - this then placed in an outer polyester or nylon carriage bag. Infected linen may be stored in different bags in other parts of the UK, eg clear with red stripes are used in parts of Scotland. Local policy should be checked and adhered to.
- Inner bag should be removed from the outer bag only at the point of transfer to the washer-extractor, followed by the outer bag.
- Storage of infected linen must be done in a secured area, prior to washing.
- The same wash temperature profile as used for used (soiled and foul) linen is thought sufficient to inactivate HIV, but the evidence is less certain for hepatitis B. The wash temperature, coupled with the dilution factor, should render linen safe to handle on cycle completion.

Current recommended treatment to ensure disinfection of heat labile linen

- These items need to be washed at ~40oC, so the wash temperature is insufficient to disinfect, and chemical alternatives are required;
- Addition of hypochlorite may be possible, but efficacy may be reduced by the presence of soiling, detergents and alkalis in the main wash;
- Disinfection with hypochlorite is only reliable if the linen can tolerate its addition and if sodium hypochlorite is added during the ultimate rinse of the cycle;
- A final concentration of 150 ppm available chlorine must be achieved for a minimum of 5 minutes exposure time.

Existing guidance states that in the community setting or elsewhere without access to specialist services, contaminated clothing or linen should be treated in one of the following ways:

- *Washed with detergent using the hot wash cycle of a domestic washing machine to a temperature of at least 80°C; or
- Dry cleaned at elevated temperatures, or dry cleaned cold followed by steam pressing; or
- Incinerated if items cannot be effectively washed as described above
- *Dilution is an important part of the washing process and therefore machine overloading should be avoided. If washing by hand is unavoidable, household rubber gloves *must* be worn.

Current Healthcare Textiles Standard in the U.S.

- Standard for reusable textiles: Hygienically clean
- Not quantified for microorganisms, but assume textiles are generally rendered free of vegetative pathogens
- Through a combination of soil removal, pathogen removal, pathogen inactivation, contaminated laundry is rendered hygienically clean
- Reusable surgical textiles: Sterilized

Conventional Laundering:

Log Reductions in Bioburden

- In the wash, rinse cycles:
- Agitation: ~3 log unit reductions
- Addition of bleach: ~3 log unit reductions
- In the dry cycle: ~1 – 2 log unit reductions
- Post wash microbial burden ~10 – 100 CFU/cm2
- Predominantly Gram-positive organisms

Alternatives to Hot-water Laundry

- In-house laundries consume an average of 50% - 70% of the facility's hot water (10% - 15% of the total energy used)
- Water temperature may be regulated locally

- Lower temperature (e.g., 22°–50°C) wash cycles can be used with appropriate detergents and laundry additives
- New detergents and processes (e.g., oxidative products) are being evaluated in Europe
- Current problems associated with bleach use:
- Not all fibers and fabrics are compatible with bleach
- Chlorine + residual chlorhexidine gluconate (CHG) = brown stains

HACCP: An Assessment Tool for Infection Prevention

- HACCP-Hazard Analysis and Critical Control Points
- Used extensively in the food service industry to help maintain product quality
- Look critically at the laundry facility and the laundry process to identify possible points at which contamination could be introduced, diminishing textile hygienic quality
- Helps to identify quality control strategies to prevent contamination of the product

Chain of Infection (COI)

- Virulent pathogen: Bacteria, fungi, viruses, parasites, prions
- Sufficient number of pathogen: Infectious dose
- Mode of transmission:Contact, droplet, airborne
- Portal of entry:Broken skin, mucous membrane, respiratory tract, ingestion
- Susceptible host: Age, immunity, medical conditions

Outbreaks Attributed to Soiled Healthcare Textiles (HCTs)

- 5 outbreaks of occupationally-acquired infections or exposure to hazardous pharmaceuticals in 43 years
- 148 – 248 workers affected
- Pathogens/chemicals identified:
- Scabies
- Microsporiscanis
- Salmonella hadar
- Hepatitis A virus
- Antineoplastic pharmaceuticals
- Breach of infection prevention practices identified
- Improper handling created aerosols
- Failure to use appropriate PPE
- Exposures to fecal and other body substance contamination

Climate Control via Ventilation: Key Engineering Specifications

- Clean HCT Storage:
- Temperature: 72 - 78°F
- Relative humidity (RH): NR*
- Air changes/hour (ACH): 2
- Airflow direction: Positive
- Surgical Pack Room Storage:
- Temperature: < 78°F

Why this is important:

- Fungi grow rapidly at RH > 80%
- Keeping the ventilation parameters consistent helps to minimize microbial growth
- Trapped excess moisture due to packaging may create opportunities for growth
- Higher temperatures encourage fungal growth

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http://www.hse.gov.uk/biosafety/blood-borne-viruses/laundry-treatments.htm

https://www.picnet.ca/wp-content/uploads/Healthcare-Textiles-Teleclass-Slides.pdf

HealthcareTextiles: Factors That Affect Cleanliness Dr.Lynne Sehulster, Division for Healthcare Quality Promotion, CDCA Webber Training Teleclass.

Swapan Kumar Datta

Born	28 January 1953 (age 64)
Residence	Kolkata, West Bengal
Citizenship	India
Nationality	Indian
Fields	Agricultural science
Institutions	Visva Bharati University
Alma mater	Presidency University
	University of Calcutta
	Cornell University
Known for	Genetic engineering of Indica Rice
Spouse	Karabi Datta (Reader, University of Calcutta)

Swapan Kumar Datta (born 28 January 1953) is a well known scientist (Professor) of rice biotechnology. He is well known for his pioneering research on genetic engineering of Indica rice. Dr. Datta has demonstrated the development of genetically engineered Indica rice from protoplast derived from haploid embryogenic cell suspension culture. Golden Indica Rice with enriched Provitamin A and Ferritin rice with high iron content were developed by his group with a vision to meet the challenges of malnutrition in developing countries. Prof. Swapan Datta has been named as one among the top 25 Indian scientists from all fields of science by India Today.

Currently, Prof. Datta is working as Pro-Vice-Chancellor of the Visva-Bharati University (a Central University founded by the great Rabindranath Tagore), Santiniketan, West Bengal, India. Before taking the present responsibility from 31.01.2015, he was positioned as Deputy Director General (DDG-Crop Science) in Indian Council of Agricultural Research (ICAR), New Delhi. He is also currently holding the position Sir Rash Behari Ghosh Chair Professor (on lien) at Department of Botany, University of Calcutta, Kolkata, India.

Early life and Education

Prof. Swapan Datta received his Bachelor of Science (B.Sc) degree in Botany (Honours) in 1972 from Presidency College (presently Presidency University), Calcutta. He completed Master of Science (M.Sc) in Botany from University of Calcutta in the year 1974. From the same university, he obtained PhD degree in 1980. He also completed a course on Intellectual Property Rights (IPR) from Cornell University, USA in 2003.

Career

At the early stage, Swapan Kumar Datta was associated as a Lecturer in Botany with Ramkrishna Mission, Vivekanada Cenetenary College, West Bengal, India from 1976 to 1979. Then he joined Visva-Bharati University, Santiniketan, West Bengal as a lecturer and became Reader in Botany in 1985 and served there up to 1989. During the time, he moved to Germany with the prestigious DAAD fellowship and worked with Prof. G. Wenzel. He then took up an assignment as senior scientist at Friedrich Miescher Institute, Basel, Switzerland. In 1987, he became group leader and senior scientist at ETH Zurich, Switzerland. Dr. Datta worked over there on rice genetic engineering for six years and was associated with Prof. Ingo Potrykus. Meanwhile, he spent six months as visiting Associate Professor at University of California, Davis, USA. For a short span of time in 1993, he joined as staff research scientist at International Centre for Genetic Engineering and Biotechnology (ICGEB), New Delhi. Dr. Swapan Datta moved to join International Rice Research Institute (IRRI), Manila, Philippines as Senior Plant Biotechnologist in 1993. During IRRI tenure, he became the HarvestPlus Rice crop Leader. He returned to India in 2005 to join as Sir Rash Behari Ghosh Chair Professor at University of Calcutta. He established Plant Molecular Biology and Biotechnology Laboratory and became the coordinator of Translational Rice Research Programme funded by DBT, Govt. of India. In 2009, he was appointed as DDG (Crop Science), ICAR, the apex body of India for co-ordinating, guiding and managing research and education in agriculture and served there up to 30.01.2015. From 31 January 2015, he is serving as Pro-Vice Chancellor (SAHA UPACHARYA) in the Visva-Bharati University, Santiniketan, West Bengal.

Awards and Honour

1. DAAD Fellow, Germany- 1985.
2. FMI Fellow, Switzerland- 1987.
3. Panchanan Maheshwari Medal (Experimental Embryology and Plant Biotechnology), Indian Botanical Society- 2006.
4. Paul Johannes Bruhl Memorial Medal, Asiatic Society- 2010
5. TATA Innovation Fellow- 2007.
6. CGIAR Science Award for the work on the enhanced iron and zinc accumulation in transgenic indica rice.

7. Indian Science Congress Association (ISCA) platinum Jubilee lecture award.
8. Member of Genetic Engineering Approval Committee (GEAC), Govt. of India.
9. Member of the task force, GMO Biosafety Committee, Department of Biotechnology, Govt. of India.
10. Member of the Review Committee on Genetic Manipulation (RCGM), DBT, Govt. of India. Chairman, Agricultural Commission, West Bengal, India.
11. Elected Fellow of Indian National Science Academy (INSA), New Delhi.
12. Elected Fellow of National Academy of Sciences, India (NASI), Allahabad.
13. Elected Fellow of National Academy of Agricultural Sciences, India (NAAS), New Delhi. Elected Fellow of The World Academy of Sciences (TWAS).
14. Elected Fellow of West Bengal Academy of Science and Technology (WAST).

Significant Contribution

- He was the pioneer worker to develop genetically engineered fertile homozygous Indica rice plant from protoplast.
- Engineered "Golden" Indica rice with genes for β-carotene synthesis. Engineered rice with ferritin gene for high iron content.
- Pioneering report on field evaluation of hybrid Bt-rice in China.
- Worked on characterization of sd1 gene responsible for green revolution.
- Developed marker free transgenic Indica rice cultivar.
- He developed bacterial blight resistant transgenic rice plant which has been field evaluated in India, Philippines and China.
- Developed Bt-rice resistant against Yellow Stem Borer.
- Demonstrated in vitro laticifer differentiation in Calotropis gigantea.
- Developed transgenic cultivars resistant to bacterial blight, yellow stem borer and sheath blight by gene pyramiding.
- Pioneered the development of genetically engineered rice plants with enhanced sheath blight resistance.

Recent works

His recent research interests include the following---

- RNAi mediated silencing and development of low phytate and low lipoxigenase rice.
- Development of drought and salinity tolerant rice variety.
- Development of transgenic rice plants with enhanced resistance to sheath blight.
- Cytology, genetic transformation system and development of transgenic Jute plant.
- Development of insect resistant Chickpea plant.

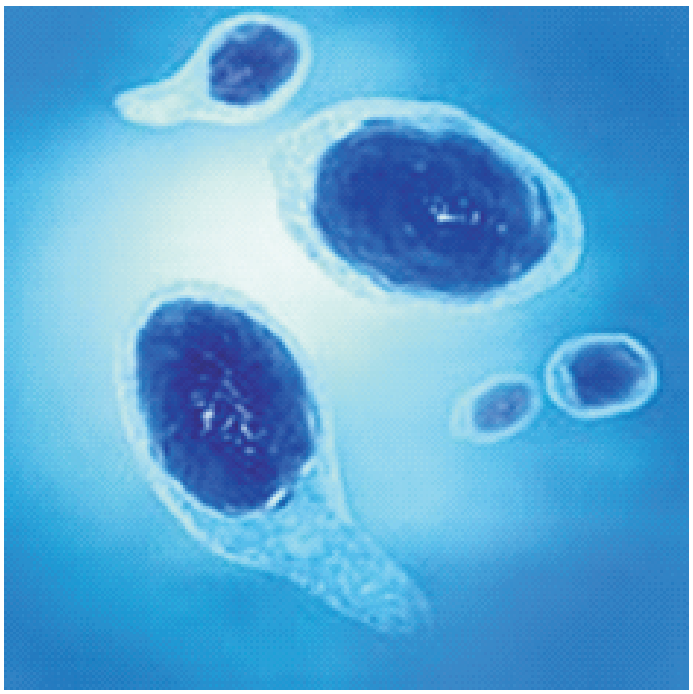
International activities

He was associated as member of scientific committees across the world at several times (International Society for Plant Molecular Biology, International Association for Plant Tissue Culture and Biotechnology, etc.) and worked as principal investigator of several internationally funded research projects (Rockefeller Foundation (USA), United States Agency for International Development (USAID), Danish International Development Agency (DANIDA), (Denmark), BMZ/GTZ (Germany), etc.). He supervised more than 30 PhD students and many other post doctoral fellows from China, Philippines, Switzerland, Myanmar, Bangladesh and India.

Motivational Quotes

1) "Our greatest weakness lies in giving up. The most certain way to succeed is always to try just one more time." -*Thomas Edison*
2) "Always do your best. What you plant now, you will harvest later." -*Og Mandino*
3) "Become the person who would attract the results you seek." -*Jim Cathcart*
4) "Don't watch the clock; do what it does. Keep going." -*Sam Levenson*
5) "Everything you've ever wanted is on the other side of fear." -*George Addair*
6) "The secret of getting ahead is getting started." -*Mark Twain*
7) "Quality performance starts with a positive attitude." -*Jeffrey Gitomer*
8) "Do you want to know who you are? Don't ask. Act! Action will delineate and define you." -*Thomas Jefferson*
9) "Setting goals is the first step in turning the invisible into the visible." -*Tony Robbins*
10) "The harder the conflict, the more glorious the triumph." -*Thomas Paine*
11) "We herd sheep, we drive cattle, we lead people. Lead me, follow me, or get out of my way." -*George S. Patton*
12) "Motivation will almost always beat mere talent." -*Norman Ralph Augustine*
13) "Change before you have to." -*Jack Welch*
14) "Human beings have an innate inner drive to be autonomous, self-determined, and connected to one another. And when that drive is liberated, people achieve more and live richer lives." -*Daniel Pink*
15) "I attribute my success to this: I never gave or took any excuse." -*Florence Nightengale*
16) "Your attitude, not your aptitude, will determine your altitude." -*Zig Ziglar*
17) "Well done is better than well said." -*Benjamin Franklin*
18) "You miss 100% of the shots you don't take." -*Wayne Gretzky*
19) "I got lucky because I never gave up the search. Are you quitting too soon? Or are you willing to pursue luck with a vengeance?" -*Jill Konrath*
20) "There is always room at the top." -*Daniel Webster*
21) "It ain't over 'til it's over." -*Yogi Berra*
22) "It's not about having the right opportunities. It's about handling the opportunities right." -*Mark Hunter*
23) "A goal is a dream with a deadline." -*Napolean Hill*
24) "Winning isn't everything, but wanting to win is." -*Vince Lombardi*
25) "Big shots are only little shots who keep shooting." -*Christopher Morley*
26) "If you're offered a seat on a rocket ship, don't ask what seat! Just get on." -*Sheryl Sandberg*
27) "Outstanding people have one thing in common: An absolute sense of mission." -*Zig Ziglar*
28) "You can't build a reputation on what you are going to do." -*Henry Ford*
29) "Trying is winning in the moment." -*Dan Waldschmidt*
30) "Fall down seven times and stand up eight." -*Proverb*
31) "If you aren't going all the way, why go at all?" -*Joe Namath*
32) "Act as if what you do makes a difference. It does." -*William James*
33) "You just can't beat the person who never gives up." -*Babe Ruth*
34) "Lean in, speak out, have a voice in your organization, and never use the word 'sorry.'" -*Trish Bertuzzi*
35) "Whatever you are, be a good one." -*Abraham Lincoln*
36) "The road to Easy Street goes through the sewer." -*John Madden*
37) "Fortune favors the bold." -*Virgil*
38) "Success is never final. Failure is never fatal. It is courage that counts." -*Winston Churchill*
39) "Don't be afraid to give up the good to go for the great." -*John D. Rockefeller*
40) "High expectations are the key to everything." -*Sam Walton*
41) "No one can make you feel inferior without your consent." -*Eleanor Roosevelt*
42) "Don't let what you cannot do interfere with what you can do." -*John R. Wooden*
43) "There is little success where there is little laughter." -*Andrew Carnegie*
44) "We cannot solve our problems with the same thinking we used when we created them." -*Albert Einstein*
45) "What we dwell on is who we become." -*Oprah Winfrey*
46) "It is not necessary to do extraordinary things to get extraordinary results." -*Warren Buffett*
47) "Nothing is impossible; the word itself says 'I'm possible!'" -*Audrey Hepburn*
48) "Innovation distinguishes between a leader and a follower." -*Steve Jobs*
49) "The successful warrior is the average man, with laser-like focus." -*Bruce Lee*
50) "Be miserable. Or motivate yourself. Whatever has to be done, it's always your choice." -*Wayne Dyer*

Bacillus anthracis



Description and significance

Bacillus anthracis is a Gram-positive, rod-shaped bacterium, 1 - 1.2µm in width and 3 - 5µm in length. It lives in soils worldwide at mesophilic temperatures. It can be grown in aerobic or anaerobic conditons (facultative anaerobe) in a medium with essential nutrients, including carbon and nitrogen sources. In 1877, this organism was the first to be shown to cause disease by Dr. Robert Koch and verified by Dr. Louis Pasteur. The organism was isolated from sick animals and grown in the laboratory to study endospore formation. It is similar to *Bacillus cereus*, *Bacillus subtilis*, and *Bacillus thuringiensis* in cellular size, morphology, and spore formation.

Bacillus anthracis is an important organism to study genome sequence because it's used as a biological weapon. Genome sequencing can also be useful for the development of vaccines. The interactions between the host's immune system cells and the spores are an important area of research that will give us a better understanding of the anthrax disease. Development of better spore detectors will also be helpful.

Other names for this organisms include *Bacteridium anthracis* and *Bacillus cereus var. anthracis*. Common names include "anthrax" and "anthrax bacterium".

Cell structure and metabolism

The vegetative *Bacillus anthracis* cells are Gram-positive, therefore they contain an extensive peptidoglycan layer, lipoteichoic acids, and crystalline cell surface proteins (S-layer proteins). *Bacillus anthracis* differs from other Gram-positive bacteria in that it does not contain teichoic acids and the S-layer proteins are not glycosylated. Cell wall polysaccharides function in anchoring the protective S-layer to the cell wall. The cell wall polysaccharides are composed of galactose (Gal), N-acetylglucosamine (Glc-NAc), and N-acetylmannose (ManNAc) in a 3:2:1 ratio.

The capsule (slime layer) is a polymer of amino acids (D-glutamate), unlike most other bacteria which have polysaccharide capsules. The cells excrete the capsule for protection and virulence. The capsule and the S-layer are compatible, but they can both be formed independently (without the presence of the other). A characteristic mucoid or "smooth" colony variant is correlated with capsule production ability. Virulent strains all form the capsule, and "rough" colony capsules are avirulent. Growth in atmospheric CO_2 cause the antiphagocytic capsule and anthrax toxin proteins to be synthesized. The nontoxic capsule has an important role in infection establishment, while the end disease phases are mediated by the toxin.

The genome of *Bacillus anthracis* contains one flagellin gene, however four essential proteins contain point mutations and frameshifts. Therefore, the flagella are nonfunctional and the organism lacks motility. In addition to the pXO1 and pXO2 plasmids, this is what distinguishes *Bacillus anthracis* from other *Bacillus cereus* group members.

When vegetative cells are deprived of certain nutrients, endospores are formed. Oxygen is necessary for spore formation. Initially, the septum forms asymmetrically in the nutrient deprived cells that produce large (mother cell) and small (forespore) genome containing compartments. The forespore is engulfed by the mother cell and surrounded with three layers (cortex, coat, and exosporium), which are simultaneously formed. The thickest and innermost layer is the cortex made of peptidoglycan. The coat, consisting of a large number of different proteins, tightly covers the cortex. The exosporium is a loose-fitting structure that encloses the spore and serves as a source of surface antigens, which are involved in detection and interaction with the soil environment. It is composed of an external hair-like nap and a paracrystalline basal layer. The hair-like nap has filaments that are mostly formed by a single collagen-like glycoprotein (called BclA), and the basal layer consists of a dozen different proteins. One of the proteins, BxpB (also called ExsF), is required for the attachment of the hair-like nap to the basal layer. Suppressing spore germination is another one of its roles. Large molecules that are a potential harm are excluded by the exosporium, which also serves as a semipermeable barrier.

The mother cell lyses and the spore is released when spore formation is finished. Spores can live in the soil and other inhospitable environments for many years because, once spores have matured, they are resistant to physical and chemical damage. They are highly resistant to heat, cold, dessication, radiation, and disinfectants. Spores germinate and grow as vegetative cells when they find an aqueous environment with the proper nutrients. Small-molecule germinants, including inosine and L-alanine, are recognized by spore receptors and activate germination. The receptors are found within the membrane of the spore that is under the cortex. Spores that enter a host germinate and grow, producing a fatal toxin.

Defense mechanisms are necessary for bacteria to survive

antimicrobial responses in the macrophage. Some of the antibacterial killing mechanisms include superoxide production by NADPH oxidase, hydrogen peroxide formation, generation of nitric oxide by nitric oxide synthase (NOS 2), defensin synthesis, and cationic protein activation. Superoxide dismutase (SOD) is the enzyme that regulates superoxide levels. Arginase, another protein, catalyzes the formation of L-ornithine and urea from L-arginine. Arginase regulates the production of nitric oxide by competing with NOS 2 for L-arginine. It is also involved in metabolite formation, including glutamic acid.

Ecology

Bacillus anthracis lives in soils worldwide. Soil is the main habitat of aerobic, endospore-forming bacilli. Spore formers are ubiquitous. Therefore, when they are isolated from a certain environment, it does not necessarily imply that the specific environment is their habitat. Other organisms that live in aerobic soil include actinomycetes and filamentous fungi. Different members of the *Bacillus* species that live in the soil are classified as acidophiles, alkaliphiles, halophiles, thermophiles, psychrophiles, denitrifiers, nitrogen fixers, antibiotic producers, and pathogens. Some of the bacilli that live in the soil include *Bacillus subtilis* (antibiotic producer); *Bacillus cereus*, *Bacillus thuringiensis*, and *Bacillus larvae* (pathogens); *Bacillus macerans* and *Bacillus polymyxa* (nitrogen fixers); and *Bacillus azotoformans*, *Bacillus laterosporus*, *Bacillus licheniformis*, *Bacillus pasteurii*, and *Bacillus stearothermophilus* (denitrifiers). Many *Bacillus* species play an important role in degradation of biopolymers (such as starch and protein) and carbon and nitrogen cycles.

It is found that *Bacillus anthracis* organisms are capable of forming biofilms, which are resistant to a broad variety of antibiotics. Biofilms are the cause of many disease. Microorganisms in biofilms associate themselves with surfaces and they are covered by an extracellular matrix. Properties of biofilms are essential for survival and pathogenicity. *Bacillus anthracis* biofilms cause the anthrax disease. The organism causes disease mainly in ruminants in North America. Humans are rarely directly infected with *Bacillus anthracis*. Rather, infection in humans generally results from contact with an infected animal.

Pathology

Bacillus anthracis causes the anthrax disease, which represents a complex interaction between the host and parasite. The particles of anthrax that are infectious are the *Bacillus anthracis* endospores. The organism penetrates into the blood stream and harms the host by producing toxins within the body. The slimy capsule layer that surrounds the organism allows it to resist phagocytosis by white cells.

The common disease forms are cutaneous, pulmonary, and gastrointestinal. The cutaneous form is caused by handling contaminated materials, and the pulmonary form is caused by inhalation. Skin abrasions allow spores to enter and cause local lesions by germinating there and developing gelatinous edema. Patients with a cutaneous anthrax disease mostly recover within 10 days, although a few progress to a life-threatening disease. Gastrointestinal anthrax is similar to cutaneous, but occurring on the intestinal mucosa. It is rare and has an extremely high mortality rate. The pulmonary form of the disease results in a higher mortality rate because the organism spreads through circulation. Macrophages in the lung's alveoli take up the spores and permit entry into the body. The infected macrophages lyse and bacteria are released into the blood stream, spreading though circulatory and lymphatic system. This results in septic shock, respiratory distress, and organ failure. Herbivorous animals become infected when they ingest spores from the soil. When humans contact infected animals (including flesh, bones, hides, hair and excrement), they become infected as well. Anthrax is almost never transmitted between people.

Until the 20th century, anthrax was a prevalent disease in humans and cattle. It is still an important pathogen in some countries today. Some scholars believe that the Egyptian plagues in the Bible may have been caused by anthrax. However, most people had not heard of anthrax until the recent 2001 scare in the United States. Robert Koch and Louis Pasteur developed a vaccine against anthrax, which was the first infectious disease they studied (Schaechter et al). The vaccines today are not fully effective. However, if the disease is diagnosed soon enough after infection, antibiotic treatment is effective. Methods to detect the organism quickly and new vaccines are under development. Because *Bacillus anthracis* lives in many soils, outbreaks are still reported. In fact, in the upper Midwest of the United States, many farms are under quarantine due to anthrax (Schaechter et al). During the first stage of inhaled anthrax illness, the symptoms are similar to influenza, including fever, coughing, sore throat, fatigue, sweating, vomiting, diarrhea, headache, nausea, chest pain, and shortness of breath. Symptoms are much more extreme in the second stage, which can result in death in 2-48 hours. The incidence (1-2 cases of cutaneous disease per year) of naturally acquired anthrax is rare in the United States. In fall 2001, intentional contamination of mail resulted in 22 cases of anthrax, of which 11 were inhalation and 11 cutaneous.

Pathogenesis

Research has suggested anthrax protective antigen (PA) can induce cellular lysis in human cells. PA-induced lysis is mediated by human cell receptor TEM8; this receptor is found in epithelial cells of the lungs, skin, and intestines as well as endothelial cells . PA is believed to first dissociate from this receptor and then insert into the membrane for toxicity. Consistent with this idea, TEM8 possesses a low biochemical affinity for PA; low affinity allows reversible binding [19]. PA-induced lysis is believed to result from hyperporation of the cell. As pores compromise osmotic integrity, the cells lysed. No evidence of apoptosis was found during the experiments.

Other than TEM8, only one other human receptor associated with anthrax toxin has been identified: CMG2. The affinity of CMG2 for PA is almost 1,000 times greater than that of TEM8 [19]. Since it is thought that PA must first dissociate from its receptor before it can insert into the membrane, the high affinity of PA for CMG2 and vice versa prevents dissociation under normal homeostatic conditions. Therefore, according to the model of PA-induced cell lysis, it is unlikely CMG2 would mediate this event.

Application to Biotechnology

The toxin of *Bacillus anthracis* is used in biological warfare and bioterrorism. During the 20th century anthrax was used as a

weapon in many countries. It has also been directed toward farm animals for warfare. The significance of anthrax as a terror weapon was realized in 2001. Although small outbreaks can result in a strong response, some people argue that anthrax is not an ideal biological weapon because the organism is not particularly pathogenic. To infect people, a large number of spores are needed. The most effective form of anthrax is a very fine powder. Therefore, to make anthrax a weapon, the preparation needs to be ground into a fine powder. Anticaking agents are necessary as well to prevent clumping of the spores. *Bacillus anthracis* can be grown easily, but it is important to have special containment facilities and to be careful when working with them. They can be engineered to be resistant to antibiotics even though they are usually sensitive to antibiotics including penicillin and ciprofloxacin (Schaechter).

Current Research

Very recent research was conducted on the effects of anthrax toxin on cardiac function. The study found that anthrax toxin had direct effects on the cardiovascular system. Hypotensive shock usually occurs in anthrax infection cases. Varying doses of lethal toxin (LeTx) and edema toxin (EdTx) were administered to rats. The onset time, degree of hypotension and mortality was determined. Lethal toxin and edema toxin were both found to induce hypotension, which results in a shock followed by death. In rats that were treated with lethal toxin, the propagation velocity doubled and the left ventricular systolic and diastolic areas increased by 20 percent. This did not occur in rats treated with edema toxin. However, the rats treated with only edema toxin had an increase in heart rate. Therefore, it was concluded that edema toxin causes a reduction in preload, while lethal toxin results in a reduction of systolic function in the left ventricle.

One current research study characterizes the microbiology of a bacterium that caused anthrax-like disease and death in four chimpanzees and a gorilla in Côte d'Ivoire and Cameroon. The motility, gamma phage resistance, and penicillin G resistance (in Cameroon isolates) of the atypical isolates differ from that of the typical *Bacillus anthracis* strains. Toxin and capsule plasmids were present in these isolates, which were similar in size to the pXO1 and pXO2 plasmids in typical *Bacillus anthracis*. The sequence of the atypical strains were found to resemble that of the typical *Bacillus anthracis* strain and virulent *Bacillus cereus* and *Bacillus thuringiensis* strains (which are uncommon). The study led to the proposal that the atypical isolates share a common ancestor with the classic *Bacillus anthracis*. Another possibility is that the *Bacillus anthracis* strain transferred its plasmids to a *Bacillus cereus* group strain, resulting in the atypical strain.

Another experiment analyzed the role of the capsule in infection and suggests a possible treatment for anthrax infection. The poly-D-glutamic acid capsule of *Bacillus anthracis*, which prevents phagocytosis by the host cells, can be degraded by the use of CapD (a polyglutamic acid depolymerase). The capsule plasmid of *Bacillus anthracis* encodes CapD. When treated with CapD, the bacterium can be phagocytosed due to the degradation of the capsule. This allows the organism to be killed by the host neutrophils. The extent of capsule degradation and the degree of phagocytosis are dependent.

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Lemons contain more sugar than strawberries

We can say that the strawberries and lemons are the world's healthiest foods. Both these fruits contain low amount of sugar that is helpful, as our body needs a certain amount of sugar. A lemon contains 70% sugar and strawberry contains only 40% of sugar. Most varieties of lemons contain higher percentage of sugar than contained by strawberry fruits. But still a lemon cannot be eaten as a dessert like strawberry as it is sour than a strawberry.

These fruits provide good source of Fibres & Vitamin C.

The reason that the lemon tastes sour even having more sugar than the strawberry is that the lemon contains a high amount of citric acid, usually 3% to 6%, that dominated the sweet taste of the lemon and results in the sour taste. The strawberry has less sugar than lemon but there is no acid content present in the strawberry, and therefore it tastes sweet.

People may think that high amount of sugar in a lemon may cause obesity, but a lemon has many medicinal properties. Also, strawberries contain a high amount of carbohydrates in the form of starch, but it also has many health benefits.

If we keep aside low amount of sugar that is present in both the fruits and just evaluate their nutritive values, we will find that the health benefits that they provide are much more than the amount of sugar present in them.

Health Benefits of Lemon:

- Lemons contain a lot of minerals like potassium, iron, sodium and calcium and vitamins like vitamin C, E, K, Vitamin B6 and Vitamin B9.
- Lemon has an alkalizing effect on the body that is they balance the pH level of the body and are perfect for consuming when you are suffering from acidity and heartburn.
- They help in treating throat infections, as they contain vitamin C that acts against infections.
- Drinking Luke warm water in the morning with lemon cures obesity and improves indigestion.
- Potassium, present in lemon, is important as it helps in controlling heart rate and blood pressure.
- Lemon contains anti-cancerous compounds like flavonol glycosides that stop the growth of cancerous cells.
- Lemons have antibacterial and antiseptic properties.
- Lemon helps to cure the fever by increasing perspiration.
- The citric acid present in lemon helps in preventing kidney stones.
- Other benefits include dental care, skin care, and hair care.

Health Benefits of Strawberries:

- Strawberries are packed with antioxidants and are an excellent source of vitamin C. Also; strawberries contain minerals like potassium, manganese, dietary fiber and folate.
- Strawberries contain antioxidants like flavonoids that can prevent damage to our eyes like preventing dry eyes and infections.
- Strawberries act as an immune booster. Eating strawberries daily can supplement the need of vitamin C.
- Strawberries help in fighting cancerous cells. Ellagic acid found in strawberries along with antioxidants like lutein possesses anti-carcinogenic properties.
- Strawberries are rich in potassium that improves the cognitive function of the brain by increasing the blood flow. Also, strawberries contain iodine that helps in proper functioning of the nervous system.
- The minerals, potassium, and magnesium found in strawberries help in lowering the blood pressure. Potassium also helps in the process of vasodilation that is widening of blood vessels, that releases hypertension.
- Other benefits of strawberries include skin rejuvenation of skin and keeping the heart healthy.

Best Practices in Endoscope Disinfection

Employee Training and Competency- Employee education and training are critical. An educated employee knows what to do why it is being done, and that it has been done correctly. The importance of this is highlighted in an investigation completed by the Centre for Disease Control and prevention (1999) in which an operator error was indicated in each instance of disease transmission. Flexible endoscopes are complex devices and the verification of acceptable endpoint results for many of the processing steps is still subjective. Therefore, consistently assigning personnel to processing tasks and verification of competency are recommended.

Cleaning Agents & Methods- Selection of the right cleaning products can make the difference between a process that is efficient and effective and one that is not.

Enzymatic agents are formulated for specific soil types: protease breaks down blood and other proteins, lipase breaks fats, and amylase breaks down sugar/ carbohydrates. Commonly used formulations consist of two or more enzymes combined with a detergent. The enzymes break down the protein, fat, and carbohydrate- enzymes do not emulsify soil or remove it. Some work better in warm water, some in cold. All require time at temperature (i:e., soak time) to be effective.

Detergents have a number of characteristics. Perhaps the best known is the pH. Alkaline agents are more effective for organic soils such as fat or protein. Acidic agents are more effective for inorganic soil, such as urine scale. “Neutral” agents (actually slightly alkaline, between pH 7 and 8.5) are used for surfaces such as anodized aluminium or stainless steel that might be discovered or destroyed by a highly acidic or alkaline agent. Because the endoscopes and endoscopic instruments have organic soil, alkaline detergents are more widely used. The detergent formulation also contains one or more additives to provide the following actions:

- Dissolving: solubility of soil in the water or cleaning solution
- Saponifying: chemical degradation of lipids or fats not freely soluble in water
- Peptizing: degradation and dispersion of proteins
- Wetting: lowering surface tension of a liquid to improve contact with the device and the adherent soil
- Emulsifying, dispersing, and suspending : preventing soil from redepositing on surfaces
- Sequestering: preventing minerals from precipitating out onto surface as salts

A detergent for cleaning flexible endoscopes and endoscopic instruments should contain peptizing, wetting, emulsifying,, dispersing, and suspending agents. If the source water has a high mineral content, the addition of a sequestering agent should be considered.

The removal of soil (i:e., cleaning) can be accomplished manually or automatically.

Friction

Friction is defined as the rubbing of one object or surface against another. Using friction to remove soil (e.g., rubbing/scrubbing the soiled area with a brush) is the oldest and still remains one of the best methods.

Because the internal channel is immovable, the friction is created by moving the brush bristles back and forth across the channel surface. To optimize the effectiveness of mechanical brushing, the brush should have concentric bristles, a diameter sized to the lumen, and a ball tip. Other brushes specifically shaped to clean the valve seats and instrument ports enhance the cleaning process.

Variances in brushing occur from employee to employee and from time to time with the same employee. Factors such as how “hard” the employee scrubs and how many times the brush is passed through the channel, as well as the quality or condition of the brush bristles, are not easily documented. Because these inconsistencies alter the end result, the procedure should incorporate methods designed for the worst-case scenario to ensure expected variances do not alter the outcome, thereby increasing the patient's risk of infection.

Fluidics

Fluidics (i.e., fluids under pressure) is used to remove soil and debris from internal channels/ lumens after brushing and when

the design does not allow the insertion and passage of a brush through the channel. When used manually, the size of the syringe and the pressure exerted by the employee pushing the solution into the lumen determine the pressure/force of the solution against the channel wall. When used automatically, a manifold in the unit establishes the pressure/force of the solution. When a fluid pathway must be established between two or more channels with a single attachment, a method to ensure consistent volume at pressure flows into each channel or lumen must be incorporated because fluids always flow through the path of least resistance (i.e., the channel with the largest diameter).

Ultrasonic Cleaners

Ultrasonic cleaners use a process called cavitation in which waves of acoustic energy are propagated in aqueous solutions where they can disrupt the bonds that hold particulate matter to surfaces. More specifically, the sound energy generates minute bubbles from gas nuclei in the solution. These bubbles expand until they can no longer be sustained; they then collapse or implode and create a minute vacuum, which disrupts the adherence of debris to surfaces. The devices must also be able to tolerate vibration. Thus, although ultrasonic cleaning is recommended for the cleaning of flexible endoscopic instruments, it is not recommended for flexible endoscopes because the vibration may break fiber optic bundles or lenses. However, preparation of each flexible endoscopic instrument is very important. There must be a fluid interface to ensure transmission of the sound energy; air-water interfaces do not efficiently transmit sound energy. This problem can be eliminated with a combination ultrasonic cleaner/irrigator in which a fluid pathway is established between the unit and the device, so that cleaning solutions can be instilled and irrigated through the internal channel during the process.

Infection Prevention

The risk of transmitting an infectious agent from one patient to another by an endoscope or endoscopic instrument is influenced by many factors, including the design complexity of the device, the type of soiling, the patient's condition, the processing procedures, and the employees competency. These variables account for the sporadic occurrence of infections. Therefore, a quality-assurance program is necessary to ensure that the endoscope and can be used safely for patient care. The quality-assurance program should provide standards with which to evaluate and thereby control variations in performance, procedures, and process outcomes. Although it may not be possible to eliminate variations completely, process variation can be minimized with appropriate procedures. Some causes of quality failure are inappropriately trained personnel, inadequate inventory, procedures that are not clear or complete, malfunctioning equipment, equipment being used for a purpose other than intended, and changes in the environmental conditions in which the process is performed. Inspection and functional testing should, as much as possible, be an integral part of the process.

A comprehensive audit of the external environment should be performed at least biannually. The purpose of this audit is to identify external changes or shifts that could have an impact on the efficacy and safety of the reprocessing procedure. The annual review should begin with an examination of the assumptions under which the procedures, practices or products were judged to be appropriate. These assumptions are then compared with the current or existing conditions. For example, have the defined attributes of the patient population changed (e.g. age, health status)? Has the procedure changed or procedure time lengthened? Is there more manipulation of body tissues in performing the procedure, or additional devices in the procedure? Have clinical studies been completed in which the results indicate a problem with the practices, procedures, or products? Today, clinical interventions take place more quickly, are much more aggressive, and are more likely to occur in an ambulatory care setting. The audit should provide the information needed to answer the following questions:

- If changes have occurred, will they alter the outcome of the process?
- If changes have occurred, will they require different procedures, practices, or products to ensure the safety and efficacy?
- If changes have occurred, are the indicators still appropriate to detect problems before the patient is compromised?

Patient risk for infection can be significantly reduced, if not eliminated, with a comprehensive program that assesses and takes appropriate action to accommodate variations in the patient population, the type of procedure, the processing procedures and practices, and the competence of the processing employee.

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Highlights of the coming issue


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