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Editorial

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We would like to thank all our valued readers for appreciating our previous efforts with the intention of still going higher.

As we have already seen some of the Chemical Disinfectants in the last issue; let's see some more of them like **Chlorine and Chlorine Compounds, Quaternary Ammonium Compounds, Biguanides (Chlorhexidine, Polyhexamethylene biguanide (PHMB), Iodophors & Miscellaneous Inactivating Agents).**

Blood is one of the most important sample received in the laboratory for the culture and sensitivity and is a sterile body fluid. The diversity of bacteria that is recovered from blood requires an equally diverse and large number of media to enhance the growth of these bacteria. A unique cap design of the blood culture bottles to prevent from the contamination and incorporation of the liquid, SPS **(sodium polyanetholsulfonate)** at a concentration of 0.05% makes the ready prepared BHI as a better option for the blood culture.

Our In Profile Scientist of the month is none other than **Dr. A. P. J. Abdul Kalam,** a renowned aerospace engineer, professor (of Aerospace engineering), and first Chancellor of the Indian Institute of Space Science and Technology (IIST), who served as the 11th President of India from 2002 to 2007.

Our Bug of the month is Neisseria gonorrhoeae, also known as ***gonococci*** (plural), or ***gonococcus*** (singular), a species of Gram-negative coffee bean-shaped diplococci bacteria responsible for the sexually transmitted infection gonorrhea.

Prebiotics are non-digestible food ingredients that stimulate the growth and/or activity of bacteria in the digestive system in ways claimed to be beneficial to health. A prebiotic is a selectively fermented ingredient that allows specific changes, both in the composition and/or activity in the gastrointestinal microflora that confers benefits upon host well-being and health. **Probiotics** are live bacteria that may confer a health benefit on the host.

In this section let's see the WHO guidelines on Hand Hygiene. Pathogens transferred not only from infected or draining wound but also from frequently colonized areas of normal, intact patient skin. The perineal or inguinal areas tend to be most heavily colonized, but the axillae, trunk, and upper extremities (including the hands) are also frequently colonized. **Hand washing with soap and water has been considered a measure of personal hygiene for centuries and has been generally embedded in religious and cultural habits.**

Enjoy the humour with our Relaxed Mood section.

Your inputs are a valuable contribution towards making this Journal more successful & looking forward for your continuous support & appreciation.

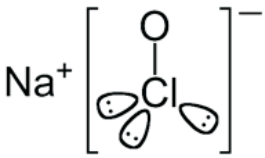
Chemical Sterilization Techniques

Contd.....

We have already discussed some of the Chemical Disinfectants in the last issue; let's see some more of them.....

Chlorine and Chlorine Compounds

***Overview*:**



Hypochlorites, the most widely used of the chlorine disinfectants, are available as liquid (e.g., sodium hypochlorite) or solid (e.g., calcium hypochlorite). The most prevalent chlorine products are aqueous solutions of 5.25%-6.15% sodium hypochlorite, usually called household bleach. They have a broad spectrum of antimicrobial activity, do not leave toxic residues, are unaffected by water hardness, are inexpensive and fast acting, remove dried or fixed organisms and **biofilms** from surfaces, and have a low incidence of serious toxicity. Sodium hypochlorite at the concentration used in household bleach (5.25-6.15%) can produce ocular irritation or oropharyngeal, esophageal, and gastric burns. Other disadvantages of hypochlorites include corrosiveness to metals in high concentrations (>500 ppm), inactivation by organic matter, discoloring or "bleaching" of fabrics, release of toxic chlorine gas when mixed with ammonia or acid (e.g., household cleaning agents), and relative stability. The microbicidal activity of chlorine is attributed largely to undissociatedhypochlorous acid (HOCl). The dissociation of HOCI to the less microbicidal form (hypochlorite ion OCl^-) depends on pH and its own concentration. The disinfecting efficacy of chlorine decreases with an increase in pH that parallels the conversion of undissociated HOCI to OCl^-. NaOCl stored at room temperature quickly loses strength (up to 40%-50%) due to the high rates of free available chlorine level over 1 month. A potential hazard is production of the carcinogen bis (chloromethyl) ether when hypochlorite solutions contact formaldehyde and production of the carcinogen trihalomethane when hot water is hyperchlorinated.

Alternative compounds that release chlorine and are used in the health-care setting include demand-release chlorine dioxide, sodium dichloroisocyanurate, and chloramine-T. The advantage of these compounds over the hypochlorites is that they retain chlorine longer and so exert a more prolonged bactericidal effect.

Sodium dichloroisocyanurate tablets are stable, and for two reasons, the microbicidal activity of solutions prepared from sodium dichloroisocyanurate tablets might be greater than that of sodium hypochlorite solutions containing the same total available chlorine. First, with sodium dichloroisocyanurate, only 50% of the total available chlorine is free (HOCl and OCl^-), whereas the remainder is combined (monochloroisocyanurate or dichloroisocyanurate), and as free available chlorine is used up, the latter is released to restore the equilibrium. Second, solutions of sodium dichloroisocyanurate are acidic, whereas sodium hypochlorite solutions are alkaline, and the more microbicidal type of chlorine (HOCl) is believed to predominate. In vitro suspension tests showed that solutions containing about 140 ppm chlorine dioxide achieved a reduction factor exceeding 10^6 of *S. aureus* in 1 minute and of *Bacillus atrophaeus* spores in 2.5 minutes in the presence of 3 g/L bovine albumin. The potential for damaging equipment requires consideration because long-term use can damage the outer plastic coat of the insertion tube. In another study, chlorine dioxide solutions at either 600 ppm or 30 ppm killed *Mycobacterium avium-intracellulare* within 60 seconds after contact but contamination by organic material significantly affected the microbicidal properties.

Although the United Kingdom manufacturer claims that superoxidized water is noncorrosive and non-damaging to endoscopes and processing equipment, one flexible endoscope manufacturer (Olympus Key-Med, United Kingdom) has voided the warranty on the endoscopes if superoxidized water is used to disinfect them. As with any germicide formulation, the user should check with the device manufacturer forcompatibility with the germicide.

***Mode of Action*:** The exact mechanism by which free chlorine destroys microorganisms has not been elucidated. Inactivation by chlorine can result from a number of factors: oxidation of sulfhydryl enzymes and amino acids; ring chlorination of amino acids; loss of intracellular contents; decreased uptake of nutrients; inhibition of protein synthesis; decreased oxygen uptake; oxidation of respiratory components; decreased adenosine triphosphate production; breaks in DNA; and depressed DNA synthesis. The actual microbicidal mechanism of chlorine might involve a combination of these factors.

$$4\ NaClO + 2\ H_2O \rightarrow 4\ Na^+ + 4\ OH^- + 2\ Cl_2 + O_2$$

***Microbicidal Activity*:** Low concentrations of free available chlorine (e.g., HOCl, OCl^-, and elemental chlorine Cl_2) have a biocidal effect on mycoplasma (25 ppm) and vegetative bacteria (<5 ppm) in seconds in the absence of an organic load. Higher concentrations (1,000 ppm) of chlorine are required to kill *M. tuberculosis*. A concentration of 100 ppm will kill ≥99.9% of *B. atrophaeus* spores within 5 minutes and destroy mycotic agents in <1 hour. Acidified bleach and regular bleach (5,000 ppm chlorine) can inactivate 10^6 *Clostridium difficile* spores in ≤10 minutes. One study reported that 25 different viruses were inactivated in 10 minutes with 200 ppm available chlorine. Several studies have demonstrated the effectiveness of diluted sodium hypochlorite and other disinfectants to inactivate HIV. Chlorine (500 ppm) showed inhibition of *Candida* after 30 seconds of exposure. Because household bleach contains 5.25%–6.15% sodium hypochlorite, or 52,500–61,500 ppm available chlorine, a 1:1,000 dilution provides about 53-62 ppm available chlorine, and a 1:10 dilution of household bleach provides about 5250-6150 ppm.

In 1986, a chlorine dioxide product was voluntarily removed from the market when its use caused leakage of cellulose-based dialyzer membranes, which allowed bacteria to migrate from the dialysis fluid side of the dialyzer to the blood side.

Sodium dichloroisocyanurate at 2,500 ppm available chlorine is effective against bacteria in the presence of up to 20% plasma, compared with 10% plasma for sodium hypochlorite at 2,500 ppm.

"Superoxidized water" has been tested against bacteria, mycobacteria, viruses, fungi, and spores. Freshly generated superoxidized water is rapidly effective (<2 minutes) in achieving a 5-$\log_{10}$ reduction of pathogenic microorganisms (i.e.,

M. tuberculosis, *M. chelonae*, poliovirus, HIV, multidrug-resistant *S. aureus*, *E. coli, Candida albicans*, *Enterococcus faecalis, P. aeruginosa*) in the absence of organic loading. However, the biocidal activity of this disinfectant decreased substantially in the presence of organic material (e.g., 5% horse serum). No bacteria or viruses were detected on artificially contaminated endoscopes after a 5-minute exposure to superoxidized water 551 and HBV-DNA was not detected from any endoscope experimentally contaminated with HBV-positive mixed sera after a disinfectant exposure time of 7 minutes.

***Uses*:**
Hypochlorites are widely used in healthcare facilities in a variety of settings. Inorganic chlorine solution is used for disinfecting tonometer heads and for spot-disinfection of countertops and floors. Because hypochlorites and other germicides are substantially inactivated in the presence of blood, large spills of blood require that the surface be cleaned before final solution of bleach is applied. Extreme care always should be taken to prevent percutaneous injury. At least 500 ppm available chlorine for 10 minutes is recommended for decontaminating CPR training manikins. Other uses in healthcare include as a disinfectant for manikins, laundry, dental appliances, hydrotherapy tanks regulated medical waste before disposal, and the water distribution system in hemodialysiscenters and hemodialysis machines.

Quaternary Ammonium Compounds

Overview: The quaternary ammonium compounds are widely used as disinfectants. Health-care–associated infections have been reported from contaminated quaternary ammonium compounds used to disinfect patient-care supplies or equipment, such as cystoscopes or cardiac catheters. The quaternaries are good cleaning agents, but high water hardness and materials such as cotton and gauze pads can make them less microbicidal because of insoluble precipitates or cotton and gauze pads absorb the active ingredients, respectively. One study showed a significant decline (~40%–50% lower at 1 hour) in the concentration of quaternaries released when cotton rags or cellulose-based wipers were used in the open-bucket system, compared with the nonwoven spunlace wipers in the closed-bucket system. As with several other disinfectants (e.g., phenolics, iodophors) gram-negative bacteria can survive or grow in them.

Chemically, the quaternaries are organically substituted ammonium compounds in which the nitrogen atom has a valence of 5, four of the substituent radicals (R1-R4) are alkyl or heterocyclic radicals of a given size or chain length, and the fifth (X-) is a halide, sulfate, or similar radical. Each compound exhibits its own antimicrobial characteristics, hence the search for one compound with outstanding antimicrobial properties. Some of the chemical names of quaternary ammonium compounds used in healthcare are alkyl dimethyl benzyl ammonium chloride, alkyl didecyl dimethyl ammonium chloride, and dialkyl dimethyl ammonium chloride. The newer quaternary ammonium compounds (i.e., fourth generation), referred to as twin-chain or dialkyl quaternaries (e.g. didecyl dimethyl ammonium bromide and dioctyl dimethyl ammonium bromide), purportedly remain active in hard water and are tolerant of anionic residues.

A few case reports have documented occupational asthma as a result of exposure to benzalkonium chloride.

Mode of Action: The bactericidal action of the quaternaries has been attributed to the inactivation of energy-producing enzymes, denaturation of essential cell proteins, and disruption of the cell membrane746. Evidence exists that supports these and other possibilities.

Microbicidal Activity: Results from manufacturers' data sheets and from published scientific literature indicate that the quaternaries sold as hospital disinfectants are generally fungicidal, bactericidal, and virucidal against lipophilic (enveloped) viruses; they are not sporicidal and generally not tuberculocidal or virucidal against hydrophilic (nonenveloped) viruses. Some *Pseudomonas sp.* can even grow in solutions of quats, eg. Cetrimide based preparations. The poor mycobactericidal activities of quaternary ammonium compounds have been demonstrated. Quaternary ammonium compounds effectively (>95%) remove andinactivate contaminants (i.e., multidrug-resistant *S. aureus*, vancomycin-resistant *Entercoccus*, *P. aeruginosa*) from computer keyboards with a 5-second application time. No functional damage or cosmetic changes occurred to the computer keyboards after 300 applications of the disinfectants.

Generations of QACs
Several generations of Qats developed with better biocidal activity & tolerance to organic matter.

First Generation: Have lowest relative biocidal activity. Eg: Benzalkonium chloride, Cetrimide etc.

Benzlkonium chloride (BKC)
Rapidly acting biocidal agent with a moderate residual action.
Lowest relative biocidal activity.

Cetrimide
Used as selective media for the growth of *P. aeruginosa*. Widely used in the examination of cosmetics, pharmaceuticals & clinical specimens to test for the presence of *P. aeruginosa*.

Second Generation: Substitution of the aromatic ring hydrogen of BKC with chlorine, methyl and ethyl groups results in second generation quat with higher biocidal activity. Eg: Alkyl dimethyl benzyl ammonium chloride (ADBAC).

Third Generation: "Dual Quats". Mixture of two specific quats with increased biocidal activity, stronger detergency & relative lower toxicity. Eg: Equal mixture of alkyl dimethyl benzyl ammonium chloride + alkyl dimethyl ethylbenzyl ammonium chloride (ADEAC).

Fourth Generation: "Twin or Dual Chain Quats". Superior in germicidal performance, lower foaming & an increased tolerance to protein loads and hard water. Eg: Didecyl dimethyl ammonium chloride or dioctyl dimethyl ammonium chloride.
Didecyl dimethyl ammonium chloride.

Fourth generation (twin or dual chain quats). Stronger/superior antimicrobial activity. Increased tolerance to hard water and organic matter. Low foaming

Target - Cytoplasmic membrane
Disruption of intermolecular interactions. Dissociation of lipid bilayers – increased permeability of cell membrane, leakage of cytoplasmic contents. Deactivation of enzymes responsible for respiration and metabolic cellular activities

Fifth Generation: Mixtures of fourth generation quats with second-generation quats. Outstanding germicidal performance, active under more hostile conditions & are safer to use. Eg: DDAC + ADBAC

Uses: The quaternaries commonly are used in ordinary environmental sanitation of noncritical surfaces, such as floors, furniture, and walls. EPA-registered quaternary ammonium compounds are appropriate to use for disinfecting medical equipment that contacts intact skin (e.g., blood pressure cuffs).Used as disinfectants, surfactants, fabric softeners & antistatic agents.

Biguanides

Biguanides include both mono and polymeric forms

Chlorhexidine (Monomeric biguanides)

Available as dihydrochloride, diacetate & gluconate. Has a wide spectrum of antibacterial activity. Also tuberculocidal in ethanolic solutions. Is sporicidal at 98-100°C. Addition of low concentrations (0.5% - 1.0%) of Chlorhexidine to alcohol based preparations result in greater residual activity.

Target - Lipids present in cell membrane. Binds to phosphate and fatty acids of phospholipids. Membrane damage. Leakage of cell components. Cytoplasmic coagulation at high concentration.

Polyhexamethylene biguanide (PHMB)

It is a Polymeric biguanide. Used for disinfection of skin. It has very low toxicity to higher organisms such as human cells. PHMB is not cytotoxic. Antimicrobial activity increases with increasing polymer length.

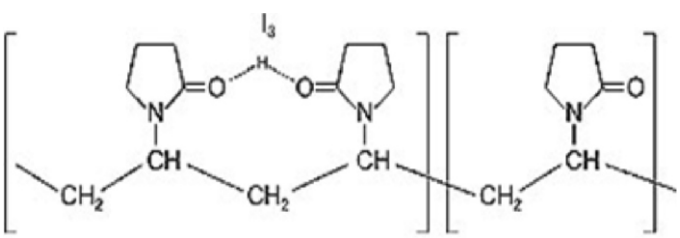
Target-

Cytoplasmic membrane, DNA. Polymer strands are incorporated into the bacterial cell wall. Disrupts the membrane and reduces its permeability. Complete loss of membrane functions. Precipitation of intracellular constituents, leakage of cytoplasmic contents - lethal for bacteria. Also binds to bacterial DNA, alterits transcription &causes lethal DNA damage.

Uses:

- Chorhexidine is a well know anti-plaque biocide that plays a crucial role in reduction of supragingival plaque and treatment of gingivitis.
- PHMB is deployed as a part of wound care system.
- PHMB formulations are now widely deployed in clinical applications such as the treatment of Acanthamoeba keratinitis etc.
- PHMB has been used in contact lens cleaning formulations.
- PHMB is also used as disinfectant for effective reduction of legionella in water cooling system.

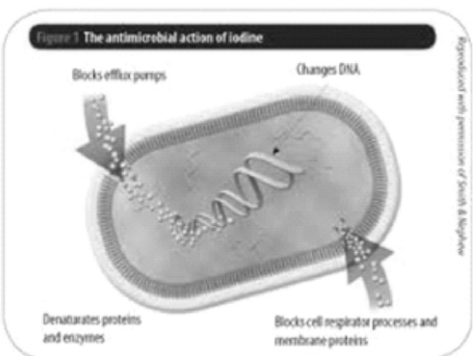
Iodophors



Overview. Iodine solutions or tinctures long have been used by health professionals primarily as antiseptics on skin or tissue. Iodophors, on the other hand, have been used both as antiseptics anddisinfectants. Regulatory bodies has not cleared any liquid chemical sterilant or high-level disinfectants with iodophors as the main active ingredient. An iodophor is a combination of iodine and a solubilizing agent or carrier; the resulting complex provides a sustained-release reservoir of iodine and releases small amounts of free iodine in aqueous solution. The best-known and most widely used iodophor is povidone-iodine, a compound of polyvinylpyrrolidone with iodine. This product and other iodophors retain the germicidal efficacy of iodine.

Several reports that documented intrinsic microbial contamination of antiseptic formulations of povidone-iodine and poloxamer-iodine. "Free" iodine (I2) contributes to the bactericidal activity of iodophors and dilutions of iodophors demonstrate more rapid bactericidal action than does a full-strength povidone-iodine solution. The reason for the observation that dilution increases bactericidal activity is unclear, but dilution of povidone-iodine might weaken the iodine linkage to the carrier polymer with an accompanying increase of free iodine in solution.

Mode of Action: Iodine can penetrate the cell wall of microorganisms quickly, and the lethal effects are believed to result from disruption of protein and nucleic acid structure and synthesis.



Microbicidal Activity: Published reports on the in vitro antimicrobial efficacy of iodophors demonstrate that iodophors are bactericidal, mycobactericidal, and virucidal but can require prolonged contact times to kill certain fungi and bacterial spores. Three brands of povidone-iodine solution have demonstrated more rapid kill (seconds to minutes) of *S. aureus*and *M. chelonae*at a 1:100 dilution than did the stock solution. The virucidal activity of 75–150 ppm available iodine was demonstrated against seven viruses. Other investigators have questioned the efficacy of iodophors against poliovirus in the presence of organic matter and rotavirus SA-11 in distilled or tapwater. Manufacturers' data demonstrate that commercial iodophors are not sporicidal.

Uses: Besides their use as an antiseptic, iodophors have been used for disinfecting blood culture bottles and medical equipment, such as hydrotherapy tanks, thermometers, and endoscopes. Antiseptic iodophors are not suitable for use as hard-surface disinfectants because of concentration differences. Iodophors formulated as antiseptics contain less free iodine than do those formulated as disinfectants 376. Iodine or iodine-based antiseptics should not be used on silicone catheters because they can adversely affect the silicone tubing.

MISCELLANEOUS INACTIVATING AGENTS

Other Germicides

Several compounds have antimicrobial activity but for various reasons have not been incorporated into the armamentarium of health-care disinfectants. These include mercurials, sodium hydroxide, β-propiolactone, chlorhexidine gluconate, cetrimide-chlorhexidine, glycols (triethylene and propylene), and the Tego disinfectants. Two authoritative references examine these agents in detail.

A peroxygen-containing formulation had marked bactericidal action when used as a 1% weight/volume solution and virucidal activity at 3%, but did not have mycobactericidal activity at concentrations of 2.3% and 4% and exposure times ranging from 30 to 120 minutes. It also required 20 hours to kill *B. atrophaeus* spores. A powder-based peroxygen compound for disinfecting contaminated spill was strongly and rapidly bactericidal.

In preliminary studies, nanoemulsions (composed of detergents and lipids in water) showed activity against vegetative bacteria, enveloped viruses and *Candida*. This product represents a potential agent for use as a topical biocidal agent.

New disinfectants that require further evaluation include glucoprotamin, tertiary amines and a light-activated antimicrobial coating. Several other disinfection technologies might have potential applications in the healthcare setting.

Metals as Microbicides

Comprehensive reviews of antisepsis, disinfection, and anti-infective chemotherapy barely mention the antimicrobial activity of heavy metals. Nevertheless, the anti-infective activity of some heavy metals has been known since antiquity. Heavy metals such as silver have been used for prophylaxis of conjunctivitis of the newborn, topical therapy for burn wounds, and bonding to indwelling catheters, and the use of heavy metals as antiseptics or disinfectants is again being explored. Inactivation of bacteria on stainless steel surfaces by zeolite ceramic coatings containing silver and zinc ions has also been demonstrated.

Metals such as silver, iron, and copper could be used for environmental control, disinfection of water, or reusable medical devices or incorporated into medical devices (e.g., intravascular catheters). A comparative evaluation of six disinfectant formulations for residual antimicrobial activity demonstrated that only the silver disinfectant demonstrated significant residual activity against *S. aureus* and *P. aeruginosa*. Preliminary data suggest metals are effective against a wide variety of microorganisms.

Clinical uses of other heavy metals include copper-8-quinolinolate as a fungicide against *Aspergillus*, copper-silver ionization for *Legionella* disinfection, organic mercurials as an antiseptic (e.g., mercurochrome) and preservative/disinfectant (e.g., thimerosal [currently being removed from vaccines]) in pharmaceuticals and cosmetics.

Ultraviolet Radiation (UV)

The wavelength of UV radiation ranges from 328 nm to 210 nm (3280 A to 2100 A). Its maximum bactericidal effect occurs at 240–280 nm. Mercury vapor lamps emit more than 90% of their radiation at 7 nm, which is near the maximum microbicidal activity. Inactivation of microorganisms results from destruction of nucleic acid through induction of thymine dimers. UV radiation has been employed in the disinfection of drinking water, air, titanium implants, and contact lenses. Bacteria and viruses are more easily killed by UV light than are bacterial spores. UV radiation has several potential applications, but unfortunately its germicidal effectiveness and use is influenced by organic matter; wavelength; type of suspension; temperature; type of microorganism; and UV intensity, which is affected by distance and dirty tubes. The application of UV radiation in the health-care environment (i.e., operating rooms, isolation rooms, and biologic safety cabinets) is limited to destruction of airborne organisms or inactivation of microorganisms on surfaces. The effect of UV radiation on postoperative wound infections was investigated in a double-blind, randomized study in five university medical centres. After following patients over a 2-year period, the investigators reported the overall wound infection rate was unaffected by UV radiation, although postoperative infection in the "refined clean" surgical procedures decreased significantly (3.8%–2.9%). No data support the use of UV lamps in isolation rooms, and this practice has caused at least one epidemic of UV-induced skin erythema and keratoconjunctivitis in hospital patients and visitors.

Pasteurization

Pasteurization is not a sterilization process; its purpose is to destroy all pathogenic microorganisms. However, pasteurization does not destroy bacterial spores. The time-temperature relation for hot-water pasteurization is generally ~70°C (158°F) for 30 minutes. The water temperature and time should be monitored as part of a quality-assurance program. Pasteurization of respiratory therapy and anesthesia equipment is a recognized alternative to chemical disinfection. The efficacy of this process has been tested using an inoculum that the authors believed might simulate contamination by an infected patient. Use of a large inoculum of *P. aeruginosa* or *Acinetobacter calcoaceticus* in sets of respiratory tubing before processing demonstrated that machine-assisted chemical processing was more efficient than machine-assisted pasteurization with a disinfection failure rate of 6% and 83%, respectively. Other investigators found hot water disinfection to be effective (inactivation factor >5 log10) against multiple bacteria, including multidrug-resistant bacteria, for disinfecting reusable anesthesia or respiratory therapy equipment.

Flushing- and Washer-Disinfectors

Flushing- and washer-disinfectors are automated and closed equipment that clean and disinfect objects from bedpans and washbowls to surgical instruments and anesthesia tubes. Items such as bedpans and urinals can be cleaned and disinfected in flushing-disinfectors. They have a short cycle of a few minutes. They clean by flushing with warm water, possibly with a detergent, and then disinfect by flushing the items with hot water or with steam. Because this machine empties, cleans, and disinfects, manual cleaning is eliminated, fewer disposable items are needed, and fewer chemical germicides are used. A microbiologic evaluation of one washer/disinfector demonstrated complete inactivation of suspensions of *E. faecalis* or poliovirus. Other studies have shown that strains of *Enterococcus faecium* can survive the British Standard for heat disinfection of bedpans (80ºC for 1 minute). The significance of this finding with reference to the potential for enterococci to survive and disseminate in the health-care environment is debatable. These machines are available and used in many European countries.

Surgical instruments and anesthesia equipment are more difficult to clean. They are run in washer-disinfectors on a longer cycle of approximately 20–30 minutes with a detergent. These machines also disinfect by hot water at approximately 90°C.

Ready Prepared BHI Broth: Better recovery of blood isolates

Blood streams infections are considered as the leading cause of mortality and morbidity among the health care infection and its early diagnosis and prompt treatment is crucial for the better management of the patients. Blood is one of the most important sample received in the laboratory for the culture and sensitivity and is a sterile body fluid. Generally blood culture is performed to diagnose the etiological agents of infections like enteric fever, pneumonia, endocarditis, brucellosis, meningitis, pyelonephritis, infective conditions in the peripheral cardiovascular system and for those pathogens entering the blood from abscesses, infected wounds etc.

Blood cultures are obtained from patients prior to instituting antibiotic therapy in an effort to identify etiologic microorganisms, focus antibiotic therapy, determine optimal duration of treatment, and guide further interventions. Unfortunately, a small proportion of blood culture yield true-positive results and inappropriately ordering blood cultures may be both wasteful and harmful. When blood cultures are contaminated by skin commensals, repeat blood cultures are obtained which may prolong hospitalization and unnecessary antibiotic administration.

DETECTION OF CONTAMINATED BLOOD CULTURES

Despite its limitations, the blood culture remains the "gold standard" for the detection of bacteremia. An accurate interpretation of culture results is critical not only from the perspective of individual patient care but also from the standpoint of hospital epidemiology and public health. The tracking and reporting of nosocomial infections and monitoring of bloodstream infection rates are both essential infection control activities that depend heavily on the accurate differentiation of contamination from true bacteremia. Reliably making this determination continues to be very challenging for clinicians, epidemiologists, and microbiologists. In recent decades, multiple approaches have been studied, advocated, and utilized for this purpose. Clues that may help to differentiate contamination from bacteremia include identity of the organism, number of positive culture sets, number of positive bottles within a set, time to growth, quantity of growth, clinical and laboratory data, source of culture, and automated classification using information technology.

Identity of Organism

Often, the identity of the microbe that grows from a blood culture is a very helpful clue that the results may or may not represent contamination. The College of American Pathologists (CAP) Q-Probes study described above found that the most important indicator when interpreting blood culture results was the identity of the organism, which was cited as very important to 79% of laboratories.

Weinstein et al.'s study of 843 episodes of positive blood cultures in adult inpatients from three hospitals around the country suggested that certain organisms should almost always be thought to represent true bacteremia or fungemia when isolated from a blood culture. These organisms included *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Escherichia coli* and other *Enterobacteriaceae*, *Pseudomonas aeruginosa*, and *Candida albicans*. Furthermore, Weinstein's personal observation is that the following organisms almost always represent a true infection when isolated from a blood culture: *Streptococcus pyogenes*, *Streptococcus agalactiae*, *Listeria monocytogenes*, *Neisseria meningitidis*, *Neisseria gonorrhoeae*, *Haemophilus influenzae*, members of the *Bacteroides fragilis* group, all *Candida* species, and *Cryptococcus neoformans*.

Along the same vein, certain organisms have been found to represent contamination in a significant proportion of cases. These organisms include coagulase-negative staphylococci, *Corynebacterium* species, *Bacillus* species other than *Bacillus anthracis*, *Propionibacterium acnes*, *Micrococcus* species, viridians group streptococci, enterococci, and *Clostridium perfringens*. However, it is crucial to recognize that each of these organisms can also represent true bacteremias with devastating consequences, particularly if untreated due to misinterpretation as contaminants. Of these organisms, the ones that are thought to represent true bacteremia only rarely are *Corynebacterium* species, *Bacillus* species other than *B. anthracis*, and *Propionibacterium acnes*.

Despite the high likelihood that certain organisms usually represent contaminants when isolated from blood cultures, determining the likelihood of true bacteremia can be challenging for clinicians. Coagulase-negative staphylococci represent an important, all-too-frequent case in point. In the past, coagulase-negative staphylococci were usually believed to represent contamination when isolated from blood cultures. In fact, coagulase-negative staphylococci are the most common blood culture contaminants, typically representing 70% to 80% of all contaminated blood cultures.

Recently, however, studies have shown that these organisms are an increasing source of true bacteremia in patients with prosthetic devices and central venous catheters, although the majority of isolates of coagulase-negative staphylococci from blood cultures continue to be contaminants. Weinstein et al. found that even though only 12.4% of coagulase-negative staphylococcal isolates were clinically significant, they ranked as the third most common cause of bacteremia because of their high prevalence. In another study, among 81 episodes of coagulase-negative staphylococcal blood culture results, the incidence of clinically significant bacteremia was 20 (24.7%) episodes, that of indeterminate bacteremia was 10 (12.3%) episodes, and that of contamination was 59 (72.8%) episodes. Other studies found rates of true bacteremias ranging from 10% to 26.4% when coagulase-negative staphylococci are isolated from blood cultures. Similarly, other organisms can be difficult to interpret when isolated from blood cultures. One study found that enterococci were pathogens 70% of the time, whereas viridans group streptococci were pathogens 38% of the time. Furthermore, that same study found that *Clostridium perfringens* was a contaminant 77% of the time, whereas other *Clostridium* species were true pathogens 80% of the time. Given these data, clinicians attempting to differentiate true infections from simply contaminated blood cultures cannot rely solely on the identity of the organism. Often, bloodstream infections involve only a single organism, prompting clinicians to sometimes conclude that a

blood culture bottle that grows multiple organisms is contaminated. However, studies have found that 6% to 21% of all true bacteremias are polymicrobial, usually in patients in high-risk groups. Furthermore, multiple coagulase-negative species have been found to cause polyclonal coagulase-negative staphylococcal infections. Therefore, one cannot conclude that the mere presence of multiple organisms in a blood culture bottle always indicates contamination.

Recovery of blood isolates

The diversity of bacteria that is recovered from blood requires an equally diverse and large number of media to enhance the growth of these bacteria. Basic blood culture media contain a nutrient broth and an anticoagulant, and several different broth formulations are available but most blood culture bottle commercially available contains trypticase soy broth, brain-heart infusion broth, glucose broth, thioglycollate broth or more specialized broth include Columbia broth or *Brucella* broth. Brain heart infusion broth is a highly nutritious general purpose liquid medium used for the cultivation of fastidious and non-fastidious microorganism, including aerobic and anaerobic bacteria from a variety of clinical and non clinical specimens. This media contains calf brain, beef heart and peptone which provide the major source of carbon, nitrogen and many growth factors. Similarly dextrose is the fermentable carbohydrate source and dipotassium phosphate acts as a buffer.

Conventionally media for blood culture is prepared in the glass vials and when blood is added to this culture bottle, its cap needs to be completely open and if this procedure is not performed maintaining the sterile condition this greatly increases the chances of contamination of air micro flora. This problem is addressed ready prepared BHI bottle by including a sterile cover rim within a cap so that needle can be directly inserted into the culture bottle through the small opening inside the flip of the cap without opening the cap. Moreover the cap is externally covered with the gamma irradiated plastic layer which should be opened at the time of adding the blood in the media and this minimizes the chances of contamination through cap. Blood is withdrawn from a patient using a sterile needle and syringe and is added to the blood culture bottle containing 0.05% Sodium Polyanethol Sulfonate (SPS).

The bottle is incubated and observed for turbidity, colour change, hemolysis, gas formation and other evidence of microbial growth. 5 ml blood culture media for neonates, 20 ml blood culture media for pediatric and 70 ml blood culture media is sufficient for adults (Pic. 1).

The growth of microorganisms in a blood culture may be delayed or prevented if an anticoagulant is not used in the culture medium since the organisms may become trapped in the fibrin clot. Blood contains antibodies, complement, ß-lysin and phagocytes which are natural bacterial inhibitors. Antibiotics in the blood also may greatly reduce, if not completely eliminate, the chances of obtaining a positive culture. These issues are overcome by the use of sodium polyanetholsulfonate (SPS). Van Hablerand Miles in 1938 first demonstrated the usefulness of SPS in blood culture medium. SPS is a polyanionic anticoagulant, which inhibits complement and lysozyme activity, interferes with phagocytosis and inactivates aminoglycosides. SPS inhibits the activity of streptomycin, polymyxin B, kanamycin and gentamicin. SPS completely inhibited serum antibacterial activity and serum-

Pic. 1

dependent phagocytosis (and killing) by isolated leukocytes at a concentration usually employed in blood culture media. SPS also stimulated both glucose C-1 oxidation in resting leukocytes and formate oxidation in both resting and phagocytosing leukocytes in serum-free systems. These in vitro studies support the concept that SPS is a useful additive to blood culture media and further elaborate on the mechanism of its inhibition of the microbicidal activity of blood.

In conclusion, unique cap design of the blood culture bottles to prevent from the contamination and incorporation of the liquid, SPS at a concentration of 0.05% makes the ready prepared BHI as a better option for the blood culture.

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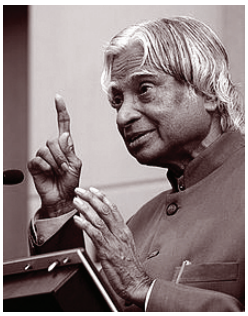
Dr. A. P. J. Abdul Kalam



Born	15 October 1931 (age 80) Rameswaram, British India (now Tamil Nadu, India)
Political party	Independent
Education	St. Joseph's College, Tiruchirappalli Madras Institute of Technology
Occupation	Professor (Aerospace engineering) nuclear scientist rocket scientist author academic
Profession	Aerospace engineer
Religion	Islam

Avul Pakir Jainulabdeen Abdul Kalam born 15 October 1931 usually referred to as **A. P. J. Abdul Kalam**, is a renowned aerospace engineer, professor (of Aerospace engineering), and first Chancellor of the Indian Institute of Space Science and Technology Thiruvananthapuram (IIST), who served as the 11th President of India from 2002 to 2007. During his term as President, he was popularly known as the People's President. He was awarded the Bharat Ratna, India's highest civilian honour in 1997.

Before his term as India's president, he worked as an aerospace engineer with Defence Research and Development Organisation (DRDO) and Indian Space Research Organisation (ISRO). He is popularly known as the Missile Man of India for his work on the development of ballistic missile and space rocket technology. Kalam played a pivotal organizational, technical and political role in India's Pokhran-II nuclear tests in 1998, the first since the original nuclear test by India in 1974. Kalam has even been circled with various controversies as many scientific experts called him a man with no authority over "nuclear physics" and a man who just carried the works of Homi J. Bhabha and Vikram Sarabhai.

He is currently a visiting professor at Indian Institute of Management Ahmedabad, Chancellor of Indian Institute of Space Science and Technology Thiruvananthapuram, a professor of Aerospace Engineering at Anna University (Chennai), a visiting professor at Indian Institute of Management Indore, and an adjunct/visiting faculty at many other academic and research institutions across India.

In May 2011, Kalam launched his mission for the youth of the nation called the What Can I Give Movement. Kalam better known as a scientist, also has special interest in the field of arts like writing Tamil poems, and also playing the music instrument Veenai.

Early life and education

Kalam spent most of his childhood running into financial problems and started working at an early age to supplement his family's income. Kalam was brought up in a multi-religious, tolerant society, with Kalam strictly following his religious routine. After completing school, Kalam along with his cousin Samsuddin Kalam distributed papers in order to financially contribute to his father's income. After completing his school education, Kalam went on to attend the Saint Joseph's College, Tiruchirappalli where he graduated in Physics in 1954 but towards the end he was not enthusiastic about seeing himself as a physicist. Kalam soon discovered aerospace engineering at Madras, and he regretted the loss of the four years spent in physics. In 1955, Kalam moved to Madras and began taking courses on Aerospace engineering.

Career as scientist

After graduation from Madras Institute of Technology (MIT – Chennai) in 1960, Kalam joined Aeronautical Development Establishment of DRDO as a chief scientist. There, Kalam started his career by designing a small helicopter for the Indian Army, but remained unconvinced with the choice of his job. Kalam was also part of the INCOSPAR committee working under Vikram Sarabhai. In 1969, Kalam was transferred to the Indian Space Research Organization (ISRO) where he was the project-director of India's first indigenous Satellite Launch Vehicle (SLV-III). Joining ISRO was one of Kalam's biggest achievements in life and he is said to have found himself when he started to work on the SLV project. However, Kalam first started work on an expandable rocket project independently at DRDO in 1965. In 1969, Kalam received the government's approval and expanded the program to many engineers. In 1979, the first maiden flight of this project was made and in 1980, country's first satellite Rohini was launched with this rocket.

From 1970s and 1990s, Kalam made an effort to develop the Polar SLV and SLV-III project which proved to be successful. In 1974, Kalam was shifted to the Terminal Ballistics Research Laboratory (TBRL), a subsidiary of DRDO. Kalam was invited to witnessed the country's first nuclear test, Smiling Buddha as the representative of TBRL, even though he had not participated in developing or even taken part in the test site preparations or weapon designing. Kalam arrived at the test site on the invitation of Raja Ramanna. In 1970s, a landmark was passed when ISRO first launched into space the locally built Rohini-1, using the SLV rocket. In the 1970s, Kalam also directed the Project Devil and Project Valiant to developed the ballistic missiles from the technology of Kalam's successful SLV programme. Despite the disapproval of Union Cabinet, Premier Indira Gandhi allotted secret funds for these aerospace projects through her discretionary powers under Kalam's directorship. Kalam played an integral role convincing the Union Cabinet to conceal the true nature of these classified aerospace projects.

His research and educational leadership brought him great laurels and prestige in 1980s, which prompted the government to initiate an advanced missile program under his directorship. As Chief Executive of the Integrated Guided Missile Development Program (I.G.M.D.P), he played a major part in developing many missiles in India including Agni and Prithvi although the entire project has been criticised for being overrun and mismanaged. He was the Chief Scientific Adviser to the Prime Minister and the Secretary of Defence Research and Development Organisation from July 1992 to December 1999. The Pokhran-II nuclear tests were conducted during this period where he played an intensive political and technological role. Kalam served as the Chief Project Coordinator, along with R. Chidambaram during the testing phase. Photos and snapshots of him taken by the Media elevated Kalam as the country's top nuclear scientist although Kalam was not directly involved with the nuclear program at the time.

Awards

He was honoured with a Padma Bhushan in 1981. He was awarded the Bharat Ratna, India's highest civilian honour. Kalam was awarded the Padma Vibhushan in 1990.

Personal life

He has enjoyed a bachelor life. He is the happiest at the drawing board, in discussion with his scientists on how their dreams for the next millennium can be fulfilled.

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Enjoy the humour

A man dies. In heaven he sees a large Wall full of Clocks.
He asks angel:"What are these for?"
Angel answers: "These r Lie Clocks, every person has lie clock! Whenever u lie on earth, clock moves."...
The man points towards a clock n asks:
Whose clock is this?
Angel says: its Mother Teresa 's. It never moved, showing that she never told lie.
The man asks:
Where is Indian Politician's clock?
Angel replies:
That's in our office ... we use it as TABLE FAN...ha ha ha !

An Angry Wife To Her Husband on Phone: "Where d Hell Are You ...?"
Husband: Darling You Remember That Jewellery Shop Where You Saw The Diamond Necklace n Totally Fell In Love With It n I Didn't Have Money That Time n I said "Baby It'll Be Yours 1 Day ... "O:)
Wife, With A Smile & Blushing: Yeah I Remember That My Love!
Husband: I'm in the Pub Just Next To That Shop

Husband was seriously ill. Doc to wife: Give him healthy breakfast, be pleasant & in gud mood, don't discuss ur problems, no tv serial, don't demand new clothes & gold jewels,
Do this for 1 yr & he will be ok.
On the way home.. Husband: what did the doc say ?
Wife:- .No chance for u to survive

Woman Buys A New Sim Card Puts It In Her Phone And Decides To Surprise Her Husband Who Is Seated On The Couch In The Living Room. She Goes To The Kitchen, Calls Her Husband With The New Number: "Hello Darling"
The Husband Responds In A Low Tone: "Let Me Call U Back Later Honey, The Dumb Lady Is In The Kitchen..

When a married man says "I'll think about it",
What he really means that, He doesn't know his wife's opinion yet..

A Lady to Doctor:
My husband has habit of talking in sleep! what should i give him to cure?
Dr: Give him an Opportunity to speak when he is awake

Having "WIFE" Is A Part Of Living...
But Having "GIRLFRIEND" Along With The "WIFE" Is Art Of Living.

What is the Difference between Mother & Wife?
A - One Woman Brings U into this world crying... & the other ensures U Continue to do so.

Interviewer to Millionaire: To whom do you owe your success as a millionaire?"
Millionaire: "I owe everything to my wife."
Interviewer: "Wow, she must be some woman.
Interviewer: "What were you before you married her?"
Millionaire: "A Billionaire"

Wife: You always carry my photo in your handbag to the office. Why?
Darling: When there is a problem, no matter how impossible, I look at your picture and the problem disappears.
Wife: You see, how miraculous and powerful I am for you?
Darling: Yes, I see your picture and say to myself, "What other problem Can there be greater than this one?

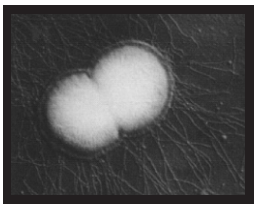
Wife: honey, what r u looking 4?
Husband: nothing
Wife: why have u been reading our marriage certificate 4 an hour?
Husband: i was just looking 4 the expiry date

A man in Hell asked Devil:
Can I make a call to my Wife?
After making call he asked how much to pay.
Devil: Nothing, Hell to hell is Free.

A man came home late at night after a party.
His wife yelled:
"how would you feel if you don't see me for two days?"
The man couldn't believe his luck: 'that would be great'!
Monday passed and he didn't see her.....
Tuesday and Wednesday passed too.....
On Thursday his swelling became better
And now he could see her from the corner of one eye.

Doctor: Madam, your husband needs rest and peace, so here are some sleeping pills.
Wife: Doc, when should I give them to him?
Doctor: They are for you.!!

Neisseria gonorrhoeae



Scientific Classification:

Kingdom:	Bacteria
Phylum:	Proteobacteria
Class:	Beta Proteobacteria
Order:	Neisseriales
Family:	Neisseriaceae

Genus: *Neisseria*
Species: *N. gonorrhoeae*

Neisseria gonorrhoeae, also known as ***gonococci*** (plural), or ***gonococcus*** (singular), is a species of Gram-negative coffee bean-shaped diplococci bacteria responsible for the sexually transmitted infection gonorrhea.

Microbiology:

Neisseria are fastidious Gram-negative cocci that require nutrient supplementation to grow in laboratory cultures. Specifically, they grow on chocolate agar with carbon dioxide. These cocci are facultatively intracellular and typically appear in pairs (diplococci), in the shape of coffee beans. Of the eleven species of *Neisseria* that colonize humans, only two are pathogens. *N. gonorrhoeae* is the causative agent of gonorrhea (also called "The Clap," which is derived from the French word "clapier," meaning "brothel") and is transmitted via sexual contact.

Neisseria is usually isolated on Thayer-Martin agar (or VPN agar) — an agar plate containing antibiotics (vancomycin, colistin, nystatin, and TMP-SMX) and nutrients that facilitate the growth of *Neisseria* species while inhibiting the growth of contaminating bacteria and fungi. Further testing to differentiate the species includes testing for oxidase (all clinically relevant *Neisseria* show a positive reaction) and the carbohydrates maltose, sucrose, and glucose test in which *N. gonorrhoeae* will only oxidize (that is, utilize) the glucose.

N. gonorrhoeae are motile (twitching motility) and possess type IV pili to adhere to surfaces. The type IV pili operate mechanistically similar to a grappling hook. Pili extend and attach to a substrate which signals the pilus to retract, dragging the cell forward. *N. gonorrhoeae* are able to pull 100,000 times their own weight and it has been claimed that the pili used to do so are the strongest biological motor known to date, exerting one nanonewton.

N. gonorrhoeae has surface proteins called Opa proteins, which bind to receptors on immune cells. In so doing, *N. gonorrhoeae* is able to prevent an immune response. The host is also unable to develop an immunological memory against *N. gonorrhoeae* – which means that future reinfection is possible. *N. gonorrhoeae* can also evade the immune system through a process called antigenic variation, in which the *N. gonorrhoeae* bacterium is able to alter the antigenic determinants (sites where antibodies bind) such as the Opa proteins and Type IV pili that adorn its surface. The many permutations of surface proteins make it more difficult for immune cells to recognize *N. gonorrhoeae* and mount a defense.

N. gonorrhoeae is naturally competent for DNA transformation as well as being capable of conjugation. Both of these concepts allow for the DNA of *N. gonorrhoeae* the ability to undergo conformational changes. Especially dangerous to the health industry is the ability to conjugate since this can lead to antibiotic resistance.

In 2011, researchers at Northwestern University found evidence of a human DNA fragment in a *Neisseria gonorrhoeae* genome, the first example of horizontal gene transfer from humans to a bacterial pathogen.

Disease:

Symptoms of infection with *N. gonorrhoeae* differ depending on the site of infection. Note also that 10% of infected males and 80% of infected females are asymptomatic.

Infection of the genitals can result in a purulent (or pus-like) discharge from the genitals which may be foul smelling. Symptoms may include inflammation, redness, swelling, and dysuria.

N. gonorrhoeae can also cause conjunctivitis, pharyngitis, proctitis or urethritis, prostatitis and orchitis.

Disseminated *N. gonorrhoeae* infections can occur, resulting in endocarditis, meningitis or gonococcal dermatitis-arthritis syndrome. Dermatitis-arthritis syndrome presents with arthralgia, tenosynovitis and painless non-pruritic (non-itchy) dermatitis.

Infection of the genitals in females with *N. gonorrhoeae* can result in pelvic inflammatory disease if left untreated, which can result in infertility. Pelvic inflammatory disease results if *N. gonorrhoeae* travels into the pelvic peritoneum (via the cervix, endometrium and fallopian tubes). Infertility is caused by inflammation and scarring of the fallopian tube. Infertility is a risk to 10 to 20% of the females infected with *N. gonorrhoeae*.

Diagnostic Tests

1) Microscopy

A direct smear for Gram staining may be performed as soon as the swab specimen is collected from the urethra, cervix, vagina or rectum. The swab should be rolled gently onto the slide to preserve cellular morphology and over an area less than 1 cm^2. Gram staining kits are commercially available. Under oil immersion (1000x magnification), urethral smears from symptomatic males usually contain intracellular Gram-negative kidney-shaped diplococci in polymorphonuclear leukocytes, the presence of which is required for the presumptive diagnosis of gonorrhea.

2) Culture

The current preferred laboratory method for the diagnosis of *N. gonorrhoeae* infections is the isolation and identification of the agent.

Media and cultural conditions for isolation:

The primary specimens should be inoculated onto nonselective chocolate agar and selective agar containing antimicrobial agents that inhibit the growth of commensal bacteria and fungi. The antibacterial agents in modified Thayer-Martin, Martin Lewis and New York City medium are vancomycin, colistin, trimethoprim lactate and the antifungal agents nystatin and

anisomycin or amphotericin B. Some fastidious strains, such as the arginine-, hypoxanthine- and uracil-requiring strains, are more susceptible to the concentrations of vancomycin or trimethoprim used in the selective media. Isolates that are inhibited by supplements in selective media should be grown on media with lower concentrations of antibiotic. Isolates that are atypical, such as vancomycin-susceptible strains, should be forwarded to reference laboratories to confirm their identification. Therefore, a quality assessment program that periodically compares isolation rates on selective and nonselective media is desirable.

The inoculated plates should be incubated at 35°C to 37°C in a moist atmosphere enriched with CO_2 (3% to 7%). An 18 h to 24 h culture should be used as the inoculum for additional tests. Plates should not be incubated for longer than 48 h because most old cultures would not survive storage conditions. Autolysis may occur during prolonged incubation, and growth from agar plates becomes difficult to suspend in solutions. Isolates should be subcultured at least once on nonselective medium after initial isolation before being used in a diagnostic test that requires pure culture or heavy inoculum.

Presumptive identification of* N gonorrhoeae*:

The presumptive identification of *N. gonorrhoeae* rests on the isolation of an oxidase-positive, Gram-negative diplococcus recovered from urogenital sites that grows on selective media. The Gram stain of a smear of urethral exudates or endocervical secretions shows typical Gram-negative intracellular diplococci. The oxidase test uses the tetramethyl derivative of the oxidase reagent (1% aqueous solution of N, N, N, N-tetramethyl-1, 4-phenylenediamine) that is commercially available (BACTIDROP Oxidase, Remel Inc, USA) or prepared in-house. To perform the test, a drop of reagent is applied to filter paper or the tip of a cotton swab. Culture is then applied to the filter paper or cotton swab tip using a platinum or plastic loop, wooden applicator stick or toothpick. A dark-purple colour change within 10 s indicates a positive sample. The catalase test (3% hydrogen peroxide) or superoxol (30% hydrogen peroxide) are other rapid tests used in the presumptive identification of *N. gonorrhoeae*. A drop of the reagent is placed in the centre of a clean glass slide and the suspect colony is picked with a loop and emulsified in the reagent. *N. gonorrhoeae* will produce a positive reaction with bubbling within 1 s to 2 s. Weak bubbling or bubbling after 3 s indicates a negative reaction. The reagents are tested daily against reference oxidase-positive and -negative cultures to ensure quality.

Confirmatory identification tests:

Several methods are available to confirm the identification of *N. gonorrhoeae*, including biochemical testing, serological testing, colourimetric testing and nucleic acid methods. More than one system may be required to confirm identification.

Biochemical tests:

N. gonorrhoeae can be differentiated from other *Neisseria* species, *Moraxella* species, *Kingella* species and other commensals based on its ability to grow on appropriate selective and nonselective media, produce acid from glucose, maltose, lactose, sucrose and fructose, reduce nitrate, produce polysaccharide from sucrose and exhibit DNase production. The ability to ferment different sugars is traditionally determined using conventional cystine trypticase agar medium (CTA) containing 1% sugar. This method is based on fermentative species and is not sensitive enough to detect acid from oxidative species. In addition, differentiating *N. gonorrhoeae* and *Neisseria cinerea* is difficult using CTA sugars. As a result, this test is no longer preferred for the detection of acid production from carbohydrates. This method has been replaced by more rapid commercially available methods in some laboratories because the preparation of the necessary media is tedious and labour intensive, and quality control of the purity of sugars is required. The rapid carbohydrate test is a nongrowth-dependent method for the detection of acid production from carbohydrates by *Neisseria* species. The Rapid Identification Method-Neisseria (Remel Inc, USA) is a commercially available rapid acid production test that compares well with the conventional method, but may also not differentiate between *N. gonorrhoeae* and *N. cinerea.* The rapid nongrowth tests have a specificity of 99% to 100% and are more sensitive than CTA sugars. Some of the commercial tests include not only acid production tests, but also tests for other biochemical characteristics (such as enzyme production), including DNase and nitrate reduction. All tests must include appropriate control strains.

Treatment and prevention:

If *N. gonorrhoeae* is resistant to the penicillin family of antibiotics, then ceftriaxone (a third-generation cephalosporin) is often used. Sexual partners should also be notified and treated.

Antibiotic-resistant gonorrhea has been noted by epidemiologists; beginning in the 1940s gonorrhea was treated with penicillin, but doses had to be continually increased in order to remain effective, and by the '70s, penicillin- and tetracycline-resistant gonorrhea emerged in the Pacific Basin. These resistant strains then spread to Hawaii, California, the rest of the United States, and Europe. Fluoroquinolones were the next line of defense, but soon resistance to this antibiotic emerged as well. Since 2007, standard treatment has been third-generation cephalosporins, such as ceftriaxone, which are considered to be our "last line of defense."

Recently, a high-level ceftriaxone-resistant strain of gonorrhea, called H041, was discovered in Japan. Lab tests found it to be resistant to high concentrations of ceftriaxone, as well as most of the other antibiotics tested. Within *N. gonorrhoeae*, there are genes that confer resistance to every single antibiotic used to cure gonorrhea, but thus far they do not coexist within a single gonococcus. Because of *N. gonorrhoeae*'s high affinity for horizontal gene transfer, however, antibiotic-resistant gonorrhea is seen as an emerging public health threat.

Patients should also be tested for other sexually transmitted infections, especially *Chlamydia* infections, since co-infection is frequent (up to 50% of cases). Antibacterial coverage is often included for Chlamydia because of this.

Transmission can be reduced by the usage of latex barriers, such as condoms or dental dams, during intercourse, oral and anal sex, and by limiting sexual partners.

References:

1) www.ncbi.nlm.nih.gov
2) www.cdc.gov/std/gonorrhea/treatment
3) www.who.int

Prebiotics Vs. Probiotics: What's the Difference?

The reason for confusion is pretty obvious. Not only do the words differ by only one letter, but they target similar benefits: improving overall health by improving digestive health through nourishing a healthy colon.

Here is a summary of the differences:

1. Prebiotics are a very special form of dietary fiber. Probiotics are living bacteria intended to benefit colon health.
2. Prebiotic Fiber is not affected by heat, cold, acid or time. Probiotics can be killed by heat, acid or simply the passage of time.
3. Prebiotics nourish the thousands of good bacterial species already living in the colon. Probiotics contain from one to a few species of bacteria which are added to the colon when they are ingested (eaten).
4. Prebiotic Fiber is a naturally-occurring substance, found in thousands of plant species (though mostly in very small amounts). Probiotics occur naturally in fermented foods like yogurt or sauerkraut.
5. Prebiotics foster an environment in the colon which is hostile to bad bacteria. Probiotics may impact bad bacteria by crowding them out.
6. The benefits of prebiotics are supported by extensive research. The benefits of probiotics are supported by extensive research.
7. BOTH Prebiotics and Probiotics must be ingested in sufficient quantity to have an impact, and should not carry an excessive "load" of sugar, calories, carbs, etc.

Now, let's discuss these in a bit more detail:

1. Prebiotics are a very special form of dietary fiber. Probiotics are living bacteria supposedly beneficial to the colon.

Prebiotics are nondigestible substances that pass through the stomach and small intestine unchanged.

Thus far only two fructooligosaccharides: oligofructose and inulin, fully meet the complete medical definition of "prebiotic". The compound created from merging these two prebiotics together is called Oligofructose-Enriched-Inulin and is considered a "full-spectrum" Prebiotic.

Some foods presented as "prebiotics" in and of themselves simply contain prebiotics. For example we often see honey presented as "a prebiotic," while it is more accurate to simply say that honey contains a small amount of prebiotics (as do many other foods).

Prebiotics enter the colon where they nourish beneficial bacteria. The beneficial bacteria, typically within the hundreds of strains under the Lactobacillus and Bifidobacter families, create many health benefits through their action in the colon.

Probiotics are supplements that contain living organisms: bacteria. They typically contain anywhere from one to a few strains. Once consumed and in your system, the bacteria are just "bacteria" not "probiotics."

However, for simplicity's sake, we will occasionally refer to the bacteria themselves as "probiotic".

2. Prebiotic Fiber is not greatly affected by heat, cold, acid or time. Probiotics can be killed by heat, acid or simply the passage of time.

Prebiotics benefit from their simplicity. They are, simply, very special fibers that nourish the good bacteria.

Because of this, they are pretty impervious to damage. Heat does not greatly harm them. They don't "die" just from the passage of time. Acid does not harm or degrade them.

Probiotics by contrast are living organisms. If they are dead when they reach your colon, they cannot provide any health benefit. Probiotics must not be subjected to excessive heat during transport and warehousing. They should typically be refrigerated to ensure the bacteria remain relatively dormant and don't die simply from "old age". And the bacteria can be killed by acid, such as found in the human stomach.

3. Prebiotics nourish the thousands of good bacterial species already living in the colon. Probiotics contain from one to a few species of bacteria which are added to the colon.

Your colon contains trillions of bacteria - more than all the 'human' cells in your body. More than all the stars in the milky way galaxy. It is a number possibly too big to really comprehend. In fact, it is likely that each person's colon "microbiota" is as unique as fingerprint.

Prebiotics nourish all the good bacteria in the colon, particularly in the lacto- and bifido- families, preserving your "fingerprint".

Probiotics typically contain a few, or even just one, strain of bacteria. These bacteria are typically from the same bifido- and or lacto- families, but may or may not match your particular microbiota.

4. Prebiotic Fiber is a naturally-occurring substance. Probiotics occur naturally in fermented foods like yogurt or sauerkraut.

Some companies have also engineered "proprietary" bacteria which they have patented and promote in their probiotic supplements/foods.

Both prebiotics and the bacteria in probiotics are naturally-occurring substances. Prebiotics have been identified in over 36,000 plant species. The good bacteria contained in probiotic supplements naturally occur in fermented foods such as Kefir and Sauerkraut (though they are almost certainly destroyed if those foods are pasteurized.)

5. Prebiotics foster an environment in the colon which is hostile to bad bacteria. Probiotics may impact bad bacteria by crowding them out.

Prebiotics create an important secondary impact in the colon. By nourishing the good bacteria, they induce these bacteria to create Short-Chain-Fatty-Acids. These SCFAs slightly lower the pH of the colon, creating an environment that is friendly to good bacteria, but inhospitable to bad bacteria.

Probiotics may also achieve this by crowding out 'bad' bacteria, but may also suffer from 'drop in the bucket' scenario: while "X Billion" may sound like a lot of bacteria, adding them to "X Trillion" of existing bacteria likely means an addition of 0.1% or less... IF they all survive!

6. The benefits of probiotics and prebiotics are supported by extensive research.

Prebiotics have been extensively researched since their identification in 1995. This research has typically been done at research-oriented universities, often in Europe where awareness of prebiotics is highest.

Probiotic benefits are also extensively researched. Also frequently in the food science department of leading universities.

7. Both Prebiotics and Probiotics must be ingested in sufficient quantity to have an impact, and should not carry an excessive "load" of sugar, calories, carbs, etc. out of proportion to their benefit.

Many authorities suggest 4g to 8g of prebiotics daily. Some researchers suggest significantly higher servings daily for those with active digestive disease - 15g daily or more.

There is truly no authoritative guideline about effective levels of probiotics. Manufacturers suggest anywhere from 5 MIL CFUs to 500 BIL CFUs, with 50 BIL CFUs being the largest commonly-seen serving size.

One area where BOTH prebiotics and probiotics are the same is that they must not bring excess calories, carbs, sugar, fat or other undesirables to the dietary mix. Probiotics often come in heavily-sugared yogurts and similarly, prebiotics sometimes arrive via a "fiber bar" with chocolate icing, lots of sugar, etc.

Anything that delivers 25% of your daily pro-/prebiotic need but 60% of your daily sugar limit isn't a "good deal." Prebiotics and probiotics are both available in a supplement format with virtually no "overhead" of calories, sugar, etc.

Hand Hygiene Techniques

Pathogens transferred not only from infected or draining wound but also from frequently colonized areas of normal, intact patient skin. The perineal or inguinal areas tend to be most heavily colonized, but the axillae, trunk, and upper extremities (including the hands) are also frequently colonized.

The number of organisms such as S. aureus, Proteus mirabilis, Klebsiella spp., and Acinetobacter spp. present on intact areas of the skin of some patients which can vary from 100 to 106 CFU/cm2. Nearly 10^6 skin squames containing viable microorganisms are shed daily from normal skin. Patient gowns, bed linen, bedside furniture and other objects in the immediate environment of the patient become contaminated with patient flora. Such contamination is most likely to be due to staphylococci, enterococci or Clostridium difficile which are more resistant to desiccation. Certain Gram-negative rods, such as Acinetobacter baumannii, can also play an important role in environmental contamination due to their long-time survival capacities. This implies the potential importance of skin and environmental contamination on microbial cross contamination and pathogen spread.

HCWs hands typically touch a continuous sequence of surfaces and substances including inanimate objects, patients' intact or non-intact skin, mucous membranes, food, waste, body fluids, and the HCWs own body. With each hand-to-surface exposure, a bidirectional exchange of microorganisms between hands and the touched object occurs and the transient hand-carried flora is thus continually changing. In this manner, microorganisms can spread throughout a healthcare environment and between patients within a few hours.

The burden of Health care associated infections is severe in immune compressed patients; prolonged hospital stay; invasive devices and procedures such as catheter, ventilators; Surgical site infections and also much more severe in high-risk populations such as adults housed in ICUs and neonates.

Several studies have shown the ability of microorganisms to survive on hands for differing times and inadequacy in hand hygiene leads to risk of cross-transmission of pathogens.

Handwashing with soap and water has been considered a measure of personal hygiene for centuries and has been generally embedded in religious and cultural habits. Nevertheless, the link between handwashing and the spread of disease was established only two centuries ago, although this can be considered as relatively early with respect to the discoveries of Pasteur and Lister that occurred decades later.

Indications for hand hygiene-

A. Wash hands with soap and water when visibly dirty or visibly soiled with blood or other body fluids or after using the toilet.
B. If exposure to potential spore-forming pathogens is strongly suspected or proven, including outbreaks of Clostridium difficile, hand washing with soap and water is the preferred means.
C. In all clinical situations use an alcohol-based handrub as the preferred means for routine hand antisepsis, if hands are not visibly soiled. If alcohol-based handrub is not obtainable, wash hands with soap and water.
D. Before handling medication or preparing food perform hand hygiene using an alcohol-based handrub or wash hands with either plain or antimicrobial soap and water.

Five moments for hand hygiene–

Moment 1- Before touching a patient

Hand hygiene at this moment will mainly prevent colonization of the patient with health care-associated microorganisms, resulting from the transfer of organisms from the environment to the patient through unclean hands, and exogenous infections in some cases.

Moment 2- Before a clean/aseptic procedure

Once within the patient zone, very frequently after a hand exposure to the patient's intact skin, clothes or other objects, the HCW may engage in a clean/aseptic procedure on a critical site with infectious risk for the patient, such as opening a venous access line, giving an injection, or performing wound care. Importantly, hand hygiene required at this moment aims at preventing HCAI.

Moment 3- After body fluid exposure risk

After a care task associated with a risk to expose hands to body fluids, e.g. after accessing a critical site with body fluid exposure risk or a critical site with combined infectious risk (body fluid site), hand hygiene is required instantly and must take place before any next hand-to-surface exposure, even within the same patient zone. This hand hygiene action has a double objective. First and most importantly, it reduces the risk of colonization or infection of HCWs with infectious agents that may occur even without visible soiling. Second, it reduces the risk of a transmission of microorganisms from a “colonized” to a “clean” body site within the same patient.

Moment 4- After touching a patient

When leaving the patient zone after a care sequence, before touching an object in the area outside the patient zone and before a subsequent hand exposure to any surface in the health-care area, hand hygiene minimizes the risk of dissemination to the health-care environment, substantially reduces contamination of HCWs' hands with the flora from patient X, and protects the HCWs themselves.

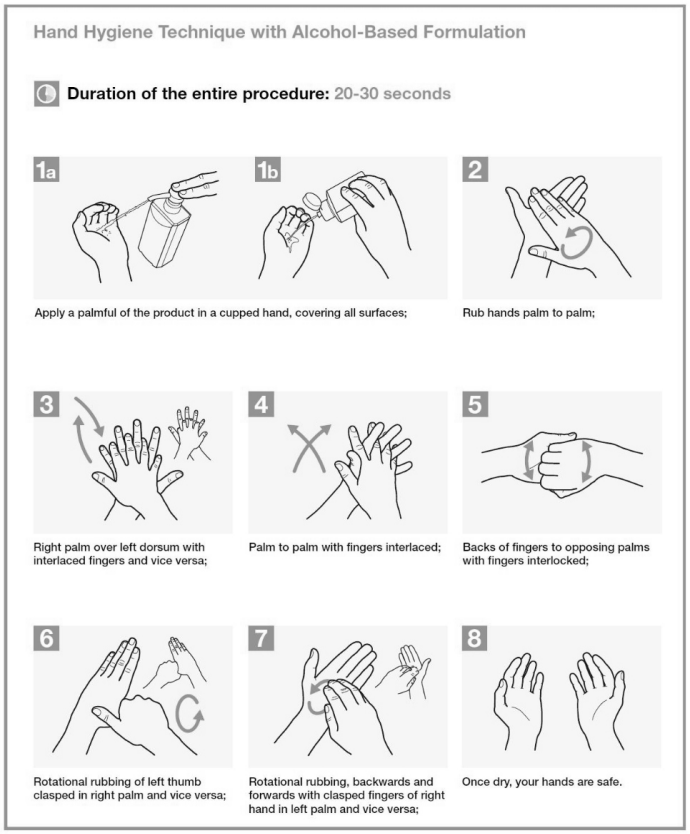
Moment 5-After touching patient surroundings

The fifth moment for hand hygiene is a variant of Moment 4: it occurs after hand exposure to any surface in the patient zone, and before a subsequent hand exposure to any surface in the health-care area, but without touching the patient. This typically extends to objects contaminated by the patient flora that are extracted from the patient zone to be decontaminated or discarded. Because hand exposure to patient objects, but without physical contact with the patients, is associated with hand contamination, hand hygiene is still required.

Considering its importance and to empower hand hygiene in health care system, WHO has given guidelines on hand hygiene.

WHO guidelines on Hand hygiene -

A. Apply a palmful of alcohol-based handrub and cover all surfaces of the hands. Rub hands until dry.
B. When washing hands with soap and water, wet hands with water and apply the amount of product necessary to cover all surfaces. Rinse hands with water and dry thoroughly with a single-use towel. Use clean, running water whenever possible. Avoid using hot water, as repeated exposure to hot water may increase the risk of dermatitis.
   Use towel to turn off tap/faucet. Dry hands thoroughly using a method that does not recontaminate hands. Make sure towels are not used multiple times or by multiple people.



Recommendations for surgical hand preparation

A. Remove rings, wrist-watch, and bracelets before beginning surgical hand preparation. Artificial nails are prohibited.
B. Sinks should be designed to reduce the risk of splashes.
C. If hands are visibly soiled, wash hands with plain soap before surgical hand preparation. Remove debris from underneath fingernails using a nail cleaner, preferably under running water.
D. Brushes are not recommended for surgical hand Preparation. Surgical hand antisepsis should be performed using either a suitable antimicrobial soap or suitable alcohol-based handrub, preferably with a product ensuring sustained activity, before donning sterile gloves.
F. If quality of water is not assured in the operating theatre; surgical hand antisepsis using an alcohol-based handrub is recommended before donning sterile gloves when performing surgical procedures.
G. When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, typically 2–5 minutes. Long scrub times (e.g. 10 minutes) are not necessary.
H. When using an alcohol-based surgical handrub product with sustained activity, follow the manufacturer's instructions for application times. Apply the product to dry hands only. Do not combine surgical hand scrub and surgical handrub with alcohol-based products sequentially.
I. When using an alcohol-based handrub, use sufficient product to keep hands and forearms wet with the handrub throughout the surgical hand preparation procedure.
J. After application of the alcohol-based handrub as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.

Other aspects of hand hygiene

A. Do not wear artificial fingernails or extenders when having direct contact with patients.
B. Keep natural nails short (tips less than 0.5 cm long or approximately ¼ inch)

These guidelines will help to achieve the goal of infection control in health-care system.

Selection and handling of hand hygiene agents

A. Provide HCWs with efficacious hand hygiene products that have low irritancy potential.
B. To maximize acceptance of hand hygiene products by HCWs, solicit their input regarding the skin tolerance, feel, and fragrance of any products under consideration.
C. When selecting hand hygiene products:

1. Determine any known interaction between products used to clean hands, skin care products, and the types of glove used in the institution.
2. Solicit information from manufacturers about the risk of product contamination.
3. Ensure that dispensers are accessible at the point of care.
4. Ensure that dispensers function adequately and reliably and deliver an appropriate volume of the product.
5. Ensure that the dispenser system for alcohol-based handrubs is approved for flammable materials;
6. Solicit and evaluate information from manufacturers regarding any effect that hand lotions, creams, or alcohol-based handrubs may have on the effects of antimicrobial soaps being used in the institution
7. Sost comparisons should only be made for products that meet requirements for efficacy, skin tolerance, and acceptability
8. Do not add soap or alcohol-based formulations to a partially empty soap dispenser. If soap dispensers are reused, follow recommended procedures for cleansing.

WHO recommend alcohol-based handrubs which are the only known means for rapidly and effectively inactivating a wide array of potentially harmful microorganism, at present.

WHO -World Health Organization
HCW - Healthcare Worker
HCAI - Healthcare Associated Infections

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Chromogenic Medium

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"Ideally, hand hygiene should be an automated behavior…"
WHO guidelines on hand hygiene in health care. ISBN 9789241597906, 2009, pg91

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FEATURES	BENEFITS
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ABS plastic	Rust free, Durable and easily cleanable
Fixed dose dispensing	Adequate disinfection Reduced wastage of handrub / handwash
AC adapter provided	No need of battery
Compatible with liquids and gels	Versatile

BIOSPRAY™ is compatible with
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TRIOSEPT™ : Colourless & odourless liquid handrub with triple action
BIOSCRUB™ : Antiseptic surgical scrub
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Highlights of the coming issue

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