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Editorial

Contents

This issue of the Journal brings forth not just topics to ponder over, but essentials for thought to read and understand....

Our section on Mini Review takes a look at Urinary Tract Infections. Urine is normally sterile. An infection occurs when bacteria get into the urine and begin to grow. The infection usually starts at the opening of the urethra where the urine leaves the body and moves upward into the urinary tract. Urinary Tract Infections commonly referred to as 'UTIs' is a term used to define bacterial infection that affects any part of the urinary tract, including the kidneys, ureters, bladder, or urethra. The article gives brief outlines of the different aspects of UTIs, namely the risk factors, signs and symptoms, etiology, pathogenesis, diagnosis and treatment.

Surface Microbiology is of key significance in food industries, health care; like hospitals, nursing homes, and institutions like kindergartens, nurseries, schools. Current Trends takes a peek at Trends in Surface Microbiology, which have been aimed at decreasing the work load of collecting the specimen and also making the processing, and transportation of the sample simpler.

Our In Profile scientist Rosalyn Sussman Yalow and Dr. Solomon Berson devised the technique of Radio Immuno Assay (RIA) which is a highly versatile procedure and can be used in a variety of ways. The RIA diagnostic process was, and continues to be, used by researchers in myriad ways. Investigators use it to screen blood for hepatitis virus in blood banks, determine effective dosage levels of drugs and antibiotics, detect foreign substances in blood, treat dwarfed children with growth hormones, and test and correct hormone levels in infertile couples.

Bug of the Month focuses on *Campylobacter* species, which is responsible for the zoonotic infection Campylobacteriosis, characterized by diarrhea (often bloody), abdominal pain, malaise, fever, nausea, and vomiting. The severity of the disease is variable but usually people who get campylobacteriosis recover completely within 10 days.

Did You Know sheds light on the role of PHMB in Diabetic Foot Ulcer Management. The primary goal in the treatment of foot ulcers is to obtain healing as soon as possible . Faster healing lowers the risk of an infection . Successful treatment of diabetic foot ulcers consists of four basic steps; debridement , offloading , infection control and the most important , controlling the blood sugar level . Use of safe and non cytotoxic antiseptics (such as Polyhexamethylene biguanide; PHMB) on open wounds helps in prevention and treatment of infection which increases the rate of the healing process .

In the monsoons, among the Best Practices, Prevention and Treatment of Waterborne diseases is a must know. Water, is not only a life sustaining drink, but has various other features that makes this fluid indispensable. However it is essential that potable water has to be of the highest quality most specially when the water is used for consumption. When water consumed is not pure, clean, and hygienic, consumption of this life sustaining water can be the primary cause of disease transmission and infection.

Relax Your Mood will help you unwind and relax and condition your mind.
Having your suggestions will make this bimonthly an even more interesting interface, so share your views and opinions with us.....

Urinary Tract Infections

Urinary Tract Infections commonly referred to as 'UTIs' is a term used to define bacterial infection that affects any part of the urinary tract, including the kidneys, ureters, bladder, or urethra. These are the structures that urine passes through before being eliminated from the body.

A Brief Note on Urine

Recognition and analysis of abnormalities of this substance expelled from the body can provide information about the condition of the body – both concerning general health, and also specific medical conditions.

Biochemical analysis of urine is called "urinalysis", and is commonly used to diagnose a wide range of diseases. Examples include high levels of urinary glucose in diabetics, and high levels of urinary ketone bodies in cases of ketonuria. Immunological analysis of urine is also the basis of most pregnancy tests.

What are the physical characteristics of normal urine?

Color: Typically yellow – amber but varies according to recent diet and the concentration of the urine. Drinking more water generally tends to reduce the concentration of urine, and therefore causes it to have a lighter color. (the converse is also true)

Smell: Generally fresh urine has a mild smell but aged urine has a stronger odor, similar to that of ammonia.

Acidity: The pH of normal urine is generally in the range 4.6 – 8, a typical average being around 6.0. much of the variation is due to diet. For example, high protein diets result in more acidic urine, but vegetarian diets generally results in more alkaline urine (both within the typical range 4.6 – 8).

Density: Density is also known as "specific gravity". This is the ratio of the weight of a volume of a substance compared with the weight of the same volume of distilled water.

What is contained in Urine?

Approx. 95 % of the volume of normal urine is due to water.

The other 5 % consists of solutes (chemicals that are dissolved in the water).

Some of these solutes are the results of normal biochemical activity within the cells of the body. Other solutes may be due to chemicals that originated outside of the body, such as pharmaceutical drugs.

Urinary Tract in Brief

Kidneys:

The kidneys are a pair of small organs that lie on either side of the spine at about waist level. They have several important functions in the body, including removing wastes and excess water from the blood and eliminating them as urine. These functions make them important in the regulation of blood pressure. Kidneys are also very sensitive to changes in blood sugar levels and blood pressure. Both diabetes and hypertension can cause damage to these organs.

Ureters:

Two ureters, narrow tubes about 10 inches long, drain urine from each kidney into the bladder.

Bladder:

The bladder is a small sac – like organ that collects and stores urine. When the urine reaches a certain level in the bladder, one experiences the sensation to void, then the muscle lining the bladder can be voluntarily contracted to expel the urine.

Urethra:

The urethra is a small tube connecting the bladder with the outside of the body. A muscle called the urinary sphincter, located at the junction of the bladder and the urethra, must relax at the same time the bladder contracts to expel urine.

Any part if this system can become infected. As a rule, the farther up in the urinary tract the infection is located, the more serious it is.

The upper urinary tract is composed of the kidneys and ureters. Infection in the upper urinary tract generally affects the kidneys (pyelonephritis), which can cause fever, chills, nausea, vomiting, and other severe symptoms.

The lower urinary tract consists of the bladder and the urethra. Infection in the lower urinary tract can affect the urethra (urethritis) or the bladder (cystitis)

Urinary Tract Infections

Urine is normally sterile. An infection occurs when bacteria get into the urine and begin to grow. The infection usually starts at the opening of the urethra where the urine leaves the body and moves upward into the urinary tract.

Urinary tract infections are much more common in adults than in children, but about 1 – 2 % of children do get urinary tract infections. Urinary tract infections in children are more likely to be serious than those in adults and therefore should not be ignored.

Urinary tract infections are usually referred to as simple or complicated.

Simple infections occur in healthy urinary tracts and do not spread to other parts of the body. They usually go away readily with treatment.

Complicated infections are caused by anatomic abnormalities, spread to other parts of the body, are worsened by underlying medical conditions, or are resistant to many antibiotics. They are more difficult to cure.

The etiological agent may vary, however the most dominant being *Escherichia coli*. Although urine contains a variety of fluids, salts and waste products, it does not usually have bacteria in it. When bacteria get into the bladder or kidney, and multiply in the urine, they may cause a UTI.

These bacteria can move from the area around the anus to the opening of the urethra. The two most common causes of this are poor hygiene and sexual intercourse.

Usually, the act of emptying the bladder (urinating) flushes the bacteria out of the urethra. If there are too many bacteria, urinating may not stop their spread.

The bacteria can travel up the urethra to the bladder, where they can grow and cause an infection.

The infection can spread further as the bacteria move up from the bladder via the ureters.

If they reach the kidney, they can cause a kidney infection (pyelonephritis), which can become a very serious condition if not treated promptly.

The following people are at an increased risk of urinary tract infection:

- People with conditions that block (obstruct) the urinary tract, such as kidney stones

- People with medical conditions that cause incomplete bladder emptying (for example, spinal cord injury or bladder decompensation after menopause)
- People with suppressed immune systems: Examples of situations in which the immune system is suppressed are AIDS and diabetes. People who take immunosuppressant medications are also at an increased risk.
- Women who are sexually active: Sexual intercourse can introduce larger numbers of bacteria into the bladder. Infection is more likely in women who have frequent intercourse. Infection attributed to frequent intercourse is nicknamed "honeymoon cystitis." urinating after intercourse seems to decrease the likelihood of developing a urinary tract infection.
- Women who use a diaphragm for birth control.
- Men with an enlarged prostrate: Prostatitis or obstruction of the urethra by an enlarged prostrate can lead to incomplete bladder emptying, thus increasing the risk of infection. This is most common in older men.
- Males are also less likely to develop UTIs because their urethra (tube from the bladder) is longer. There is a drier environment where a man's urethra meets the outside world, and fluid produced in the prostrate can fight bacteria.
- Breastfeeding has been found to decrease the risk for urinary tract infections.

The following special groups may be at an increased risk of urinary tract infection:

- Very young infants: Bacteria gain entry to the urinary tract via the bloodstream from other sites in the body.
- Young children: Young children have trouble wiping themselves and washing their hands well after a bowel movement. Poor hygiene has been linked to an increased frequency of urinary tract infections.
- Children of all ages: Urinary tract infection in children can be (but is not always) a sign of an abnormality in the urinary tract, usually a partial blockage. An example is a condition in which urine moves backward up the ureters (vesicoureteral reflux).
- Hospitalized patients or nursing home residents: Many of these individuals are catheterized for long periods and are thus vulnerable to infection of the urinary tract. Catherterization means that a thin tube (catheter) is placed in the urethra to drain urine from the bladder. This is done for people who have problems urinating or cannot reach a toilet to urinate on their own.

Risk Factors

Sexual Activity

In young sexually active women, sex is the cause of 75 – 90 % of bladder infections, with the risk related to the frequency of sex. In post menopausal women sexual activity does not affect the risk of developing a UTI. Spermicide use independent of sexual frequency increases the risk of UTIs.

Gender

Women are more prone to UTIs than men because in females, the urethra is much shorter and closer to the anus than in males, and they lack bacteriostatic properties of prostatic secretions. Among the elderly, UTI frequency is roughly in equal proportions in women and men. This is due, in part, to an enlarged prostrate in older men. As the gland grows, it can press on the urethra and cause urination and bladder problems. Because there is less urine flushing of the urethra, there is a higher incidence of *E. coli* colonization.

Urinary Catheters

Indwelling urinary catheters increase the risk of UTIs. *Staphylococcus epidermidis* is one of the most common microorganisms involved in catheter related UTIs. Scrupulous aseptic techniques or the use of intermittent catherterization rather than an indwelling catheter may decrease these associated risks.

Factors associated with an increased risk of catheter associated UTI include:

- female sex
- prolonged catheterization
- severe underlying illness
- disconnection of the catheter and drainage tube
- other types of faulty catheter care
- lack of systematic antimicrobial therapy

Genetics

A predisposition for bladder infections may run in families.

Pregnancy

UTI in pregnancy is attributable to decreased ureteral tone, decreased ureteral peristalsis and temporary incompetence of the vesicoureteral valves.

Genitourinary obstruction

Refers to any impediment to the free flow of urine – tumor, stricture, stone, or prostatic hypertrophy. Urethral obstruction due to prostatic hypertrophy is an important predisposing factor in men.

Neurogenic bladder dysfunction

Symptoms of neurogenic bladder range from detrusor underactivity to overactivity, depending on the site of neurologic insult. The urinary sphincter also may be affected, resulting in sphincter underactivity or overactivity and loss of coordination with bladder function.

Vesicoureteral reflux

Reflux of urine from the bladder cavity up into the ureters and sometimes into the renal pelvis, during voiding or with elevation of pressure in the bladder.

Family History

A maternal history of UTI is more often found among women who have experienced recurrent UTIs than among others.

High level of bacterial virulence

Depending on the virulence of the bacterial strain affecting the Urinary tract, the course of the infection will vary.

HIV infection

Individuals infected with HIV who have CD4+ T-cell counts of < 200 / µl are at an increased risk of both bacteriuria and symptomatic UTI.

Prior antibiotic treatment

Certain infecting strains may be resistant to the antibiotics that are used and therefore the infection may persist and or even worsen.

Hospital

Acquired pathogens reach the patient's catheter or urine – collecting system on the hands of hospital personnel, in contaminated solutions or irrigants, and via contaminated instruments or disinfectants.

The patient's own bowel flora may colonize the perineal skin and periurethral area and reach the bladder via the surface of the catheter.

Others

Other risk factors include diabetics, sickle cell disease or anatomical

malformations of the urinary tract such as prostrate enlargement.

While ascending infections are generally the rule for lower urinary tract infections and cystitis, the same is not necessarily true for upper urinary tract infections like pyelonephritis which may originate from a blood borne infection.

Pathogenesis

The most common organism implicated in UTIs (80 – 85 %) is *E. coli*, while *Staphylococcus saprophyticus* is the cause in 5 – 10 % of UTIs.

The bladder wall is coated with various mannosylated proteins, such as Tamm – Horsfall proteins (THP), which interfere with the binding of bacteria to the uroepithelium. As binding is an important factor in establishing pathogenicity for these organisms, its disruption results in reduced capacity for invasion of the tissues. Moreover, the unbound bacteria are more easily removed when voiding. The use of urinary catheters (or other physical trauma) may physically disturb this protective lining, thereby allowing bacteria to invade the exposed epithelium.

During cystitis, uropathogenic, *Escherichia coli* (UPEC) innate defenses by invading superficial umbrella cells and rapidly increasing in numbers to form intracellular bacterial communities (IBCs). By working together, bacteria in biofilms build themselves into structures that are more firmly anchored in infected cells and are more resistant to immune system assaults and antibiotic treatments. This is often the cause of chronic urinary tract infections.

The microbial etiology of urinary infections has been regarded as well established and reasonably consistent. *Escherichia coli* remains the predominant uropathogen (80 %) isolated in acute community – acquired uncomplicated infections, followed by *Staphylococcus saprophyticus* (10 – 15 %). *Klebsiella*, *Enterobacter*, *Proteus* species, and enterococci infrequently cause uncomplicated cystitis and pyelonephritis.

The pathogens traditionally associated with UTIs are changing many of their features, particularly because of antimicrobial resistance. The etiology of UTI is also affected by underlying host factors that complicate UTI, such as age, diabetes, spinal cord injury, or catheterization. Consequently, complicated UTI has a more diverse etiology than uncomplicated UTI, and organisms that rarely cause disease in healthy patients can cause significant disease in hosts with anatomic, metabolic, or immunologic underlying disease. The majority of community – acquired symptomatic UTIs in elderly women are caused by *E. coli*. However, Gram positive organisms are common, and polymicrobial infections account for up to 1 in 3 infections in the elderly. In comparison, the most common organisms isolated in children with uncomplicated UTI are Enterobacteriaceae. Etiological pathogens associated with UTI among patients with diabetes include *Klebsiella* species, Group B Streptococci, and *Enterococcus* species, as well as *E. coli*. Patients with spinal cord injuries commonly have *E. coli* infections. Other common uropathogens include *Pseudomonas* and *Proteus mirabilis*.

Etiology

Most UTIs result when bacteria gain access to the bladder via the urethra.

Upper tract disease occurs when bacteria ascend from the bladder.

Hematogenous infection of the kidney is less common and occurs most often in debilitated patients.

Bacterial virulence factors markedly influence the likelihood that a given strain, once introduced into the bladder, will cause UTI.

The most common etiological agents are Gram negative bacilli.

Escherichia coli

Causes ~80% of acute UTIs in patients without catheters, urologic abnormalities, or calculi

Most *E. coli* strains that cause symptomatic UTIs in noncatheterized patients belong to a small number of specific O, K, and H serogroups.

Proteus

Klebsiella

Occasionally *Enterobacter*

In addition to the above pathogens, *Serratia and Pseudomonas* cause recurrent infections and infections associated with urologic manipulation, catheters, calculi, or obstruction.

Factors that predispose to periurethral colonization with Gram-negative bacilli remain poorly understood.

Gram-positive etiologic agents of UTI play a lesser role.

Staphylococcus saprophyticus causes 10–15% of acute symptomatic UTIs in young women.

Enterococci are common among catheterized patients.

Staphylococcus epidermidis is a common cause of catheter-associated UTI.

Infecting strains in catheter-related infection display markedly greater antimicrobial resistance than organisms that cause community-acquired UTIs.

The causative role of several more unusual bacterial and nonbacterial pathogens in UTIs remains poorly defined, including:

Ureaplasma urealyticum

Mycoplasma hominis

Mycoplasma genitalium

Candida and other fungal species

Commonly colonize the urine of catheterized or diabetic patients

Colonization sometimes progresses to symptomatic invasive infection.

Mycobacteria

Adenoviruses

Cause acute hemorrhagic cystitis in children and in some young adults, often in epidemics

Chlamydia trachomatis, *Neisseria gonorrhoeae*, and herpes simplex virus cause urethritis.

Other viruses (e.g., cytomegalovirus) can be isolated from urine but are thought not to cause acute UTI.

Signs and Symptoms

The most common symptoms of a bladder infection are burning with urination (dysuria), frequency of urination, an urge to urinate, without vaginal discharge or significant pain. An upper tract infection or pyelonephritis may additionally present with flank pain and fever. Healthy women have an average of 5 days of symptoms.

The symptoms or urinary tract infections may vary with age and the part of the urinary system that was affected. In young children, urinary tract infection symptoms may include diarrhea, loss of appetite, nausea and vomiting, fever and excessive crying that cannot be resolved by typical measures. Older children on the other hand may experience abdominal pain, or incontinence. Lower urinary tract infections in adults may manifest with symptoms including hematuria (blood in the urine), inability to urinate despite the urge and malaise.

Other signs of urinary tract infections include foul smelling urine and urine that appears cloudy.

Depending on the site of infection, urinary tract infections may cause different symptoms. Urethritis, meaning only the urethra has been affected, does not usually cause any other symptoms besides dysuria. If the bladder is however affected (cystitis), the most common type of UTI is acute cystitis often referred to as a bladder infection. the patient is likely to experience more symptoms including lower abdomen discomfort, low grade fever, pelvic pressure and frequent urination all together with dysuria. Infections of the kidneys (acute pyeloneprititis) typically causes more serious symptoms such as chills, nausea, vomiting and high fever.

Whereas in newborns the condition may cause jaundice and hypothermia, in elderly, symptoms of urinary tract infections may even include lethargy and a change in the mental status, signs that are otherwise nonspecific.

How is UTI diagnosed?

To find out whether one is suffering from an UTI, the doctor will test a sample of urine for pus and bacteria. One will be asked to give a "clean catch" urine sample by washing the genital area and collecting a "midstream" sample of urine in a sterile container. This method of collecting urine helps prevent bacteria around the genital area from getting into the sample and confusing the test results. Usually, the sample is sent to a laboratory, although some doctors' offices are equipped to do the testing.

In the urinalysis test, the urine is examined for white and red blood cells and bacteria. Then the bacteria are grown in a culture and tested against different antibiotics to see which drug best destroys the bacteria. This last step is called a sensitivity test.

Some microbes, like Chlamydia and Mycoplasma, can be detected only with special bacterial cultures. A doctor suspects one of these infections when a person has symptoms of a UTI and pus in the urine, but a standard culture fails to grow any bacteria.

When an infection does not clear up with treatment and is traced to the same strain of bacteria, the doctor may order some tests to determine if your system is normal. One of these tests is an intravenous pyelogram, which gives x – ray images of the bladder, kidneys, and ureters. An opaque dye visible on x – ray film is injected into a vein, and a series of x – rays is taken. The film shows an outline of the urinary tract, revealing even small changes in the structure of the tract.

If the patient has recurrent infections, the doctor may also recommend an ultrasound exam, which gives pictures from the echo patterns of soundwaves bounced back from internal organs. Another useful test is cystoscopy. A cystoscopy is an instrument made of a hollow tube with several lenses and a light source, which allows the doctor to see inside the bladder from the urethra.

How is UTI treated?

UTIs are treated with antibacterial drugs. The choice of drug and length of treatment depends on the patient's history and the urine tests that identify the offending bacteria. The sensitivity test is especially useful in helping the doctor select the most effective drug. The drugs most often used to treat routine, uncomplicated UTIs are trimethoprim (Trimpex), trimethoprim/ sulfamethoxazole (Bactrim, Septra, Cotrim), amoxicillin (Amoxil, Trimox, Wymox), nitrofurantoin (Macrodantin, Furadantin), and ampicillin (Omnipen, Polycillin, Principen, Totacillin). A class of drugs called quinolones includes four drugs approved in recent years for treating UTI. These drugs include ofloxacin (Floxin), norfloxacin (Noroxin), ciprofloxacin (Cipro), and trovafloxin (Trovan).

Often, a UTI can be cured within 1 or 2 days of treatment if the infection is not complicated by an obstruction or other disorder. Still, many doctors ask their patients to take antibiotics for a week or two to ensure that the infection has been cured. Single-dose treatment is not recommended for some groups of patients, for example, those who have delayed treatment or have signs of a kidney infection, patients with diabetes or structural abnormalities, or men who have prostate infections. Longer treatment is also needed by patients with infections caused by *Mycoplasma or Chlamydia*, which are usually treated with tetracycline, trimethoprim/ sulfamethoxazole (TMP/SMZ), or doxycycline. A followup urinalysis helps to confirm that the urinary tract is infection-free. It is important to take the full course of treatment because symptoms may disappear before the infection is fully cleared.

Severely ill patients with kidney infections may be hospitalized until they can take fluids and needed drugs on their own. Kidney infections generally require several weeks of antibiotic treatment. Researchers at the University of Washington found that 2-week therapy with TMP/SMZ was as effective as 6 weeks of treatment with the same drug in women with kidney infections that did not involve an obstruction or nervous system disorder. In such cases, kidney infections rarely lead to kidney damage or kidney failure unless they go untreated.

Various drugs are available to relieve the pain of an UTI. A heating pad may also help. Most doctors suggest that drinking plenty of water helps cleanse the urinary tract of bacteria. During treatment, it is best to avoid coffee, alcohol, and spicy foods. And one of the best things a smoker can do for his or her bladder is to quit smoking. Smoking is the major known cause of bladder cancer.

Recurrent Infections in Women

Women who have had three UTIs are likely to continue having them. Four out of five such women get another within 18 months of the last UTI. Many women have them even more often. A woman who has frequent recurrences (three or more a year) can ask her doctor about one of the following treatment options:

Take low doses of an antibiotic such as TMP/SMZ or nitrofurantoin daily for 6 months or longer. If taken at bedtime, the drug remains in the bladder longer and may be more effective. NIH-supported research at the University of Washington has shown this therapy to be effective without causing serious side effects.

Take a single dose of an antibiotic after sexual intercourse.

Take a short course (1 or 2 days) of antibiotics when symptoms appear.

Dipsticks that change color when an infection is present are now available without a prescription. The strips detect nitrite, which is formed when bacteria change nitrate in the urine to nitrite. The test can detect about 90 percent of UTIs when used with the first morning urine specimen and may be useful for women who have recurrent infections.

Doctors suggest some additional steps that a woman can take on her own to avoid an infection:

Drink plenty of water every day.

Urinate when you feel the need; don't resist the urge to urinate.

Wipe from front to back to prevent bacteria around the anus from entering the vagina or urethra.

Take showers instead of tub baths.

Cleanse the genital area before sexual intercourse.

Avoid using feminine hygiene sprays and scented douches, which may irritate the urethra.

Complicated Infections

Curing infections that stem from a urinary obstruction or other systemic disorders depends on finding and correcting the underlying problem, sometimes with surgery. If the root cause goes untreated, this group of patients is at risk of kidney damage. Also, such infections tend to arise from a wider range of bacteria, and sometimes from more than one type of bacteria at a time.

Infections in Men

UTIs in men are often a result of an obstruction—for example, a urinary stone or enlarged prostate—or from a medical procedure involving a catheter. The first step is to identify the infecting organism and the drugs to which it is sensitive. Usually, doctors recommend lengthier therapy in men than in women, in part to prevent infections of the prostate gland.

Prostate infections (chronic bacterial prostatitis) are harder to cure because antibiotics are unable to penetrate infected prostate tissue effectively. For this reason, men with prostatitis often need long-term treatment with carefully selected antibiotics. UTIs in older men are frequently associated with acute bacterial prostatitis, which can have serious consequences if not treated urgently.

Encyclopedia

Hyponatremia is decrease in serum sodium concentration < 136 mEq/L caused by an excess of water relative to solute. Common causes include diuretic use, diarrhea, heart failure, and renal disease. Clinical manifestations are primarily neurologic (due to an osmotic shift of water into brain cells causing edema), especially in acute hyponatremia, and include headache, confusion, and stupor; seizures and coma may also occur. Diagnosis is by measuring serum Na. Serum and urine electrolytes and osmolality help determine the cause. Treatment involves restricting water intake and promoting its loss, replacing any Na deficit, and treating the cause.

Etiology: Hyponatremia reflects an excess of Total Body Water (TBW) relative to total body Na content. Because total body Na content is reflected by Extracellular Fluid (ECF) volume status, hyponatremia must be considered along with status of the ECF volume: hypovolemia, euvolemia, and hypervolemia. Note that the ECF volume is not the same as effective plasma volume. For example, decreased effective plasma volume may occur with decreased ECF volume, but it may also occur with an increased ECF volume (eg, in heart failure, hypoalbuminemia, capillary leak syndrome).

Hypovolemic hyponatremia: Deficiencies in both TBW and total body Na exist, although proportionally more Na than water has been lost; the Na deficit produces hypovolemia. In hypovolemic hyponatremia, both serum osmolality and blood volume decrease. Anti Diuretic Hormone (ADH) secretion increases despite a decrease in osmolality to maintain blood volume. The resulting water retention increases plasma dilution and hyponatremia.

Extrarenal fluid losses: Such as those that occur with the losses of Na-containing fluids as in protracted vomiting, severe diarrhea, or sequestration of fluids in a 3rd space can cause hyponatremia typically when losses are replaced by ingesting plain water or liquids low in Na or by hypotonic IV fluid. Significant ECF fluid losses also cause release of ADH, causing water retention by the kidneys, which can maintain or worsen hyponatremia. In extrarenal causes of hypovolemia, because the normal renal response to volume loss is Na conservation, urine Na concentration is typically < 10 mEq/L.

Renal fluid losses: Resulting in hypovolemic hyponatremia may occur with mineralocorticoid deficiency, diuretic therapy, osmotic diuresis, or salt-losing nephropathy. Salt-losing nephropathy encompasses a loosely defined group of intrinsic renal disorders with primarily renal tubular dysfunction. This group includes interstitial nephritis, medullary cystic disease, partial urinary tract obstruction, and, occasionally, polycystic kidney disease. Renal causes of hypovolemic hyponatremia can usually be differentiated from extrarenal causes by the history. Patients with ongoing renal fluid losses can also be distinguished from patients with extrarenal fluid losses because the urine Na concentration is inappropriately high (> 20 mEq/L). Urine Na concentration may not help in differentiation when metabolic alkalosis (as occurs with protracted vomiting) is present and large amounts of HCO_3 are spilled in the urine, obligating the excretion of Na to maintain electrical neutrality. In metabolic alkalosis, urine Cl concentration frequently differentiates renal from extrarenal sources of volume depletion.

Diuretics: May also produce hypovolemic hyponatremia. Thiazide diuretics, in particular, decrease the kidneys' diluting capacity and increase Na excretion. Once volume depletion occurs, the nonosmotic release of ADH causes water retention and worsens hyponatremia. Concomitant hypokalemia shifts Na intracellularly and enhances ADH release, thereby worsening hyponatremia. This effect of thiazides may last for up to 2 weeks after cessation of therapy; however, hyponatremia usually responds to replacement of K and volume deficits along with judicious monitoring of water intake until the drug effect dissipates. Elderly patients may have increased Na diuresis and are especially susceptible to thiazide-induced hyponatremia, particularly when they have a preexisting defect in renal capacity to excrete free water. Rarely, such patients develop severe, life-threatening hyponatremia within a few weeks after the initiation of a thiazide diuretic. Loop diuretics much less commonly cause hyponatremia.

Euvolemic hyponatremia: In euvolemic (dilutional) hyponatremia, total body Na and thus ECF volume are normal or near-normal; however, TBW is increased.

Primary polydipsia can cause hyponatremia only when water intake overwhelms the kidneys' ability to excrete water. Because normal kidneys can excrete up to 25 L urine/day, hyponatremia due solely to polydipsia results only from the ingestion of large amounts of water or from defects in renal capacity to excrete free water. Patients affected include those with psychosis or more modest degrees of polydipsia plus renal insufficiency.

Euvolemic hyponatremia may also result from excessive water intake in the presence of Addison's disease, hypothyroidism, or nonosmotic ADH release. Postoperative hyponatremia most commonly occurs because of a combination of nonosmotic ADH release and excessive administration of hypotonic fluids after surgery. A deficiency in water excretion is common in all these conditions. Diuretics can cause or contribute to euvolemic hyponatremia if another factor causes water retention or excessive water intake.

Hypervolemic hyponatremia: Hypervolemic hyponatremia is characterized by an increase in both total body Na (and thus ECF volume) and TBW with a relatively greater increase in TBW. Various edematous disorders, including heart failure and cirrhosis, cause hypervolemic hyponatremia. Rarely, hyponatremia occurs in nephrotic syndrome, although pseudohyponatremia may be due to interference with Na measurement by elevated lipids. In each of these disorders, a decrease in effective circulating volume results in the release of ADH and angiotensin II.

The following factors contribute to hyponatremia: The antidiuretic effect of ADH on the kidneys, Direct impairment of renal water excretion by angiotensin II, Decreased GFR, Stimulation of thirst by angiotensin II. Urine Na excretion is usually < 10 mEq/L, and urine osmolality is high relative to serum osmolality.

...Trends in Surface Microbiology

Newer and better trends help in improving the existing system by making the already present techniques more effective and the whole process a more simpler and efficient one. In this article we take a look at the new and better means of analyzing surface flora.

Microbiology has always captured the interest of people from various walks of life, including students, health care workers, ecologists, environmentalists. It is this interest and need to know the subject and its advantages that continuously surface as improved techniques.

Surface Microbiology is very significant especially when the places in question are related to food, health care; like hospitals, nursing homes, kindergartens, nurseries, schools and institutions.

Hygiene of food contact surfaces and food handlers are a major challenge for food service facilities since controlling the spread of food – borne pathogens is an essential but time consuming process. Food service areas are considered critical to health, and therefore the bacteriological quality of these surfaces as well as non food service surfaces in child care centers must be assessed. Although many cases of food – borne illness have been attributed to inadequate cooking, temperature abuse, and the use of contaminated raw ingredients, cross contamination between raw and cooked foods via food contact surfaces also has been identified as a significant risk factor. Environmental microbiological studies have suggested that the use of easily cleaned surfaces could help reduce environmental contamination and thus its role in the transmission of disease.

In conditions when there are doubts about the cleanliness and hygiene of any surface, surface testing has to be conducted which can be done by obtaining a sample of the surface wipes.

In order to perform laboratory tests on specimens that are collected outside the laboratory, they must be collected and transported properly. It is essential that the container bearing the specimen does not contribute its own microbial flora. Also, the original flora should neither multiply nor decrease because of prolonged standing on a hospital ward or in the field.

A variety of containers have been devised for collecting bacteriological specimen. The most commonly used is a cotton – or Dacron tipped applicator stick. These must be sterile and remain sterile before specimen collection. One approach uses a sterile disposable culture unit, consisting of a plastic tube containing a sterile polyester – tipped swab and a small glass ampule of holding medium. This medium maintains a favorable pH and prevents both dehydration of secretions during transport and oxidation and enzymatic self – destruction of any pathogens present. There are other versions of this type of transport media, such as a gel in the bottom of the tube, or a separate test tube into which the specimen swab is inserted.

The unit is removed from its sterile envelop, and the swab is used to collect the specimen. It is then returned to the tube, the ampule is crushed (if there is one), and the swab is forced into the released holding medium. This will provide sufficient moisture for storage up to 72 hours at room temperature. After the specimen arrives in the laboratory, the swab can be removed and used to inoculate the appropriate media.

A variety of transport media is available for prolonging, the survival of microorganisms when a significant delay occurs between collection and culturing. Special media is needed for specific types of specimens. One example is for anaerobic specimen transport. A specimen of anaerobes is stored in an anaerobic jar.

Different products will have different instructions for use, for instance

Collecting and Transporting a Specimen

- Follow the direction on the package to open and use the swab.
- Use the specimen swab to collect a specimen from somewhere away from the laboratory.
- Some places to collect samples from home include the following: Kitchen, bathroom, bed linens, washer, dryer. Some items that could be sampled include toothbrush bristles, hairbrush, cutting board, sink handle, TV remote.
- Follow directions on the package for transporting the swab back to the laboratory.

Preparing a streak plate for the specimen

- Use the specimen swab to streak back and forth onto one third of the media plate.
- Flame and cool a loop to streak for isolation from the primary streak area.
- Incubate the inoculated plate at desirable temperature until required.
- Note the results so obtained after incubation.

Technology used in Microbiological Plates

There are specialized plates that are used for the detection and enumeration of microorganisms present on surfaces of sanitary importance. The plates are specially constructed so that the agar medium can be overfilled, producing a meniscus or dome shaped surface that can be pressed onto a surface for sampling its microbial content. After touching the surface to be sampled with the medium, the dish is covered and incubated at $30^{o}C$ or $35^{o}C$ (temperature of choice), depending on the day of the week and on the organisms that are being looked for. The presence and number of microorganisms is detected by the appearance of colonies on the surface of the agar. Collection of samples before and after cleaning and treatment with a disinfectant permits the evaluation of the efficacy of sanitary procedures. The media used for these plates consists of a general purpose medium with some other ingredients to select for certain types of bacteria. The plate has a grid which helps as an aid in counting the colonies.

Colonies per Plate
Good (hygiene) = 0 – 25
Fair (hygiene) = 26 – 50
Poor (hygiene) = 50 and over

Collection and Inoculation of a plated sample

Choose an area to which you will touch the plate. Some examples are a kitchen cutting board or counter, shower, or bathtub floor.

- Lightly press the plate to the chosen surface.

- Label the plate.
- Tape it closed.
- Incubate the plate at 30°C until the next lab period.
- Note the results.

How can a modified plate design be useful in better surface hygiene monitoring?

In normal plating techniques, the flat surface of the plate is filled with media approximately up to half the height of the plate and then the microorganisms of choice are introduced via spread plate technique, or streak plate technique or are introduced into the semisolid warm media and pour plated into a pre - sterilized petri plate, thus the microorganisms of choice are introduced in a preferential growth media. This inoculated media plate is then incubated at a temperature of choice depending on the target organisms.

The new design of the plate is aimed at making sampling a one step, process which ensures that many tedious, cumbersome intermediate steps are truncated or completely eliminated. For instance, the sample is collected from the specified location with a sterile non – absorbent cotton swab, the swab is aseptically introduced into a sterile collection container or tube and carefully transferred to the lab where the cotton swab is introduced into a suitable sterile diluent. Then this solution is used as the inoculum with which the media laden plates are inoculated. Now with the specially designed plates, the media is introduced into the plates, allowed to solidify, the plates having a convex bottom surface will have the media protruding in a convex pattern, which can be contacted to the test surface directly.

These plates are then either transferred to the lab for incubation or are retained at the site of collection, if the incubation temperature of choice is the ambient temperature. Thus the challenge of all the skilled techniques is summarized in knowing how to contact the surface of the medium to the test surface, making microbiological plating pretty simple!

Some common surfaces that need to be attended to:

Cutting board (meat): The microorganisms present will largely depend on the type of meat (raw material) that is being cut. In case of chicken the dominant organisms might include *Salmonella* species and *E. coli*, which may be present in the meat itself or may be contributed to, by the water or knife that is used to dress the chicken at the cold storage, whereas beef and pork may comprise of many other organisms including infestations like tape worm and/or hook worm.

Cutting board (vegetables): Whereas when a cutting board is used for vegetables, its best if the vegetables are washed properly before they are cut, to minimize contaminating organisms that may be present on the vegetables and may also adhere to the surface of the board and hence further add to the flora of the board. This also means that in cases when the board is not washed in between the cutting of different sets of vegetables, there may also be cross contamination from one set of vegetables to another.

Vegetables are frequently contaminated by soil flora owing to their closeness to soil and also during transportation. For instance cabbage, may be housing *Neisseria meningitidis* which is one of the causative agents for meningitis (inflammation of the brain and spinal cord meninges).

Taps / Sinks: Taps of bathrooms and toilets very often act as fomites (inanimate objects that aid in the transfer of microbes), thus when checking hygiene the taps and sinks are a common site from where samples are picked for analysis. Taps are the common places that different people touch and thus this becomes a common surface on which microbes from different hands adhere and are transferred from one person to another. In cases of persons who pay less importance to hygiene these may be surfaces that act as common fomites. These may have present on their surfaces *E. coli*, *Salmonella* species, *Campylobacter* species, corona viruses, etc.

Kitchen taps and sinks also play a vital role in the flora present on the raw materials, since these can act as vehicles to transmit the microbes from one type of material to another. Therefore it is vital that the handler washes the food item well and the tap should also be rinsed at least once in a while, so that visible debris of the material should not be transferred from one food item to another.

Knives: Knives or other instruments that are used to cut and clean should be clean, most especially when these are used for already cooked food. Since after cutting food may be directly consumed and this can be a source of contamination. It is also essential that there should be separate knives and/or instruments maintained to cut uncooked material and cooked food as lacking the same could be a major problem. When the same instruments are used for uncooked as well as cooked food there are further chances that food pathogens from uncooked food will get directly transferred to cooked food items.

Tables: In this context, tables specifically refers to tables at eateries, which should be cleaned properly with an antiseptic, disinfectant or low residue detergent solution after use and before another set of customers use the same, since food particles that remain on the table can contribute to a increase in the number of microbial load and attract insects. These insects can be vectors that carry infectious particles that can contaminate the food served and hence compromise the quality of food and the reputation of the eatery.

Hospital wards / beds / tables: Hospitals are a common place for the transmission of infection (nosocomial infections) and if rigorous hygiene is not maintained in these places, the result can be catastrophic, which can put the lives and health of the patients, attendants as well as the health care providers at risk. Therefore it is a must that hygiene of a very high standard is maintained in such places, with the best available solutions of antiseptics and disinfectants.

Items in play schools and kindergartens: Like toys, tables, counting boards, etc, which constantly come in contact with different children, thus the organisms that may have originated from one child are easily transmitted to the other children. Also it is essential that child handlers maintain high standards of hygiene and are trained well in the field so that these personnel assigned the duty of maintaining a good hygiene do not themselves become responsible for adversities and cross infections.

The above examples are only a few instances which can be used to demonstrate the need for better hygiene and continuous monitoring of surfaces which are crucial to health.

The overall aspect of development in surface analysis has been aimed at bringing about an effective, efficient and easy solution to the various surface analysis.

Rosalyn Sussman Yalow
Birth: July 19, 1921
Nationality: American
Known for: Devising Radio Immunoassay (RIA) Technique

Rosalyn Sussman was born on July 19, 1921 is an American medical physicist, and co – winner of the 1977 Nobel Prize in Physiology or Medicine for her development of the radioimmunoassay (RIA). She was born in the city of New York and has spent most of her lifetime there. The younger of the two children born to Clara Zipper and Simon Sussman, Rosalyn was a stubborn but a determined child. Neither of her parents had the advantage of a high school education. She attended Walton High School and graduated in 1941 from Hunter College.

Roslayn was excited about a career in physics. Her family, being more practical, thought the most desirable position for her would be as an elementary school teacher. Furthermore, it seemed most unlikely that good graduate schools would accept and offer financial support for a woman in physics. However her physics professors encouraged her and she persisted in her endeavor. Later she received an offer of a teaching assistantship in physics at the University of Illinois, the most prestigious of the schools to which she had applied. It was an achievement beyond belief for then young Rosalyn. In September that year she went to Champaign – Urbana, the home of the University of Illinois. At the first meeting of the faculty of the College of Engineering she became aware that she was the only woman among its 400 members. The Dean of the Faculty congratulated her on her achievement and told her that she was the first woman there since 1917.

On the first day of graduate school she met Aaron Yalow, who was also beginning graduate study in physics at Illinois and who in 1943 was to become her husband. The first year was not easy, during her graduate training in Illinois under the renowned nuclear physicist Maurice Goldhaber, Yalow became proficient in the construction and use of apparatus for the measurement of radioactive substances, a skill that would prove critical in her later research.

Later in 1945 her husband came to New York, where they established their home in an apartment in Manhattan. She was a full time teacher at the Hunter and her husband was in Medical Physics at Montefiore Hospital in the Bronx. Through him Rosalyn met Dr. Edith Quimby, a leading medical physicist at P & S. Here Rosalyn volunteered to work in Dr. Quimby's laboratory to gain research experience in the medical applications of radioisotopes. Dr. Quimby introduced Rosalyn to Dr. G. Failla, Dean of American medical physicists. It was Dr. Failla who introduced Rosalyn to Dr. Bernard Roswit, Chief of the Radiotherapy Service at the Bronx Veterans Administration Hospital and she worked at the Hospital part – time and continued her service at Hunter.

In January 1950 Rosalyn decided to leave teaching and join Bronx VA full time. That spring Rosalyn met Dr. Solomon Berson, when the latter joined the Service after completing his residency in internal medicine at the Bronx Veterans Administration (VA).

During that period Aaron and Rosalyn had two children Benjamin and Elanna, after which Rosalyn gave up collaborative work with others and concentrated on their joint researches. Their first investigation together was in the application of radioisotopes in blood volume determination, clinical diagnosis of thyroid diseases and the kinetics of iodine metabolism. They extended these techniques to studies of the distribution of globin, which had been suggested for use as a plasma expander, and of serum proteins. It seemed obvious to apply these methods to smaller peptides,i.e., the hormones. Insulin was the hormone most readily available in a highly purified form. They soon deduced from the retarded rate of disappearance of insulin from the circulation of insulin – treated subjects that all these patients develop antibodies to the animal insulins. In studying the reaction of insulin with antibodies they had developed a tool with the potential for measuring circulating insulin. It took several more years of work to transform the concept into the reality of its practical application to the measurement of plasma insulin in man. Thus the era of radioimmunoassay (RIA) can be said to have begun in 1959.

The RIA diagnostic process was, and continues to be, used by researchers in myriad ways. Investigators use it to screen blood for hepatitis virus in blood banks, determine effective dosage levels of drugs and antibiotics, detect foreign substances in the blood, treat dwarfed children with growth hormones, and test and correct hormone levels in infertile couples. RIA is remarkably sensitive. It measures incredibly low concentrations of many substances. Adaptations of the RIA principle are also possible. Nonradioactive labels, such as linked enzymes and fluorescent markers, can be used in place of radioisotopes. Because of its almost limitless applicability, the RIA concept has spawned innumerable innovations in basic research and practical applications. The commercial possibilities for RIA were enormous, but while Yalow and Berson recognized this, they refused to patent the method. Instead, they made every effort to get RIA into common use, putting its value to humanity ahead of their own financial interests. Yalow asserted, “We never thought of patenting RIA.... patents are about keeping things away from people for the purpose of making money. We wanted others to be able to use RIA.” The seemingly inextricable connection between money and medicine was never a primary concern to Yalow. Indeed, Yalow and Berson performed all their work without ever receiving a research grant!. This stands in sharp contrast to much contemporary medical research, which is corporate sponsored and profit – oriented in the quest for intellectual property.

It is of interest from this brief history that neither Dr. Solomon nor Dr. Rosalyn had the advantage of specialized post – doctoral training in investigation. They learned from and disciplined each other and were probably each other's severest critic. Rosalyn had the good fortune to learn medicine not in a formal medical school but directly from a master of physiology, anatomy and clinical medicine. This training was essential if she was to use her scientific background in areas in which she had no formal education.

The laboratory in which Dr. Rosalyn and Dr. Solomon worked was on Dr. Rosalyn's request designated 'The Solomon A Berson Research Laboratory', after Berson assumed Chairmanship of the Department of Medicine at the Mount Sinai School of Medicine.

The laboratory since its inception has been supported solely by the Veterans Administration Medical Research Program and the hospital is now affiliated with the Mount Sinai School of Medicine where she holds the title of Distinguished Service Professor and she is the member of National Academy of Sciences. Honors which she received include, among others: Albert Lasker basic Medical Research Award; A Cressy Morrison Award of the American Medical Association; Koch Award of the Endocrine Society; Gairdner Foundation International Award; American College of Physicians Award for distinguished contributions in science as related to medicine; Eli Lilly Award of the American Diabetes Association; First William S. Middleton Medical Research Award of the VA and five honorary doctorates.

Enjoy the humour

Police arrested a drunkard & asked: Where are you going?
Man: I'm going to participate in a lecture on ill effects of drinking.
Cop: Who'll lecture at midnight?
Man: My wife...

So many options: Poison, sleeping pills, hanging, jumping from a building, lying on train tracks, but we chose Marriage, slow but sure!

Wife: If I dismiss the cook and make the food myself for a month, what will you pay me?
Husband: I won't have to pay you, you'll get my entire insurance amount.

What's the difference between Complete & Finished? If you find a good wife you are complete otherwise you are finished.

Thoughts to live by

- Man becomes man only by his intelligence, but he is man only by his heart. (Henri Frederic Amiel)
- Don't knock the weather; nine-tenths of the people couldn't start a conversation if it didn't change once in a while. (Kin Hubbard)
- A mistake is simply another way of doing things. (Katharine Graham)
- Forgiveness is the economy of the heart... forgiveness saves the expense of anger, the cost of hatred, the waste of spirits. (Hannah More)
- There are two ways to live your life. One is as though nothing is a miracle. The other is as though everything is a miracle. (Albert Einstein)

Track your brain

1. Presence of ketone bodies in urine is referred to as _ _ _ _N_ _ _ _(9).
2. _R_T_ _ _ (7) are a pair of narrow tubes connecting the kidneys to the bladder.
3. Urinary Tract Infections involving the kidneys is termed as _Y_ _ _N_ _ _R_ _ _ _(14).
4. _ _S_ _ _A(7) refers to pain during urination.
5. _E_ _ _ _ _I_(9) indicates presence of blood in urine.
6. Decrease in serum sodium ion concentration is referred to as H_ _ _N_ _ _E_ _ _(12).
7. A plate with a _ _ _ _ _X (6) bottom surface is a better alternative to analyze surfaces.
8. Taps of bathrooms and toilets very often act as _ _ _I_ _ _(7).
9. Campylobacteriosis is an emerging infectious _ _O_ _T_ _(8) disease.
10. _ _ _ _ _ _N(7) was the hormone most readily available in a highly purified form.
11. The first step in successfully treating diabetic foot ulcer is _ _ _ _ _DE_ _ _ _(11).
12. The organophosphates and C_ _ _ _N_ _ _ _(10) present in pesticides affect and damage the nervous system and can cause cancer.

Check your Answers on Page 16

Campylobacter species

The genus Campylobacter includes 18 species and subspecies; 11 of these are considered pathogenic to humans and cause enteric and extraintestinal illnesses. The major pathogens are *Campylobacter jejuni* and *Campylobcater fetus*.

Campylobcater pathogens are small, curved, motile, microaerophilic, Gram negative rods. They vary in width from 0.2 – 0.9 mm and vary in length from 0.5 – 5.0 mm. They exhibit rapid, darting motility in corkscrew fashion using a single flagellum or 2 flagella (monotrichous, amphitrichous). They also possess a lipopolysaccharide endotoxin.

In general, biochemical characteristics are as described for the family Campylobacteriaceae. Several species require anaerobiosis for optimal growth or require fumarate with formate or hydrogen for growth under microaerobic conditions. Gelatin, casein, starch, and tyrosine are not hydrolyzed. Oxidase activity is present in all species except *C. gracilis*. There is no lipase or lecithinase activity. Some species are pathogenic for humans and animals. They are found in the reproductive organs, intestinal tract, and oral cavity of man and animals. The G + C content of the DNA ranges from 29 to 47 mol%.

Campylobacteriosis, the illness caused by Campylobacter, is a zoonotic, emerging infectious disease characterized by diarrhea (often bloody), abdominal pain, malaise, fever, nausea, and vomiting. The severity of the disease is variable, but usually people who get campylobacteriosis recover completely within 10 days. For a small number of people, Campylobacter infection may result in long term health problems. For instance, Campylobacter infection is the most common cause of a rare disease called Guillain – Barre syndrome (GBS) that occur several weeks after the acute diarrheal illness, and may result in permanent paralysis.

Campylobacteriosis afflicts both humans and animals. The animal reservoir is the gastrointestinal tract of dogs, cats, and other pets that can carry the organism. Transmission of *C. jejuni* to humans occurs by ingestion of contaminated food or water, including unpasteurized milk and undercooked poultry, or by direct contact with fecal material from infected animals or persons. The 2 types of illnesses associated with Campylobacter infections in humans are intestinal and extraintestinal infections. The prototype for intestinal infection is *C. jejuni* and the prototype for extraintestinal infection is *C. fetus*.

There is no simple 'gold standard' for the routine isolation of all Campylobacter species. Simultaneous application of a microaerobic atmosphere containing hydrogen with a filtration method and a selective base is methodologically the optimal solution. However, the predominant species in human infection can be readily grown under a microaerophilic atmosphere on selective media without the necessity to use hydrogen. To evaluate the presence of other, less common species, appropriate culture conditions must be applied.

Cause

Campylobacteriosis is usually transmitted via handling raw poultry, eating undercooked poultry, drinking nonchlorinated water or raw milk, or handling infected animal or human feces. Most frequently, poultry and cattle waste are the sources of the bacteria, but feces from puppies, kittens, and birds may also be contaminated.

The sites of tissue injury include the jejunum, the ileum, and the colon. Most strains of *C. jejuni* produce a toxin (cytolethal distending toxin) that hinders the cells from dividing and activating the immune system. This helps the bacteria to evade the immune system and survive for a limited time in the cells. The organism produces diffuse, bloody, edematous, and exudative enteritis.

Signs and Symptoms

- Diarrhea (often bloody)
- Abdominal cramping and pain
- Nausea and vomiting
- Fever
- Tiredness
- Convulsions
- Meningitis

Pathophysiology

Factors responsible for the disease caused by *C. jejuni* are not well known. Based on clinical illness, researchers have postulated the following mechanisms.

Adherence and production of heat labile enterotoxins, inducing secretory diarrhea.

Invasion and proliferation within the intestinal epithelium, leading to cell damage and inflammatory response.

Translocation of the organism into the intestinal mucosa and proliferation in the lamina propria and mesenteric lymph nodes, leading to extraintestinal infections such as meningitis, cholecystitis, urinary tract infection, and mesenteric adenitis.

Information on the pathogenesis of Campylobacter infections other than *C. jejuni* is scarce. Bacteremia is more common with *C. fetus* infection. A surface protein *C. fetus* inhibits the C3b binding responsible for both the serum and phagocytic resistance of the organism, making the organism resistant to the bactericidal effects of human serum. After oral ingestion, *C. fetus* may colonize the intestinal tract, resulting in portal bacteremia. In immunocompetent hosts, the organism is phagocytosed by the reticuloendothelial cells in the liver, preventing further spread. However, in patients that have predisposing factors that might serve as a local site of infection such as a gravid uterus, bacteremia can lead to severe complications, infants may be affected hematogenously or by ascending infection during amnionitis and premature rupture of membranes.

Diagnosis of Campylobacteriosis

Microbiologic studies in *Campylobacter* infection

- Presumptive diagnosis can be made by examination of fecal specimens by darkfield or phase-contrast microscopy, which demonstrates the characteristic darting motility, and a Gram stain of the stool, which shows *Vibrio* forms (slim, short, curved rods). RBCs and neutrophils are present in stool in approximately 75% of patients with *Campylobacter* enteritis.
- Definitive diagnosis of infection is based on isolation of organisms from stool culture or from another site.

- Culture of *C. jejuni* from stool requires special isolation techniques and special media such as Campy-BAP or Skirrow. These media contain antibiotics that reduce the emergence of other enteric microorganisms. Inoculated media should be incubated in 5% oxygen and 10% carbon dioxide at 42°C. If *C. fetus* or other atypical enteric species are suspected, isolation from stool requires inoculation on media lacking antibiotics and at 37°C. Filtration technique may be needed. Routine media are adequate for isolation of *Campylobacter* from normally sterile sites such as blood, body fluids, and tissues.

Hematology and blood chemistries

- Peripheral WBC count is usually within the reference range; however, a left shift may occur.
- The alanine aminotransferase level and the erythrocyte sedimentation rate (ESR) may be slightly elevated.
- Other laboratory evaluations are within the reference ranges.

Serology

- Diagnostic rise usually occurs after symptoms have resolved. Because the median duration of fecal excretion in the convalescent phase is less than 3 weeks, serology testing may be more sensitive than culture for the diagnosis of recent *C. jejuni* infection.
- Although serologic testing is also useful for epidemiologic investigations it is not recommended for routine diagnosis.

Treatment for Campylobacteriosis

In the initial assessment, a practitioner must ascertain whether the patient is dehydrated. Are the patient's mucus membranes moist? How is the skin tugor? Are the eyes or fontanel sunken? Is the patient still urinating? If fluids are needed, then can the patient tolerate fluids by mouth, or is intravenous fluid treatment needed?

Patients with *Campylobacter* infection should drink plenty of fluids as long as the diarrhea lasts in order to maintain hydration. Antidiarrheal medications such as loperamide may allay some symptoms. Campylobacteriosis is usually a self-limited illness, but when it is identified specific treatment with antibiotics is indicated, as treatment may shorten the course of the illness or symptomatic treatment by liquid and electrolyte replacement is enough in human infections.

In more severe cases of gastroenteritis, antibiotics are often begun before culture results are known. Macrolide antibiotics (erythromycin, clarithromycin, or azithromycin) are the most effective agents for *Campylobacter jejuni*. Fluoroquinolone antibiotics (ciprofloxacin, levofloxacin, gatifloxacin, or moxifloxacin) can also be used, but resistance to this class has been rising, at least in part due to the use of this class of antimicrobials in poultry feed.

Epidemiology

C. jejuni , first identified as a human diarrheal pathogen in 1973, is the most frequently diagnosed bacterial cause of human gastroenteritis in the United States. Sequelae including GBS and reactive arthritis are increasingly recognized, adding to the human and economic cost of illness from human campylobacteriosis. The emergence of fluoroquinolone-resistant infections in Europe and the United States, temporally associated with the approval of fluoroquinolone use in veterinary medicine, is also a public health concern. The consumption of undercooked poultry and cross-contamination of other foods with drippings from raw poultry are leading risk factors for human campylobacteriosis. Reinforcing hygienic practices at each link in the food chain—from producer to consumer—is critical in preventing the disease.

Control and Preventive Measures

- Treatment is not generally indicated, except electrolyte replacement and rehydration. Antimicrobial treatment (erythromycin, tetracycline, quinolones) is indicated in invasive cases or to eliminate the carrier state.
- The prevention of infection requires control measures at all stages of the food chain, from agricultural production on the farm, to processing, manufacturing and preparation of foods in both commercial establishments and the domestic environment.
- Specific intervention methods on the farm have been shown to reduce the incidence of Campylobacter in poultry. Measures include enhanced biosecurity to avoid horizontal transmission of Campylobacter from the environment to the flock of birds. This control option is feasible only where birds are kept in closed housing conditions.
- There are no proven intervention methods to reduce Campylobacter in cattle farms. Prevention of the contamination of raw milk should be avoided.
- Good hygienic slaughtering practices will reduce contamination of carcasses by feces, but will not guarantee the absence of Campylobacter from meat and meat products. Education in hygienic handling of foods for abattoir workers and those involved in the production of raw meat is essential to keep microbiological contamination to a minimum.
- The only effective method of eliminating Campylobacter from contaminated foods is to introduce a bactericidal treatment, such as heating (eg. cooking or pasteurization) or irradiation.
- Preventive measures for Campylobacter infection in the household kitchen are similar to those used against other food borne bactericidal diseases.
- In countries without adequate sewage disposal system, articles soiled with feces should be disinfected before disposal.

Recommendations for the Public and Travelers

- Make sure your food is properly cooked and still hot when served.
- Avoid raw milk and products made from raw milk. Drink only pasteurized or boiled milk.
- Avoid ice unless you are sure it is made from safe water.
- When the safety of drinking water is doubtful, boil it or if this is not possible, disinfect it with a reliable, slow – release disinfectant agent. These are usually available at pharmacies.
- Wash hands thoroughly and frequently using soap, in particular after contact with pets or farm animals, or after having been to the toilet.
- Wash fruits and vegetables carefully, particularly if they are eaten raw. If possible, vegetables and fruits should be peeled.

Recommendations for Food Handlers

- Both professional and domestic food handlers should be vigilant during the preparation of food and should observe hygienic rules of food preparation.
- Professional food handlers who suffer from fever, diarrhea, vomiting or visible infected skin lesions should report to their employer immediately.

PHMB in Diabetic Foot Ulcer Management

Diabetes mellitus (DM) is a metabolic disorder where in the human body does not produce or properly utilize insulin. This leads to an increased concentration of glucose in the blood (hyperglycemia). This given condition does not only harm the cells that need glucose for fuel, but also harms certain organs and tissues exposed to the high glucose levels such as the retina of the eye, kidneys, nerves and the blood vessels. Uncontrolled diabetes can lead to heart attack, stroke, **toe, foot, or leg infections, amputation,** blindness, kidney failure, tooth and gum disease, pregnancy complications.

The International Diabetes Federation (IDF) estimates that 285 million people around the world have diabetes. This total is expected to rise to 438 million within 20 years. Each year a further 7 million people develop diabetes. According to IDF, by next year, India will be home to 50.8 million diabetics, making it the world's unchallenged diabetes capital. China stands second in this infamous table with 43.2 million diabetes cases at present.

Diabetic Foot …

Diabetic foot ulcers (open sores or wounds) are significant complications associated with **Diabetes mellitus,** that most commonly occurs on the bottom of the foot (they can also appear along the top and bottom of each toe) in ~ 15 % of patients with diabetes & precede almost 85% of all foot amputations.

Treatment and Management of Diabetic Foot Ulcers…

The primary goal in the treatment of foot ulcers is to obtain healing as soon as possible. Faster healing lowers the risk of an infection. Successful treatment of diabetic foot ulcers consists of four basic issues: **debridement, offloading, infection control** and the most important, **controlling the blood sugar level**.

Healing of foot ulcers may occur within weeks or require several months depending on various factors, such as, wound size and location, pressure on the wound, swelling, circulation, blood glucose levels, wound care, and what is being applied to the wound. Use of antibiotics needs to be reserved for controlling systemic infections. Inappropriate use of antibiotics increases chances of development of resistant strains. This fact has renewed interest in the use of antiseptics (for topical use only) for wound management. Antiseptics can provide a useful alternative to antibiotics in controlling infections.

Antiseptics destroy or inhibit the growth and development of microorganisms in or on living tissue. Unlike antibiotics antiseptics have multiple targets and a broader spectrum of activity, which include bacteria, fungi, viruses, protozoa, and even prions. Antiseptics are also considered superior to topical antibiotics when their rates of causing contact sensitization are compared.

Due to the cytotoxicity, delay in wound healing and safety issues of several antiseptics (povidone iodine, iodine, silver), their use is **generally** avoided on foot ulcers. The use of full strength betadine, peroxide, whirlpools and soaking are not recommended, as this could lead to further complications. Use of safe and non cytotoxic antiseptics (such as Polyhexamethylene biguanide; **PHMB**) on open wounds helps in prevention and treatment of infection which increases the rate of the healing process. PHMB is a heterodisperse mixture of polymers and is a synthetic compound structurally similar to naturally occurring antimicrobial peptides (AMPs). AMPs are important in innate immune response and are produced by a majority of living organisms. They bind to bacterial cell membranes and induce cell lysis by destroying membrane integrity, similar to penicillin and cephalosporin antibiotics. They have a broad spectrum of activity against bacteria, viruses and fungi and have been suggested as therapeutic alternatives to antibiotics. The basic molecular chain of PHMB can be repeated from two to 30 times, with increasing polymer chain length correlating with increasing antiseptic/antimicrobial efficacy.

Successful wound management involves…

Adequate antisepsis
Epithelisation (regeneration of epithelial cells of the skin)
Hydrobalance
Not harming the cells involved in the repair process
Patient-compliance
The antiseptic solution used should be non-irritating, non-staining and not malodorous.

PHMB in wound management…

Wound healing is a highly complicated multifactorial process that requires a sophisticated local wound management. **Thorough and gentle wound cleaning,** keeping the wound moist and necrosis- and detritus-free, are **crucial for wound healing.**

Typically, neutral physiological solutions are used for the purpose. The latest research shows that, use of safe and non cytotoxic antiseptics (such as **PHMB**) on open wounds helps in prevention and treatment of infection which increases the rate of the healing process. It is established that infections may delay healing, cause failure of healing, and even cause wound deterioration. In medicine PHMB was introduced by Willenegger in 1994 as an antiseptic in abdominal surgery. PHMB/Betaine containing wound rinsing solutions are found to be superior to salt solutions (saline or Ringer solution) as wounds treated with PHMB/Betaine containing wound rinsing solution show superior wound healing.

Wound healing also requires great care to ensure no damage or harm to vital and especially to naturally functional important structures. Keeping this objective in mind, the application of PHMB/Betaine containing wound rinsing solutions seems to be a highly appropriate concept in supporting these effects and to promote wound healing. PHMB has good tissue compatibility based on its activity against the acid lipids contained within the bacterial cell membranes and minor effect on the neutral lipids of human cell membranes. This helps to prevent damage to the surrounding healthy tissue.

Use of **polyhexamethylene biguanide** (PHMB), in the form of gels, wound irrigants and dressings, is ideal in care and management of wounds including chronic wounds, burns and diabetic foot ulcers. Over the past years end-use (ready-to-use) wound care products containing PHMB have been successfully launched including wound rinsing solutions, wound gels and dressings. Special features qualify PHMB for growing and effective application in wound care management.

Multiple Benefits of PHMB…

• Uniform dispersion within the matrix; • Provides adequate antisepsis, minimized microbial burden levels; • Reduced chances of pathogens developing resistance, due to its nonspecific mode of action; • Promotes epithelisation (regeneration of epithelial cells of the skin) & healing; • Maintains hydrobalance in the wound; • Does not damage or harm the surrounding healthy tissue; • Reduces pain; • Non-irritating/non-staining & non-malodourous; • Very high safety profile (LD 50 >2000 mg/kg body weight).

For long term care after wound healing is complete…

• Avoid walking bare feet and wear comfortable footwear; • Regular examination of feet for swelling, discoloration, redness, cuts, skin cracks, callus, lesions, blisters, infections, deformalities etc; • Keep feet clean and moisturized; • Remove/smooth excess corns/ callus and trim toe nails; • Control high blood sugar (diabetes), monitor blood sugar regularly; • Exercise regularly.

Waterborne Diseases
Prevention and Treatment

Hydrogen and oxygen, arguably, might have never made a better and richer combination on the planet like that of the chemical molecule, H_2O.....yes WATER.

Water, is not only a life sustaining drink, but in addition has many other features that makes this fluid indispensable. However it is essential that potable water has to be of the highest quality most specially when the water is used for consumption. When water consumed is not pure, clean, and hygienic, consumption of this life sustaining water can be the primary cause of disease transmission.

Waterborne diseases are any illness caused by drinking water contaminated by human or animal feces, which contains pathogenic microorganisms. Though these diseases are spread either directly or through flies or filth, water is the chief medium for spread of these diseases and hence they are termed as waterborne diseases.

The visualization of water associated diseases is complex for a number of reasons. Over the past decades, the picture of water related human health issues has become increasingly comprehensive, with the emergence of new water related infectious diseases and the re-emergence of ones already known. The burden of several disease groups can only partly be attributed to water determinants. Even where water plays an essential role in the ecology of diseases, it may be hard to pinpoint the relative importance of aquatic components of the local ecosystem.

Facets of the Problem!
In developing countries four – fifths of all the illnesses are caused by water borne diseases, with diarrhea being the leading cause of childhood death.

The global scenario of water and health has a strong local dimension with some billions of people still lacking access to improved drinking water sources and some 2 billion to adequate sanitation. There is a strong evidence that lacs of people die annually after succumbing to water borne diseases.

Most intestinal (enteric) diseases are infectious and are transmitted through fecal waste. Pathogens – which include virus, bacteria, protozoa, and parasitic worms – are diseases producing agents found in the feces of infected persons. These diseases are more prevalent in areas with poor sanitary conditions.

These pathogens travel through water sources and interfuses directly through persons handling food and water. Since these diseases are highly infectious, extreme care and hygiene should be maintained by people looking after an infected patient. Hepatitis, cholera, dysentery, and typhoid are the common waterborne diseases that affect large populations in the tropical regions.

A large number of chemicals that either exist naturally in the land or are added due to human activity dissolve in the water as a result of surface runoff, thereby contaminating it and leading to various diseases.

Pesticides: The organophosphates and the carbonates present in pesticides affect and damage the nervous system and can cause cancer. Some of the pesticides contain carcinogens that exceed recommended levels. They contain chlorides that cause reproductive and endocrinal damage.

Lead: Lead is hazardous to health as it accumulates in the body and affects the central nervous system. Children and pregnant women are most at risk.

Fluoride: Excess fluorides can cause yellowing of the teeth and damage to the spinal cord and other crippling diseases.

Nitrates: Drinking water that gets contaminated with nitrates can prove fatal especially to infants that drink formula milk as it restricts the amount of oxygen that reaches the brain causing the 'blue baby' syndrome. It is also linked to digestive tract cancers. It causes algae to bloom resulting in eutrophication in surface water.

Petrochemicals: Benzene and other petrochemicals can cause cancer even at low exposure levels.

Chlorinated solvents: These are linked to reproduction disorders and to some cancers.

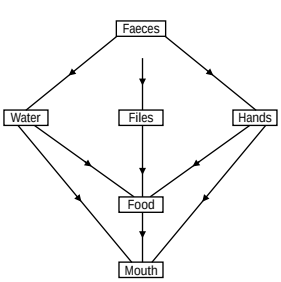
Arsenic: Arsenic poisoning through water can cause liver and nervous system damage, vascular diseases and also skin cancer.

Other Heavy metals: Heavy metals cause damage to the nervous system and the kidney, and other metabolic disruptions.

Salts: It makes fresh water unusable for drinking and irrigation purposes.

Exposure to polluted water can cause diarrhea, skin irritation, respiratory problems, and other diseases, depending on the pollutant that is in the water body. Stagnant water and other untreated water provide a habitat for mosquitoes and a host of other parasites and insects that cause a large number of diseases especially in the tropical regions. Among these, malaria is undoubtedly the most widely distributed and causes most damage to human health.

Transmission
Waterborne diseases spread by contamination of drinking water system with the urine and feces of infected animal or people.
This is likely to occur where public and private drinking water systems, get their water from surface waters



(rain, creeks, rivers, lakes etc.), which can be contaminated by infected animals or people. Runoff from landfills, septic fields, sewer pipes, residential or industrial developments can also sometimes contaminate surface water.

This has been the cause of many dramatic outbreaks of fecal-oral diseases such as cholera and typhoid. However, there are many other ways in which fecal material can reach the mouth, for instance on the hands or on contaminated food. In general, contaminated food is the single most common way in which people become infected.

The germs in the feces can cause the diseases by even slight contact and transfer. This contamination may occur due to floodwaters, water runoff from landfills, septic fields, and sewer pipes.

The picture above shows the fecal oral route of disease transmission

The only way to break the continued transmission is to improve the people's hygienic behavior and to provide them with certain basic needs: drinking water, washing and bathing facilities and sanitation. Malaria transmission is facilitated when large numbers of people sleep outdoor during hot weather, or sleep in houses that have no protection against invading mosquitoes. Malaria mosquitoes, tropical black flies, and bilharzias snails can all be controlled with efficient drainage because they all depend on water to complete their life cycles.

Prevention

Waterborne epidemics and health hazards in the aquatic environment are mainly due to improper management of water resources. Proper management of water resources has become the need of the hour as this would ultimately lead to a cleaner and healthier environment.

In order to prevent the spread of waterborne infectious diseases, people should take adequate precautions. The city water supply should be properly checked and necessary steps taken to disinfect it. Water pipes should be regularly checked for leaks and cracks. At home, the water should be boiled, filtered, or other methods and necessary steps taken to ensure that it is free from infection.

Chlorination: Adding chlorine in liquid or tablet form to drinking water stored in a protected container.

At doses of a few mg/L and contact times of about 30 minutes, free chlorine generally inactivates > 99.99% of enteric bacteria and viruses, provided water is clear. Chlorine can come in a variety of sources, including solid calcium hypochlorite, liquid sodium hypochlorite or Na2DCC tablets. Household level chlorination has been implemented most commonly in combination with safe storage and behavior change techniques, including social marketing, community mobilization, motivational interviewing, communication and education.

Solar disinfection: Exposing water in disposable clear plastic bottles to sunlight for a day, typically on the roof of a house.

A combination of heat and ultra – violet radiation from the sun are used to inactivate pathogens present in water. One low – cost technique involves exposing water in clear plastic bottles to sunlight for six hours, for example on the roof of a house (or for 2 days if the sun is obscured by clouds). The water should be consumed directly from the bottle or transferred to a clean glass. To be effective, solar disinfection must be applied to relatively clear water.

Filtration: Water filtration is another option to purify water. Higher quality ceramic filters with small pores, often coated with silver to control bacterial growth, have been shown to be effective at removing many microbes and other suspended solids. Filters need to be cleaned regularly to maintain flow rates. If properly maintained, they have a long life. Ceramic filters can be mass produced centrally or manufactured locally in smaller batches. Some commercial systems that combine filtration and disinfection have also been shown to be safe and effective, though their up – front cost may be an obstacle to low – income populations.

Combined flocculation / disinfection systems: Adding powders or tablets to coagulate and flocculate sediments in water followed by a timed release of disinfectant.

These are typically formulated to coagulate and flocculate sediments in water followed by a timed release of chlorine. These typically treat 10 – 15 liters of water, and are particularly useful for treating turbid water. The water is normally stirred for few minutes, strained to separate the flocculation, and then allowed to stand for another half hour for complete disinfection.

Boiling: If practical, households can disinfect their drinking water by bringing it to a rolling boil, which will kill pathogens effectively. In order to be effective, however, the treated water must be protected from re – contamination. Caution must also be exercised to avoid scalding accidents, especially among young children. While boiling is widely practiced, it may be more costly, inconvenient and environmentally unsustainable than other emerging POU water treatment options.

Safe Storage: Research has shown that water that is safe at the point of collection is often subject to fecal contamination during collection, transport and use in the home, mainly by unclean hands. Studies have also shown that vessels with narrow mouths and taps can significantly reduce such contamination and reduce the risk of diarrheal disease. Where possible, safe storage should also be incorporated included in interventions to treat water in the home

Different technologies are better suited for different situations. Solar disinfection, for example, may be especially suited for very poor households in sunny regions that draw relatively clear water. Combined flocculation / disinfection systems are a suitable option for treating turbid water. Filters have higher-up front costs but are straight forward to use, and may not require the same degree of behavior change efforts as other approaches. Household chlorination has achieved widespread use, is appropriate for the very poor, and after boiling is the most common treatment approach.

Treatment

Depending on the type of infection and the infecting organism, the treatment will vary, however for those infection that lead to dehydration the mainstay of treatment lies in Oral rehydration with WHO recommended ORS (Oral Rehydration Solution).

Microxpress is delighted to introduce four new Accessory products in the Microxpress range.

1. **Steristick** (Cat. No. AC0003/100 Nos.) (Individually Packed)

   Description: Gamma Irradiated Sterile Cotton Swab with Polypropylene stick.

   Application: Hospital - Surface and equipment sampling (ICU, Operation theater & surgical equipments)

   Pharmaceutical Industries - Surface (environmental monitoring) and equipment sampling (Sterile area & non- sterile area)

   Food & Dairy Industries - Surface and equipment sampling (Food processing & packaging area)

   Cosmetic Industries - Surface and equipment sampling (Sterile area)

2. **Steritrans** (Cat. No. AC0004 /100 Nos.)

   Description: Gamma irradiated sterile transport cotton swab with Polypropylene stick.

   Application: In hospital, Pharmaceutical Industries, Food & Dairy Industries & Cosmetic Industries for collection & transportation of the specimen sample.

3. **Kontact plate** (Cat. No. MXPPG5511 / 1122 plates) (11 X 102) Size: 55mm x 12mm

   Description: Sterile disposable scored plates/ contact plates, for surface monitoring.

   Application: Pharmaceutical Industries - Detection and enumeration of the presence of microorganisms to ensure bacterial contamination (Sterile & non sterile area).

   Food, Dairy & Cosmetic Industries - Direct microbial count (filling & packaging)

4. **SteriLoop** (Cat. No. AC0005 /100 Nos.) (Individually Packed)

   Description: Gamma irradiated Sterile 10µl inoculation loop.

   Application: In hospital, Pharmaceutical Industries, Food & Dairy Industries & Cosmetic Industries to cultivate microbes by streaking Agar in a petri dish or plate for subsequent growth.

   Easy to handle, sterile, disposable, Individually wrapped (No chance of contamination).

Track your brain

1. KETONURIA.
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BioShields Presents Nusept

Composition - 1% w/v Poly (hexamethylene biguanide) hydrochloride, Perfume, Fast green FCF as color.

Description: NUSEPT™ is a new generation, powerful, non stinging, safe, highly effective and resistance-free microbicidal antiseptic solution. NUSEPT™ is an ideal antiseptic for use in medical settings. The main active ingredient of NUSEPT™ is poly (hexamethylenebiguanide) hydrochloride (PHMB). PHMB is a polymeric biguanide. There is no evidence that PHMB susceptibility is affected by the induction or hyper expression of multi-drug efflux pumps, neither there have been any reports of acquired resistance towards this agent.

ACTIVITY : Broad spectrum: Bactericidal, Fungicidal & Virucidal.

CONTACT TIME :1 min (undiluted & 10% v/v solution), 5 min (5% v/v solution), 10 min (2.5% v/v solution).

APPLICATIONS :
Medical: In Hospitals, Nursing homes, Medical colleges, Pathological laboratories for Inter-operative irrigation. Pre & post surgery skin and mucous membrane disinfection. Post-operative dressings. Surgical & non-surgical wound dressings. Surgical Bath/Sitz bath. Routine antisepsis during minor incisions, catheterization, scopy etc. First aid. Surface disinfection.
Industrial: In Pharmaceutical industry, Food & beverage industry, Hotel industry etc. General surface disinfection. Eliminating biofilms.

USAGE DIRECTIONS :

Surgical, postoperative, non surgical dressings	–	Use undiluted
Pre & post surgery, skin cleaning & disinfection	–	Use undiluted
Surgical/Sitz bath	–	Add 50 ml of NUSEPT™ in 1L of water & use
Antisepsis during minor incisions, catheterization,	–	Use undiluted scopy, first aid, bites, cuts stings etc
Midwifery, nursery & sickroom	–	Use undiluted
General surface disinfection	–	Add 100 ml of NUSEPT™ in 1L of water and gently mop the floor or surfaces

Highlights of the coming issue

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