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Editorial

Contents

The Journal of Hygiene Sciences is devoted exclusively to topics of Microbiology & Disinfection. So let's go on & explore the information…...

Mini Review Section – In their natural state, most of the cells and microorganisms that we observe under the microscope lack color and contrast. This makes it difficult, if not impossible, to detect important cellular structures and their distinguishing characteristics without artificially treating specimens. The morphological analysis of stained smears is one of the main diagnostic tools.

The manual staining of large numbers of slides is one of the most repetitive tasks performed in the laboratory. Clinical and pathology laboratories are implementing automated staining methods with increasing frequency. Automated stainers have a wide range of applications.

Current Trends section - Glutaraldehyde is used in large volume in a variety of industries as a disinfectant, preservative, fixative and crosslinking agent, and as a chemical intermediate in the synthesis of pharmaceuticals and pesticides. It is widely used in the industrial, scientific and biomedical fields. Many adverse health effects on humans have been reported in association with biomedical uses of GA, with 2 3.5% aqueous GA solution generally used for cold sterilization and GA exposure ranges of 0.001 to 2.6 ppm for this type of use.

In Profile Scientist – Suniti Solomon was an Indian physician and microbiologist who pioneered AIDS research and prevention in India after having diagnosed the first Indian AIDS cases among the Chennai sex workers in 1986 along with her student Sellappan Nirmala.

Bug of the Month – Norovirus is a very contagious virus that causes vomiting and diarrhea. People of all ages can get infected and sick with **norovirus**. **Norovirus** spreads easily! People with **norovirus** illness can shed billions of **norovirus** particles. And only a few virus particles can make other people sick.

Did You Know? - Marijuana refers to the dried leaves, flowers, stems, and seeds from the Cannabis sativa or Cannabis indica plant. The plant contains the mind-altering chemical THC and other similar compounds. Marijuana is the most commonly used psychotropic drug in the United States, after alcohol.

Best Practices - Isopropyl alcohol is a secondary alcohol, that is widely used as an industrial solvent and as a preservative and antiseptic in the clinical environment. Since 2009, the World Health Organization published its guidelines on hand hygiene for health care professionals, there has been a marked upswing in the distribution and use of alcohol-based products because of the numerous advantages they offer over traditional hand washing. Before these products were developed, isopropyl alcohol was rarely used in medical or cosmetic preparations. Type IV hypersensitivity reactions were, therefore, rare leading some authors to even doubt whether isopropyl alcohol was in fact an allergen in humans.

"Laughter is the best medicine" so have great laughs with our Relaxed Mood section.

Automated Staining Machine for Biological Samples

In their natural state, most of the cells and microorganisms that we observe under the microscope lack color and contrast. This makes it difficult, if not impossible, to detect important cellular structures and their distinguishing characteristics without artificially treating specimens. The morphological analysis of stained smears is one of the main diagnostic tools.

The manual staining of large numbers of slides is one of the most repetitive tasks performed in the laboratory. Clinical and pathology laboratories are implementing automated staining methods with increasing frequency. Automated stainers have a wide range of applications.

Introduction

Manual Slide Staining procedure occupies considerable amount of technician's time. Automatic Slide Staining Machines are made to accelerate the process. The Automatic Slide Staining Machines are designed on modern principles for carrying out practically all slide staining techniques of Cytology Histology and Microbiology.

Consider the 25 steps of a manual H&E stain procedure outlined in Figure 1. The stain takes about 25 minutes to complete. Six minutes of this are hands-on time for the technologist; these 6 minutes are distributed over the entire 25 minutes

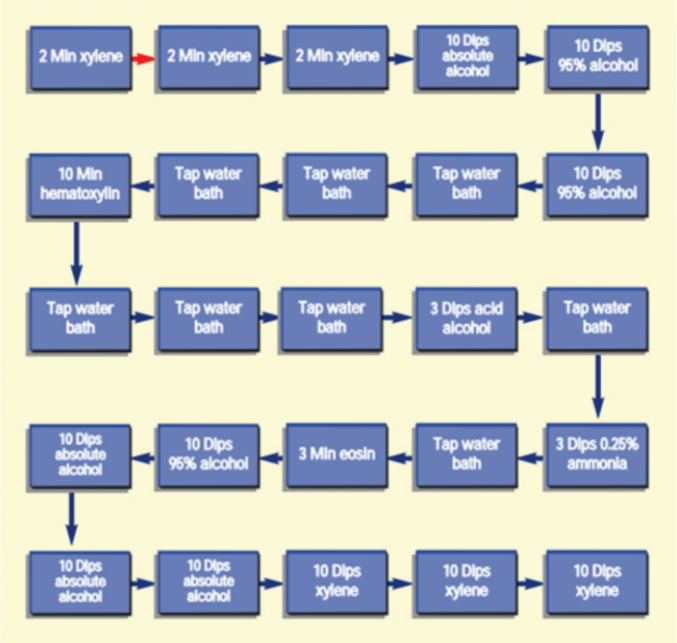

Fig 1. Schematic of manual H&E staining procedure

The benefits of using autostainers can be more than time savings. Repetitive motion, bending, and twisting are reduced, as are the injuries attributable to these movements. Some stainers have built-in fume hoods or can be operated under a hood, which eliminates some chemical exposure. Stainers offer an advantage in consistency of technique by eliminating personal variation; they also maintain a consistent temperature for temperature-sensitive procedures.

They can save space and money. The footprint, or space requirement, of some stainers is smaller than the manual stain apparatus required for some procedures. Other stainers may require more room than a manual procedure; in many cases the workspace can be rearranged so the area is used more efficiently. The built-in fume hoods available with many stainers eliminate the need for larger overhead hoods. Equipment that applies stain does so more conservatively, reducing reagent use and contamination.

Autostainers work on 1 of 2 principles: Either the stainer

(1) Dips the slides into the stain or

(2) Applies the stain to the slides.

A. Stainers That Dip the Slide

Stainers that dip the slide into the stain (bath stainers) can be of either linear or batch design**. Linear stainers** have a carrier mechanism. Slides are loaded onto this mechanism 1 at a time, then sequentially dipped into staining solutions. The slides are clipped into slide holders, which attach to the carrier mechanism. The carrier mechanism moves at a constant rate, and the slides exit the machine singly. Slides are raised and lowered into the baths.

Batch stainers move racks containing several slides through baths of staining solution. An early approach with this method used a rotary tissue processor as a batch stainer. The timing of the processing cycle was changed from 24 hours (overnight) to 1 hour, and staining racks were hooked into the tissue basket carriers on the processor. Slides progressed through processing beakers filled with stain solution. Stainers that use this principle are still manufactured.

Sophisticated, programmable batch stainers are now available that use robotic arms to move the racks of slides from one position to the next (Fig 2). Agitation of the slides in the bath can be programmed, if desired. The arms usually move on X,Y coordinates. Some equipment using this principle can perform multiple stain procedures in parallel, mimicking the actions of a person doing 2 different things at once.

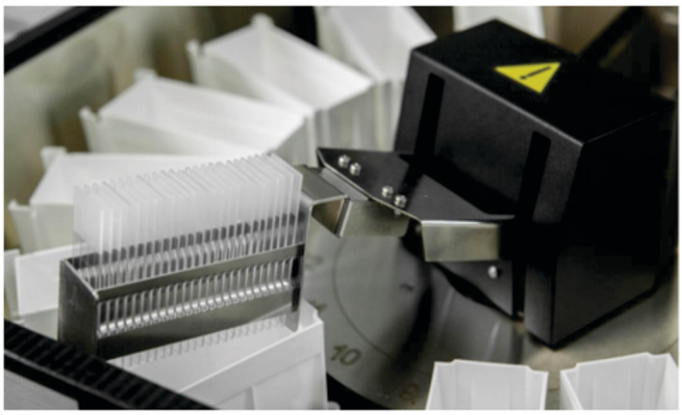

Fig 2: Batch stainer using robotic arm to move the rack of slide.

B. Stainers That Apply Stain

Stainers that apply stain to specimen on the slide operate in 1 of 3 different ways.

B.1. Capillary Gap Stainers

Capillary gap stainers force or draw the stain between the specimen slide and another surface.

A familiar example of this technology is the platen-type stainer in use for many years in hematology departments for Wright's staining. Rotating worm gears move slides, face down, along a platen (plane surface) which has holes through which stain can be pumped at appropriate intervals. The advancing slides press a switch as they pass each staining station, activating a pump. This principle has been applied more recently to Pap and H&E staining. Because each advancing slide triggers stain application individually, the platen-type stainer is a linear stainer. The stain is discarded after the slide moves to the next station, so the bulk containers of stain are not contaminated. The instrument pumps stain from the closed bulk containers to the platen via small tubing. This minimizes reagent evaporation. Capillary gap technology is also employed in stainers that use 2 slides face-to-face to provide the capillary gap. Stain solution is drawn between the slides by capillary action (Fig 3). Robotic arms move holders of paired slides to staining, draining, and rinsing stations. This application of capillary gap technology uses very little stain solution and has been used for immunohistochemical staining of large numbers of slides. A variation of capillary gap staining uses a plastic device, or slide cover, that fits against the slide. Stain reagents are then dispensed through this device: a robotic arm picks up reagent and drops it into the space between the cover and the slide according to a programmed stain protocol. The reagent is drawn down over the specimen on the slide by gravity. This instrument uses very small quantities of reagent, and is used for immunohistochemistry.

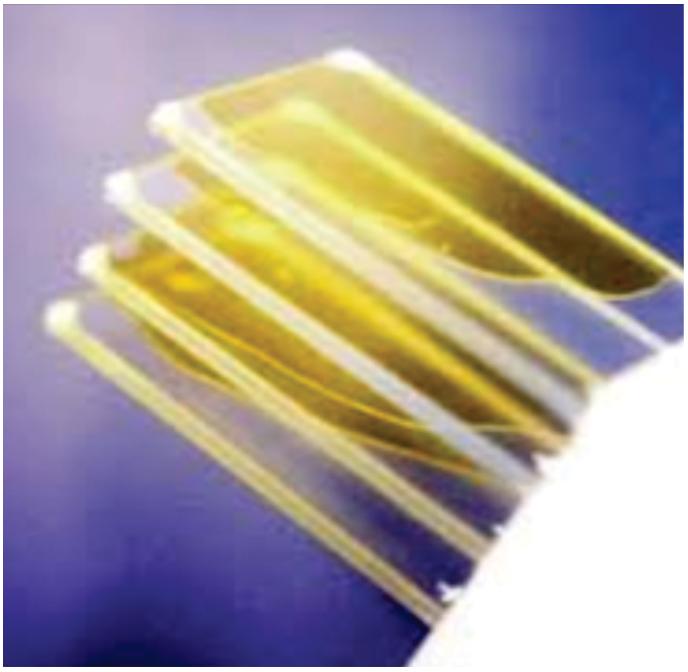

Fig 3: Capillary gap stainer. Stain solution is drawn between the paired slides by capillary action.

B.2. Centrifugal Stainers

Centrifugal stainers spray stain onto the specimen as the slides rotate past spray nozzles in a spinning chamber. Common applications of this technology are Pap, Gram, acid-fast, and hematology staining. The prepackaged reagents are in closed containers with pump tubing. This eliminates evaporation and contamination of reagents.

B.3. Flat-Method Stainers

"Flat-method" stainers drop staining solutions onto the specimen as the slide lies flat within the stainer. Many immunohistochemistry stainers use this principle; some employ robotic arms to apply solutions to the slides. Some flat-method stainers use a robotic arm programmed with X,Y coordinates to pick up and apply solutions to slides located in a rectangular grid. Other instruments employ a rotating carousel and swinging arm; the arm picks up reagents and dispenses them as the slides move past. Another method employs rotating reagent and slide carousels. As the slide and required reagent are rotated into alignment, a tiny "hammer" presses the dispenser button on the reagent, dropping a small amount onto the slide

Concerns

Concerns associated with the use of autostainers include the initial expense, space availability, and repair issues. A routine stainer may have only a manual method as a backup, but the stainer may be occupying the only space in the laboratory where a manual stain system can fit! Downtime for repairs can be lengthy if service technicians must come from another state. Some technologists object to being limited to the dedicated reagents required by some systems.

Another concern is that the technologist is now removed from the staining process. When doing a manual stain, the technologist can observe each step; if he or she sees that something is wrong, the procedure can often be stopped to correct the problem. A staining problem on an automated system may not be noticed until the finished product is reviewed, and sometimes troubleshooting at this stage is difficult. In training situations, learning the principles of staining is important, and the use of a machine instead of human eyes and hands may impair the trainee's ability to understand the actual process of staining.

Conclusion

Automated stainers can improve laboratory efficiency and quality. When used properly, an automated stainer can ensure consistency in an otherwise subjective procedure. In addition, less hands-on time is required of technologists, allowing them to use their time more productively.

Genetic Toxicity and Carcinogenicity Studies of Glutraldehyde (GA)

Glutaraldehyde is used in large volume in a variety of industries as a disinfectant, preservative, fixative and crosslinking agent, and as a chemical intermediate in the synthesis of pharmaceuticals and pesticides. It is widely used in the industrial, scientific and biomedical fields. Many adverse health effects on humans have been reported in association with biomedical uses of GA, with 2 3.5% aqueous GA solution generally used for cold sterilization and GA exposure ranges of 0.001 to 2.6 ppm for this type of use. GA is metabolized extensively to CO , but urinary excretion of it is low. Sensory irritant effects, sensitization of skin and respiratory organs and other symptoms have been reported among endoscopy nurses and medical radiation technologists. The prevalence of chronic bronchitis and nasal symptoms in humans is significantly correlated with peak concentrations of GA exposure. The extent of primary skin irritation depends on the duration and site of contact, and the severity of symptoms is doserelated. Chronic inhalation affects the nose and respiratory tract, and lesions become severe with prolonged duration of exposure. Increases in neither mortality nor tumor incidence have been found in workers with less than 0.2 ppm GA exposure, no evidence of carcinogenic activity has been obtained in experimental animal studies. There has been no clear evidence of genetic toxicity of GA in either in vitro or in vivo studies, and neither developmental nor reproductive toxicity has been found in humans or animals. Glutaraldehyde (GA) is a colourless liquid with a pungent odour. It has a wide spectrum of medical, scientific and industrial applications. GA is the best disinfectant for cold sterilization of medical equipment and is also used as a fixative in histochemistry and electron microscopy, a developer and fixer in X-ray film processing, a linking material, a leather tanning agent and as an ingredient in cosmetic, toiletry and chemical specialty products It is irritating and corrosive to the skin, eyes and respiratory tract and is recognized as a cause of health problems in those handling it.

Many regulatory organizations including the Japanese Ministry of Health, Labour and Welfare (MHLW) have therefore set limits on exposure to GA to prevent its irritating effects.

Chemical Formula: $C_5H_8O_2$

Molecular Weight: 100.13

Synonyms: 1, 3-Diformylpropane; glutaral;glutardialdehyde; glutaric dialdehyde; 1,5-pentanedial; 1,5-pentanedione; potentiated acid glutaraldehyde.

Recently, not only irritation and sensitization but also darkroom disease (DRD) among radiographers, associated with various symptoms including indefinite complaints, has been reported to be related to GA exposure, though the relationship between DRD and GA exposure has not been clarified. In addition, onset of multiple chemical sensitivity (MCS) has been reported among nurses using GA, however, there was no description about work environmental conditions. Aldehydes are one of the major pollutants of indoor air and cause sick building syndrome (SBS) and sick house syndrome, the major symptoms of which are irritation and indefinite complaints. Since the symptoms of DRD are very similar to those of SBS, GA, one of the aldehydes, may contribute to the onset of DRD. Prolonged low exposure to formaldehyde affects regulation of hypothalamic-pituitary-adrenal axis activity in the female mouse, which may be a suitable animal model for SBS and/or MCS. Thus, not only formaldehyde but also GA may cause MCS.

Toxicity

Acute Toxicity

There are several reports on accidental acute exposure to GA in humans. In a case in which approximately 100 ml of GA was spilled on a child's face by mistake during surgery, fever, vomiting, tachypnea and tachycardia were noted for 6 h after the accident, and chemical pneumonia was diagnosed. The child finally recovered without sequelae. It was reported that colitis was induced by retention of 2% GA disinfectant in endoscope channels. The acute toxicity of GA has been investigated in many studies with various animal species too.

Genetic Toxicology

In genetic toxicity studies, glutaraldehyde was mutagenic with and without S9 metabolic activation in S. typhimurium strains TA100, TA102, and TA104. Glutaraldehyde was mutagenic in mouse L5178Y lymphoma cells in the absence of S9 and induced sister chromatid exchanges in cultured Chinese hamster ovary cells with and without S9. No increase in chromosomal aberrations was induced by glutaraldehyde in cultured Chinese hamster ovary cells with or without S9 at one laboratory; at another laboratory, chromosomal aberrations were induced in the absence of S9 only. Glutaraldehyde did not induce sex-linked recessive lethal mutations in germ cells of male D. melanogaster treated as adults by feeding or injection or treated as larvae by feeding. In vivo, glutaraldehyde induced a significant increase in chromosomal aberrations in mouse bone marrow cells 36 hours after a single intraperitoneal injection. In a subset of the 36-hour chromosomal aberrations test, there was a small increase in the number of micronucleated bone marrow polychromatic erythrocytes, which was judged to be equivocal. Additional short-term (3-day) and subchronic (13-week) micronucleus tests in mice, using the intraperitoneal or inhalation routes, respectively, yielded negative results.

Irritation and Sensitization

1. Skin

GA has been used to treat hyperhidrosis because of its antiperspirant effect, and has been investigated in dermatological studies. The findings obtained indicated little irritation by and low sensitivity to GA. Although Juhlin and Hansson observed no allergic reactions to GA, even in patients sensitive to

formaldehyde, they noted that evaluation of their findings concerning sensitivity was difficult because the dose used in their experiments was too small (1–10% with occlusion). GA is also used to treat warts. There were no cases of sensitization to buffered 10% GA solution, although a 20% solution produced necrosis. Reaction to applied GA depends on the thickness of the skin. Irritation and sensitization were observed on the anterior ankle but not on the posterior ankle or medial, lateral or posterior heel.

Allergy to Glutaraldehyde

2. Eye

In reports by the National Institute for Occupational Safety and Health in the United States (US NIOSH), eye irritation was noted to occur in medical workers using GA. For instance, in one hospital, 28 of 44 workers (64%) using GA at least once a week complained of eye irritation while using GA solution. Cases of keratopathy and conjunctivitis were caused by use of medical equipment with incomplete washing and removal of 2% GA solution.

Genotoxicity and Mutagenicity

Although there has been no report on genetic toxicity of GA to humans, it has been investigated extensively in animals. Both positive and negative results have been reported in in vitro mutagenicity studies, while almost all in vivo tests have yielded negative results. GA exhibited mild to strong mutagenic effects with and without S9 metabolic activation in S. Typhimurium strain TA102. In TA100, negative results were reported both with and without S9 81), while weakly positive results were reported with S9. GA was mutagenic without S9 in TA104, which exhibited higher sensitivity to carbonyl mutagenesis than TA100 did. GA was not mutagenic with or without S9 in TA98,TA1535, TA1537 and TA1538. GA was positive in the DNA repair test by liquid rec-assay and by umu test without S9 activation. GA was mutagenic in E. Coli WP2 tester strains, but yielded negative results in the SOS chromotest with E. Coli PQ37. GA did not induce mutation in in vitro chromosomal aberration tests, in sister chromatid exchanges (SCE) tests, or forward gene mutation assays in cultured Chinese hamster ovary cells. SCE and a low frequency of chromosomal aberration were induced by high concentrations of GA, 3.6 16 mg/l, without metabolic activation. Gene mutation was induced by GA in L5178Y tk +/tk mouse lymphoma cells and the humanTK6 lymphoblast cell line. Since GA induced a marginal increase in unscheduled DNA synthesis in the in vitro hepatocyte DNA repair assay (50, 100 ìM), DNA-reactive genotoxic activity of GA was suggested to involve DNA-protein cross-linking.

Preventive Measures

GA is an eye, skin and respiratory tract irritant and skin and respiratory tract sensitizer. Generally, alkalinized 2 3.5% GA aqueous solution is used for cold sterilization of endoscopy instruments. GA concentrations of commercial products range from 3 to 20%, and a 20% GA solution is diluted to 2% at use. Since these levels of GA solution produce moderate to severe irritation of the skin, wearing gloves is essential to prevent hazards to the skin. When the permeability of gloves was tested with 2% or 3.4% GA solutions, nitrile rubber, butyl rubber, a synthetic surgical glove and polyethylene were each impermeable for at least 4 h, but latex gloves exhibited breakthrough at 45 min. With 50% GA, only butyl rubber and nitrile rubber were impermeable for 4h. When changing sterilization solutions, workers are exposed to high concentrations of GA solution, and should therefore wear butyl rubber or nitrile rubber gloves.

In addition, airborne GA concentrations can be high during the changing of GA solutions or dipping of instruments by hand. Since the vapor pressure of GA is low but its airborne concentration depends on the temperature of aqueous solution, the temperature of the solution should be kept low, and a respirator may be necessary.

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Suniti Solomon

Microbiologist who played a key role in alerting India to the threat from the HIV/AIDS epidemic. She was born on Oct 14, 1939, in Chennai, India, and died from pancreatic cancer on July 28, 2015, in Chennai, aged 76 years.

Suniti Solomon was a small, softly spoken woman who succeeded against the odds in making her voice heard throughout India. In 1986, she and her team at Madras Medical College in Chennai, India, documented for the first time the extent of HIV infection in the country. She tested a group of sex workers and found six of them were HIV positive. The implication was that India faced an HIV epidemic on an undreamt of scale. The Indian Government was forced to sit up and take notice. Many experts had predicted the disease would cause devastation in the subcontinent, with its tens of thousands of sex workers, brothels, and truck drivers, as well as millions of seasonal workers living far from home. Yet today, although India has the third highest number of people living with HIV because of its vast population, the infection rate has remained below about 0·3%. Colleagues say that is due, at least in part, to Solomon.

One of the first patients Solomon diagnosed with HIV was a 13-year-old girl who had been forced into sex work. The prevailing view among some people at that time was that individuals infected with HIV had done something “immoral”. But this patient was obviously different. “That case changed me”, Solomon later said. Solomon established one of India's first voluntary HIV counselling and testing facilities in 1993, the Y R Gaitonde Centre for AIDS Research and Education (now YRG CARE) in Chennai. Since then, the centre has cared for more than 20 000 patients with HIV from across south India and currently treats 100 outpatients a day with 15 000 patients on regular follow-up. The non-profit organisation also educates other doctors about HIV and works to reduce the stigma about people living with HIV. Nagalingeswaran Kumarasamy, Chief Medical Officer at YRG CARE since 1994 and a former student of Solomon's, said: “She was one of the first to talk openly about HIV in India. Her work and the setting up of YRG CARE were significant factors in slowing the epidemic. But she also did a lot to educate other doctors that HIV was not a fatal disease and could be treated.”

Rana Chakraborty, Professor of Pediatrics in the Division of Pediatric Infectious Diseases at Emory University School of Medicine in Atlanta, GA, USA, met Solomon at a conference she organised in Chennai in 1997, together with his colleague James Oleske, Professor of Pediatrics at Rutgers University New Jersey Medical School in Newark, NJ, USA. “We were struck by how daunting the job in India seemed and how impressive Dr Solomon was in the strength and energy she brought to the task. In the late 1980s, people in India refused to believe what she was saying. She encountered huge opposition. It was remarkable for an Indian woman to break through in the way she did on the strength of her personality. She was ahead of her time”, Chakraborty said.

One of eight siblings, Solomon was the only daughter of the Gaitonde family who were prominent in the leather trade in Chennai. She qualified in medicine at Madras Medical College where she met her husband, Victor Solomon, a cardiac surgeon. For almost a decade she trained in pathology in the UK, the USA, and Australia, before returning to Chennai in 1973. She did her doctorate in microbiology and in the 1980s, after reading about HIV and AIDS, decided to track the virus in India. That decision set the course of her life.

In 2009, the Ministry of Science and Technology conferred the National Award for Women Bioscientists on Solomon. She was actively involved in the work of the YRG Centre and in HIV education to the end of her life, hosting a major conference in Chennai in January, 2014. Outside her work, she enjoyed reading and the company of her two golden retrievers. She died from pancreatic cancer and was predeceased by her husband, who died in 2006, but is survived by her son, Sunil Solomon, an epidemiologist at Johns Hopkins University in the USA. Solomon's commitment to her patients and her country is what is remembered by colleagues. “She was such a passionate person. In the past many doctors from India went abroad for training, found better jobs and stayed. But she felt her services were more needed in India”, said Kumarasamy.

Jokes

Mrs Cameron, a primary teacher, was teaching her class about the difference between right and wrong.

"All right children, let's take an example," Mrs Cameron said. "If i were to get into a man's pocket and take his wallet with all his money, what would I be?"

Little tony raises his hand, and with a confident smile says, "You'd be his wife.

A man stopped at his favorite watering hole after a hard days work to relax. He noticed a man next to him ordered a shot and a beer. The man drank the shot, chased it with the beer and then looked into his shirt pocket. This continued several times before the man's curiosity got the best of him. He leaned over to the guy and said, "excuse me, i couldn't help but notice your little ritual, why in the world do you look into your shirt pocket every time you drink your shot & beer"? The man replied, "there's a picture of my wife in there, and when she starts lookin' good, i'm headin' home"!

Chintu was writing past tense of "I make a mistake"
Guess what he wrote ?
"I was made by a mistake"

Definition of honeymoon:
A man's last holiday
Before he starts working
For a new boss !!

Lady secretary: Sir, it's ur wife's call.
She wants to kiss u on the phone.
Boss: I am busy. U may take the msg & pass it on to me, later.

A doctor and a lawyer are talking at a party. Their conversation is constantly interrupted by people describing their ailments and asking the doctor for free medical advice. After an hour of this, the exasperated doctor asks the lawyer, "what do you do to stop people from asking you for legal advice when you're out of the office?" "I give it to them," replies the lawyer, "and then i send them a bill." The doctor is shocked, but agrees to give it a try. The next day, still feeling slightly guilty, the doctor prepares the bills. When he goes to place them in his mailbox, he finds a bill from the lawyer.

Wife: "In my dream, i saw you in a jewelry store and you bought me a diamond ring."
Husband: "I had the same dream and i saw your dad paying the bill."

What is a Norovirus?

Norovirus is a small virus that contains RNA and is surrounded by a protein coating. By sequencing the RNA, scientists have discovered that there are many different types of norovirus. Originally, strains were named based on the city in which they were first identified. Thus, one common strain used to be called the Norwalk virus. Based on genetic typing, we now know that there are at least 25 different strains of norovirus that affect humans. The RNA genome in noroviruses easily mutates to produce new norovirus types. The disease occurs worldwide with peak occurrence from about November until the end of May in the U.S. Therefore, the infection is sometimes termed "winter vomiting disease."

Norovirus infection is the most common cause of gastroenteritis outbreaks in the U.S. Although some people call this the "stomach flu," norovirus is not related to the influenza virus. According to statistics from the U.S. Centers for Disease Control and Prevention (CDC), there are 19-21 million cases of norovirus infection annually in the U.S., of which one-quarter are related to foodborne outbreaks. Norovirus infections annually cause about 570-800 deaths in the U.S., mainly in young children and the elderly. Outbreaks occur throughout the year but are more common in the winter months. There is no specific treatment for norovirus. Fortunately, the disease is self-limited, and simple supportive measures are sufficient to care for most people unless they become dehydrated.

What causes a norovirus infection? How are norovirus infections transmitted?

Infection occurs when humans inadvertently ingest material contaminated with small amounts of fluids or feces from an infected person. It only takes a small number of viruses to cause infection, so even microscopic amounts of feces or fluids can be contagious.

An infected person with vomiting or diarrhea can contaminate their environment directly, or they may indirectly spread virus particles through aerosolized droplets when vomiting; however, the main route is by touching surfaces contaminated with the virus. Contamination may also occur in food and/or in water, which has led to infection spreading widely in restaurants or aboard cruise ships. Outbreaks in school systems occur regularly, sometimes spreading widely. The virus is very hardy and can live for days or weeks on surfaces, including clothing. Outbreaks often occur when groups of people congregate (for example, cruise ships, dormitories, schools, day-care centers).

What is the incubation period for a norovirus infection? How long are people infected with norovirus contagious?

Norovirus may have a prolonged infection period that starts even before someone gets sick.

- There is a short lag or incubation period (up to two days) between the time that people acquire the virus and the time they get symptoms.
- People may be contagious during this period.
- All people are contagious while they are having symptoms or showing signs.

Although the most contagious period is over when the patient's symptoms resolve, even some people who appear to have recovered completely after a norovirus infection may continue to shed the virus for weeks in their stool and maybe a source of infection to others.

- People with compromised immune systems (for example, those receiving chemotherapy or undergoing organ transplant) may shed the virus for months.
- However, in general, most individuals become noncontagious about 72 hours after symptoms have resolved.
- Consequently, although it may be difficult for parents to do so, children and adults should not go back to school, daycare, or work until they have been symptom-free for three days.

How is a norovirus infection diagnosed?

Because the symptoms of norovirus are similar to those of other common viral diarrheas like rotavirus, it is necessary to do specific tests to identify the virus. Norovirus cannot be cultured in a laboratory. However, the RNA inside the virus may be detected directly using polymerase chain reaction (PCR) tests, and these tests are the ones that are most commonly used. Enzyme-based immunoassays (EIA) can also be used to detect the virus in stool samples. EIAs use special antibodies that attach to virus particles. In addition, the Ridascreen Norovirus 3rd Generation EIA assay is approved for use to detect norovirus when a number of people have simultaneously contracted gastroenteritis and there is a clear avenue for virus transmissions, such as a shared location or food source. However, this new test is not sensitive enough for a definitive diagnosis of norovirus infection in an individual. The human body makes antibodies against norovirus, and these can be identified with immunoassay testing of blood samples. Unfortunately, it takes 10-14 days for the body to make antibodies, so this test is not useful for real-time diagnosis. It is also possible to see the virus particles using electron microscopy, although this is mostly a research tool. Currently, the preferred test for norovirus according to the CDC is the PCR test. This test helps distinguish between other diseases (for example, rotavirus and Salmonella infections) that may produce similar symptoms.

What are possible complications of a norovirus infection?

Although most cases of norovirus infection are mild, complications may occur. Complications are related to the degree of dehydration. People who cannot keep up with fluid losses may require hospitalization for intravenous fluids.

Approximately 10% of infected people seek medical attention. Very young children and infants are at high risk for dehydration because they cannot communicate their symptoms and because dehydration may occur rapidly. Pregnant women should pay particular attention to keeping up with fluid losses and electrolyte imbalances as these problems, if severe, may lead to preterm labor.

Although norovirus infection is not fatal, it can contribute to mortality by causing underlying illnesses to become worse. Elderly, debilitated people are especially at risk for complications related to dehydration, including kidney failure.

What is the prognosis of a norovirus infection?

Norovirus infection is a self-limited illness that lasts two to three days in most people. As discussed above, complications are usually related to dehydration or underlying illnesses. In some countries where poor hydration already may exist in children, many may die from dehydration if IV replenishment is not available. In 2006, the World Health Organization recommended a new prepackaged oral rehydration salts (ORS) formula that can be shipped to underdeveloped countries and simply poured into clean water that can prevent dehydration in many patients. This approach has improved the prognosis for many children in developing countries.

Is it possible to prevent norovirus infections? Is there a norovirus vaccine?

Once a person is sick, it is important for caretakers and household contacts to use good hand hygiene. This includes washing hands after coming in contact with the person or his environment. Hands should also be washed before preparing food or touching the face. The CDC recommends washing hands with soap and water over using hand sanitizers; alcohol-based hand sanitizers are not very effective but have been shown to reduce the rate of transmission in some settings. Silverware and dishes should not be shared. Diluted chlorine bleach (5 to 25 tablespoons of bleach per gallon of water) may be used to clean solid surfaces. Other disinfectants like Lysol can help decontaminate some surfaces.

Norovirus infections can be prevented by using good hand hygiene with soap and water (not alcohol solutions) and avoiding contact with sick individuals and their environment. This is much harder than it sounds. One sick crew member on a cruise ship can contaminate food served to hundreds of people. Contamination while picking fresh vegetables or fruit can lead to widespread outbreaks as the product is sold across the country. Strict hygiene standards for food handlers can help reduce the risk of outbreaks. Many investigators suggest routine washing of fruits and vegetables before serving may also help reduce or prevent infections.

Noroviruses may also be spread in a hospital or nursing home environment. The CDC has published guidelines for institutions to follow to reduce the infection rate. Hand hygiene is highlighted as the single most important component of these infection-control measures. Hospital epidemiologists and people with infection-control training should be contacted whenever an outbreak is suspected within a hospital or institution. Public-health officials should be notified whenever there is suspicion of a community-based outbreak. The major risk factor for norovirus infection is close contact with a person who has the infection or with any items they touch or on which they may cough. The risk is increased if an infected person prepares your food or lives with you and others in a relatively confined space (dorm, cruise ship, school).

Unfortunately, people who get norovirus do not have immunity against future infections. Although the body makes antibodies against the infecting strain, there are many strains that cause infection. The virus constantly creates small mutations in its RNA to make new strains that evade the human immune system.

Because there are many different strains of norovirus, it has been difficult to make a vaccine. However, this is an active area of research, and there are some vaccines that have shown promise in mouse (murine) models. Vaccine trials are now beginning in humans, but there is no commercial vaccine currently available.

Health Effects of Marijuana

What is marijuana?

Marijuana refers to the dried leaves, flowers, stems, and seeds from the *Cannabis sativa* or *Cannabis indica* plant. The plant contains the mind-altering chemical THC and other similar compounds. Extracts can also be made from the cannabis plant.

Marijuana is the most commonly used psychotropic drug in the United States, after alcohol.1 Its use is widespread among young people. In 2018, more than 11.8 million young adults used marijuana in the past year. With the growing popularity of vaping devices, teens have started vaping THC (the ingredient in marijuana that produces the high), with nearly 4% of 12th graders saying they vape THC daily. In addition, the number of young people who believe regular marijuana use is risky is decreasing.

How do people use marijuana?

People smoke marijuana in hand-rolled cigarettes (joints) or in pipes or water pipes (bongs). They also smoke it in blunts—emptied cigars that have been partly or completely refilled with marijuana. To avoid inhaling smoke, some people are using vaporizers. These devices pull the active ingredients (including THC) from the marijuana and collect their vapor in a storage unit. A person then inhales the vapor, not the smoke. Some vaporizers use a liquid marijuana extract.

People can mix marijuana in food (*edibles*), such as brownies, cookies, or candy, or brew it as a tea. A newly popular method of use is smoking or eating different forms of THC-rich resins.

How does marijuana affect the brain?

Short-Term Effects

When a person smokes marijuana, THC quickly passes from the lungs into the bloodstream. The blood carries the chemical to the brain and other organs throughout the body. The body absorbs THC more slowly when the person eats or drinks it. In that case, they generally feel the effects after 30 minutes to 1 hour.

THC acts on specific brain cell receptors that ordinarily react to natural THC-like chemicals. These natural chemicals play a role in normal brain development and function.

Marijuana over activates parts of the brain that contain the highest number of these receptors. This causes the "high" that people feel. Other effects include:

- Altered senses (for example, seeing brighter colors)
- Altered sense of time
- Changes in mood
- Impaired body movement
- Difficulty with thinking and problem-solving
- Impaired memory
- Hallucinations (when taken in high doses)
- Delusions (when taken in high doses)
- Psychosis (risk is highest with regular use of high potency marijuana)

Long-Term Effects

Marijuana also affects brain development. When people begin using marijuana as teenagers, the drug may impair thinking, memory, and learning functions and affect how the brain builds connections between the areas necessary for these functions. Researchers are still studying how long marijuana's effects last and whether some changes may be permanent.

For example, a study from New Zealand conducted in part by researchers at Duke University showed that people who started smoking marijuana heavily in their teens and had an ongoing marijuana use disorder lost an average of 8 IQ points between ages 13 and 38. The lost mental abilities didn't fully return in those who quit marijuana as adults. Those who started smoking marijuana as adults didn't show notable IQ declines. In another recent study on twins, those who used marijuana showed a significant decline in general knowledge and in verbal ability (equivalent to 4 IQ points) between the preteen years and early adulthood, but no predictable difference was found between twins when one used marijuana and the other didn't. This suggests that the IQ decline in marijuana users may be caused by something other than marijuana, such as shared familial factors (e.g., genetics, family environment). NIDA's Adolescent Brain Cognitive Development (ABCD) study, a major longitudinal study, is tracking a large sample of young Americans from late childhood to early adulthood to help clarify how and to what extent marijuana and other substances, alone and in combination, affect adolescent brain development.

What are the other health effects of marijuana?

Physical Effects

- **Breathing problems.** Marijuana smoke irritates the lungs, and people who smoke marijuana frequently can have the same breathing problems as those who smoke tobacco. These problems include daily cough and phlegm, more frequent lung illness, and a higher risk of lung infections. Researchers so far haven't found a higher risk for lung cancer in people who smoke marijuana.
- **Increased heart rate.** Marijuana raises heart rate for up to 3 hours after smoking. This effect may increase the chance of heart attack. Older people and those with heart problems may be at higher risk.
- **Problems with child development during and after pregnancy.** One study found that about 20% of pregnant women 24-years-old and younger screened positive for marijuana. However, this study also found that women were about twice as likely to screen positive for marijuana use via a drug test than they state in self-reported measures. This suggests that self-reported rates

of marijuana use in pregnant females is not an accurate measure of marijuana use and may be under reporting their use. Additionally, in one study of dispensaries, nonmedical personnel at marijuana dispensaries were recommending marijuana to pregnant women for nausea, but medical experts warn against it. This concerns medical experts because marijuana use during pregnancy is linked to lower birth weight and increased risk of both brain and behavioral problems in babies. If a pregnant woman uses marijuana, the drug may affect certain developing parts of the fetus's brain. Children exposed to marijuana in the womb have an increased risk of problems with attention,11 memory, and problem-solving compared to unexposed children. Some research also suggests that moderate amounts of THC are excreted into the breast milk of nursing mothers. With regular use, THC can reach amounts in breast milk that could affect the baby's developing brain. Other recent research suggests an increased risk of preterm births. More research is needed. **Intense nausea and vomiting.** Regular, long-term marijuana use can lead to some people to develop Cannabinoid Hyperemesis Syndrome. This causes users to experience regular cycles of severe nausea, vomiting, and dehydration, sometimes requiring emergency medical attention.

Mental Effects

Long-term marijuana use has been linked to mental illness in some people, such as:

- Temporary hallucinations
- Temporary paranoia
- Worsening symptoms in patients with *schizophrenia*—a severe mental disorder with symptoms such as hallucinations, paranoia, and disorganized thinking

Marijuana use has also been linked to other mental health problems, such as depression, anxiety, and suicidal thoughts among teens. However, study findings have been mixed.

ALLERGIC CONTACT DERMATITIS CAUSED BY ISOPROPYL ALCOHOL: A MISSED ALLERGEN

Isopropyl alcohol is a secondary alcohol, a structural isomer of propanol that is widely used as an industrial solvent and as a preservative and antiseptic in the clinical environment. It is known to be a mild irritant for the eyes and mucous membranes, but is considered to be a weak and infrequent sensitizer.

Since 2009, when the World Health Organization published its guidelines on hand hygiene for health care professionals, there has been a marked upswing in the distribution and use of alcohol-based products because of the numerous advantages they offer over traditional hand washing.

The hand rubs that have achieved the greatest commercial success are those that contain isopropyl alcohol.

Before these products were developed, isopropyl alcohol was rarely used in medical or cosmetic preparations. Type IV hypersensitivity reactions were, therefore, rare leading some authors to even doubt whether isopropyl alcohol was in fact an allergen in humans.

However, the marked increase in the use of products containing isopropyl alcohol has led to a substantial increase in exposure. At the same time, it has been found that isopropyl alcohol is potentially an important allergen, especially when used directly on the skin although also in the case of occupational exposure.

In Europe, there are already numerous reports of health professionals who have been diagnosed with contact allergy to this substance, especially nurses and nursing assistants working in highly specialized units where frequent hand sanitizing is required (An Goossens, personal communication).

It is important to remember that, in addition to isopropyl alcohol, commercial alcohol-based hand rubs may contain other ingredients, such as emulsifiers, additives (lanolin, propylene glycol, bisabolol), and perfumes, and that the allergenic potential of these components may be even greater than that of the alcohol.

What is Allergic Hypersensitivity?

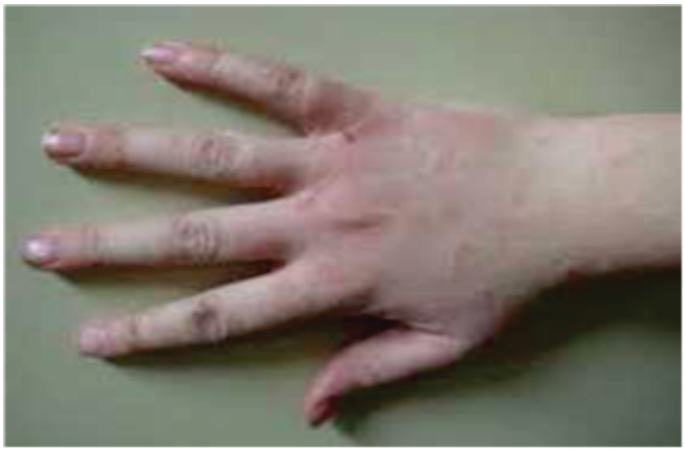
Allergic contact dermatitis (ACD) is synonymous with "eczema", a term derived from the Greek word meaning "boiling out". It is characterized by redness, oozing, crusting, weeping, and chronic scaling. Contact dermatitis occurs when the skin or mucous membrane meets foreign chemicals. Contact dermatitis may be allergic (due to different mechanisms) or irritant; it is important to distinguish between the two to know what to avoid.

Allergic skin sensitization is due to special mechanisms of the immune system and is found in genetically susceptible persons. An allergic skin reaction requires re-exposure or continuous exposure to the allergen, the substance causing the allergy. The first exposure "sensitizes" the person and the later exposure "elicits" the reaction. The hypersensitivity to an allergen can be immediate (Type I) – a sometimes-hazardous response that occurs within minutes to an hour of contact with the allergen – or delayed (Type IV), appearing at 24-72 hrs.

Immediate (Type I) Reactions versus Allergic Contact Dermatitis (Type IV)

Allergic Contact Dermatitis (ACD) usually is due to delayed hypersensitivity, which has a mechanism something like a tuberculin skin test. Most contact allergens are small, simple, lipophilic chemicals like nickel; these haptens must combine with a skin protein before becoming allergenic. The allergenic chemical (called an antigen) penetrates the skin, reaching the living cells below. Antigen-presenting cells such as Langerhans Cells present the chemical to special sets of genetically pre-programmed T-lymphocyte cells that recognize the chemical. The complex goes into draining lymph nodes and circulates in the body. More T-cells become sensitized. Thus, the contact dermatitis can spread from the primary contact site to distant parts of the body not in direct contact with the allergen. ACD susceptibility varies with the allergen, e.g., almost everyone can become sensitive to poison ivy, but most contact allergens affect fewer than 1% of the population.

The immediate (Type I) allergic reaction occurs through a different mechanism from delayed hypersensitivity. In this reaction a certain serum antibody, immunoglobulin E, is produced by the B lymphocytes, and pharmacological mediators like histamine are released from special cells known as mast cells. Skin contact with antigens like latex protein or potatoes can cause the immediate skin condition called contact urticaria – characterized by hives, itching, tingling, burning, and an immediate "wheal and flare" skin reaction (having a raised area and redness). Sometimes tiny vesicles appear, and sometimes it is followed by eczema. The reaction may disseminate to become a generalized urticaria. Common allergens causing urticaria by contact are found in medicines, foods such as flour, cosmetics, and industrial chemicals. Exposure to allergens systemically (by eating certain foods or injection) may also cause urticaria. Raw fruits and vegetables may elicit reactions in the mouth, lips, and tongue, and throat hoarseness or irritation may occur.



Urticaria may be mediated immunologically, non-immunologically, or through unknown mechanisms. Non-immunological contact reactions occur without previous sensitization. Among the causes of non-immunological reactions are cinnamic aldehyde (found in spices, flavors, and perfumes), benzoic acid and other preservatives. Acetylsalicylic acid or NSAIDs inhibits the reaction. Diagnosis is usually based on an open epicutaneous test. If negative, a prick test (antigen applied by puncture through the palm side of the forearm skin) or scratch test (antigen applied through a scratch in the skin) may be used. This identification is important for avoidance, since treatment is only palliative.

In the contact urticaria syndrome, immunologically-mediated systemic effects can appear in other organs, especially in atopic individuals (with a history of allergy). An additional immediate response is the severe body reaction known as anaphylaxis (a shock or drop in blood pressure). Anaphylaxis may occur in conjunction with urticaria, as with the serious allergic reactions to latex products. Other important immediate reactions may include rhinitis, bronchitis, and asthma. Certain people (atopics) have a family history of immediate allergy and are more prone to get Type I reactions; they constitute about 25% of the population.

The table below summarizes the classic types of hypersensitivity reactions that are involved in allergy. One chemical may elicit both immediate and delayed types of reactions.

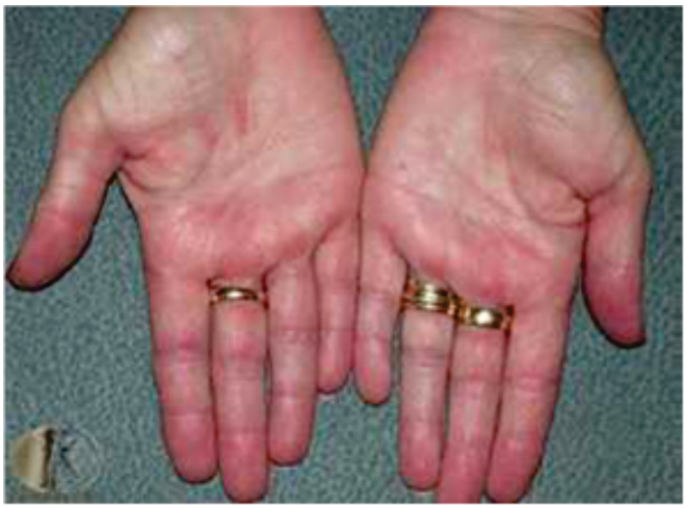
Although allergic contact dermatitis is generally due to direct contact, the allergen can be transmitted through the air, as with dust, pollen, pesticides, or aerosols. Contact dermatitis can spread systemically from the primary contact site to distant parts of the body not in direct contact with the allergen.

In true respiratory hypersensitivity, characteristic changes occur in lung function tests; this does not usually occur with lung irritation and ill-defined conditions, such as sick building syndrome and multiple chemical sensitivity.

Long-Term Exposure to Isopropyl Alcohol

Drying and cracking of skin may results from prolong skin exposure. Epidemiological investigations have established that a carcinogenic substance is present in isopropyl manufacturing areas, but have not confirmed isopropyl alcohol as causative agent of a cancer.

“Forty-four patients showed an allergic response to isopropyl alcohol. Four cases presented as occupational hand eczema. Fourteen cases were seen in patients with leg ulcers. Twenty-six patients presented with eczematous lesions following the use of products containing isopropyl alcohol to disinfect previous skin lesions. Eighty-four percent of the patients showed sensitization to three or more allergens. Relevance was present in 84% of the patients.”



**The alcohols to be concerned about in skin-care products are ethanol, denatured alcohol, ethyl alcohol, methanol, benzyl alcohol (when it's one of the main ingredients), isopropyl alcohol, and SD alcohol, all of which can be extremely drying and irritating to skin, and are capable of generating free-radical damage and disrupting the skin's protective barrier.*

Summary of Toxicology

The most important toxic effect of isopropyl alcohol is necrosis, which occurs in mice at vapor concentrations of 3000 ppm, the effects increasing with duration of exposure. Exposure to higher concentrations results in ataxia, followed by deep necrosis and death. Reversible changes occurred in the liver fat of mice repeatedly exposed to high concentrations of vapor. Isopropyl alcohol is metabolized fairly rapidly, and acetone may be detected in urine following heavy exposures. Human volunteers reported mild irritation of eyes, nose and throat after 3-5 minutes exposure to vapor at 400 ppm; at 800 ppm the results were not severe, but most subjects found the atmosphere to be objectionable.

Accidental, extensive wetting of the skin could occur in industrial situations and as isopropyl alcohol is absorbed readily through the skin, the addictive effect of inhalation and skin absorption could have serious results.

Similarly, there is a risk of deliberate ingestion of isopropyl alcohol as a substitute for ethyl alcohol, which would add to the effect of inhalation. The defatting action of isopropyl alcohol can cause mild skin irritation, but a small percentage of workers may develop contact dermatitis of a serious nature. No chronic systemic effects have been reported.

Reference: www.WHO.int

Highlights of the coming issue

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