SPER NEWSLETTER

For Month of September'2021





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- MAJOR APPLICATIONS OF 3D PRINTING
- SCRUB TYPHUS
- NIPAH VIRUS

- LIST OF SOFTWARES USED IN COMPUTER AIDED DRUG DESIGN
- SMOG TOWER

3D PRINTING IN HEALTHCARE SYSTEM

Unlike traditional methods, in which products are created by shaping raw material into a final form through carving, grinding, or molding. 3D printing is an additive manufacturing technique that creates threedimensional objects by building successive layers of raw material such as metals, plastics, and ceramics. The objects are produced from a digital file, rendered from a magnetic resonance image (MRI) or a computer-aided design (CAD) drawing, which allows the manufacturer to easily make changes or adapt the product as desired. A variety of 3D printers are available on the market, ranging from inexpensive models aimed at consumers and capable of printing small, simple parts, to commercial grade printers that produce significantly larger and more complex products.



- Advances in 3D printing,
 also called additive manufacturing, are capturing attention in the health care field because of their potential to improve treatment for certain medical conditions.
- The technology is not limited to planning the surgeries or producing customized dental restorations such as crowns; 3D printing has enabled the production of customized prosthetic limbs, cranial implants, orthopedic implants such as hips and knees.





APPLICATION OF 3-D PRINTING IN HEALTHCARE SYSTEM

At the same time, its potential to change the manufacturing of medical products—particularly highrisk devices such as implants—could affect patient safety, creating new challenges for Food & Drug Administration (FDA) oversight.

In healthcare, 3D bioprinting is used to create living human cells or tissue for use in regenerative medicine and tissue engineering. Organovo and Envision TEC are the pioneers of this technology. 3D printing is also used to manufacture precision and personalised pharmaceuticals.



MAJOR APPLICATIONS OF 3D PRINTING



3D Printing in egenerative medicines

There is a major health crisis in terms of the shortage of organs, as the population is living for longer due to medical advances.



Since 2013, the number of patients requiring an organ has doubled, while the actual number of available donor organs has barely moved (HRSA, 2020).

3D Printing in personalized/ precision medicine

Introducing 3D printers to pharmacies and hospitals would allow physicians, nurses,and pharmacists to form a dose and delivery system based on the patient's body size, age, lifestyle,and sex.

This would make medicine personal to the patient, and also save money and resources .

3D Printing to fight the Covid-19 pandemic:

-Major manufacturers to individuals, haveresponded to the Covid-19 crisis by supporting the production of vital medical equipment for hospitals.



3D Systems, Carbon,and Renishaw have begun designing and manufacturing open-source PPE for healthcare workers worldwide.



Streamlined and more efficient R&D processes

Bioprinted

tissues and organs are already being used to help increase the success rate of clinical trials.

Withbioprinting, researchers can print fully functional organs made of human cells to test a drug'sefficacy prior to using in vivo animal or human tests.

NIPAH VIRUS

Nipah virus (NiV) is a zoonotic virus (it is transmitted from animals to humans) and can also be transmitted through contaminated food or directly between people.

The Nipah virus (NiV) is a type of RNA virus in the genus Henipavirus.

Signs and symptoms

Initial symptoms of NIPAH virus are -

- Fever
- Headache
- Drowsiness
- Disorientation
- Mental confusion.



Some people can also experience atypical pneumonia and severe respiratory problems, including acute respiratory distress. Encephalitis and seizures occur in severe cases, progressing to coma within 24 to 48 hours. The incubation period (interval from infection to the onset of symptoms) is believed to range from 4 to 14 days. However, an incubation period as long as 45 days has been reported.



This disease was first identified in 1998 by a team of researchers at faculty of medicine, University of Malaya during an outbreak in Malaysia.





Risks Of NIPAH Virus

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The World Health Organization classifies it as a "virus of concern" for future epidemics because "each year it spills over from its animal reservoir into humans," says Dr. Stephen Luby, a professor of infectious disease at Stanford University. And when humans are infected, it can be transmitted from person to person.

But the virus is not as transmissible as some other viruses. "There are occasional Nipah superspreaders who infect a lot of people," says Luby.

Laboratory

diagnosis



The main tests used are real time polymerase chain reaction (RT-PCR) from bodily fluids and antibody detection via enzyme-linked immunosorbent assay (ELISA). Other tests used include polymerase chain reaction (PCR) assay, and virus isolation by cell culture.





The risk is that a new strain that is more efficiently transmitted person to person could generate a devastating outbreak. Indeed, since 70% of people who are infec ted with Nipah virus die, such a strain could represent the worst pandemic humanity has ever faced."

Treatment

Treatment

- No effective drug therapies available yet.
- Ribavirin-reduces mortality
- Recent development for NiV antivirals focus on inhibitors of fusion and receptor binding
- Soluble versions of the G glycoprotein and Ephrin B2 shown to inhibit NiV envelope-mediated infection
- No passive immunoprophylaxis, antiviral chemoprophylaxis, or vaccine is currently available

Prevention

Reduce the risk of bat-to-human transmission by focussing on the bat's access to food products.

Reduce the risk of animal-to-human transmission by wearing gloves and other personal protective equipment and gear, including masks.

Reduce the risk of human-to-human transmission by avoiding close unprotected physical contact with Nipah-infected people & Wash hands regularly.



There are currently no drugs or vaccines specific for Nipah virus infection.

Intensive supportive care is recommended to treat patients of severe respiratory and neurologic complications.



SCRUB TYPHUS: AN EMERGING THREAT





Figure 1

- Scrub typhus also known as bush typhus was described in Japan in 1899. It is caused by bacteria Orientia tsutsugamushi. It is spread to people through bites of infected chiggers (larval mites)(Figure 1 and Figure 2). It affects people of all ages including children. Human are accidental hosts in this zoonotic disease.
- While scrub typhus is confined geographically to the Asia Pacific region, a billion people are at risk and nearly a million cases are reported every year.
- Mortality rate for scrub typhus range from <1 % to 50 % depending on proper anti biotic treatment, status of the individual infected and the strain of O. tsutsugamushi encountered.





Figure 2

Signs and Symptoms

- The average incubation period of O. tsutsugamushi in humans is 10-12 days.
- Signs and symptoms may include:
- Fever and chills
- Headache
- Body aches and muscle pain
- A dark, scrab-like region at the site
- of the chigger bite(also known eschar)(Figure 3)
- Mental changes, ranging from confusion to coma
- Enlarged lymph nodes
- Rash





Figure 3

• People with severe illness may develop organ failure and bleeding which can be fatal if left untreated.

Eschar-inducing capacity of different strains of
0. tsutsugamushi is variable.

• The detection of eschar depends on the skin colour of the individual (difficult in dark-skinned people) and the anatomical location of the eschar and also the type of clothing.

• Rarely, multiple eschars may be found, for example, under a trouser belt.

Diagnosis and Testing

- The immunochromatographic test (ICT) to detect antibodies against O. tsutsugamushi also serves as a rapid diagnostic test which is available in some of the commercial laboratories in India.
- The symptoms of scrub typhus are similar to symptoms of many other disease. The presence of fever and eschar supports the diagnosis.
- Serology remains the mainstay of diagnosis. The cheapest and most easily available serological test is the Weil-Felix (WF) test. The WF test has a high specificity but a low sensitivity
- Based on the detection of antibodies to various Proteus species which contain cross-reacting antigenic epitopes to antigens from members of the genus Rickettsia with the exception of Rickettsia akari.
- The gold standard is indirect immunofluorescence antibody (IFA). This detects the presence of scrub typhus-specific antibody bound to smears of scrub typhus antigen. This can confirm infection before their seroconversion.





A recombinant protein-based enzyme linked immunosorbent assay using the most abundant and immunodominant protein for the detection of Orientiaspecific antibodies in serum has been developed.





- Scrub typhus should be treated with tetracyclines or chloramphenicol.
 Doxycycline can be used in persons of any age group.
- Antibiotics are most effective if given soon after symptoms begins.
- People who are treated early with doxycycline usually recover quickly.
- Other antibiotics which are found to be effective are azithromycin, rifampicin and roxithromycin. Rifampicin has been shown to be superior to doxycycline in several studies.

Treatment





Prevention





Figure 4

- No vaccine is available to prevent scrub typhus.
- To avoid mite-infested areas, the following measures should be followed:
- Wearing protective clothes
- Following personal prophylaxis against the mite(Figure 4) vector by impregnating clothes with miticidal chemicals (permethrin and benzyl benzoate) and the application of mite repellents (diethyltoluamide) to exposed skin surfaces.
- Mites from sites should be eliminated by application of chlorinated hydrocarbons (lindane, dieldrin and chlordane) to the

List of Software Used In Computer Aided Drug Design

Computer needs software for its functions such as programs. This software makes our work simpler and faster. Various companies such as Accelrys, Schrodinger, Auto Dock and Argus lab offering drug designing software's.

Accelrys









Accelrys is a Scientific Informatics software and services company for life sciences, chemical and materials R and D. The different software produce by Accelrys are:

- Insight II:- Insight II is a graphical molecular modeling program.
- Pipeline Pilot: Pipeline Pilot dates are based on powerful client server platform
- that leads to construct graphic workflows for data retrieval, filtering, analysis.
- Discovery Studio: -Discovery studio is the advanced software solutions for life science researchers and easy to use, and graphical interfaces for powerful

Schrodinger



•Schrodinger software provides accurate, reliable and high performance computational technology and provides facilities to solve problems in life science research .The various products of Schrodinger are:

Prime: - Prime is a package used for protein structure predictions.

Jaguar:-Jaguar is a high performance ab-intio package for both gas and solution phase.

Glide: - Glide offers the full spectrum of speed and accuracy from high –throughput virtual screening of millions of compounds to extremely accurate binding mode predictions, providing consistently high enrichment at every level







•Auto Dock is a pack of automated tools which is designed to dock small molecules, like how substrates or drug candidate binds to the receptor of a known 3D structure. It consists of 2 programs -



1.Auto Dock – it performs docking of ligand with target molecule which is a protein.

2.Auto Grid pre calculates this binding of ligand with the target molecule.

Auto Dock has several applicants

·X-ray crystallography

·Structure based drug design

Argus lab



Smog Tower

Smog tower-A smog tower is a device in the form of a tower that helps to create a clean air zone around the surrounding to overcome the problem of air pollution and make the air breathable again by reducing the particulate matter load.



It works as large-scale air purifiers to reduce air pollution having multiple layers of air filters and fans at the base or top to suck the air, when the air enters in the device it cleans the pollutants of air as it passes through them before being recirculated into the atmosphere.

It is able to reduce particulate matter by 50% in the surrounding area.

•Argus lab is molecular modeling software that runs on windows. It is free software and can be easily accessed by the public.

•By using Argus lab we can able to build an atom, build molecules using templates, to change the structure bond types, and to build new structures from the preexisting structures.



The smog tower works on the principle of H14 HEPA filtration or ionization technology to remove PM 2.5 particles. This filter can clean up to 99.99% particulate matter (PM) present in the air .





It uses two types of cleaning system: -(i) Downdraft air cleaning system (ii) Updraft air cleaning system

(i) In "Updraft Air Cleaning System" 60 meters smog tower used where air is sucked in from near the ground and is propelled upwards by heating and convection filtered air is released at the top of the tower.

(ii) In "Downdraft Air Cleaning System" polluted air is sucked in at height of 24 meter and filtered air is released at the bottom of the tower at the high of about 10 meters from the ground.



- o It is a structure of concrete that has multiple layers of filters, air purifiers and fans.
- o The structure is 24 m high and 18-meter concrete tower topped by a 60 m high canopy.
- o There is total 40 fans, 10 on each side at its base.
- o It is able to take in air from all 360-degree angles and generate 1,300,000 cubic meters of clean air per hour.
- o The filters installed in the tower will use carbon nanofibers as a major component and will be fitted along its peripheries.
- o An Automated Supervisor Control and Data Acquisition (SCADA) system in the tower has installed will monitor air quality levels of PM 2.5 and PM 10.
- o The smog tower is expected to improve the air quality within an area of 1 sq kilometer of the unit.
- o It uses 1170 watts of green electricity and positive ionization technology.
- o The first this type of tower was erected in 2015, in Rotterdam, Netherlands and was built in 2017 by Dutch artist DaanRoosegaarde, in Beijing.

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wishes you

Happy

EACHERS' DAY

SEPTEMBER 5TH -





Tubercolosis

THIS AWARENESS VIDEO WILL INFORM YOU ABOUT

- INTRODUCTION OF COVID-19 & TB
- DIFFERENCES B/W COVID-19 & TB
- HOW DOES COVID-19 EFFECT TUBERCULOSIS PATIENTS
- CLINICALLY
 VULNERABLE/
 SHIELDING GROUP

Informative Video on TB Vs COVID







SPER 10th Annual International Conference & Exhibition [SPER 2021]

[October 8-9, 2021]

(In Collaboration with)

The Faculty of Pharmacy, Ganpat University, Mehsana (Gujarat) India

Theme: Innovations in healthcare: Integrating academia and industry

Invited Guest of Honors



Shri Dilip Shanghvi Founder and MD, Sun Pharmaceutical Industries Ltd., India



Dr. G. N. Singh Former Drugs Controller General (1), Govt. of India



Dr. H. G. Koshia Commissioner, Licencing Authority (Drug) & Commissioner of Food Safety, Gujarat, India



Dr. Ganpat I. Patel Pro-Chancellor & Director General, Ganpat University, Mehsana, India



Prof. (Dr.) S. S. Pancholi Executive Dean – FoP & FoS, Ganpat University & Principal and Professor, SKPCPER, Mehsana, India

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