THE LAB CYCLE

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SCIENCE SPEAKS

Laboratory Guidelines for the Detection of Monkeypox Virus Infection

The World Health Organization (WHO) Director-General declared the escalating global monkeypox outbreak a Public Health Emergency of International Concern (PHEIC) last July 23, 2022. According to WHO, there are more than 35,000 cases across 92 countries/territories, and 12 deaths as of August 17. Most reported cases (with travel history) traveled to areas in Europe and North America.

Monkeypox is a rare disease caused by infection with the monkeypox virus (MPVX)—an enveloped double-stranded DNA virus that belongs to the same family of viruses that cause smallpox. *Continue at page 2.*

IN THE BLUELIGHT

Monkeypox Vaccine Storage Guidelines

The Centers for Disease Control and Prevention (CDC) has released a statement regarding considerations for Monkeypox vaccination. Two vaccines are mentioned by the CDC that is approved to be used for the prevention of Monkeypox virus infection: namely JYNNEOS® and ACAM2000®. *Continue at page 5.*

UP AND ABOUT

Aquaculture and Its Global Relevance

With the non-stop growing world population, there are more mouths to feed. Faster and larger food production is needed to accommodate the increasing demand. The current production from agriculture alone is not sufficient to supply the high demand but with the innovations in fishing technologies, aquaculture is becoming an effective method of farming seafood. *Continue at page 7.*

WHAT'S INSIDE?

Laboratory Guidelines for the Detection of Monkeypox Virus Infection

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Monkeypox is a rare disease caused by infection with the monkeypox virus (MPVX)—an enveloped double-stranded DNA virus that belongs to the same family of viruses that cause smallpox. This virus can be transmitted via contact with bodily fluids, lesions on the skin, or internal mucosal surfaces with symptoms like fever, headache, and muscle aches. The incubation period of monkeypox is usually from 6 to 13 days but can range from 5 to 21 days (about three weeks).

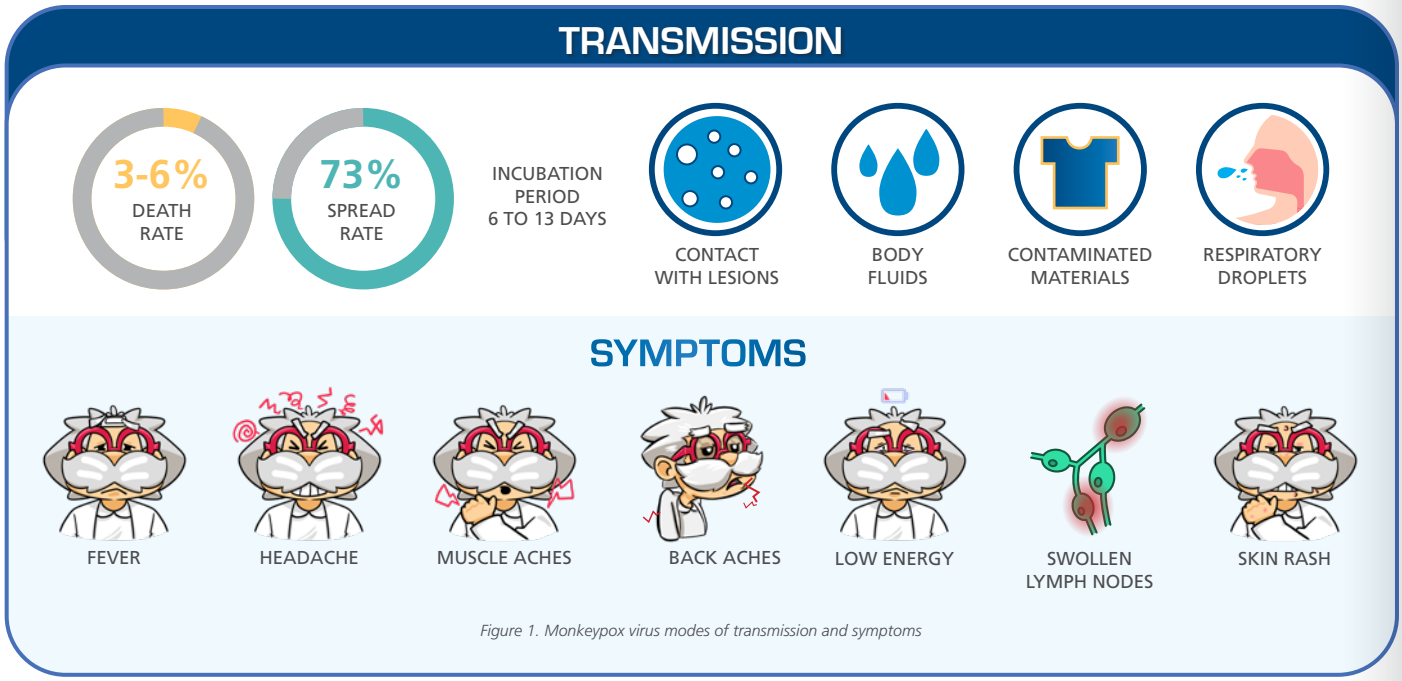


Figure 1. Monkeypox virus modes of transmission and symptoms

According to the WHO, the best diagnostic specimens are directly from the rash—skin, fluid, or crusts, or biopsy where viable. Other methods like antigen and antibody detection may not be useful as they do not distinguish between orthopoxviruses.

A risk-based approach is recommended in manipulating the specimens from the suspected, probable, or confirmed cases of monkeypox in the laboratory. Therefore, the procedures for detecting the presence of the MPXV, which is categorized as a risk group 3 pathogen, must be carried out in a Biosafety Level 2 laboratory using the list of equipment shown below.

Equipment Guide for Monkeypox Virus Detection

1

HR1-700S Laboratory Refrigerator

HF2-700S Laboratory Freezer

UUS-597B Ultra-low Temperature Freezer

Specimen and Reagent Storage

The MPXV specimens are recommended for refrigeration at 2°C to 8°C or must be frozen (-20°C or lower) within an hour of collection. If the transport time exceeds seven days, specimens should be stored at -20°C or below. Meanwhile, -70°C is advised for long-term specimen storage (>60 days from collection).

Esco Laboratory Refrigerators, Laboratory Freezers, and Ultra-low Temperature Freezers are equipped with well-designed refrigeration systems and high-quality materials suitable for storage of temperature-sensitive biological samples that require critical storage conditions.

2

Sample Handling and Preparation

MCR-88
Microcentrifuge

AC2-4S_
Class II Biosafety Cabinet

VST-ROT-101

VST-ROT-007

PV-PVC
Microplate Shaker

MPXV can be transmitted during the specimen processing stage due to contaminated material or improper methods. As a result, increased biosafety measures are to be observed. Prior to sample inactivation, specimens from patients with suspected MPXV must be prepared in a functional Class II biosafety cabinet; however, this is not required for properly inactivated specimens.

Aside from the protection that the biosafety cabinets provide, Esco Class II Biological Safety Cabinets are NSF 49 and EN 12469 compliant with user-friendly features and are coated with antimicrobial powder on all its external and internal painted surfaces for improved safety.

Centrifuges are necessary for the separation of the specimen's liquid and solid components. Safety cups or sealed rotors are advised if essential for the procedure. Esco Versati™ Micro Refrigerated Centrifuges are equipped with maintenance-free motors, a durable mechanism, and an intelligent Versati™ microprocessor control system that offers extreme reliability and safety.

Microplate shakers ensure accurate incubation of reactions and denaturation of nucleic acids and proteins. Esco Provocell™ Microplate Shaker/Incubator is designed for rapid switching between heating and cooling with accurate temperature control and block uniformity.

3

Detection and Analysis

PCR-4A
PCR Cabinet

SWT-PG-96
Real-time PCR Detection
System

Nucleic acid amplification testing (NAAT) is conducted to confirm the MPXV infection. To detect unique viral DNA sequences, either PCR real-time or conventional polymerase chain reaction (PCR) is used. There are two steps involved in virus detection. The first PCR detects orthopoxviruses but does not identify the species while the second PCR (or sequencing) specifically detects MPXV.

A real-time PCR thermal cycler provides efficient amplification of nucleic acids for virus analysis. Esco Lifesciences offers the new Swift™ PCR Thermal Cyclers with a built-in computer for stand-alone operation from PCR program input, monitoring, and analysis.

PCR cabinets provide a sterile environment for the reagent and sample preparation during PCR mastermix preparation. Esco Airstream® PCR Cabinets (PCR) are equipped with HEPA-filtered laminar flow, airflow monitoring, UV lamp & prefilter change alarm to provide a sterile environment for the PCR mastermix preparation.

SAFETY REMINDERS

Laboratory personnel should wear complete Personal Protective Equipment (PPE) when handling suspected monkeypox specimens.

Waste coming from the cultures, stocks, and residual specimens should be decontaminated before disposal using an autoclave.

Processing and testing of monkeypox lesion material is recommended to be done in a facility with vaccinated (smallpox vaccination within the past 3 years) lab personnel, engineering controls, safety equipment, and diagnostic assays.

Follow the approved guidelines set by the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC).

Decontaminate the work surfaces before and after the test procedures using an EPA-registered hospital-grade disinfectant.

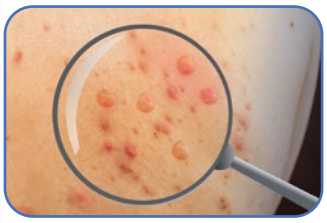
References:

[1] Centers for Disease Control and Prevention. (2022, June 29). Laboratory Procedures and Biosafety Guidelines. https://www.cdc.gov/poxvirus/monkeypox/lab-personnel/lab-procedures.html#:~:text=Use%20of%20a%20certified%20Class,centrifugation%20are%20recommended%20for%20use

[2] Pathogen Safety Data Sheets: Infectious Substances – Monkeypox virus. (2022, June 07). https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/monkeypox-virus.html

[3] World Health Organization. (2022, May 23). Laboratory testing for the monkeypox virus. https://www.who.int/publications/i/item/WHO-MPX-laboratory-2022.1

Monkeypox Vaccine Storage Guidelines



The Centers for Disease Control and Prevention (CDC) has released a statement regarding considerations for Monkeypox vaccination. Two vaccines are mentioned by the CDC that is approved to be used for the prevention of Monkeypox virus infection: namely JYNNEOS® and ACAM2000®.

What Do We Know About These Vaccines?

JYNNEOS® (Imvamune/Imvanex) is recommended for persons 18 and older who have been found to have a high risk of contracting smallpox or Monkeypox disease. It is approved by the U.S. Food and Drug Administration (FDA) for the prevention of Monkeypox virus infection.

ACAM2000® is for active immunization against smallpox disease in people who have been determined to be at high risk of infection. It is approved by the U.S. FDA for use against smallpox. Under an Expanded Access Investigational New Drug application, it is made available for use against Monkeypox.

Vaccine Storage Requirements

When it comes to administering potent vaccines, an efficient cold storage management system is critical. Failure to provide optimal storage for these irreplaceable products may result in spoilage and incur significant additional costs for health care providers.

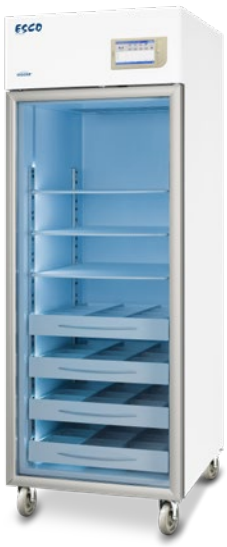
Table 1. Comparison of Leading Monkeypox Vaccines *(As of August 2022)*

VACCINE NAME		JYNNEOS®	ACAM2000® (Lyophilized)
Required storage temperature and shelf-life	Long-term storage	-15°C to -25°C until expiration date on vial label	-15°C to -25°C until expiration date on vial label
	Short-term storage	+2°C to +8°C for 8 weeks from thawing	+2°C to +8°C for 18 months
			+2°C to +8°C for 30 days (reconstituted)
Cold storage solution	Long-term storage	Laboratory Freezer	Laboratory Freezer
	Short-term storage	Laboratory Refrigerator	Laboratory Refrigerator

Table 2. Monkeypox Vaccine Vial Capacity Guide for Lab Refrigerator

HP Series Laboratory Refrigerator			
	Model	JYNNEOS® Vials	ACAM2000® Vials
Temperature Range: +2°C to +8°C	HR1-140_	3,300	3,600
	HR1-400_	14,520	12,600
	HR1-700_	24,320	28,350
	HR1-1500_	48,640	56,700

**Figures are only an estimation and does not represent the actual storage capacity.*



HR1-700T-_

HR1-1500T-_

Table 3. Monkeypox Vaccine Vial Capacity Guide for Lab Freezer

HP Series Laboratory Freezer			
	Model	JYNNEOS® Vials	ACAM2000® Vials
Temperature Range: -15°C to -25°C	HF2-140_	3,300	3,600
	HF2-400_	14,520	12,600
	HF2-700_	24,320	28,350
	HF2-1500_	48,640	56,700

**Figures are only an estimation and does not represent the actual storage capacity.*

HF2-700T-_

HF2-1500S-_

Investing in a reliable cold storage matters. Esco Scientific is a trusted provider of cold storage equipment worldwide.

With more vaccines being rolled out, everyone is encouraged to work together to prevent the further spreading of the virus and follow science-based guidelines.

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References:

[1] ACAM2000 [package insert]. Gaithersburg, MD USA: Emergent Product Development Gaithersburg Inc.; 2018

[2] Considerations for Monkeypox Vaccination. (2022, July 28). Centers for Disease Control and Prevention. https://www.cdc.gov/poxvirus/Monkeypox/considerations-for-Monkeypox-vaccination.html

[3] JYNNEOS [package insert]. Kvistgaard, Denmark: Bavarian Nordic A/S; 2021

Aquaculture and Its Global Relevance

With the non-stop growing world population, there are more mouths to feed. Faster and larger food production is needed to accommodate the increasing demand. The current production from agriculture alone is not sufficient to supply the high demand but with the innovations in fishing technologies, aquaculture is becoming an effective method of farming seafood.

What is Aquaculture?

Aquaculture is the controlled breeding, rearing, and harvesting of various seafood such as fish, shellfish, crustaceans, algae, and other aquatic organisms. It is one of the fastest, if not the fastest, growing food-producing sectors and currently accounts for 50% of fish for human consumption around the world. Aquaculture can be done in both inland and coastal waters. The methods can vary from onshore tanks filled with either freshwater or seawater to floating cages anchored on the seabed. In tropical and subtropical zones, ponds or open ground tanks with brackish water are used for shrimp farming.

Floating cages offshore

Open ground tanks

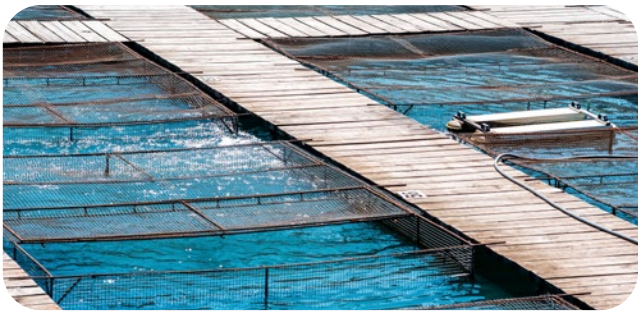
Besides the massive contribution to global food production, aquaculture also helps in repopulating threatened and endangered aquatic species, restoring habitats, and replenishing wild stocks of freshwater and seawater species. However, poorly managed fish farms can cause water pollution and damage to the local environment.

Types of Aquacultures

Various aquatic organisms such as fish, seaweed and macrophyte, mollusk, crustacean, and other invertebrates are grown in diverse ways. Aquaculture systems, phases of culture, and technologies are considered for successful aquaculture. Here are several types of aquacultures:

FISH FARMING

This is the most common and considered one of the easiest types of aquacultures. The purpose of this system is to produce a selective breed of fish, either freshwater or seawater fish, for human consumption. This method only requires a minimal care-intensive process and a lesser landmass for fish production as it only needs food and proper water conditions.



MARICULTURE

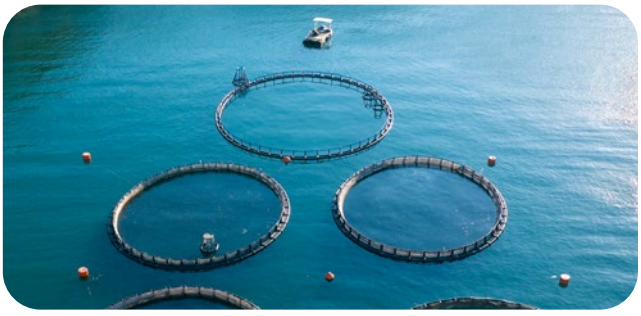
This type of aquaculture utilizes seawater. It can be done on a sectioned-off part of the ocean, next to the sea, or on separate ponds containing salt water. Crustaceans and mollusks such as shrimps, shellfish, and even seaweed, are typically bred here.

ALGACULTURE

Cultivation of algae is involved in this type of aquaculture. Algae are a diverse group of eukaryotic, photosynthetic microbial organisms. They are usually grown and harvested in large quantities. Algae have a wide range of commercial and industrial uses—in cosmetics, in biochemicals, and in agriculture to name a few.

INLAND POND CULTURE

This is an artificial inland pond with an aeration system to introduce air for fish to grow. Constructed ponds usually support the production of freshwater fish such as catfish, tilapia, salmon, etc.



OPEN-NET-PEN AND CAGE SYSTEMS

This system is commonly located offshore and in freshwater lakes. It is made of mesh cages using natural waters where fish are bred and reared. Environmental regulations are observed in this type of aquaculture.

RACEWAY

This is one of the oldest methods for inland aquaculture. It consists of canals or basins with a continuous supply of water flowthrough, providing the needed quality of water to allow optimal growth of freshwater fishes.

Laboratory Testing Involved in Aquaculture

The application of proper techniques in aquaculture is important, as well as the right technologies used to study and propagate aquatic organisms that benefit human consumption and save endangered species. Here are some tests and the equipment needed in the lab to conduct a safe, accurate, and successful aquaculture.

IFC

Water Analysis

IFA

In this testing, variables such as temperature, salinity, dissolved oxygen, alkalinity, total ammonia nitrogen, and nitrite are tested to determine the quality of water which supports aquaculture. Collected water samples are stored and preserved in a Refrigerated Incubator to keep them oxygenated and O_2 stress-free.

The detection of the presence of microorganisms also falls under water analysis. A Forced Convection Laboratory Incubator is used to maintain optimal temperature vital for microbiological cultures.

Diagnostic Testing

Examination of live fish, tissue samples, and hatchery finfish and shellfish for the presence of bacteria, viruses, fungi, protozoa, or other parasites can be done in a fish pathology laboratory. With the use of engineering control equipment such as Universal Animal Research Workstations and Class II Biosafety Cabinets, laboratory personnel will be protected from biological hazards and odors while providing sterile working areas for aquatic samples.

VA2

AC2

HR1

While a live fish is preferred as a diagnostic sample, there are instances where there are no live clinical diseased/moribund fish available. In this case, dead fish or tissue samples should be kept cool in a Laboratory Refrigerator and then tested within 72 hours after collecting the sample.

The large potential aquaculture offers in providing the world population with a healthy and sustainable source of seafood may help alleviate food crisis. However, to achieve this, more research and studies must be performed to improve the current methods of aquaculture. And with Esco Lifesciences' solutions, the next breakthrough in aquaculture can be done in a controlled and safe environment.

References:

[1] C. Boyd. 2016. The importance of water analysis in aquaculture. https://www.globalseafood.org/advocate/the-importance-of-water-analysis-in-aquaculture/

[2] Conserve Energy Future. (n.d.). Aquaculture: Types, Benefits and Importance (Fish Farming). https://www.conserve-energy-future.com/aquaculture-types-benefits-importance.php

[3] Fisheries & Aquaculture. (n.d.). Food and Agriculture Organization of the United Nations. https://www.fao.org/fishery/en/aquaculture

[4] What is aquaculture? (n.d.). Aquaculture Stewardship Council. https://www.ascaqua. org/aquaculture-explained/why-is-aquaculture-important/what-is-aquaculture/

[5] What is aquaculture? (n.d.). National Ocean Service, National Oceanic and Atmospheric Administration, US Department of Commerce. Oceanservice.noaa.gov. https://oceanservice.noaa.gov/facts/aquaculture.html#:~:text=Aquaculture%20is%20breeding%2C%20raising%2C%20and

Back-to-back Lab Events with Esco Lifesciences

See you on the following dates:

07-09 SEPT 2022

LabIndonesia 2022
Jakarta Convention Center
Booth C-17

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14-16 SEPT 2022

THAILAND LAB INTERNATIONAL
Analysis. Diagnostics. Testing. Automation.
Bangkok International Trade & Exhibition Centre
Booth 3G07

REGISTER NOW

13-15 OCT 2022

13th MEDITEX Bangladesh 2022
International Convention City Bashundhara
Hall 4 - Booth 25 & 26

REGISTER NOW

24-26 OCT 2022

ARAB LAB LIVE
Dubai World Trade Centre
Hall S1 - Booth 460

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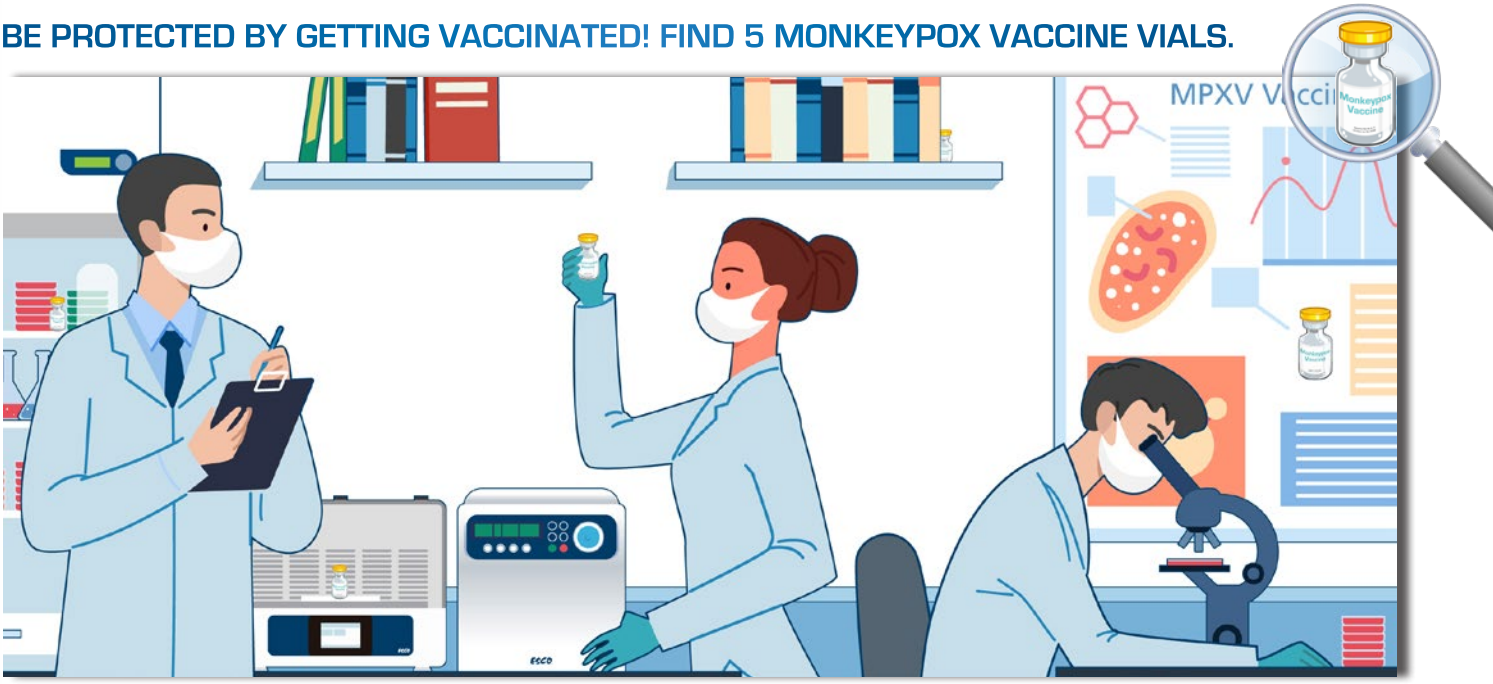
MORE EVENTS

EINESCO'S ZONE

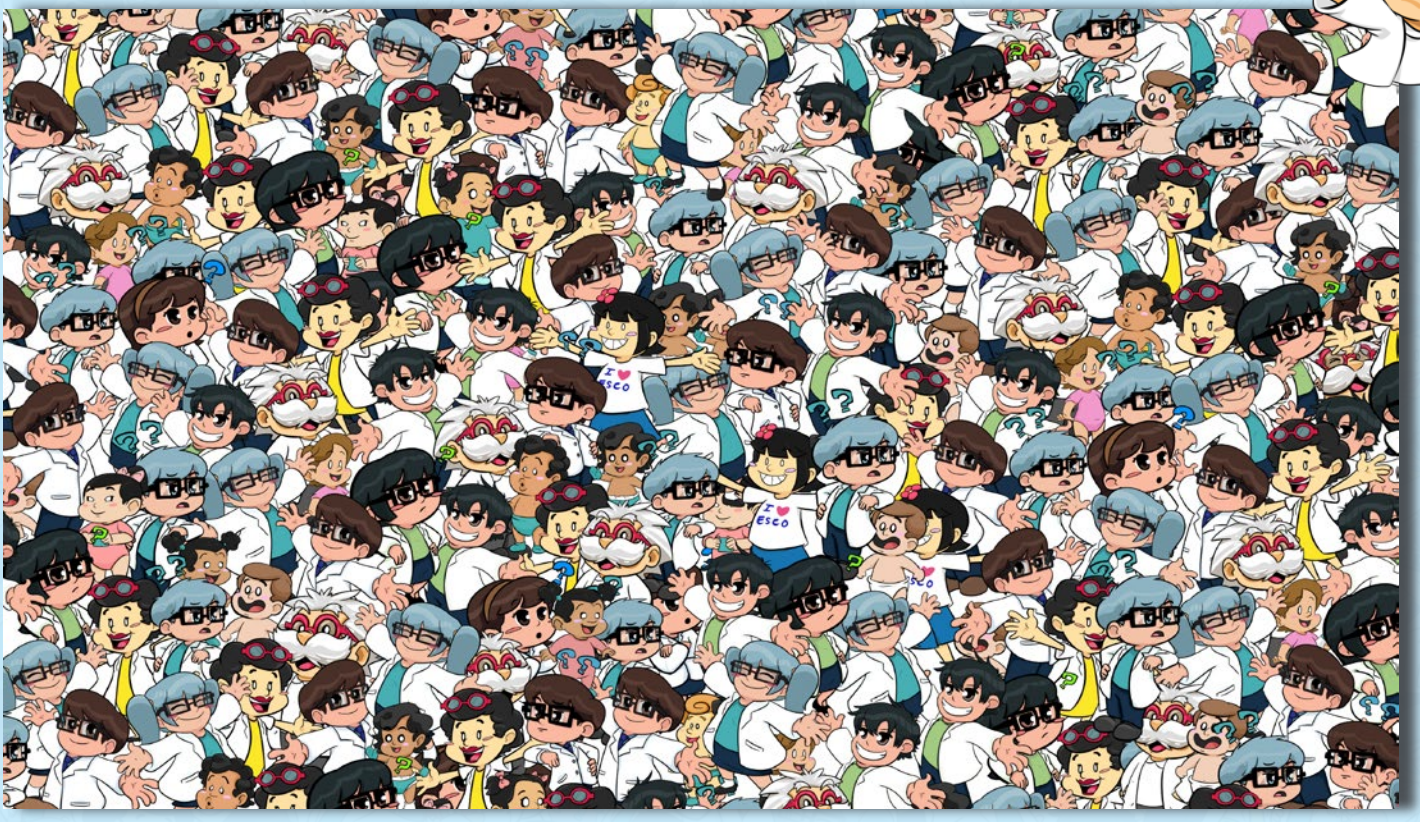
Test your EYE-Q!

BE PROTECTED BY GETTING VACCINATED! FIND 5 MONKEYPOX VACCINE VIALS.



UP FOR MORE CHALLENGE?

Find the winking Dr. Einesco



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Here is the answer key to last issue's EinesComic: Laboratory Slip-ups

EinesComic

LABORATORY SLIP-UPS

Dr. Einesco wants you to always remember that

S A F E T Y

IS OUR PRIORITY

ESCO SCIENTIFIC

Esco Micro Pte. Ltd.
21 Changi South Street 1 • Singapore 486 777
Tel +65 6542 0833 • mail@escolifesciences.com • www.escolifesciences.com

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