

BIOLOGICAL RISK ASSESSMENT



Learning Outcome

By the end of this module, participants will be able to:

- ▶ Able to list hazards and risk
- ▶ Able to describe the likelihood and consequences
- ▶ Able to describe risk group and BSL
- ▶ Able to demonstrate risk characterization
- ▶ Able to apply risk assessment procedure

RISK ASSESSMENT IN THE NEWS



PENILAIAN DAN PENENTUAN RISIKO (RISK ASSESSMENT) JANGKITAN DAN PENULARAN COVID-19 BAGI SESUATU KAWASAN

6th Nov 2020 | SOROTAN, HIGHLIGHTS, RISK ASSESSMENT, PENENTUAN RISIKO, JANGKITAN DAN PENULARAN, DISTRICT RISK REDUCTION PROGRAM, DRRP

Secara umumnya, kaedah penentuan zon jangkitan COVID-19 berdasarkan bilangan kes harian dan jumlah kes kumulatif untuk tempoh 14 hari yang lepas adalah menjadi asas kepada **District Risk Reduction Program (DRRP)**. Ia membantu pemahaman tindakan selanjutnya yang perlu diambil oleh komuniti dan dipandu oleh pihak Kerajaan di kawasan setempat.

Walau bagaimanapun, kaedah penentuan zon jangkitan COVID-19 bukan hanya bergantung kepada DRRP, sebaliknya lebih ia diambil kira

Dr Noor Hisham: SOPs for arrivals into country tightened to mitigate risk of Covid-19 variants

Thursday, 24 Jun 2021 07:37 PM MYT
BY ASHMAN ADAM



Risk assessment and seroprevalence of SARS-CoV-2 infection in healthcare workers of COVID-19 and non-COVID-19 hospitals in Southern Switzerland

By DocWire News Featured Reading · June 26, 2021

Like Suka 0



This article was originally published here

Lancet Reg Health Eur. 2021 Feb;1:100013. doi: 10.1016/j.lanepe.2020.100013. Epub 2020 Dec 17.

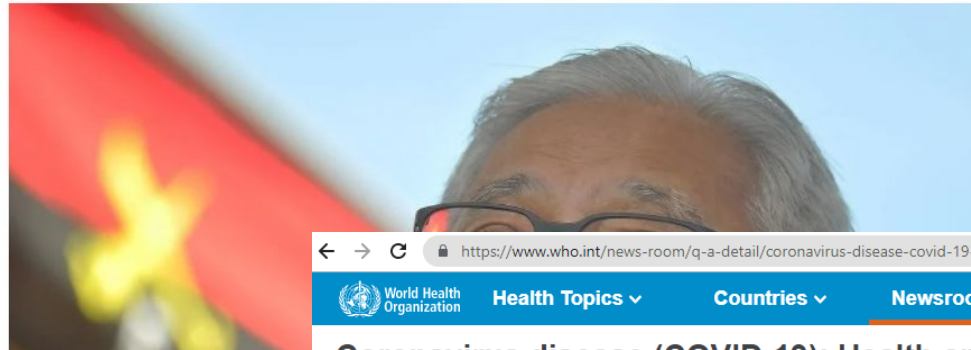
ABSTRACT



Sandia
National
Laboratories

Extension of Phase 1 based on risk assessment, MCO SOPs remain

By NURADZIMMAH DAIM and HANA NAZ HARUN · June 27, 2021 @ 7:53pm



https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-health-and-safety-in-the-workplace

World Health Organization Health Topics Countries Newsroom Emergency

Coronavirus disease (COVID-19): Health and safety in the workplace

26 June 2020 | Q&A

Consideration for public health and social measures in the workplace in the context of COVID-19

Can COVID-19 be transmitted at the workplace?



What is the risk of contracting COVID-19 in the workplace?



How can people assess the risk for exposure to COVID-19 in their workplace and plan for preventive measures?



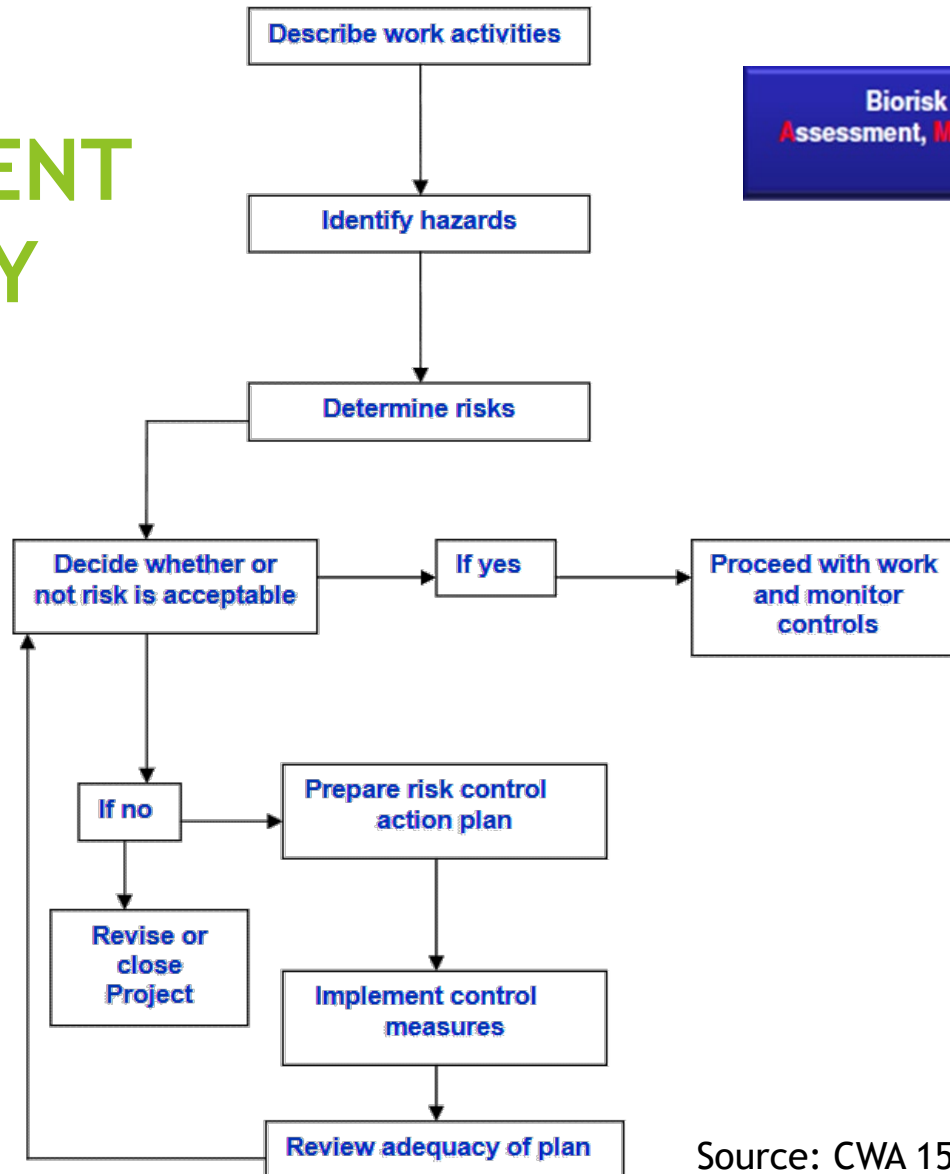
Who should carry out the workplace risk assessment?



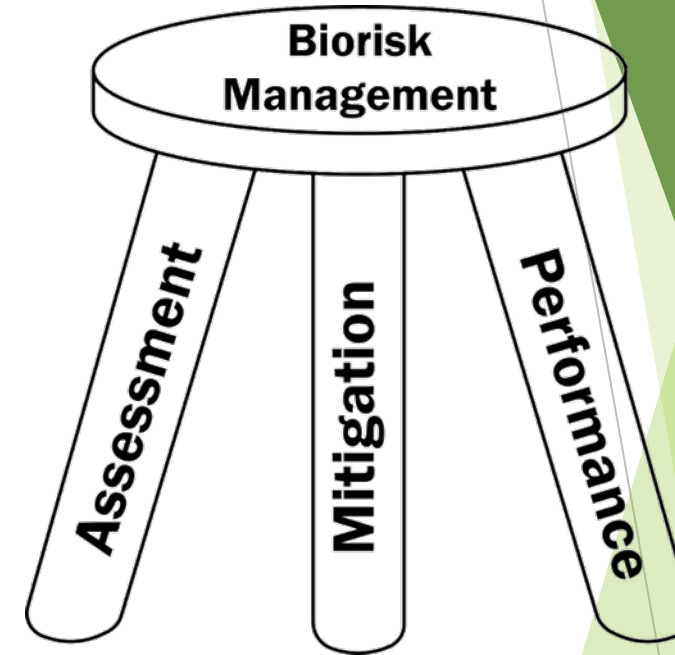
BIOLOGICAL RISK ASSESSMENT

- ▶ A systematic process of gathering information and evaluating risks to support a risk management strategy that is informed by the likelihood and consequences of an inadvertent release of and/or exposure to biological agents
- ▶ Essential to guide the selection of risk control measures
- ▶ Deciding whether or not the risk is acceptable
- ▶ Purpose: To ensure risks to laboratory personnel, the public, and the environment are consistently minimized to acceptable levels

RISK ASSESSMENT STRATEGY



Biorisk Management =
Assessment, Mitigation, Performance



Global Biorisk Management Curriculum Library
(GBRMC): Sandia National Laboratories

Source: CWA 15793: 2011

FRAMEWORK RISK-BASED DECISION MAKING

**Five steps or procedures
based on
Plan-Do-Check-Act cycle**



Exercise 1



Group Exercise:

Time allocation for group discussion: 10 minutes

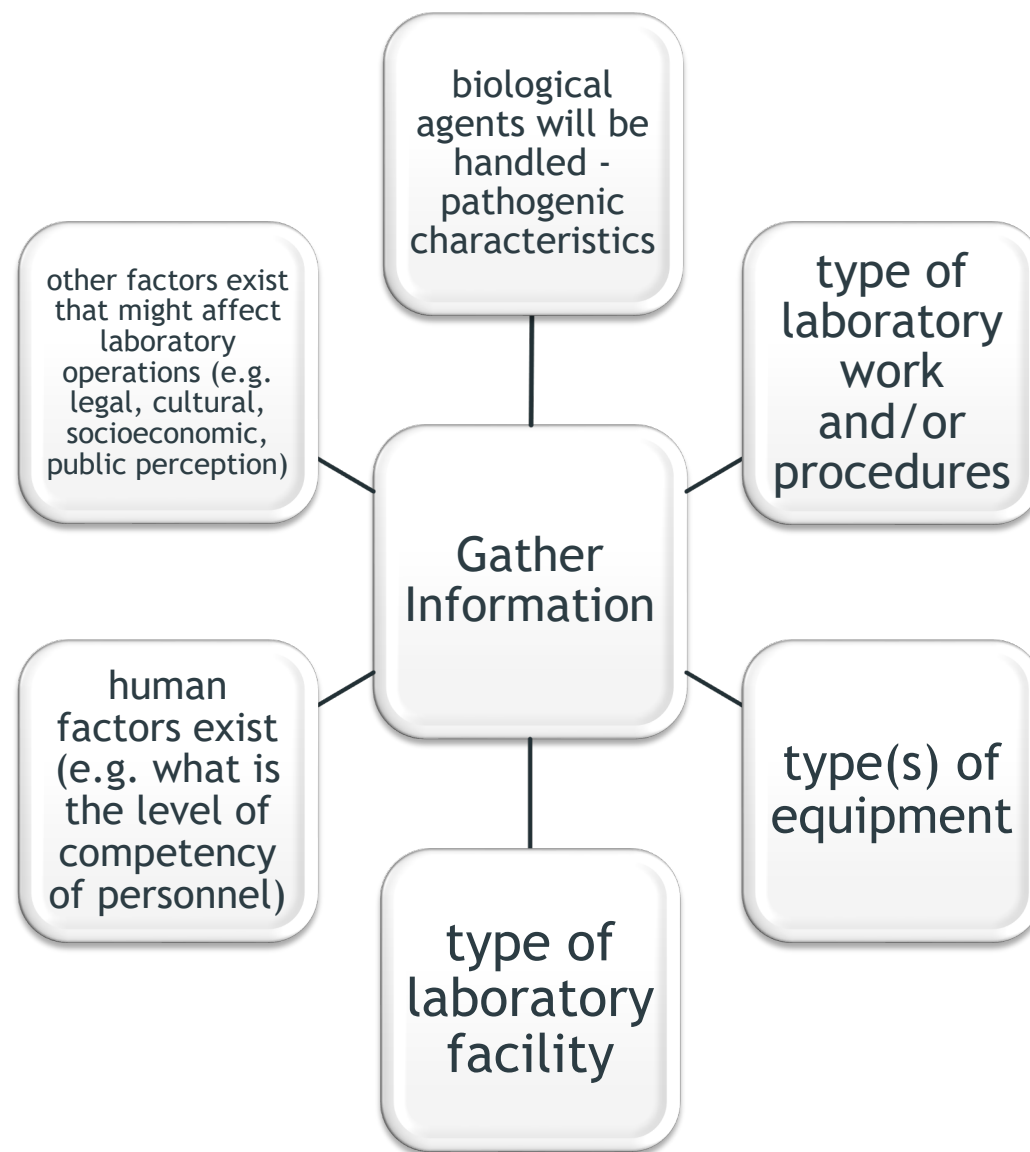
Question:

List situations that require laboratory personnel to conduct a risk assessment exercise

Choose a group member to represent the outcome of your discussion



INFORMATION GATHERING





METHODS OF INFORMATION GATHERING

AGENT

- ▶ What is known about the agent?
 - ❖ Pathogenicity - ability to cause disease
 - ❖ Virulence - degree of pathogenicity
 - ❖ Host range - restricted or broad, human, animals, plants
 - ❖ Communicability - are there reports of epidemics or laboratory infections?
 - ❖ Transmission - means (e.g. direct contact, vector borne) and routes (e.g. ingestion, inhalation)
 - ❖ Environmental stability - e.g. resistance to disinfection

AGENT (Cont.)

► Additional agent factors:

- ❖ Toxicity
- ❖ Is the agent associated with cancer (e.g., Hepatitis B virus associated with liver cancer)?
- ❖ Does the agent or by-products induce allergic reactions (e.g., Penicillin)?

Pathogen Safety Data Sheet



Public Health Agency of Canada

www.publichealth.gc.ca

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Pathogen Safety Data Sheets and Risk Assessment

For more information about Ebola, visit [Ebola Virus Disease](#)

Pathogen Safety Data Sheets (PSDSs) (previously titled Material Safety Data Sheets for infectious substances) are technical documents that describe the hazardous properties of a human pathogen and recommendations for work involving these agents in a laboratory setting. These documents have been produced by the Public Health Agency of Canada (the Agency) as educational and informational resources for laboratory personnel working with these infectious substances. Please note that work involving pathogens in Canada may require compliance with international, national, and provincial laws and guidelines.

ROUTES OF LABORATORY EXPOSURE

Route	Microbiological practice
Ingestion	Mouth pipetting Splashes of infectious material into mouth Contaminated articles or fingers placed in mouth Consumption of food in workplace
Inoculation	Needlestick accidents Cuts from sharp objects Animal and insect bites and scratches
Contamination of skin and mucous membranes	Spills or splashes into eyes, mouth, nose Spills or splashes on intact or nonintact skin Contaminated surfaces, equipment, articles
Inhalation	Numerous procedures that produce aerosols

Laboratory-Associated Infections and Biosafety

DAVID L. SEWELL*

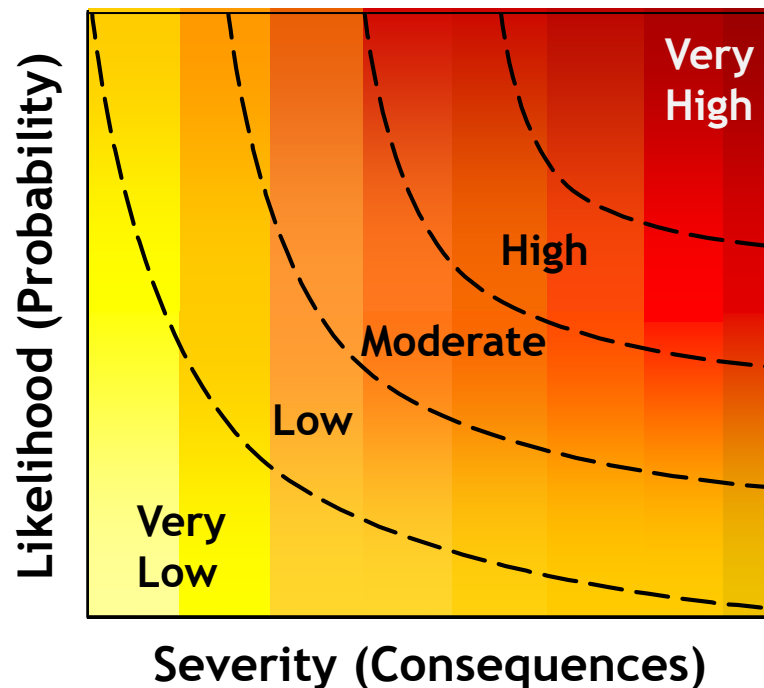
Pathology and Laboratory Medicine Service, Veterans Affairs Medical Center, and Dep



Sandia
National
Laboratories

Risk Equation

$$\text{Risk} = \text{Likelihood} \times \text{Severity}$$



$$R = f(L, S)$$

The risk associated with the hazard is defined as the combination of the likelihood of an incident and the severity of the harm (consequences) if that incident were to occur

LIKELIHOOD (PROBABILITY)

- ▶ The probability of an incident (that is exposure to and/or a release of a biological agent) occurring in the course of laboratory work
- ▶ Assess with consideration of existing control measures

RANGE OF CLASSIFICATION FOR LIKELIHOOD

Rare: almost impossible to occur

Unlikely: not very possible to occur

Possible: might occur

Likely: very possible to occur

Almost certain: highly probable to occur

FACTORS ASSOCIATED WITH A HIGH LIKELIHOOD OF INCIDENTS OCCURRING

Laboratory activities associated with aerosolization

: When aerosols are generated the likelihood of exposure through inhalation is increased



Laboratory activities associated with sharps materials

: likelihood of percutaneous exposure to a biological agent through a puncture wound increases.



CONSEQUENCES (SEVERITY)

Definition:

The outcome of an incident (exposure to and/or release of a biological agent) of varying severity of harm, occurring in the course of laboratory operations.

- * Has no bearing on existing control measures in place

RANGE OF CLASSIFICATION FOR CONSEQUENCES

Negligible: Trivial incident or near-miss requiring reporting and follow up

Minor: Incident with self-limiting consequences

Moderate: Incident that requires medical treatment and/or has insignificant environmental consequences

Major: Incident with potential lost time due to infection but a non-permanent consequence and/or limited environmental impact

Severe: Potential fatality or serious illness with permanent disability and/or serious environmental impact

FACTORS ASSOCIATED WITH GREATER CONSEQUENCES IF AN INCIDENT WERE TO OCCUR

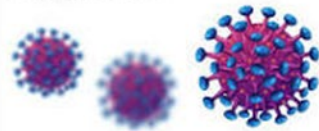
HIGH SEVERITY AND MORTALITY

A laboratory-associated infection following exposure is more likely to cause personnel to become debilitated, lose their quality of life, or die



WHAT IS HIV?

Human Immunodeficiency Virus (HIV) is a virus that attacks cells that help the body fight infection.

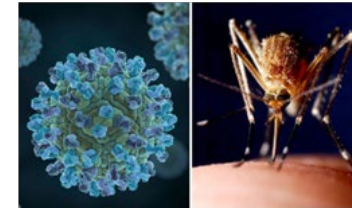


There's no cure, but it is treatable with medicine.



LIMITED AVAILABILITY OF EFFECTIVE PROPHYLAXIS OR THERAPEUTIC INTERVENTIONS

The symptoms or outcomes of a laboratory-associated infection cannot be effectively prevented, reduced or eliminated by a medical intervention



Risk Matrix

- Risk assessment matrix defining the risk based on the likelihood of exposure and/or release and the consequences
- “acceptable” level of risk in the laboratory is usually referred to as “risk tolerance” - work to be considered safe enough to proceed

		Likelihood of exposure/release				
		Rare	Unlikely	Possible	Likely	Almost certain
Consequences of exposure/release	Severe	Medium	Medium	High	Very high	Very high
	Major	Medium	Medium	High	High	Very high
	Moderate	Low	Low	Medium	High	High
	Minor	Very low	Low	Low	Medium	Medium
	Negligible	Very low	Very low	Low	Medium	Medium

DESCRIPTION	RISK ACCEPTABILITY	RECOMMENDED ACTION
HIGH RISK	Not Acceptable	A HIGH risk requires immediate action to control the hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion. Work shall not start.
MEDIUM RISK	Tolerable	A MEDIUM risk requires a planned approach to control the hazard interim control measures may be implemented while longer term measures are being establish and to ensure that the risk level is reduce to as low as ressonably practicable within a define period. It is acceptable to start the work activities and actions taken must be documented on the risk assessment form including date for completion.
LOW RISK	Acceptable	A risk identified as LOW may be considered as acceptable and further reduction may not be necessary. However, if the risk can be resolved quickly and efficiently, control measures should be implemented and recorded.

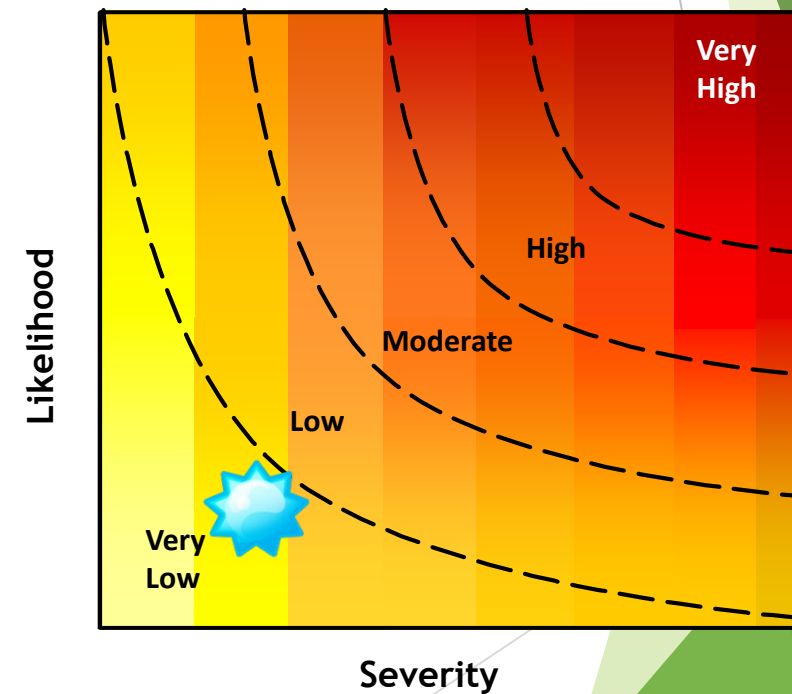
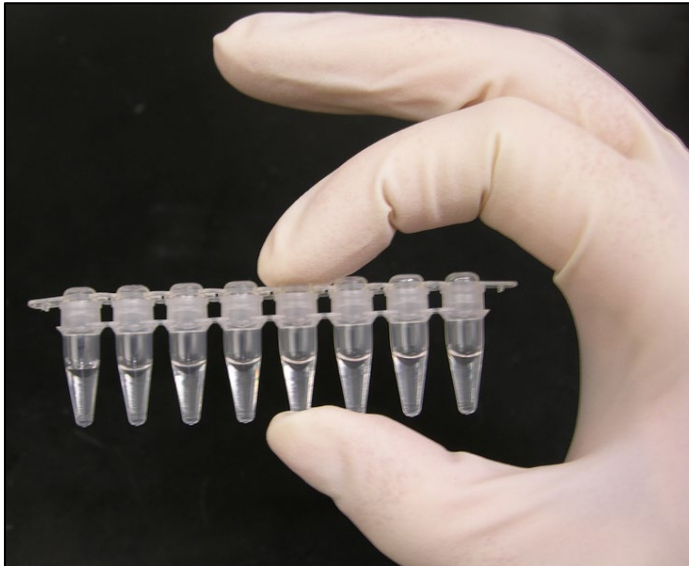
Exercise 4



Consider the risk if you are...

Conducting a PCR test for COVID-19 patient samples

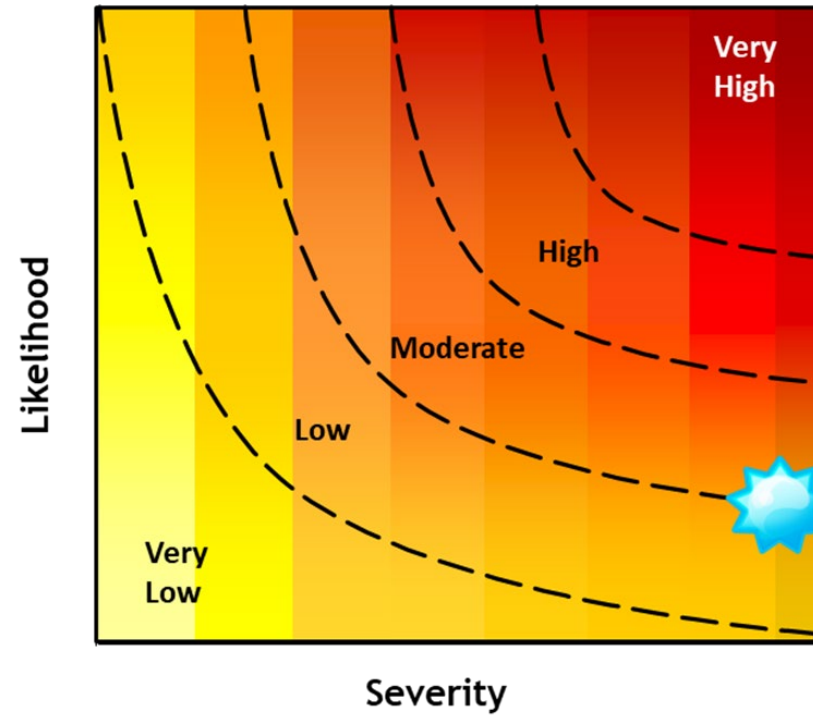
$$R = f(L, S)$$



Consider the risk if you are...

$$R = f(L, S)$$

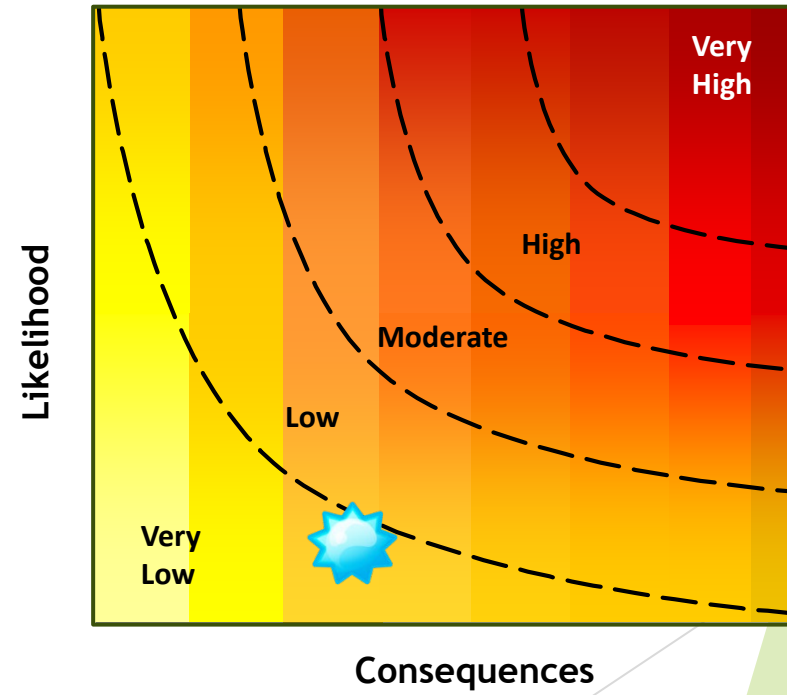
Preparing for acid-fast bacilli (AFB) smear microscopy examination using BSC



Consider the risk if you are...

$$R = f(L, S)$$

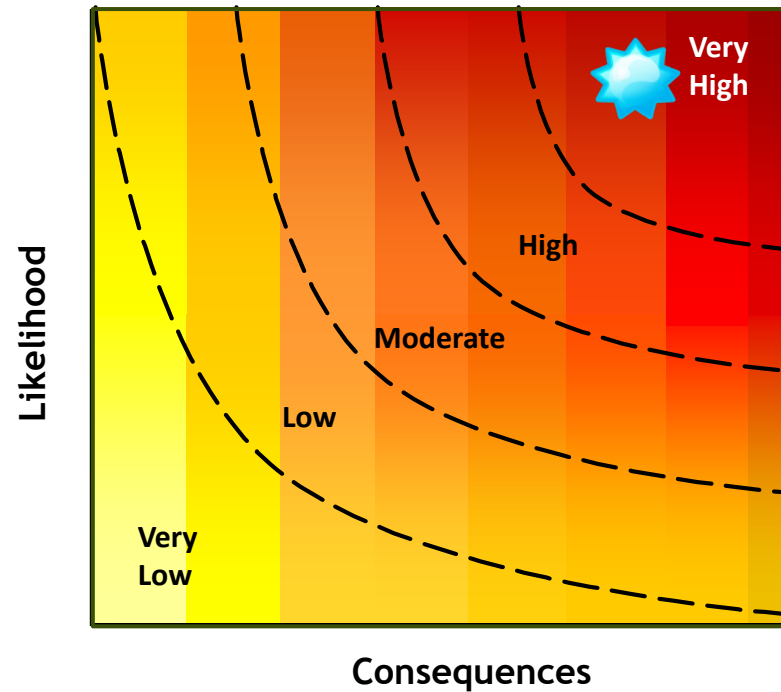
Processing blood samples of a healthy adult subject on an open bench



Consider the risk if you are...

Handling Brucella culture
in an open bench

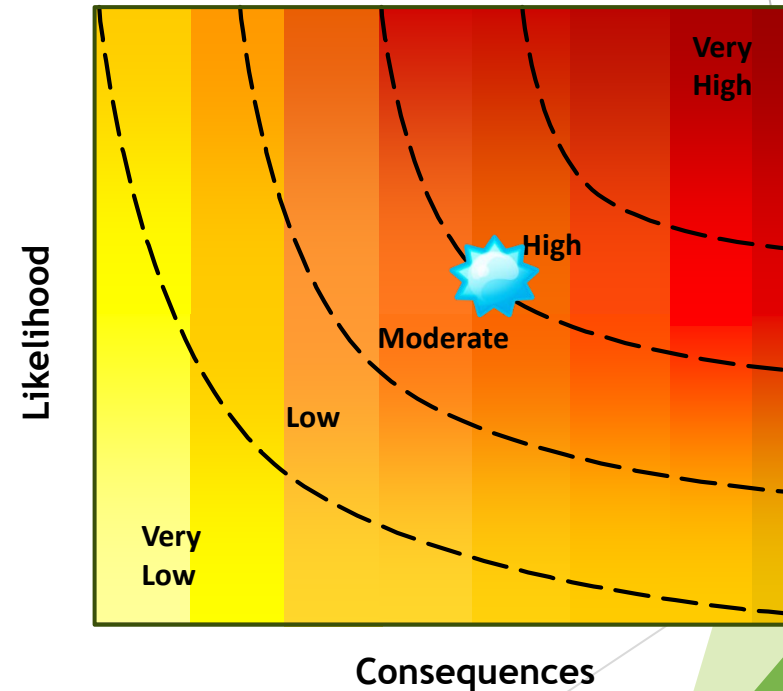
$$R = f(L, S)$$



Consider the risk if you are...

Conducting animal inoculation
using SARS CoV2 virus

$$R = f(L, S)$$



Risk assessment requires careful judgment!

**Under-estimation
of risk**

Adverse consequences

Over-estimation or risk

- ❖ Extra cost and burden
- ❖ No enhancement in safety
- ❖ Unnecessary burden leading to circumvention of required safeguard