Biohazards

- **Biohazard:** Biological hazards refer to organisms or organic matters produced by organisms that are harmful to human health.
  - These include bacteria, virus, parasites, fungi and their toxins.
  - These may cause harm to human in the form of infections, allergy and poisoning.
- **Biosafety:** The containment principles, technologies and practices that are implemented to prevent the unintentional exposure to pathogens and toxins, or their accidental release
- **Biosecurity:** Control of accidental and deliberate release of biohazardous material

- **Biohazard levels**, more commonly referred to as "**biological safety levels**" or "**biosafety levels**," are **classifications of safety precautions** necessary to be applied in the clinical microbiology laboratory depending on specific pathogens handled when performing laboratory procedures.
- Laboratory facilities are designated as basic –
  - Biosafety Level 1,
  - Basic – Biosafety Level 2,
  - Containment – Biosafety Level 3,
  - Maximum containment – Biosafety Level 4.

- **Biosafety level designations** are based on a composite of the design features, construction, containment facilities, equipment, practices and operational procedures required for working with agents from the various risk groups.
- **Biohazardous Agents** may be classified by Risk Group (RG) that are required biosafety precautions.
- The risk group classification is used **for laboratory work only**.

Risk Group 1 (RG1)/Biohazard level 1

- **Agents that are not associated with disease in healthy adult humans.**
- **Example: *Bacillus subtilis*, canine hepatitis, *Escherichia coli* etc.**
- **Handling these agents require minimum safety measures like gloves, masks etc.**

Risk Group 2 (RG2)/Biohazard Level 2

- **Agents that are associated with human disease which is rarely serious.**
- **Preventative or therapeutic interventions are often available.**
- **E.g., hepatitis A, B, and C, influenza A, Lyme disease, Salmonella, mumps, measles, scrapie, dengue fever.**
- **Laboratory personnel can carry out diagnostic tests on the specimens but need to wear gloves, facial protection, and a gown.**
- **Additionally, standard precautions at this level should be applied when handling clinical samples from the current outbreak investigations of acute respiratory distress syndrome (ARDS) caused by COVID-19..**

Risk Group 3 (RG3)/ Biohazard Level 3

- **Agents that are associated with serious or lethal human disease.**
- **Preventive or therapeutic interventions may be available**
- **High individual risk**
- **Low community risk.**
- **Example: West Nile virus, SARS virus, tuberculosis, typhus, Rift Valley fever, HIV, yellow fever, and malaria.**

Risk Group 4 (RG 4)/ Biohazard Level 4

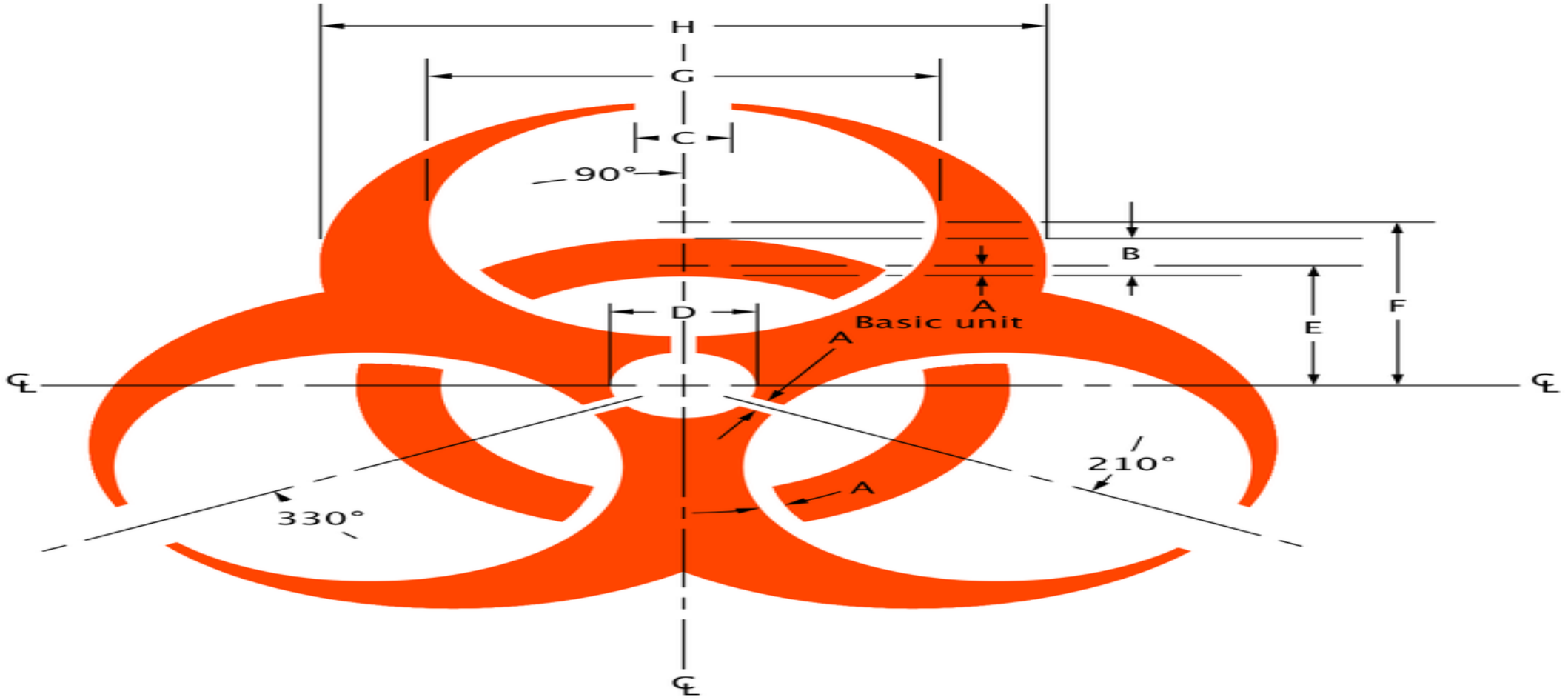
- **Agents that are likely to cause serious or lethal human disease**
- **Preventive or therapeutic interventions are not usually available**
- **High individual risk**
- **High community risk**
- **Example: Bolivian and Argentine hemorrhagic fevers, Marburg virus, Ebola virus, hantaviruses, Lassa fever virus and Crimean-Congo hemorrhagic fever.**

- There are no bacteria in this group.
- Only specific persons can work with these viruses.
- It requires them to wear a positive pressure personnel suit, with a segregated air supply.
- There is no treatment available for these viruses, and extreme isolation precautions are mandatory.

Table 2. ***Relation of risk groups to biosafety levels, practices and equipment***

RISK GROUP	BIOSAFETY LEVEL	LABORATORY TYPE	LABORATORY PRACTICES	SAFETY EQUIPMENT
1	Basic – Biosafety Level 1	Basic teaching, research	GMT	None; open bench work
2	Basic – Biosafety Level 2	Primary health services; diagnostic services, research	GMT plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosols
3	Containment – Biosafety Level 3	Special diagnostic services, research	As Level 2 plus special clothing, controlled access, directional airflow	BSC and/or other primary devices for all activities
4	Maximum containment – Biosafety Level 4	Dangerous pathogen units	As Level 3 plus airlock entry, shower exit, special waste disposal	Class III BSC, or positive pressure suits in conjunction with Class II BSCs, double-ended autoclave (through the wall), filtered air

BSC, biological safety cabinet; GMT, good microbiological techniques (see Part IV of this manual)



Dimension	A	B	C	D	E	F	G	H
Units	1	3.5	4	6	11	15	21	30

The Biohazard Symbol with dimensions as defined in https://archive.org/stream/federalregister39kunit#page/n849/mode/1up

Thanks