



澳門大學
UNIVERSIDADE DE MACAU
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Laboratory Waste in ICMS

實驗室廢物 (ICMS)

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How to deal with the laboratory waste 如何處理實驗室廢棄物？

分類

- **Classification**

處理

- **Treatment**

標識

- **Label (if needed)**

收集

- **Collection**





Wastes we always find in ICMS

- **General Waste**
- **Sharps**
- **Solid hazardous waste**
- **Liquid hazardous waste**
- **Acid & Alkaline**
- **Broken Glass**
- **Empty chemical glass bottle**
- **Biological Waste**
- **Others...**





General waste (household waste)

- **Materials not chemical & biological contaminated**
- **E.g. Paper, unused plastic tools, bottles, can, containers, product packaging, cards, herbs, plants...**





Sharps

E.g. Syringe needle, tip, razor blade, nail ...





Solid Hazardous waste (chemical waste)

E.g. Contaminated Plastic, Container, Gloves, tools or chemicals ***NOT classified as High Dangerous Good***

Yellow Hazardous Bag





DANGEROUS GOODS HAZARD IDENTIFICATION

Hazardous Materials Classification				
2.2 Non-flammable	2.3 Toxic gases	3. Flammable liquids	4.1 Flammable solids	4.3 Dangerous when wet
				
5.1 Oxidizing substances	5.2 Organic peroxides	6.1 Toxic substances	8. Corrosive substances	9. Miscellaneous
				
Highly Hazardous Materials Classification				
1. Explosive	2.1 Flammable gases	2.3 Toxic gases	4.8 Spontaneously combustible	6.2 Infectious substances
				
7. Radioactive material				
				

The hazardous materials classification are based on the IMDG code (International Maritime Dangerous Goods Code)



Liquid Hazardous waste (Chemical waste)

- **Organic Solvent waste**
- **Waste oil**
- **Heavy metal waste (trace metal)**
- **Toxic Waste**
- **Acid and Alkaline**
- ...





Liquid Hazardous Waste

Organic Solvent Waste

- Halogenated
- Non-Halogenated

Do NOT discharge any solvent to the laboratory sink!





Common Organic Solvent Waste in ICMS

Acetonitrile	乙腈	Non-Halogenated
Methanol	甲醇	
Acetone	丙酮	
1-Butanol	正丁醇	
Diethyl ether anhydrous	無水乙醚	
Ethanol	乙醇	
Ethyl acetate	乙酸乙酯	
n-Hexane	正己烷	
n-Heptane	正庚烷	
Isooctane	異辛烷	
3-Methyl-1-Butanol	3-甲基-1-丁醇	
Petroleum ether	石油醚	
Aniline	苯胺	
2-propanol	2-丙醇	
Triethylamine	三乙胺	Halogenated
Chloroform, Trichloromethane	三氯甲烷	
Dichloromethane	二氯甲烷	



Liquid Hazardous waste

Waste Oil

- vacuum pump oil
- silicone oil





Liquid hazardous waste

Heavy metal waste (trace heavy metal) (NOT INCLUDED Hg and radioactive metal)

1. Inform lab technician the info
2. Store it in the collection point (e.g. 6028)





Liquid hazardous waste

Toxic waste

e.g. Hg, Acrylamide (丙烯酰胺), chromate (鉻酸鹽)
pyridine (吡啶)....

Inform lab technician

- Collect them separately
- Seal, Pack & store well,
- store it under a ventilated area if possible
- store it in a designated collection point in any

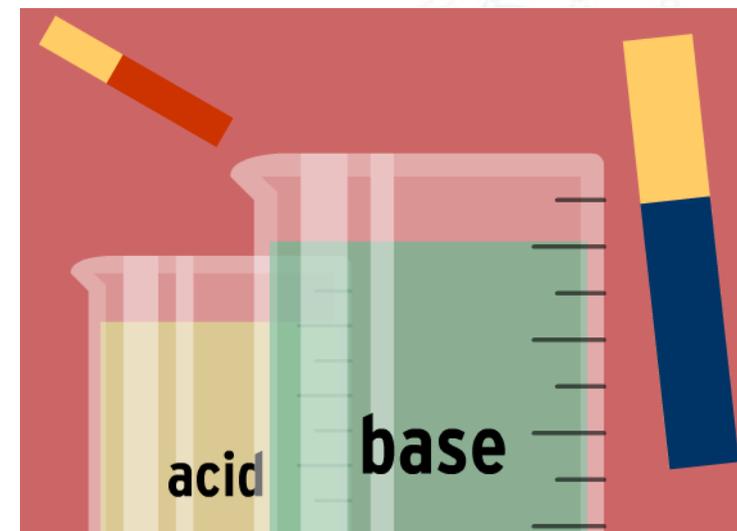


TOXIC RISK
毒性危險



Acid / Alkaline waste

- 1. Waste with low concentration/ small amount:**
 - neutralization PH 6-8
 - dilution
 - Laboratory sink
- 2. Waste with high concentration / Large amount:**
 - inform lab technician
 - Pack well and dispose it as a whole hazardous waste (e.g. one bottle of 1L 98% H_2SO_4)
- 3. Not include chromic acid (H_2CrO_4), Hydrofluoric acid (HF), Perchloric acid (HClO_4)...**





Broken glass disposal

- Broken glass NOT chemical & biological contaminated

E.g. broken separating funnel, beaker, measuring cylinder, test tube...





Empty chemical glass bottles

Pack well and store in the collection point (e.g. Room 6027)





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Biological waste

- **Solid biological waste**
- **Liquid biological waste**
- **Animal carcasses**



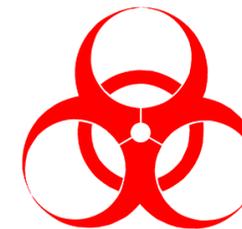


Solid Biohazard waste (biological waste)

E.g. Plasticware, Container, Gloves, tools, paper, etc. that are contaminated with biological specimens, bacterial, cell culture materials, nucleic acids, etc.



BIOHAZARD



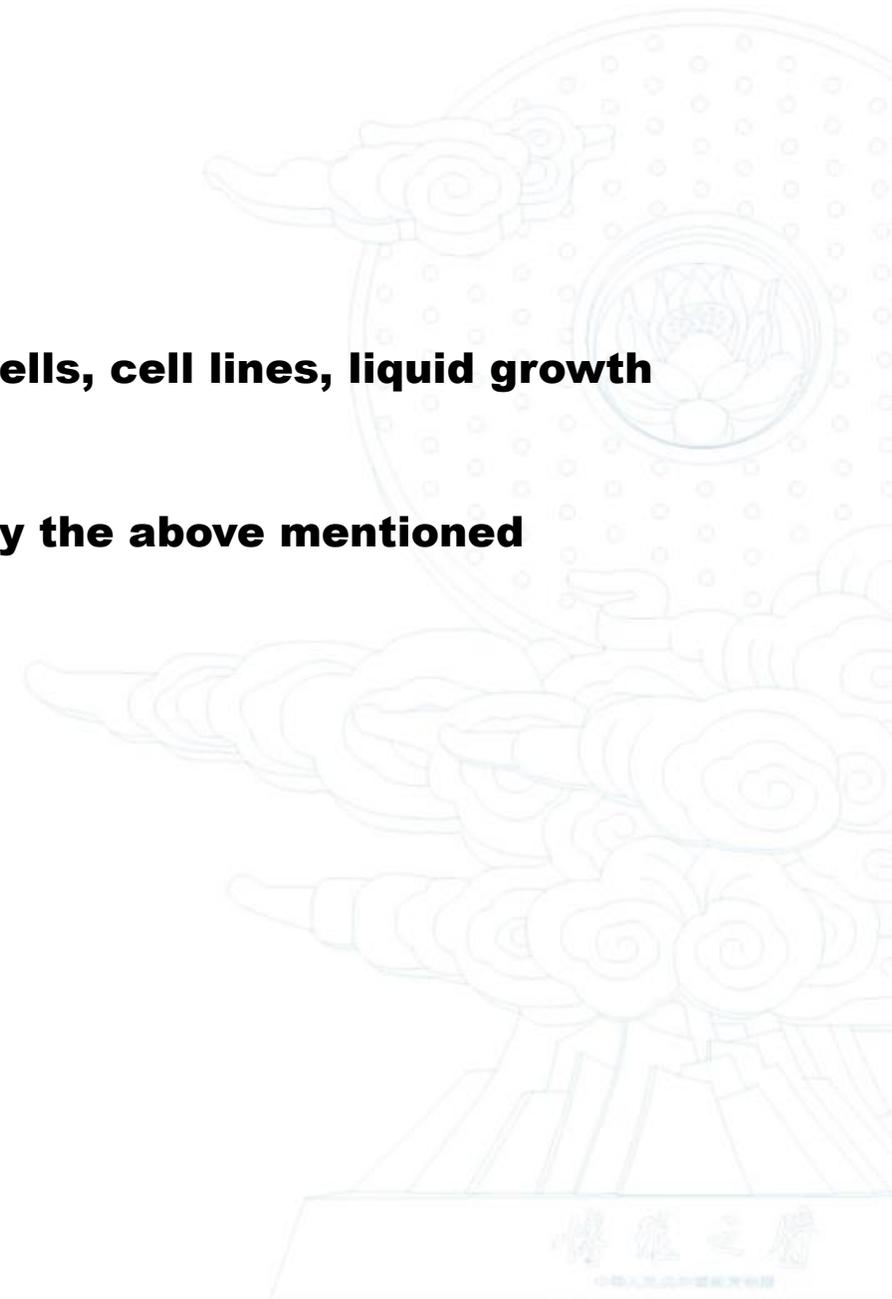
CAUTION
BIOLOGICAL HAZARD





For example, **biological wastes** include:

- ◆ **Bacteria, fungi, viruses, DNA, human or non-human cells, cell lines, liquid growth media....**
- ◆ **Or the materials / tools/ containers... contaminated by the above mentioned agents....**





Liquid (& Solid) Biological Waste Treatment

AUTOCLAVE



13/2013





Liquid (& Solid) Biological Waste Treatment

Heat/Steam sterilization – Autoclaving

Non-toxic

Heat resistant

Pressure: Under pressure e.g. 1.2 KG/cm²

Steam: Saturated steam

Temperature 121°C / 132°C

Time: depends on the waste (usually 15-20mins or more)

Use:

- **pre-disposal treatment and sterilization of waste material**

Hazard:

- **Bleach, flammable, explosive materials are not allowed.
Get Trained before use**





Clean: Disinfection and sterilization

Chemical disinfectant

70% (V/V) Alcohol (Ethanol)

actives against vegetative bacteria, fungi, lipid-containing viruses **but not against spores**

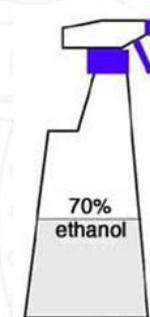
widely available

non-toxic

Non-corrosive, very good for work surface/equipment/BSC/ skin

May harden rubber and dissolve certain types of glue

flammable, should be away from open flames & heat when in use



Bleach (NaOCl > Chlorine, Cl₂)

oxidant,

(e.g.10% Bleach solution)

a widely available and broad-spectrum chemical germicide

Corrosive to metal, do not use it to clean equipment, BSC...

Toxic

Incompatible with the waste treatment plant in N22-building, **Not recommended** in ICMS



VirkonS (Powder or tablet)

Peroxide

1 – 5 % working solution

a Broad spectrum chemical germicide

Non-corrosive / Non-bleaching / biodegradable, more safe

Consider to be **a substitution for bleach solution in ICMS**

a freshly prepared VirkonS solution can be stable for 7 days



<https://www.youtube.com/watch?v=bPKIOj8DTKI>



Liquid (& Solid) Biological Waste Treatment

Physical sterilization:

UV Lamp / UV 燈 :

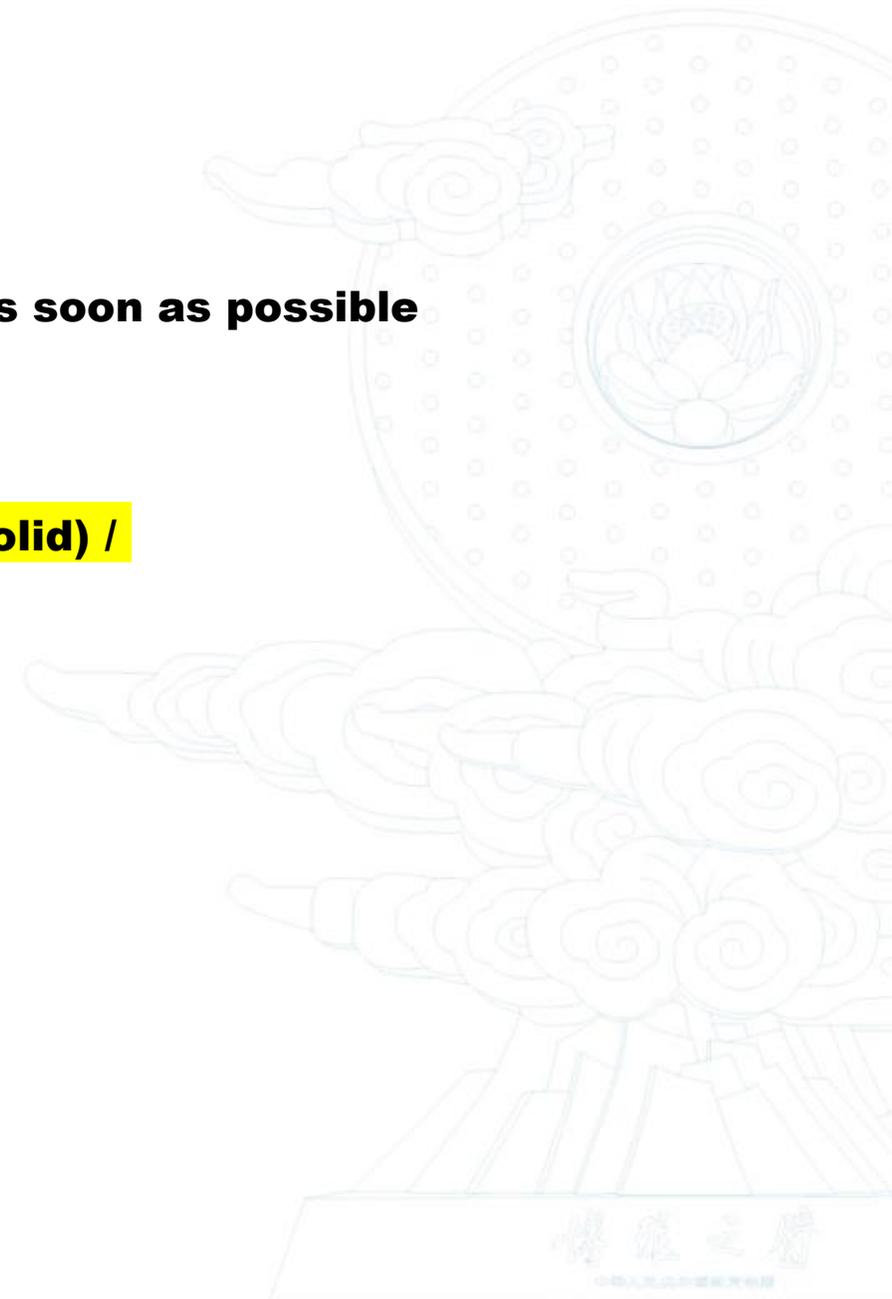
- 254 nm,
- **Use: Sterilizing microbiological contaminates from the working surface**
- **Skin and Eye hazard**
- **Location: e.g. cell culture room, BSC**





**Try to disinfect/sterilize your biological waste as soon as possible
(better within 1 day)**

**Discharge the waste into general rubbish bin (solid) /
laboratory sink (liquid) after correct treatment.**





Biological waste

Animal Carcasses (dead body of animal)

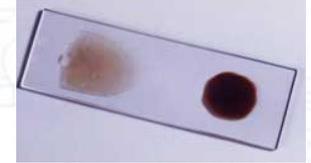
- **Collect in a bio-hazardous bag**
- **Store in the freezer in the Animal Room**
- **Inform lab technicians**
- **Follow the rule during Animal Room Training**





DISCUSSION:

- **Microscope slide with microorganism (e.g. *E.Coli*)??**
- **Organic solvent and toxic chemical mixture??**
- **Chromatography silica??**
- **Culture media with biological specimen??**





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Thank You!

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