Risk Assessment

- Identify hazards and causes
    - Look at microbes, risk group, infectious dose, nature of work
    - Chemicals and their SDS
    - Equipment to be used
    - Processes/tasks to be carried out
    - How will agents be stored and transported
    - Hazardous waste products
    - Any workers who are more susceptible (immunocompromised, pregnant)
    - Emergency situations (spill, fire, explosion, release to atmosphere)
- Assess risk
    - How severe is the harm
    - What is likelihood of occurrence
- Control hazards in order of reliability
    - Eliminate hazard
    - Substitute
    - Isolate
    - Engineering
    - Administration
    - PPE
- Review control measures

Safe Work Procedure

- Author
- Title and basic description of activity or process
- List potential hazards and risk control as specified in risk assessment including specific precautions, include title and location of risk assessment
- Resources required to perform task (plant, chemicals, PPE)
- Step by step instructions to carry out task safely
- Instructions on emergency shutdown
- Emergency procedures on dealing with emergency situations
- Clean up and waste disposal requirements
- Requirements from legislation, standards and codes of practice used in developing SWP
- Competency and training requirements (qualification, certification, licensing)
- Person or position that has supervisory responsibility for process
- Sign off sheet demonstrating competency

Safe Handling of Biological Fluids

Introduction

- Greater risk from handling biological material, especially with HIV/AIDS
- Main problems are HIV and Hepatitis B and C, but immunisation against Hep B available
- Urine, saliva much less risky but contaminated glassware or respiratory valves should be sterilised by alcohol/chemically or autoclaving

Learning Objectives

- Be wary of risks in handling body fluids

- Safety procedures when handling body fluids
- Simple aspects of blood groups

Blood Typing

- Spills cleaned with 1% Virkon, then water and commercial detergent
- Blood typing – ABO

Blood group (%)	RBC (antigens/agglutinogens)	Plasma (antibodies)
A (38)	A antigen	B antibodies
B (10)	B antigen	A antibodies
AB (3)	A and B antigen	Neither
O (49)	Neither	A and B antibodies

- A antigens (blood group A) will be agglutinated by anti-A plasma, AB by both, O by neither
- People with AB can receive any blood type as they don't have any A or B Antibodies (they have both A and B Antigens). O blood group doesn't express any A or B antibodies hence not reacting with donated bloood

Appendix – Donating Blood

- Fit, healthy, not suffering from illness in the previous 7 days
- Over 50kg
- Cannot donate if
    - HIV positive
    - Hep B, Hep C
    - Injected with drugs not prescribed
    - Infectious diseases with overseas travel
        - Malaria
        - HIV
        - Mad Cow-Variant Creutzfeldt-Jakob disease (vCJD)
        - Dengue fever
        - West Nile virus
- Cannot donate if in the past 12 months
    - Blood transfusion
    - Been in prison
    - Sex with an at risk person
- Can donate if
    - Registered acupuncture
    - Over 16
    - Birth control pills
    - Genital herpes unless suffering from a current episode
    - 6 months after a tattoo

Excitable Cell Physiology

Membrane Potentials

- The concentration differences that exist between ECF and ICF are essentially energy differences.
- Permeability of artificial membrane to K^+ or Cl^-
- ICF remains constant concentration at 150mM
- Setup

- Auxiliary chambers with 3M KCl, Ag/AgCl electrodes attach to voltmeter with 200mV range
- Salt bridges connect auxiliary chambers with ICF/ECF
- ICF and ECF connected by funnel to artificial membrane
- Common earth electrode connected to ECF (since membrane potentials calculated wrt ECF)

- Experiment – membrane potential upon KCL dilution
  - 1.5, 5, 10, 50, 100, 150mM solutions of KCl prepared
  - Suck ICF/ECF, replace with 150mM KCl
  - Make sure no air bubbles near membrane/funnel
  - Record voltage
  - Repeat with different ECF concentration
  - Nernst equation
    - $V_m = \frac{RT}{zF} \times \ln\left(\frac{[X]_o}{[X]_i}\right)$
    - R (universal gas constant, 8.3145)
    - T (absolute temperature, C + 273.15)
    - F (Faraday's constant, 96485)
    - Z (valency of species)
    - [X] (concentration)

ECF [KCl] (mM)	Measured potential (mV)	Theoretical K^+ Nernst potential (mV)	Theoretical Cl^- Nernst potential (mV)
150 control	0	0	0
100	36.2	-10.2	10.2
50	21.9	-27.8	27.8
10	54.3	-68.4	68.4
5	76.5	-85.9	85.9
1.5	82.8	-116.3	116.3
150 wash	1.1	0	0

  - Plotting on voltage vs log concentration scale produces negative linear line, theoretical Cl^- potential was slightly higher than measured values
  - Conclusion
    - When ECF was changed, concentration gradient set up from ICF → ECF
    - Funnel membrane selectively permeable to Cl^-, Cl^- ions moved down its concentration gradient from ICF → ECF
    - ECF therefore became negatively charged, while ICF became positively charged, generating positive membrane potential

Neurons in Action

- AP refractory periods
  - Procedure
    - Set delay of second pulse to 9ms after first
    - Keep pulse duration very short (0.15ms)
    - Keep both stimulus amplitudes of 0.2nA
    - Change delay to find relative refractory period

Increase stimulus strength of second pulse to 1nA, then repeat to find absolute refractory period. After