Glove Selection Guide

1. SCOPE

There is no one type of glove that will protect against all the hazards encountered in the workplace. That is why it is important to conduct a risk assessment prior to the purchase and selection of any gloves in order to determine the aspects of use and the type of glove to suit the task or tasks being performed.

This guideline should be consulted when choosing which glove to be worn to protect against a specific hazard.

2. DEFINITIONS

Usual terms referred to in glove compatibility charts are:

- Breakthrough time - Time it takes for the chemical to travel through the glove material. This is only recorded at the detectable level on the inside surface of the glove.
- Permeation Rate - The rate at which the chemical passes through the glove material. This involves the absorption of the chemical into the glove material, migration of the chemical through the material, and then desorption once it is inside the glove.
- Degradation rating - The change to the physical properties of the glove as it is affected by the chemical. This includes, but is not limited to swelling, shrinking, hardening, cracking, etc. of the glove material.

3. TRAINING REQUIRED

At the workplace, training should be provided on the appropriate use of gloves. This training includes:

- How to choose the right type of glove for the task
- Appropriate method of glove removal
- Cleaning and maintenance
- How to inspect gloves for wear and tear

4. HAZARDS

The table below discusses the most common hazards requiring gloves to be used as personal protection equipment (PPE).

Table 1. Hazards requiring the use of gloves

Type of hazard	Considerations
Chemical	Glove selection guides can be found in catalogs of various scientific and safety suppliers. Gloves are rated for degradation, breakthrough, and permeation rates. Choose a glove that provides the best resistance to the chemical being used. For some hazards, double gloving may be needed.
Biological	Standard latex exam gloves provide protection for biological hazards. Non-latex gloves such as synthetic rubber, nitrile, vinyl, or neoprene also provide acceptable barrier protection against biological hazards without the potential to cause severe allergic reactions associated with latex. If required, sterile packaged gloves are also available from various brands. Note: for combination of biological and chemical hazards, the chosen glove must provide protection from both the chemical and the biological material.

Type of hazard	Considerations
Radioactive	For radioactive hazards, glove selection is based on the carrier material (e.g. water, toluene, etc.). Radioiodination procedures require double gloving.
Physical (sharps, extreme temperatures)	Cut resistant gloves should be worn when working with sharp objects or glass that may shatter. Thermally protective gloves are necessary to protect against hot and cold burns. It is important to consider the level of dexterity required by the task as some of the gloves can reduce dexterity.
Combination of chemicals	Where different chemicals have different recommended glove material, the best choice is usually the glove with the greatest resistance to the chemical (e.g. the slowest breakthrough time). In some cases, it may be necessary to double glove when no single type of glove material will provide full protection. In this case, it is advisable to select two sets of gloves made from different materials. If one chemical is significantly more dangerous (e.g. highly toxic) than others, then this may take priority for choice of glove material rather than chemical breakthrough time. Seek advice from your supervisor if you are uncertain about which should take priority (i.e. fastest breakthrough time or highest toxicity).

5. GLOVE MATERIALS

Depending on the type of hazard identified and contact time, different glove materials will provide different protection. See a summary below*.

Glove material	Protects against	Advantages	Disadvantages
Natural rubber (Latex) 	Biological hazards	Excellent tensile strength and elasticity	Can cause allergic reactions
Butyl 	Peroxide, strong acids and bases, alcohols, aldehyde, ketones, esters.	Protects against a wide variety of chemicals	Do not use with aliphatic and aromatic hydrocarbons and halogenated solvents
Neoprene 	Alcohols, oxidizing acids, hydraulic fluids, phenol, glycol ethers	Good pliability, finger dexterity, high density and tear resistance	Poor for halogenated and aromatic hydrocarbons
Nitrile  **(disposable or reusable)**	Biological hazards Oils, greases, aliphatic chemicals, xylene, alcohols, acids and caustics	Good dexterity and sensitivity	Poor against strong oxidizing agents, benzene, methylene chloride, phenol, ketones, acetates and aromatic solvents
 **Polyvinyl chloride (PVC)**	Strong acids and bases, salts, and other water solutions	Can be used for immersion, less dexterity and sensitivity	Plasticizers can be stripped, poor tear resistance

Glove material	Protects against	Advantages	Disadvantages
 **Cryogenic gloves**	Cryogens	Protects against tissue damage from cryogens or very cold containers and equipment	Not for immersion
Leather 	Welding, sheet metal work, handling hot or cold objects, gardening	Provides protection against heat, cold, sparks and cuts, they come in a wide variety of styles and fit	Not for working with liquids and when wet will offer poor protection against heat and cold
Kevlar brand fiber 	Work where temperature extremes are an issue	Protects against tear, abrasion and cutting	Thicker gloves can impede movement
Mesh gloves 	Used for work that requires repeated cutting and slicing	Protects against cutting and slicing	Steel mesh gloves can be heavy and impede movement
 **Aluminized gloves**	Furnace work, handling hot objects	Provides good protection against heat	Not to be used for electrical work
Cotton 	General duty work	Moderate resistance to heat and cold	May need to be thicker to offer full protection

* The photos included are examples; glove colors and appearances will vary.

6. GLOVE SELECTION

To ensure the most appropriate glove(s) are used for the task and environmental conditions, it is necessary to consider several important factors (e.g. the type of hazard and its properties, the manual dexterity required, the duration and nature of contact, etc.). Use the tables below to help you with the selection process.

GLOVE SELECTION FLOWCHART

1. Identify the hazard

Base selection of glove type and material on the type of exposure and nature of the hazard.

Consider:

- chemical type
- temperature extremes
- toxicity
- physical hazards (sharps, piercing objects)
- pH
- infectious potential of biological hazards

Read the Safety Data Sheets (SDSs) for the chemical(s) involved - section 8 has information on PPE and recommended gloves. Some chemicals can easily penetrate gloves that work very well for other chemicals.

2. Determine the type of contact

Incidental contact (little or no direct contact) includes this situations:

- accidental spills or splashes
- accidental overspray from a dispensing device
- handling infectious agents that require barrier protection
- to prevent contamination of materials during handling

Extended contact includes these situations:

- handling highly contaminated materials
- submerging hands in a chemical or other hazardous substance
- need for physical protection from temperature extremes or sharp/piercing objects

3. For incidental contact

Type of glove: disposable, surgical-type gloves are appropriate for incidental contact. *Nitrile gloves* are preferred over latex because their chemical resistance, their tendency to visibly rip when punctured, and to prevent latex allergies (see Table 2)

Disposable glove usage:

- check for rips or puncture before use
- remove and replace gloves immediately with new ones when a chemical spills or splashes on them
- never wash or reuse disposable gloves
- always remove glove before touching common objects as doorknobs or phones

4. For extended contact

Type of glove: more substantial gloves are required for extended use (see Table 2)

Reusable glove usage:

- check gloves for
  - rips or punctures before and after each use
  - prior contamination
  - signs of degradation (change in color or texture)
- replace gloves as soon as signs of degradation appear
- wash after removal and air dry in the laboratory
- consider wearing inner surgical gloves for extra protection

5. Dispose of used and damaged gloves

Disposed of gloves according to whether or not they are contaminated with a hazardous material.

- No contamination: place in the regular lab trash
- Radioactive materials: see the Radiation Reference Manual
- Chemical or biohazard contamination:

ALWAYS wash your hands after removing gloves.

7. ADDITIONAL RESOURCES

Use these additional resources for information on specific chemicals or glove materials.

Chemical compatibility and permeation charts

- VWR Chemical Resistance Guide
- Fisher HealthCare Chemical Resistance Guide

Glove sizing

- Fisher Scientific Glove Sizing Guide
- Grainger Safety Glove Size Chart

General

- Canadian Centre for Occupational Health and Safety – Glove selection
- WorkSafe BC – Glove removal procedure

8. DOCUMENT INFORMATION

Written / Reviewed by:	SRS Advisor, Chemical Safety
Contact:	research.safety@ubc.ca