

Medical Gloves:

WHAT YOU NEED TO KNOW

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What are medical gloves?

Prevent
harmful
infections

Made of
polymer

Powdered or
powder-free

For
surgical and medical
procedures



Disposable

Medical Glove Types

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graph TD; A[Medical Glove Types] --> B[Examination]; A --> C[Surgical]; B --- B1[Natural rubber latex]; B --- B2[Vinyl (PVC)]; B --- B3[Nitrile]; C --- C1[Natural rubber latex]; C --- C2[Polychloroprene]; C --- C3[Polyisoprene];
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Examination

Natural rubber latex

Vinyl (PVC)

Nitrile

Surgical

Natural rubber latex

Polychloroprene

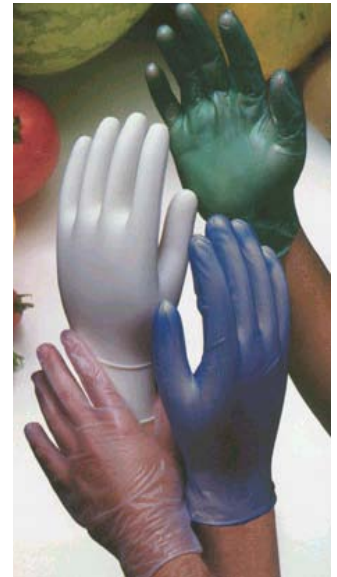
Polyisoprene

Question:

Do **ALL** gloves provide the same degree of safety measure that is needed?

Answer:

NO





Different Glove Materials



Different barrier properties

&

Different glove qualities



Barrier Protection

The most important glove function:

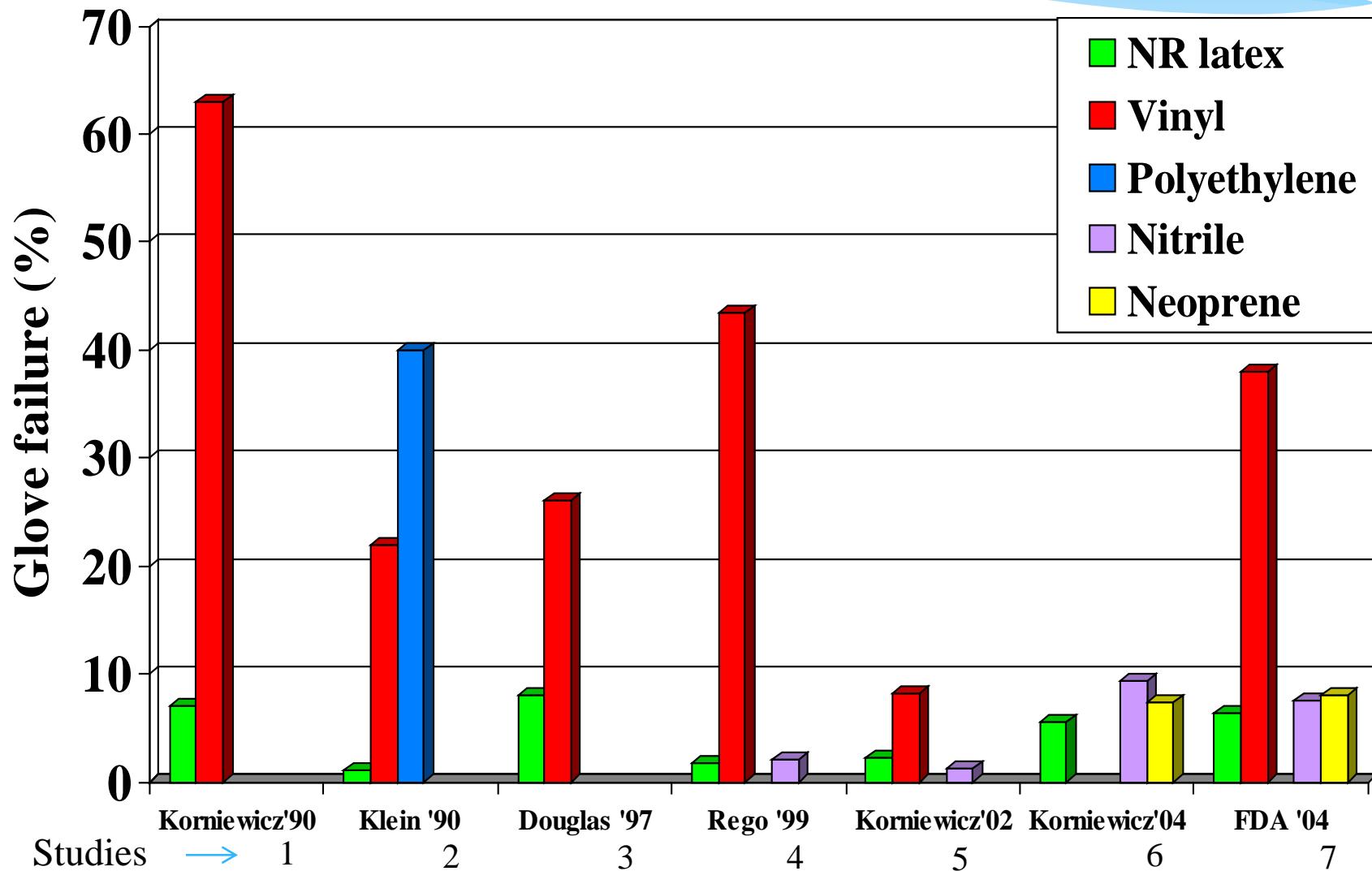
Ability to provide very effective barrier protection against blood pathogens and harmful infections

- ▶ **Barrier Properties:**
 - Barrier performance
 - Comfort, fit, durability
 - Puncture/tear resistance
 - Tactile sensitivity

Aspects of Interest

- ▶ Potential Health Risks:
 - *Latex protein allergy*
 - *Chemical toxicity (DEHP)*
- ▶ Environmental Impact

Barrier Integrity of Medical Gloves – “In-use” – 7 studies



Barrier Effectiveness of *Punctured Gloves* Against Viral Penetration (**Resealing Properties**)

Gloves	Needle diameter = 0.22mm Virus leak (% of gloves)	Needle diameter = 0.45 mm Virus leak (Volume, ml)
Vinyl	78%	3 – 18
Nitrile	53%	8 – 11
NR latex	Zero failure	0.013 – 0.023

Challenge virus - Φ X 174, diameter = 27 nm

(Hasma & Othman 2001)

Comfort and Fit

Ability of gloves :

- ▶ **to stretch**
- ▶ **to remain soft**
- ▶ **conform to hand**



Durability of Medical Examination Gloves

U.S. FDA – “Assessment of the Durability of Medical Examination Gloves”, J. Occupational & Environmental Hygiene, 2004; 1: 607-612

NR latex

Nitrile

> > > **Vinyl**

Polychloroprene



Tactile Sensitivity

Latex >> Synthetics

ASTM Glove Standards

Lower specifications for non-latex gloves

Property	Surgical		Examination			
	NR	SR	NR	Vinyl	Nitrile	Poly-Chloroprene
Min. TS (MPa) (Strength)	24	17	18/14	11	14	14
Min. EB (%) (Elasticity)	750	650	650	300	500	500
	(ASTM D3577)		(D3578)	(D5250)	(D6319)	(D6977)

NR – natural rubber latex
SR, Vinyl, Nitrile, Polychloroprene – synthetic, non-latex

Potential Health Risks

- ❖ Latex Protein Allergy
- ❖ Chemical Toxicity
(DEHP in Vinyl products)



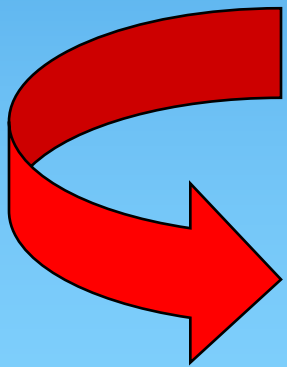
What is Latex Protein Allergy?

- Type I allergy of immediate hypersensitivity
- Type I allergy can be caused not only by latex proteins, but also by some foods like fish, crab, peanut, banana, water melon, kiwi etc.
- Symptoms include watery eyes, runny nose, asthma and in rare cases, anaphylactic shock.
- Prevalence for latex protein allergy is 1% for the general public, and higher among healthcare workers, 0.6% - 10%

Latex gloves with:

High residual proteins

High powder content



Cause of allergy

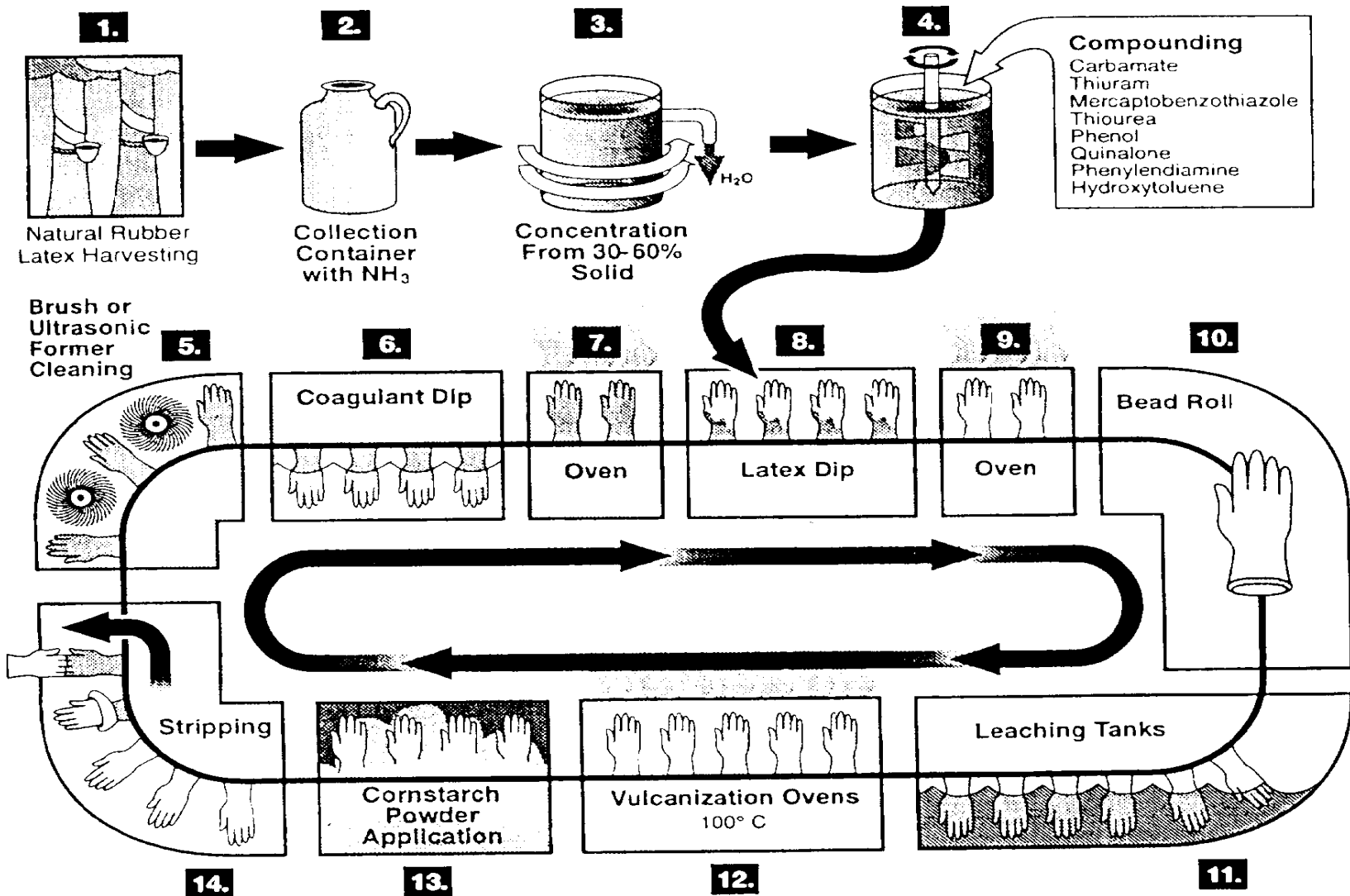
Hevea Brasiliensis Latex



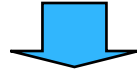
It contains:

- Rubber particles
- Proteins
- Carbohydrates
- Inorganic constituents
- Water

Latex Glove Line (Schematic)



Powder-free gloves



Often low protein content –

Due to extensive washing, and chlorine treatment during processing

Powdered gloves



Can also have low protein content – using modern technologies

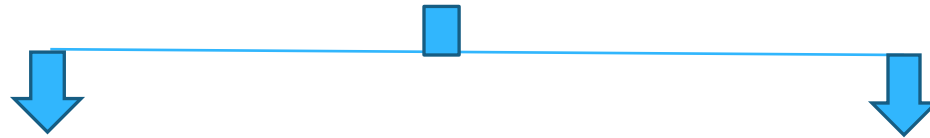
Manufacturing Improvements



Low protein powder-free latex gloves in hospitals

- Eliminate sensitization;
- Significant reduction in incidence of latex allergy reactions;
- Healthcare workers using these gloves can now work alongside their latex allergic co-workers with no heightened allergy concerns

Solution to Allergy Problem



*For majority of
healthcare workers*

*For latex allergic
individuals*



Low-protein
NR latex



Nitrile,
Polyisoprene,
Polychloroprene

Chemical Toxicity

DEHP: 2 Di-ethyl hexyl phthalate



DEHP is a highly toxic plasticizer used in many **vinyl gloves** to make them more flexible



Often 30-50% in vinyl products



DEHP can leach out from vinyl gloves:

- ◆ when in contact with blood or body fluids of patients during medical procedures
- ◆ when in contact with food during food handling



Adverse Effects of DEHP

- ▶ Toxic to liver, kidney and heart
- ▶ Causes reproductive problems:
 - *Toxic to Sertoli cells (sperm production)*
 - *Reduced fertility*
 - *Ovarian dysfunction*
 - *Structural changes in testes*
- ▶ Decrease hormone production in females
- ▶ Fetus malformation
- ▶ Listed as probable human carcinogen

Sanctions against DEHP

- * US Department of Health and Human Services issued warning on use of PVC medical devices with DEHP
- * Many countries have banned DEHP in children's toys
- * Japan and the European Union have banned DEHP in food service gloves
- * DEHP is banned in California's Safe Drinking Water and Toxic Enactment Act of 1986





Impact on Environment

- *Raw materials
- *Disposal of end-products

Natural Rubber Latex

Green material – *environmentally-friendly*:

- ▶ Sustainable and renewable resource
- ▶ Biodegradable

Conclusion

Latex gloves –

These remain the gold standard (superior barrier performance, durability, comfort, fit, tactile sensitivity, high tear resistance.) However, only *low-protein* gloves should be used.

Vinyl gloves –

Not for medical procedures (high risks exposure to blood etc.) appropriate only for short-term low-risk tasks that involve minimal stress.

Nitrile and other synthetics –

More superior than vinyl gloves, but are more costly. They are recommended *for latex allergic individuals* who have to avoid latex proteins.

Standard Malaysian Glove *for* *Quality Certification*

- A voluntary certification scheme for latex examination gloves
- Establishes requirements for **4 Ps**:

- ❖ Pin holes
- ❖ Physical properties
- ❖ Protein content
- ❖ Powder content



POWDER-FREE



POWDERED

- Operated by the Malaysian Rubber Board, an ISO/IEC Guide 65 body, authorized by Standards Malaysia
- Assurance that SMG gloves comply with the requirements of the SMG specification

Barrier Integrity and Protein Content

Requirement	SMG	Other standards
Freedom of Holes (AQL)	1.5 <i>Stringent low defective rate required</i>	1.5 – 2.5 <i>(EN, ASTM, ISO)</i>
Extractable Protein Content ($\mu\text{g}/\text{dm}^2$)	50 <i>(Powder-free)</i> <i>Very low protein limit permitted</i>	200 <i>(ASTM)</i>

*For more information about NR
latex medical gloves:*

www.latexglove.info

www.smg-gloves.com





Malaysia is the World's Leading Exporter of Medical Gloves

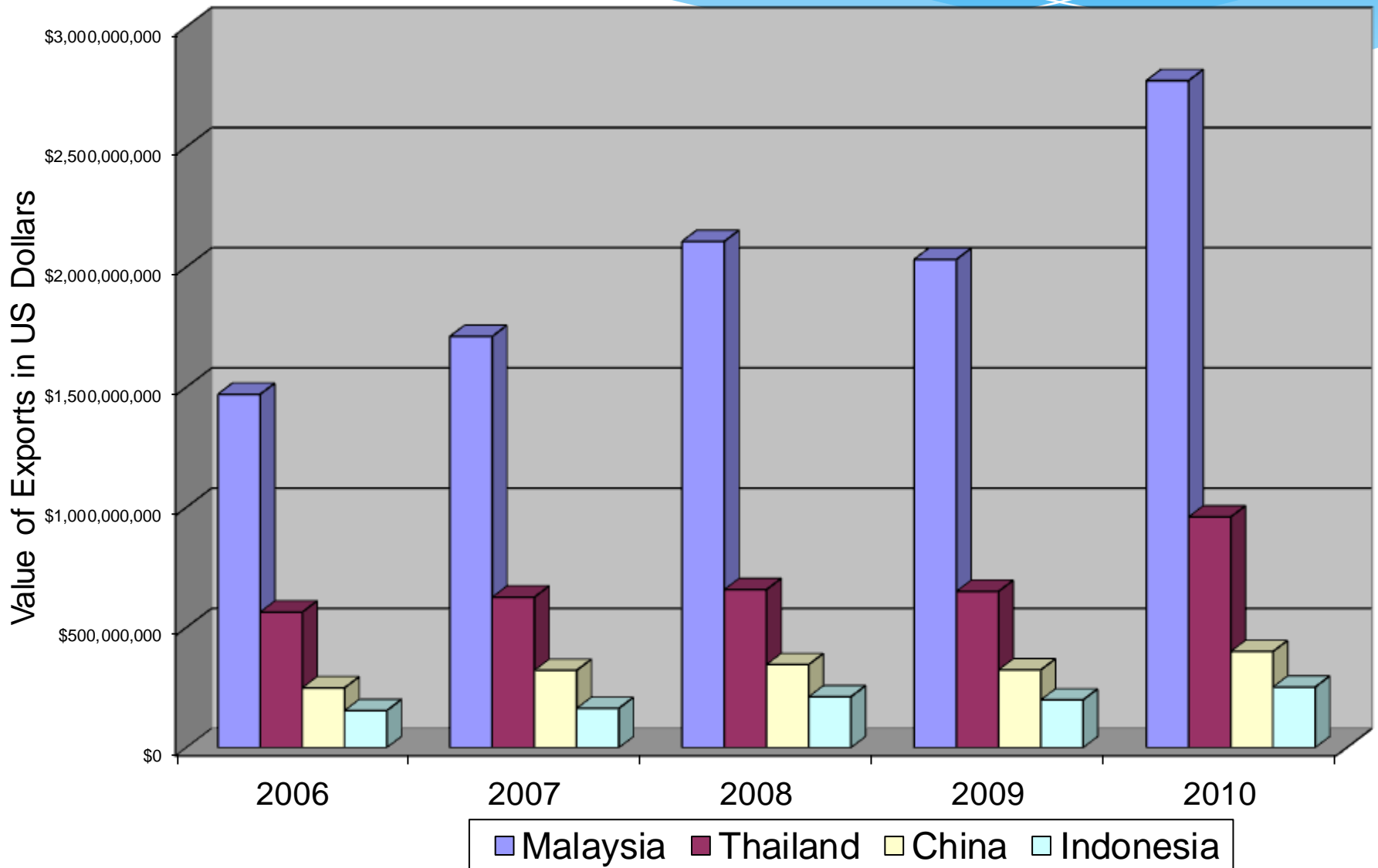


Currently exporting to 180 countries



Supplying > 50 % of the world's demand

World's Major Exporters of Rubber Gloves (HS 401511 & HS 401519) (2006-2010)



Source: Global Trade Atlas



For more information about
Malaysian Rubber Export Promotion Council

Please visit:

www.mrepc.com



*Thank you
for your attention*

