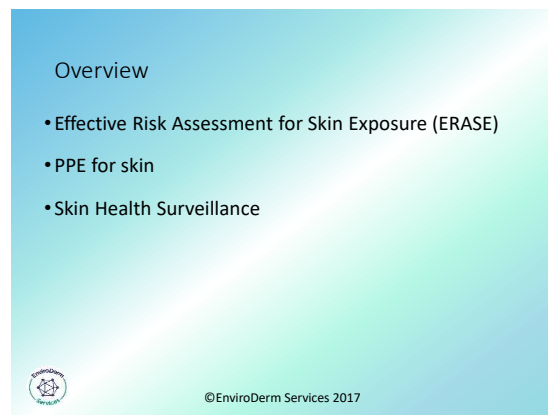
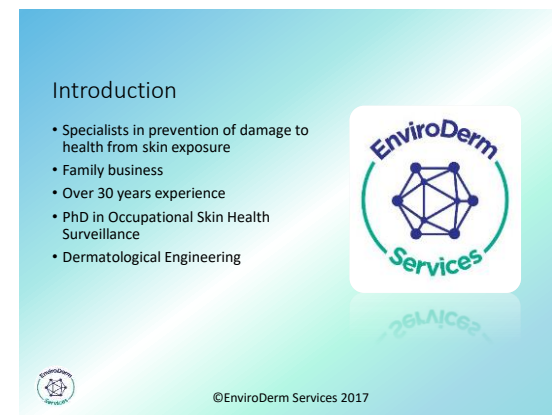




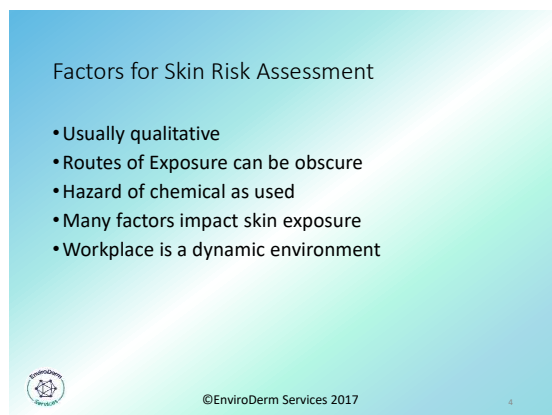
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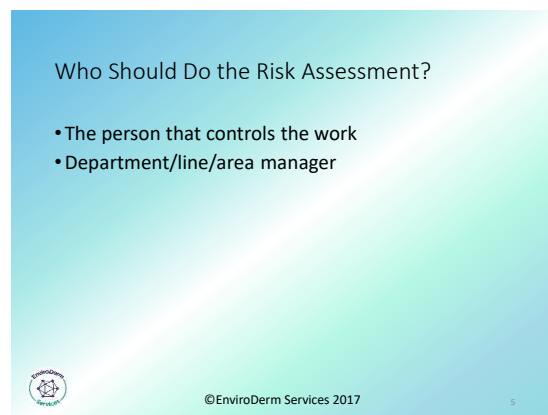
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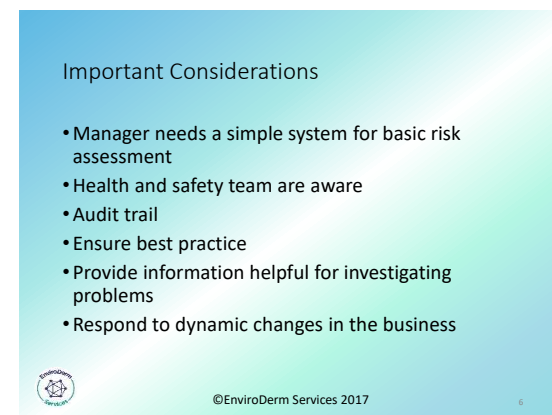
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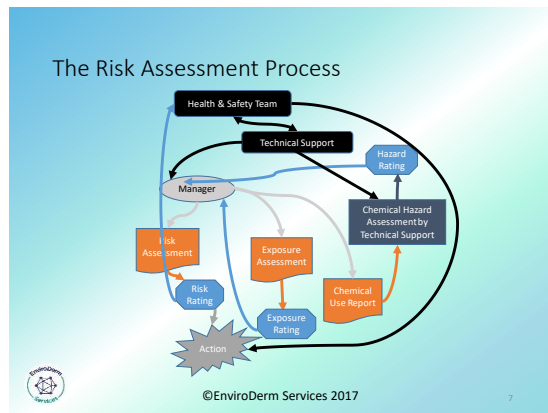
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### Chemical Use Report

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- ### Hazard Rating
- Permanency
  - Effect
  - Time Scale
  - Systemic or local
  - Duration of effect
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- ### Exposure Assessment
- Extent
  - Duration
  - Frequency
  - Probability
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### Exposure Assessment

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### Exposure Assessment: Extent of exposure

Exposure	Details	Factor
Light	Almost no exposure	1
Medium	More obvious splashing, clearly visible	2
Heavy	Extensive splashing, visible soiling of workwear	3
Extreme	Immersion in liquid or slurry, heavy skin soiling	4

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### Exposure Assessment: Duration of exposure

Duration	Time	Factor
Short	<2 minutes	1
Medium	2-10 minutes	2
Long	10-60 minutes	4
Continuous	>60 minutes at any one time	6



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### Exposure Assessment: Frequency of exposure

	Frequency	Factor
Seldom	Not every day and not more than once a day	1
Occasional	2-3 times per day but not every day	2
Regular	3-5 times per day	4
Frequent	More than 5 times per day	6
Extreme	More than 20 times per day	12



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### Exposure Assessment: Probability of exposure

Probability	Factor
Virtually excluded	0.1
Improbable, but possible	0.5
Possible	0.75
Highly probable	0.9
Forms part of the normal activity	1.0



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### Exposure Rating

$$\text{Exposure Rating} = \frac{(\text{Extent} + \text{Duration} + \text{Frequency}) \times \text{Probability}}{2}$$



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### Risk Assessment: part 1

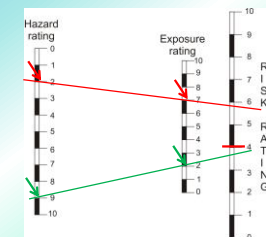
Extent	Duration	Frequency	Probability	Exposure rating	Hazard rating
4	4	6	1	7	2
2	2	4	0.5	2	9



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### Risk Assessment: part 2



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### What Next?

- Risk rating above threshold; help required from relevant support
- Risk rating below threshold can get on with task
- Health & safety team can review and intervene if necessary



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### ERASE

- Empirical approach
- Consistent
- Can be used by non-specialist
- Can be monitored easily by health & safety team
- Clear audit trail



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### ERASE Benefits

- Conducted by those with first hand knowledge of the task
- No significant knowledge of chemicals required by assessor
- Can be updated easily
- Managers encouraged to 'think' health and safety
- Clearly documented risk assessment system
- Risk assessments more likely to represent the real risk



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### Control of exposure using PPE

So far as is reasonably practicable, the prevention or adequate control of exposure of employees to a substance hazardous to health, except to a carcinogen or a biological agent, shall be secured by measures **other than** the provision of personal protective equipment.

COSHH Regulation 7(2)

There is in effect a hierarchy of control measures, and PPE should always be regarded as the **'last resort'** to protect against risks to safety and health; engineering controls and safe systems of work should always be considered first.

PPE ACOP, para. 20

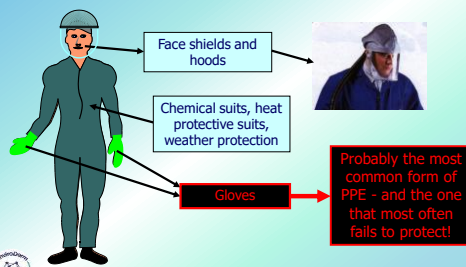


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### PPE for dermal protection can include ...



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### Ways in which gloves can fail



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### Misuse

- Using the wrong glove
- Using gloves when not necessary
- Using gloves of the wrong size or length
- Incorrect donning or doffing of gloves
- Using gloves for prolonged periods without a cotton liner
- Inadequate training on glove use



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### Misuse - Not using the right glove

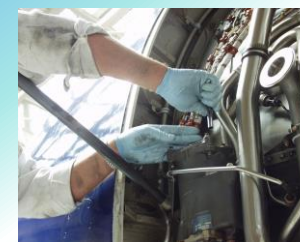


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### Misuse - A glove too short



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### Misuse - Storing where they can become contaminated



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### Misuse or Physical Damage



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### Physical Damage



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## Degradation – direct damage to the glove material

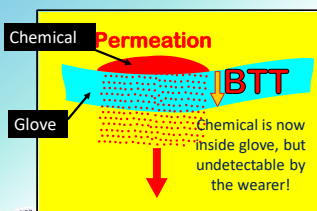


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## Permeation

Permeation is a transfer of the liquid at molecular level through the glove material. It is invisible and undetectable by the wearer.



What we need to know is the permeation breakthrough time (**BTT**) for **that chemical** with **that particular** glove.

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## Classification of Gloves



Permeation breakthrough time in excess of **30** minutes from **six** of the chemicals in a selected list. The chemicals are indicated by the letters below the pictogram

Permeation breakthrough time in excess of **30** minutes from **three** of the chemicals in a selected list. The chemicals indicated by the letters below the pictogram.

A permeation breakthrough time in excess of **10** minutes against **one** of the chemicals in a selected list. Minimal hazard and splash protection

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## Permeation

### Permeation Breakthrough Time . . .

The permeation breakthrough time may be given in minutes or, under EN standards (EN374), by "class".

Measured breakthrough time (minutes)	Protection index (class)
>10	1
>30	2
>60	3
>120	4
>240	5
>480	6

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## Potential Effects of Temperature on Permeation Breakthrough Times (BTT)

Chemical	BTT @ 23°C	BTT @ 35°C
N-Butanol	>480	240 (50%)
Diethylamine	60	6 (10%)
Dipentene	>480	36 (7.5%)
Isobutanol	>240	>240 (100%)
Methyl Ethyl Ketone	>1440	>240 (16%)

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## Choosing a Glove for a Mixture

Spray gun cleaner	NRL	Nitrile	Chloroprene	Butyl	Viton
Toluene	X	1	X	1	6
Xylene	1	2	X	2	6
Acetone	2	X	1	6	X
MEK	X	X	X	5	1
Ethyl/butyl acetate	1	1	1	1	4
Isopropyl alcohol	1	6	4	6	6
Methanol	1	2	1	4	6

1	2	3	4	5	6
>10	>30	>60	>120	>240	>480

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### Potential Effects of Mixtures on Permeation

Chemical	BTT (35°C)
Methy-ethyl-ketone (MEK)	>240 mins
Toluene	>240 mins
MEK + Toluene (1:1)	9 mins
Acetone	>240 mins
Petrol	>240 mins
Acetone + Petrol (1:1)	3 mins



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### Assessing the Safe Maximum Use Time (SMUT) for chemical protective gloves is complex!

There are many factors which affect how long a glove may be used with safety.

Decrease ←	BTT	→ Increase
Degradation		Volatility
High temperature		Intermittent contact
Mechanical damage		Incomplete contact
Mixtures		Low temperature
Abrasion		Mixture strength
Flexing and stretching		Frequent glove washing
Ageing		
Poor maintenance		



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### Testing under actual working conditions



Glove material: Nitrile  
Chemical: Xylene  
Nominal BTT: >30 mins.  
Usage: immersion for component cleaning

Until we have a system which integrates the various factors the SMUT of a glove as protection is simply guesswork!

Location	µl detected	
	Time: (mins) 5	Time: (mins) 15
1	0	0.35
2	0	0.07
3	0.16	3.16
4	0.33	1.32



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### Testing under actual working conditions



Glove material: Nitrile  
Chemical: Xylene  
Nominal BTT: >30 mins.  
Usage: splash protection only

Until we have a system which integrates the various factors the SMUT of a glove as protection is simply guesswork!

Location	µl detected	
	Time: (mins) 5	Time: (mins) 15
1	0	0
2	0	0
3	0	0
4	0	0



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### Phenolic resin compound

	Latex	Nitrile	Chloro-prene	Butyl	Viton
Ethanol (20-25% wt)	2	4	3	6	6
Phenol (10-15% wt)	5	3	6	6	6
Formaldehyde (2% wt)	2	6	5	6	6
Modified phenolic resin	n.d.	n.d.	n.d.	n.d.	n.d.

>10	1
>30	2
>60	3
>120	4
>240	5
>480	6

Data taken from KCL catalogue

Optimum glove is thus from butyl rubber, but...

...what about physical contamination by the resin?

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### Solvent for epoxy compound

Solvent for removal of excess uncured special resin was being applied using a cloth. Manufacturer's recommendation was PVC gloves. Six out of 12 workers had dermatitis and were off work permanently.

	Latex	Nitrile	Chloro-prene	Butyl	Viton
Methylene chloride 90%	0	0	0	1	4
Methanol 10%	0	2	2	6	4

Data taken from KCL catalogue

>10	1
>30	2
>60	3
>120	4
>240	5
>480	6



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## Other Considerations

- Size
- Storage and disposal
- Effects on productivity
- Effects on operating costs
- Effects on health and safety

43

43

## Effects on health and safety from wearing gloves

Possible increased risk of accident due to loss of dexterity

Possible skin reactions due to occlusion

Possible skin reactions due to gloves themselves

Irritant contact dermatitis due to hyperhydration and irritant effect of sweat: **the most common cause** of skin problems from wearing gloves

Allergic contact dermatitis (chemical allergy) is more common, due to reactions to chemicals used in glove manufacture.

Contact urticaria due to proteins in natural rubber latex gloves (latex allergy) is easily avoided.

44

44

## Latex – The German Experience

Epidemiology of occupational allergies to natural rubber latex in the German health care system - Privatdozent Dr. med. Henning Allmers, M.P.H., Jörg Schmengler, M.D., Privatdozent Dr. Med. Swen Witte Jahn, Dr. Med. Christoph Skudlik

45

45

## Barrier Creams

What about protection by using “barrier” or “protective” creams?

Most dermatologists do not consider these to offer any real protection. For example:

“It should be recognised that there is no cream which actually provides a barrier preventing penetration of substances into the skin. In fact, in some situations, barrier creams may actually aid penetration.”

Foulds + Wattie for National Eczema Society

46

46

## Barrier Creams

“Pre-work creams cannot be relied upon for primary protection of the skin as there is no information on the rate of penetration of chemicals through creams. Also, people habitually miss areas of their exposed skin when applying creams and so complete skin cover cannot be guaranteed. It is not always obvious if the barrier has been removed, damaged or thinned. Because of this, pre-work creams should not be regarded as PPE. They cannot give the same level of protection as gloves and should not be used as an alternative to properly selected PPE.”

from  
*Skin exposure to chemical agents*  
HSE, 2000, ISBN 0-7176-1826-9

47

47

## Skin Health Surveillance: Why Bother?

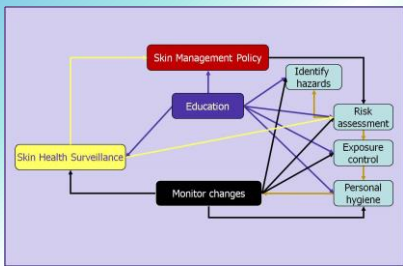
- For a complete skin management system
- Our ‘Early warning’
- Regulatory requirements
- Economic implications
- Social effects

48

48



### Skin Management System



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### Our 'early warning'

- We inspect our cars and equipment
- Find problems & prevent costly repair bills
- Why not people?



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### COSHH Regulations 11 states:

- (2) Health surveillance shall be treated as appropriate where –
- (b) The exposure of the employee to a substance hazardous to health is such that –
- (i) An identifiable disease or adverse health effect may be related to the exposure;
  - (ii) There is reasonable likelihood that the disease or effect may occur under the particular conditions of his work; and
  - (iii) There are valid techniques for detecting indications of the disease or effect, and the technique of investigation is of low risk to the employee.



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Examples where health surveillance is appropriate under the criteria in regulation 11(2)(b) are stated in the ACoP as:

- where there have been previous cases of work-related ill health in the workforce/place;
- where there is reliance on PPE, eg gloves or respirators, as an exposure control measure; eg printers wearing gloves to protect against solvents used during press cleaning, or paint sprayers using two-pack paints wearing respirators to prevent asthma. Even with the closest supervision there is no guarantee that PPE will be effective at all times;
- where there is evidence of ill health in jobs within the industry; eg frequent or prolonged contact with water (termed 'wet working') causing dermatitis in hairdressers and health care workers, or breathing in mists from chrome plating baths causing chrome ulcers in platers.

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### What percentage are you getting?



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### Preventing hidden costs



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### Social effects

- Discomfort
- Impact on social life
- Potential effects on income
- Effects on ability to participate fully in home life



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### Aspects of Skin Health Surveillance

- Questionnaires
- Visual Assessment
- Skin Condition Measurement

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### Why a questionnaire is important

- To gain background information
- To provide information in a structured manner for analysis
- To ensure that all aspects are covered
- To ensure compliance with the regulations
- To raise awareness
- To help decide if a problem is occupational or not
- Gives time for acclimatisation and relaxation of the test subject

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### When to use a questionnaire

- Every time a skin health assessment is made
- When carrying out pre-placement assessment
- For skin health surveillance and monitoring

More than one questionnaire may be needed

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### Information in a questionnaire

<ul style="list-style-type: none"><li>• Name</li><li>• Occupation</li><li>• Age</li><li>• Male/female</li><li>• Right or left handed</li><li>• Description of work done</li></ul>	<ul style="list-style-type: none"><li>• Use of personal protective equipment</li><li>• Frequency of PPE use</li><li>• Frequency of chemical contact</li><li>• Skin Problems – current or previous</li><li>• Allergies?</li><li>• Medically Confirmed?</li></ul>
---	---

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### Information in a questionnaire

<ul style="list-style-type: none"><li>• Use of moisturiser</li><li>• Frequency of moisturiser use</li><li>• Skin care and cosmetic products used</li><li>• Housework??</li><li>• Dishwasher??</li></ul>	<ul style="list-style-type: none"><li>• Gloves for housework??</li><li>• Gloves at any other time??</li><li>• Hobbies</li><li>• Other non work activities</li><li>• Second job?</li></ul>
---	---

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### Suggested uses of the information

- To advise an individual
- To distinguish between occupational and non-occupational skin problems
- In management reports (e.g. to support the need for action)
- Identifying system weaknesses so that they can be addressed
- To provide supporting data for medical referral



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### Comparison technique



- Look at the skin of the individual
- Compare with the images
- Compare with your experience
- Simple 'yes' or 'no'
- Less extensive training



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### Scoring Systems

- Look at the individuals' skin
- Assign their skin a score based on the scoring system being used
- Where a greater level of discrimination is required
- Requires more experience and training
- Quantify the visual problem
- Consensus about visual appearances



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### EnviroDerm Simple Scoring Technique

- Look at the individuals' skin
- Assign their skin a score based on the scoring system being used

Score	Details
0	Skin looks normal
1	1 of
2	2 of
3	3 of
4	4 of
5	5 or more of

Dryness, Redness, discolouration, thickening, cracking, flaking, blisters, open sores, bleeding, infection



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### Osnabrueck Scoring System

- Six morphological signs of hand eczema
  - Erythema
  - Scaling
  - Papules
  - Vesicles
  - Infiltration
  - Fissuring
- Each given a score
- Scores are added for final score



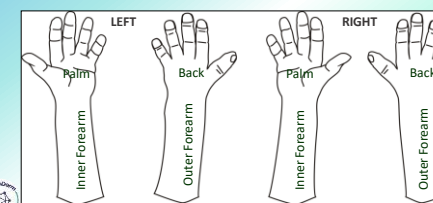
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### Recording Problems

- Draw on a chart
- Photographs
  - Control ambient light



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Where to look

On skin where there is potential for a problem to occur



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What next

- Investigate the problem
  - Is it occupational?
  - What is causing the problem
- Involve
  - Occupational physician
  - Dermatologist
- Advice
  - Hand hygiene
  - PPE use
  - Work practices
  - At home as well as at work!



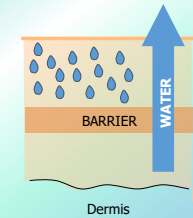
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Important parameters

- Transepidermal Water Loss (TEWL)
- Skin Hydration
- Barrier function

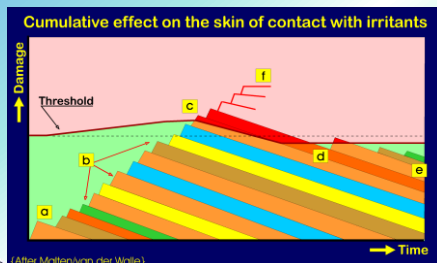


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Importance of Skin Hydration



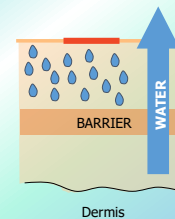
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Important parameters

- Transepidermal Water Loss (TEWL)
- Skin Hydration
- Skin Colour (erythema)
- Barrier function
- General skin condition
- Quantify and monitor rashes



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Equipment available



- Dermal Measurement System EDS12
  - Hydration
  - TEWL
  - Colour
- Skin Hydration Monitor EDS10
  - Hydration



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## Skin Condition Measurements



- Require individual acclimatises to the measurement conditions
- Recommended at least 10 minutes
- Preferable that there is 15-20 minutes acclimatisation



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## Where to measure

On skin where there is potential for a problem to occur



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## Interpretation: Hydration

Value	Suggested action
1	Probably a visible problem apparent; investigation/action needed as skin condition very poor
2	Skin condition poor; further investigation /action needed
3	Skin condition not good; further investigation/action may be needed
4	Skin condition borderline; further investigation/action may be needed, but good advice may solve the problem; this individual may fall outside the normal range
5-8	Skin condition normal no action required
9-12	Skin abnormally moist; may be due to sweating or other factors (e.g. use of moisturiser or hand washing); it may be necessary to repeat the measurements after further acclimatisation



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## Interpretation: Water Loss

Value	Suggested action
0-4	Very healthy barrier function
5-9	Healthy barrier function
10-12	Normal barrier function
13-16	Strained barrier function
17-20	Critical barrier function



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## What next

- Investigate the problem
  - Is it occupational?
  - What is causing the problem
- Involve
  - Specialist
  - HSE advice
- Advice
  - Hand hygiene
  - PPE use
  - Work practices
  - At home as well as at work!



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## How can it be used?

- Pre-placement assessment
- Identifying problem areas
- Health surveillance/monitoring
- Assessing intervention
- Investigating a problem




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Identifying problem areas

- Engineering factory
- 52 workers measured
- 48 low but expected values
- 4 extremely low
- All worked on same machine
- Using the wrong glove




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How can it be used?

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How can it be used?

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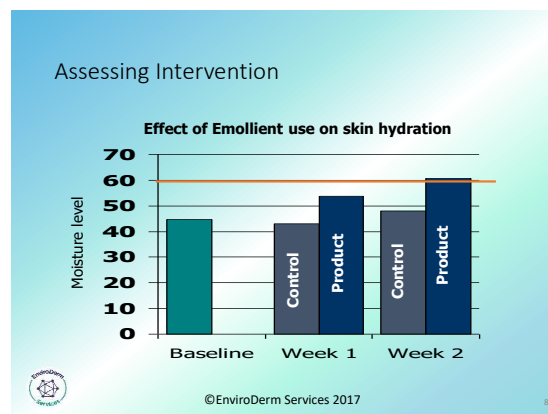
Assessing Intervention

- Study carried out to assess the effectiveness of an emollient
- Baseline measurement
- Control group just cleanser
- Product group use emollient




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How can it be used?

- Pre-placement assessment
- Identifying problem areas
- Health surveillance/monitoring
- Assessing intervention
- Investigating a problem



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### Investigating a problem

- An engineering workshop had changed from a mineral oil based metalworking fluid to a semi-synthetic - on the basis that this was "safer".
- Subsequently they had experienced an outbreak of irritant contact dermatitis.
- There had been no other changes, so could it be that the new fluid was more irritant than the older one, despite what the manufacturer thought?
- How could we test this?

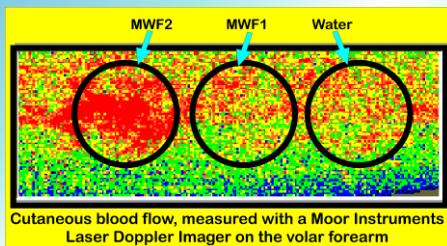


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### Investigating a problem



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### Increasing Resources: The importance of responsible people

- Only brief training required
- More frequent skin checks
- Non health and safety qualified personnel
  - Line manager
  - First aider
- Report those with problems
- Advise to seek assistance



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### Skin Health Surveillance System

- Involve colleagues to improve resources
- Set up a system including
  - Questionnaire
  - Visual assessment
  - Skin condition measurement
- Ensure regular monitoring of all employees
  - The frequency will depend on your organisation, the work carried out, and the number of employees
  - The more frequent the better particularly where exposure is to irritant chemicals or work situations



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88

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### Thank you for your attention! Questions?



If you think of any questions later, please feel free to contact us

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89

89