WORKING FOR A HEALTHY FUTURE

Skin notation for chemicals: the new NIOSH approach

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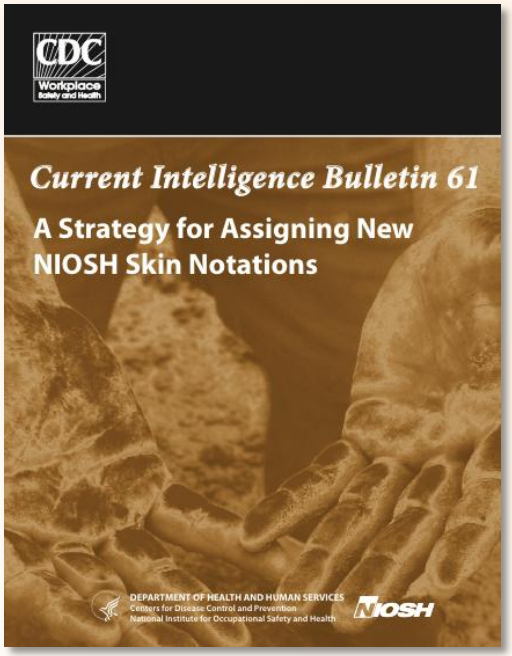
Summary…

- Skin notation – history and rationale
- The new NIOSH approach to assigning skin notation
- Advantages and disadvantages of this initiative
- Its relevance to OH practice in Ireland



http://www.cdc.gov/niosh/docs/2009-147/pdfs/2009-147.pdf

Skin notation…

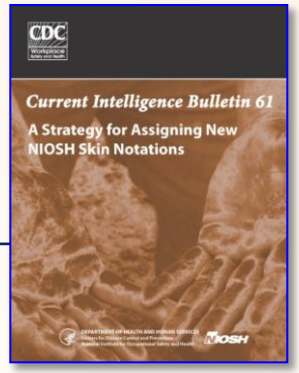
- Skin notation was originally introduced by the ACGIH in 1961
- Indication of hazard not risk
- Notionally indicates potential for “significant” dermal uptake of a chemical
- No consistent definition, either within or between countries!
- The USA have not had hazard and risk phrases so Sk notation has been particularly important

Inconsistencies…

Organisation	Number of Chemicals with Sk
NIOSH (REL)	142
ACGIH (TLV)	219
United Kingdom (WEL)	101
Germany (MAK)	286
Netherlands (MAC)	163
Finland (MAC)	199
Sweden (OEL)	115
Ireland (OELV)	174
Total for all chemicals on above	480

Issues with the previous NIOSH approach

- Limitations:
  - Intended only to indicate the potential for skin absorption
  - Provide no warning for direct, systemic or sensitizing effects
  - This rationale for developing notation has been inconsistently applied
  - Did not reflect the current state of knowledge
- New NIOSH Strategy for the Assignment of Hazard Specific Skin Notations (SK)
  - Published July 2009 [NIOSH 2009-147]



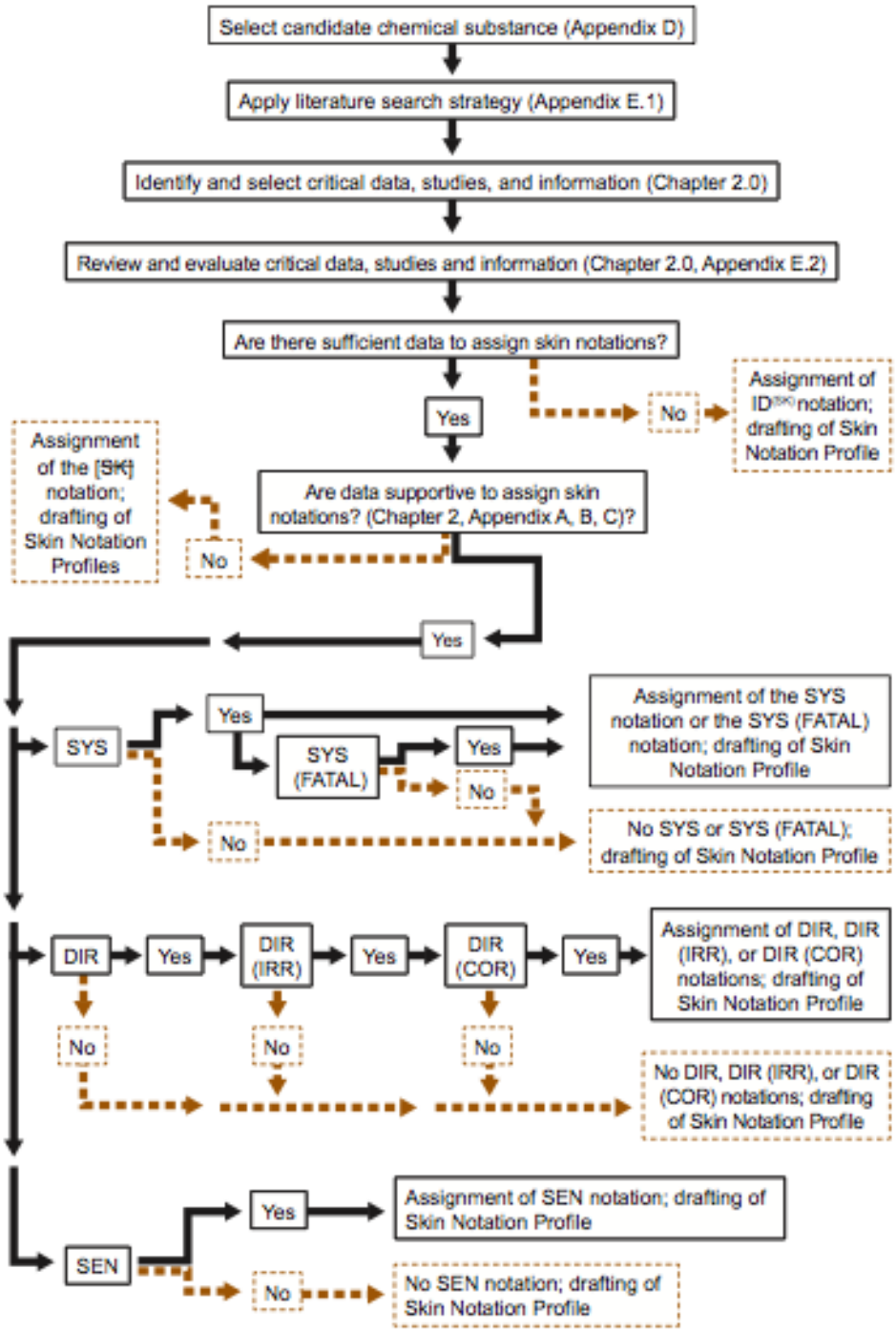
New NIOSH approach…

- Still just hazard identification
- Uses multiple hazard-specific skin notations (Sk) to differentiate between systemic, direct and immune-mediated responses
- Includes well-defined criteria and rationale to ensure consistency in the assignment of chemicals with the Sk

http://www.cdc.gov/niosh/docs/2009-147/pdfs/2009-147.pdf

Dotson GS, *et al. The evolution of skin notations for occupational risk assessment: A new NIOSH strategy. Regul Toxicol Pharmacol 2011:1–10.*

Hazard-specific Sk	Definition
SYS	Skin notation indicating the potential for systemic toxicity following exposure of the skin
(FATAL)	Sub-notation of Sk: SYS indicating chemicals are highly or extremely toxic and may be potentially lethal or life threatening following exposure of the skin
DIR	Skin notation indicating the potential for direct effects to the skin following contact with a chemical
(IRR)	Sub-notation of Sk: DIR indicating the potential for a chemical to be a skin irritant following exposure to the skin
(COR)	Sub-notation of Sk: DIR indicating the potential for a chemical to be corrosive following exposure of the skin
SEN	Skin notation indicating the potential for immune-mediated reactions following exposure of the skin
ID (SK)	Skin notation indicating that a chemical has been evaluated, but insufficient data exist to accurately assess the hazards of skin exposure
~~Sk~~	No hazard indentified
ND	Not evaluated – not known if there is a skin hazard



Select
Identify literature

Set a Sk notation?

SYS

DIR

SEN

Sk: SYS and Sk: SYS(FATAL)

- **Key Questions:**

1. Can the material be absorbed through the skin in toxicologically significant amounts?

2. Can skin contact with a chemical cause some form of systemic toxic effect?

- Human studies preferred, but limited availability; animal studies tend to be primary basis

Sk: DIR, Sk: DIR(IRR) and Sk: DIR (COR)

- **Key Question:** Can the chemical induce adverse effects on the skin from direct contact?

- Criteria for irritation and corrosion are generally qualitative based on descriptions of the skin effects from the published studies.

- Predictive human studies and well-conducted animal studies given greatest weight

Sk: SEN

- **<u>Key Question:</u>** Can skin contact result in an immune-mediated response?
- Criteria are generally qualitative based on weight of evidence.
- Predictive human studies and well-conducted animal studies given greatest weight

First skin notations published…

- First 20 Sk Assignments were issued in 2011
- All available on the NIOSH website…
- Further profiles under development
- Further development of the underlying process for assigning notation

Acrylamide CAS No: 79–06–1

- Molecular weight (MW): 71.08
- Molecular formula: C_3H_5NO
- Skin notation SK: SYS - DIR (IRR) – SEN

Skin notation	Critical effects	Available data
SK: SYS	Neurotoxicity; reproductive effects	Sufficient human and animal data
SK: DIR (IRR)	Skin irritation; skin tumors (cancer)	Limited human and animal data
SK: SEN	Skin allergy	Limited human data; sufficient animal data

Trichloroethylene CAS No: 79-01-6

- Molecular weight (MW): 131.39
- Molecular formula: C_2HCl_3
- Skin notation: SK: SYS - DIR (IRR) - SEN

Skin Notation	Critical Effect(s)	Available Data
SK: SYS	Hepatotoxicity; nephrotoxicity	Limited human data
SK: DIR (IRR)	Skin irritation	Limited human data; sufficient animal data
SK: SEN	Skin sensitization; liver damage associated with delayed-type hypersensitivity reaction	Limited animal data

TRI SDS example…

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Some more examples…

Chemical	CAS #	Proposed Notation	Pub	Ireland
2,4-Dinitrotoluene	121-14-2	SK: SYS - DIR (IRR)	2011	-
Acrylamide	79-06-1	SK: SYS - DIR (IRR) - SEN	2011	Sk
Epichlorohydrin	106-89-8	SK: SYS - DIR (COR) - SEN	2011	Sk
Glutaraldehyde	111-30-8	SK: DIR (COR) - SEN	2011	Sen
Hydrazine	302-01-2	SK: SYS (FATAL) - DIR (COR) - SEN	2011	Sk
Nitroglycerin	55-63-0	SK: SYS (FATAL) -DIR (IRR) - SEN	2011	Sk
Nonane	111-84-2	SK: DIR (IRR)	2011	-
Phenol	108-95-2	SK: SYS (FATAL) - DIR (COR)	2011	Sk
2-Butoxyethanol	111-76-2	SK: SYS – DIR (IRR)	2011	Sk
Trichloroethylene	79-01-6	SK: SYS - DIR (IRR) - SEN		Sk

IOM

Blue text = chemicals not previously assigned the Sk notation by NIOSH

Alignment with GHS

Chemical	GHS	NIOSH
2,4-Dinitrotoluene	H311: Toxic skin	SK: SYS - DIR (IRR)
Acrylamide	H312: Harmful skin H315: Skin irritation H317: Allergic skin reaction	SK: SYS - DIR (IRR) - SEN
Phenol	H314: Severe skin burns H311: Toxic skin	SK: SYS (FATAL) - DIR (COR)
2-Butoxyethanol	H312: Harmful skin H315: Skin irritation	SK: SYS – DIR (IRR)
Trichloroethylene	H315: Skin irritation	SK: SYS - DIR (IRR) - SEN

REACH…

- The European Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- Risk characterisation by route
- Derived No Effect Level (DNEL) or Derived Minimal Effect Level (DMEL) will be available by route
- Opens opportunities for quantitative risk management

Implications for Ireland?

- Scope for further confusion or drive better consistency?
- Perhaps unlikely to be adopted here because of…
  - Tradition of hazard and risk phrases
  - Further information likely to come from REACH
- If you want to find out about ideas for improving Sk notation read…

Sartorelli et al (2007) How to improve skin notation. Position paper from a workshop. Regulatory Toxicology and Pharmacology; 49: 301–30.

OH-world.org

This blog is about exposure science, occupational hygiene and the work that I carry out at the Institute of Occupational Medicine in Edinburgh, UK. I have a particular interest in chemical exposures in the workplace and the environment.

Sunday, 5 February 2012

Small people have lower cancer risks than tall people

Cancer risks are less for short people compared to tall people. Jane Green and colleagues from the University of Oxford report on cancer incidence in relation to height in a prospective cohort study of more than one million middle-aged women in the UK [1]. The relative risk for all cancers was of 1·16 for every 10 cm increase in height. Risks increased with height for 15 of the 17 cancer sites that they looked at and were statistically significant for ten sites.

If you are tall then you should not be seriously alarmed.
As the NHS website points out, for every thousand women in the tallest group studied (about 175cm) there will be about 10 cases of cancer each year, for a thousand women in the shortest group (about 155 cm) there will be 8 cancers diagnosed per year. Just two additional diagnoses per 1,000 women per year in the tallest group compared to the shortest group.

The association of risk with height did not seem to depend on socio-economic status, smoking habits, body mass index, alcohol consumption or a range of other personal factors considered by the researchers. The consistency in the pattern of increased risks with height is remarkable. I think the most interesting hypothesis for this is that taller people have more cells in their body and this means there is a greater chance for mutations leading to malignancy. If this is the case then you might expect fat people to also be at increased risk of a wide range of cancers because they also have more cells in their body.

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Montoring for Health Hazards at Work

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