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Does sex make a difference to exposures in the welding trades?

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Alberta and the need for welders



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Background

- Canadian study of *women in welding* (and electrical) trades
- Earlier analysis of *metals in urine* (N=45) showed high manganese and chromium compared to general population
- High manganese and copper compared to published data on *male welders*

Urinary metal concentrations in female welders. Arrandale et al. 2014. Annals of Occupational Hygiene.

Limitations of previous analysis

- No data on **men**
- **Delays** between exposure data (detailed self report on tasks, schedules, PPE on last day of welding) and urine collection
- Women tended to collect urines during periods **away from work**.

Current analysis

- Women and now men (new study) living in Alberta, in **welding at last contact**.
- Requested to complete urine sample on **same day** as questionnaire
- Requested to do both **close to the end** of a period of normal work.
- Questionnaires and urine analysis **identical** for men and women

Does sex make a difference?

Do male and female welders differ in urinary concentrations of metals associated with welding?

If so, is this explained by differences in tasks, schedules, use of PPE?

If not – why do they differ?

Study population to date

Sample collection kits sent out

Male: **350**

Female: **101**

Urine samples received

Male: 230

Female: 41

Urine sample results available 27/4/2015

Male: 224

Female: 39

With urine results and welded in last 6 months

Male: **149**

Female: **27**

Similarity of male and female welders at baseline

	Men	Women	p
Mean age (baseline)	34.4	30.0	***
Mean year started	2006	2008	**
% left school 17+	89%	92%	
% current smoker	29%	32%	
% drinks alcohol	90%	92%	
% with pregnancy	52%	48%	
N	284	92	

Urinary concentration $\mu\text{g/g creat.}$

	Geometric Mean		p=
	Men (N=126)	Women (N=25)	
Aluminum	4.27	5.54	0.10
Cadmium	0.16	0.21	0.04
Chromium	0.21	0.22	0.33
Cobalt	0.32	0.59	0.00
Copper	8.98	12.41	0.00
Manganese	0.92	1.11	0.18
Nickel	1.31	1.83	0.10
Lead	0.05	0.10	0.01

Main task and type of welding

	Men	Women	p=
Fabrication	72%	33%	0.00
Repair	34%	13%	0.04
Pipe welding	22%	29%	0.47
Construction	19%	8%	0.20
SMAW	58%	50%	0.45
GMAW	54%	50%	0.75

Differences in exposure factors

	Men	Women	p=
Trade (% 'welder')	79%	88%	0.41
Mean hours welding	6.3	7.0	0.46
Weld only mild steel	75%	88%	0.18
Only one type welding	74%	83%	0.34
Never use respirator	41%	64%	0.05
Never use LEV	68%	91%	0.03
Never use either	32%	55%	0.04

Regressions (lognormal) p=

	Cd	Co	Cu	Pb
Sex	0.00	0.00	0.00	0.01
Smoking	0.00	0.16	0.06	0.19
Age at start	0.00	0.86	0.04	0.52
Hours welding	0.01	0.68	0.58	0.23
Last welded >7 days	0.76	0.80	0.07	0.93
Never used resp	0.78	0.92	0.58	0.32
Fabricator	0.80	0.59	0.50	0.96

Discussion

- Sex *does* make a difference – **but does welding?**
- Women have different tasks, **less PPE/LEV** – but work factors *not* strongly related to metal concentrations in women *or* men.
- Need to consider **alloys, consumables....**
- But do the same sex differences occur ***without*** welding? In the electrical trades?

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