

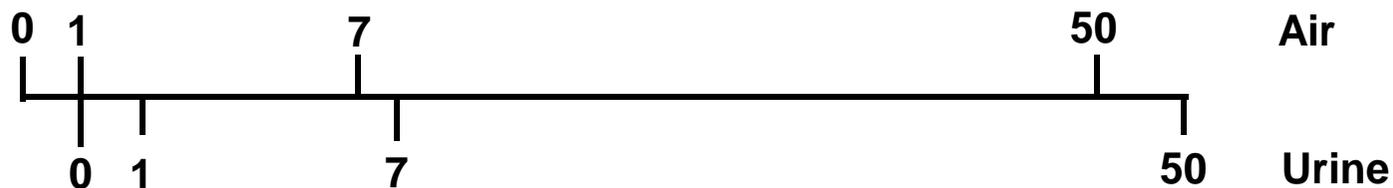
## **Metals and metabolites as markers of exposure in welder apprentices**

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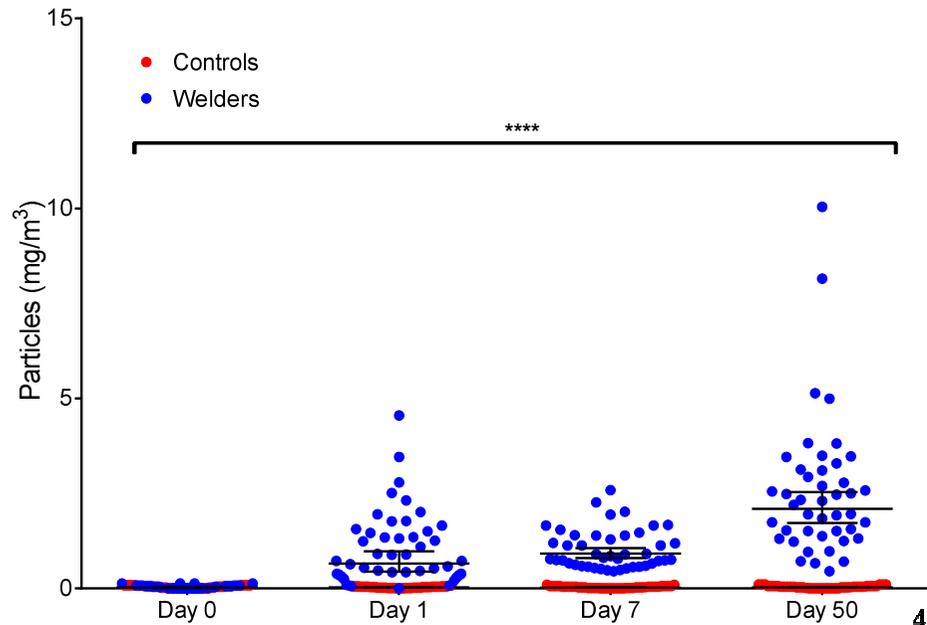


## Study design

- **4 cohorts:**
  - Controls – non-smokers
  - Welders – non-smokers
  - Controls – smokers
  - Welders – smokers
- **Air (13 metals) and urine (13 metals + 52 metabolites)**
- **4 sampling days (0, 1, 7, 50)**

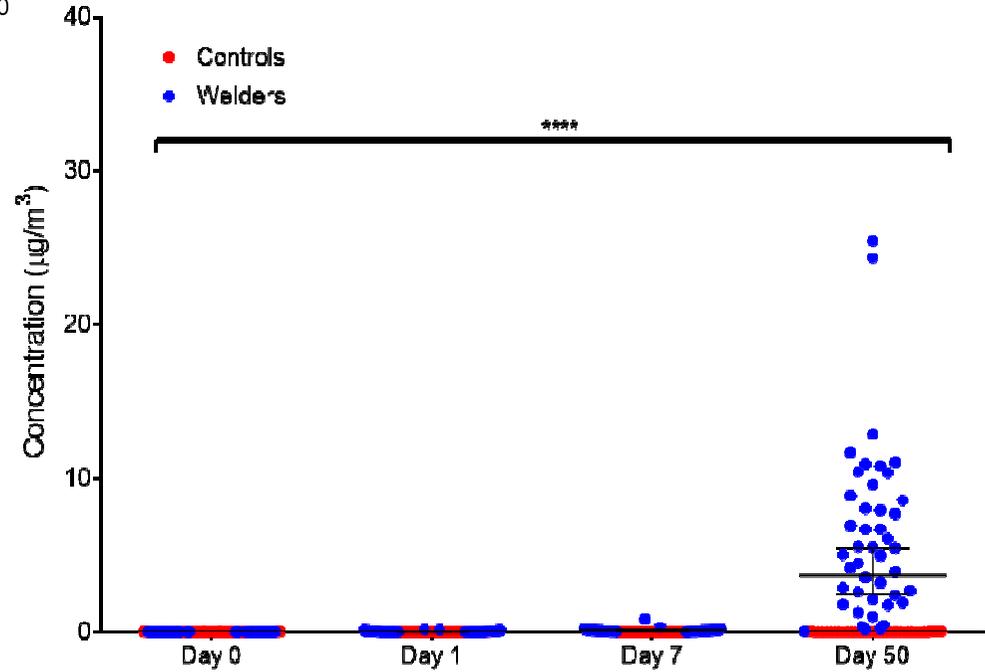


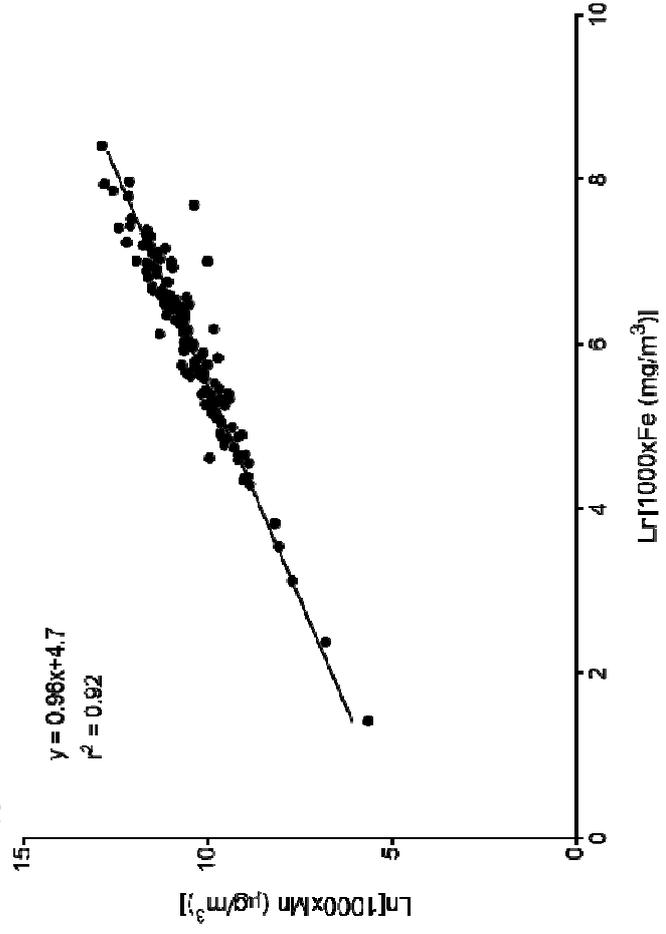
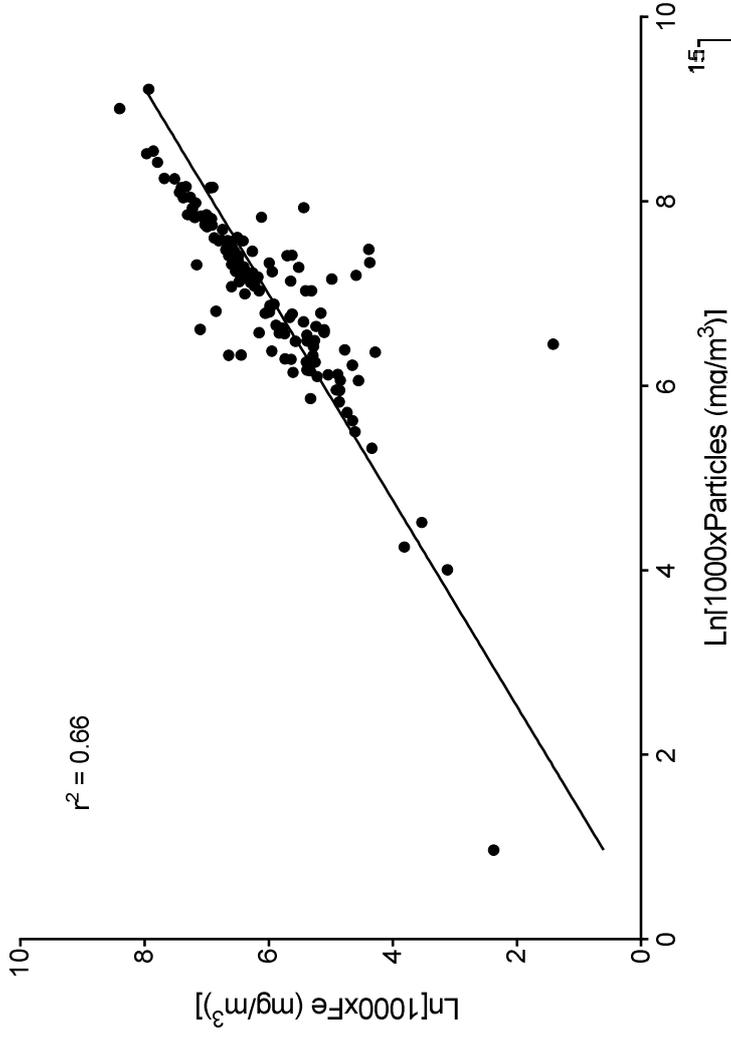
	Controls (non-smoking)	Controls (smoking)	Welders (non-smoking)	Welders (smoking)
Number of subjects	20	21	23	20
Age	29.6 ± 6.1	31.5 ± 5.5	26.7 ± 4.8	30.9 ± 7.2
Ethnicity - European descent	80%	76%	78%	75%
BMI	25.4 ± 2.7	27.8 ± 4.7	26.1 ± 3.0	25.9 ± 4.1
Cigarettes/day		14.4 ± 9.2		14.3 ± 8.2
Alcohol consumption	95%	76%	65%	75%
Drug use	30%	43%	26%	40%
High blood pressure		10%		
Heart problems			4%	
Kidney problems				5%
Liver problems				5%
Asthma	5%		13%	5%
Prescription drugs	10%	5%	13%	20%
Over the counter medicine	35%	14%	4%	20%
Vitamins and supplements	30%	24%	48%	25%
Previously exposed to welding fumes	15%	10%	91%	90%



Particle concentrations

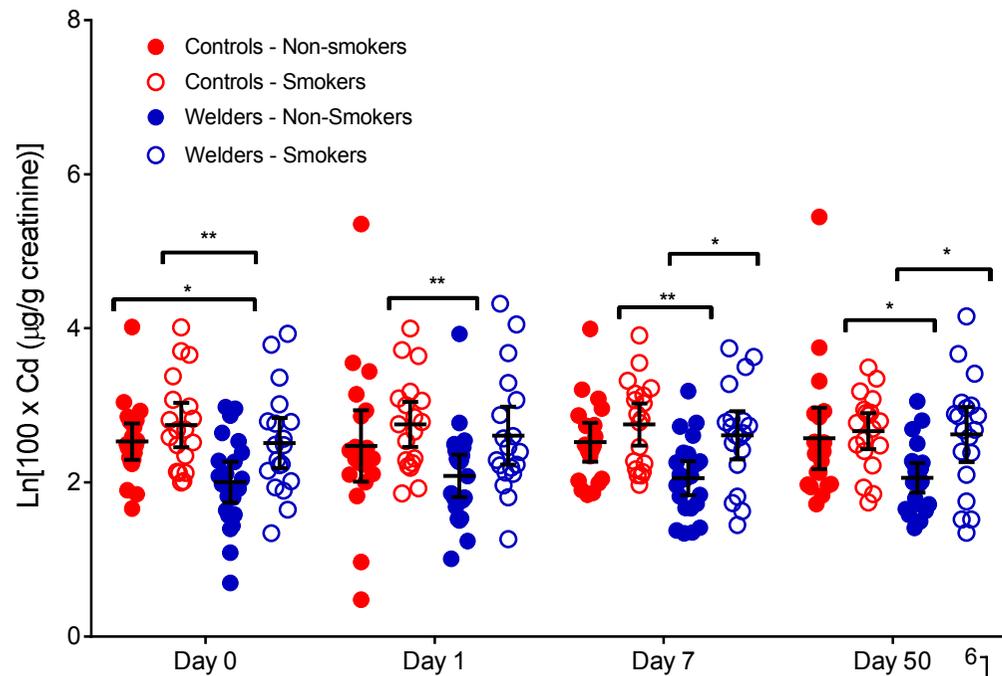
Antimony concentrations



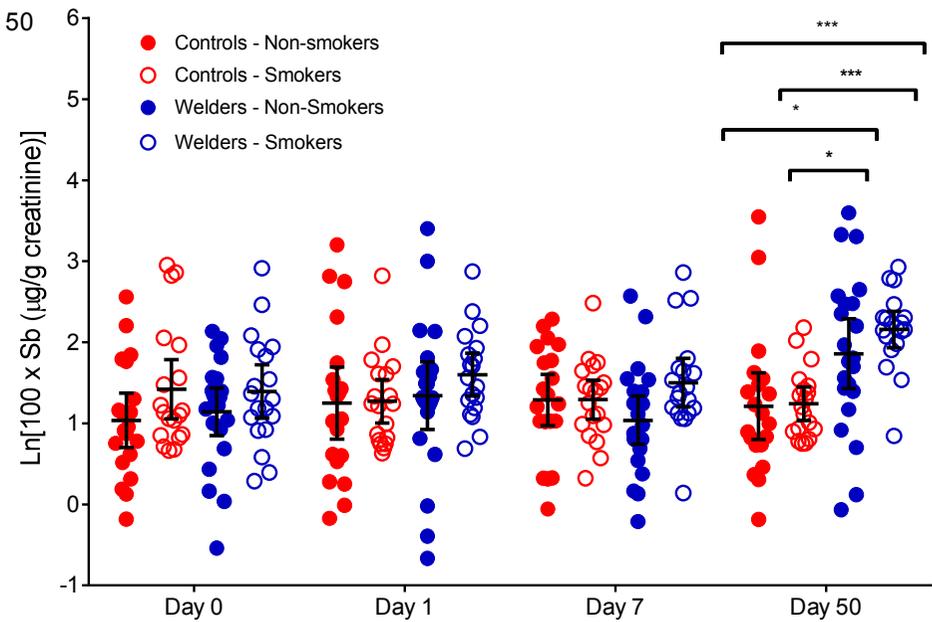


Urinary Metals	Urinary Metabolites
Cd Sb	1-Methylnicotinamide N-Acetylornithine Proline Pyroglutamate Sarcosine Trigonelline Trimethylamine U217 (unknown)

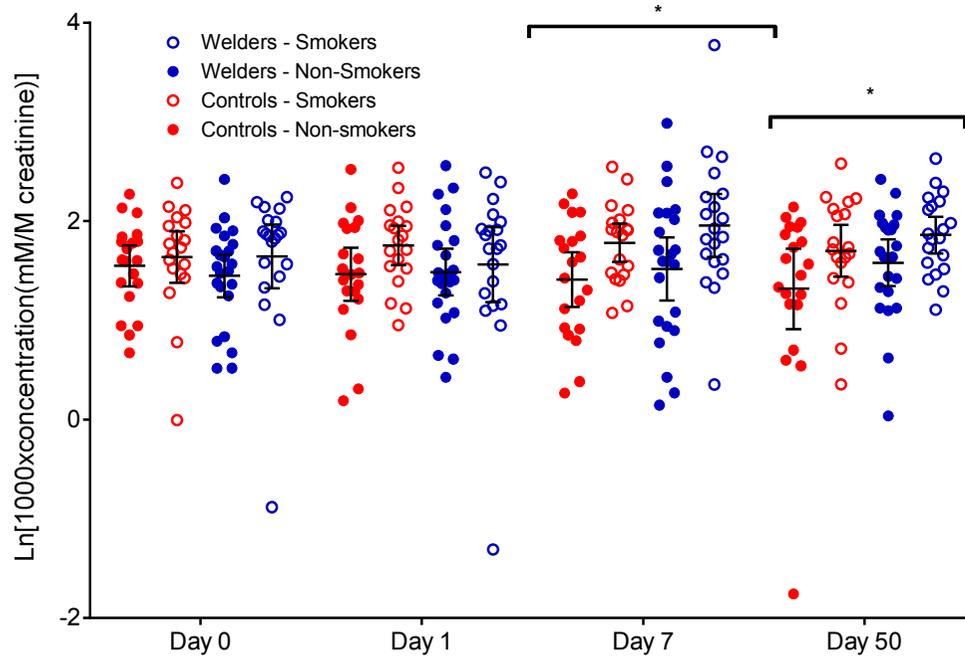
- Other metabolites showed difference but it was not consistent
- Differences seem to be due to smoking for Cd and metabolites



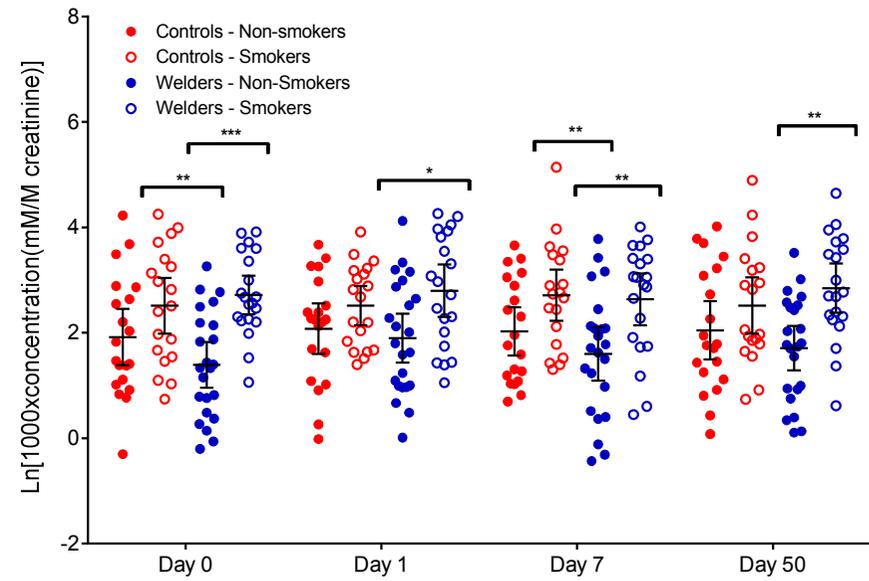
**Sb**



### 1-Methylnicotinamide



### Trigonelline



## Linear mixed models on urine samples

	Fixed effects		
Cd	Smoker		
Sb		Particulate Sb	
1-Methylnicotinamide	Smoker		
N-Acetylornithine	Smoker	BMI	
Proline	Smoker	Day	
Pyroglutamate	Smoker	Ethnie	
Sarcosine	Smoker	Day	
Trigollenine	Smoker		
Trimethylamine	Smoker		
U217 (unknown)	Smoker	Age	Particles

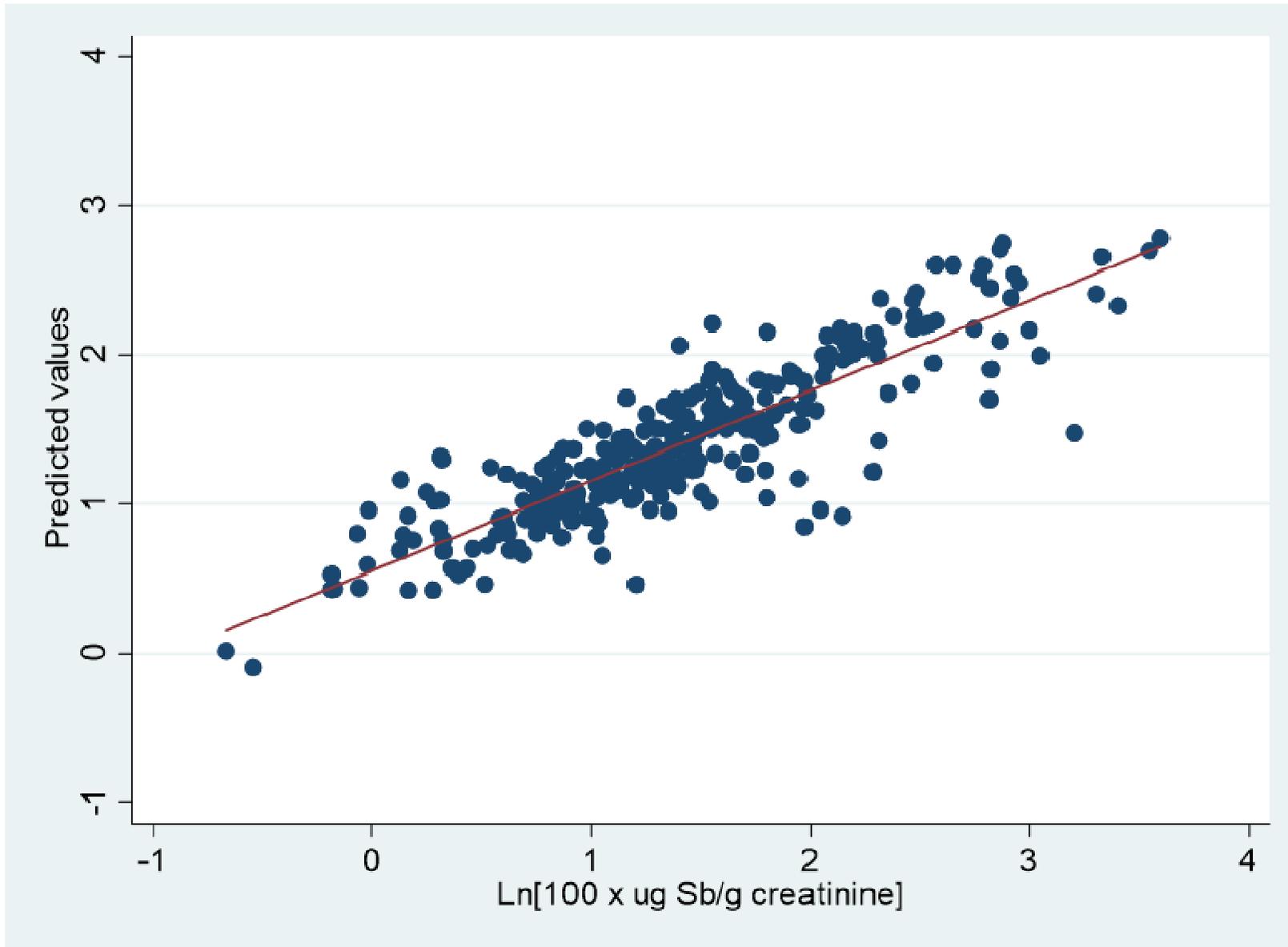
Subject and day as random effects

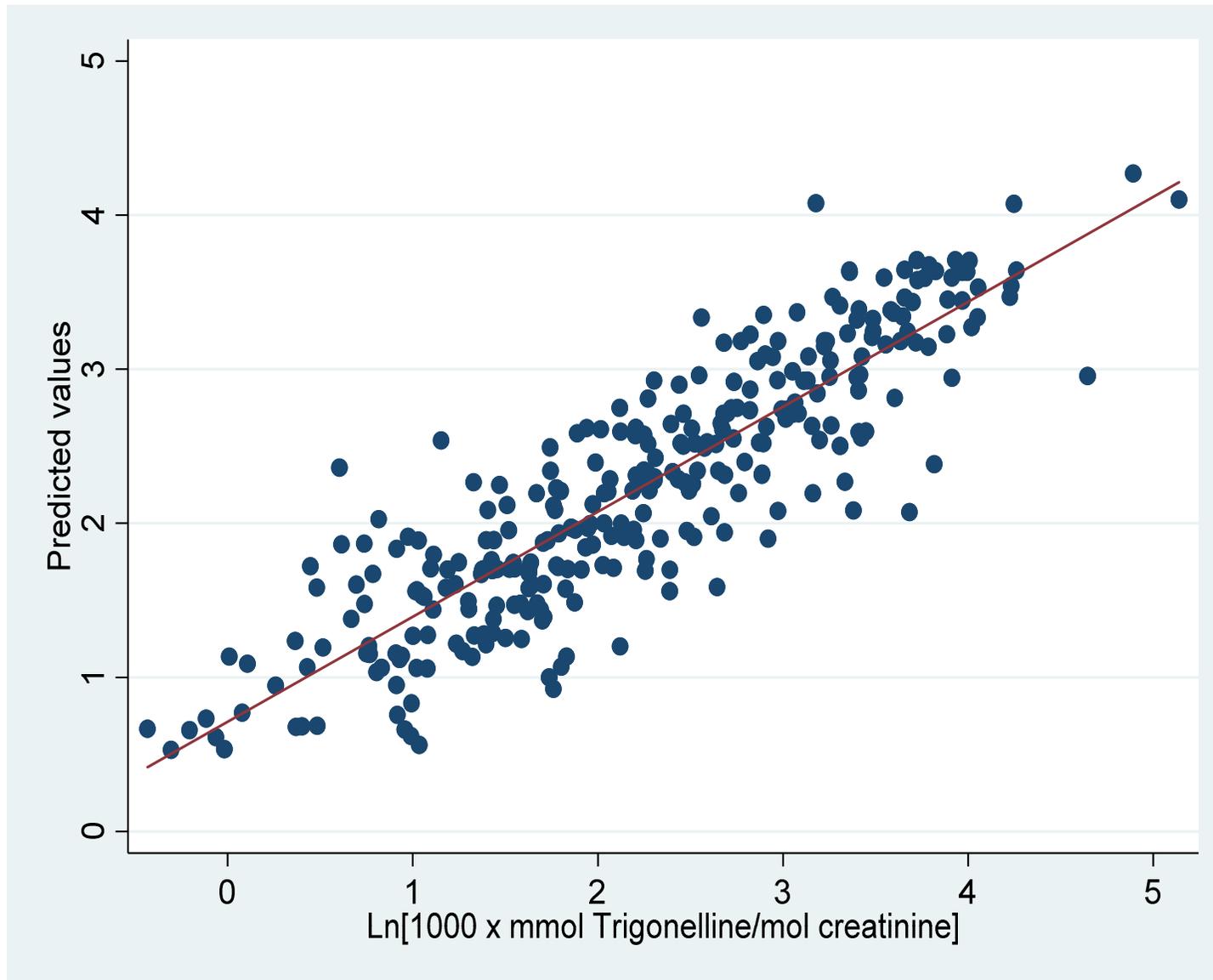
## Linear mixed models on urine samples

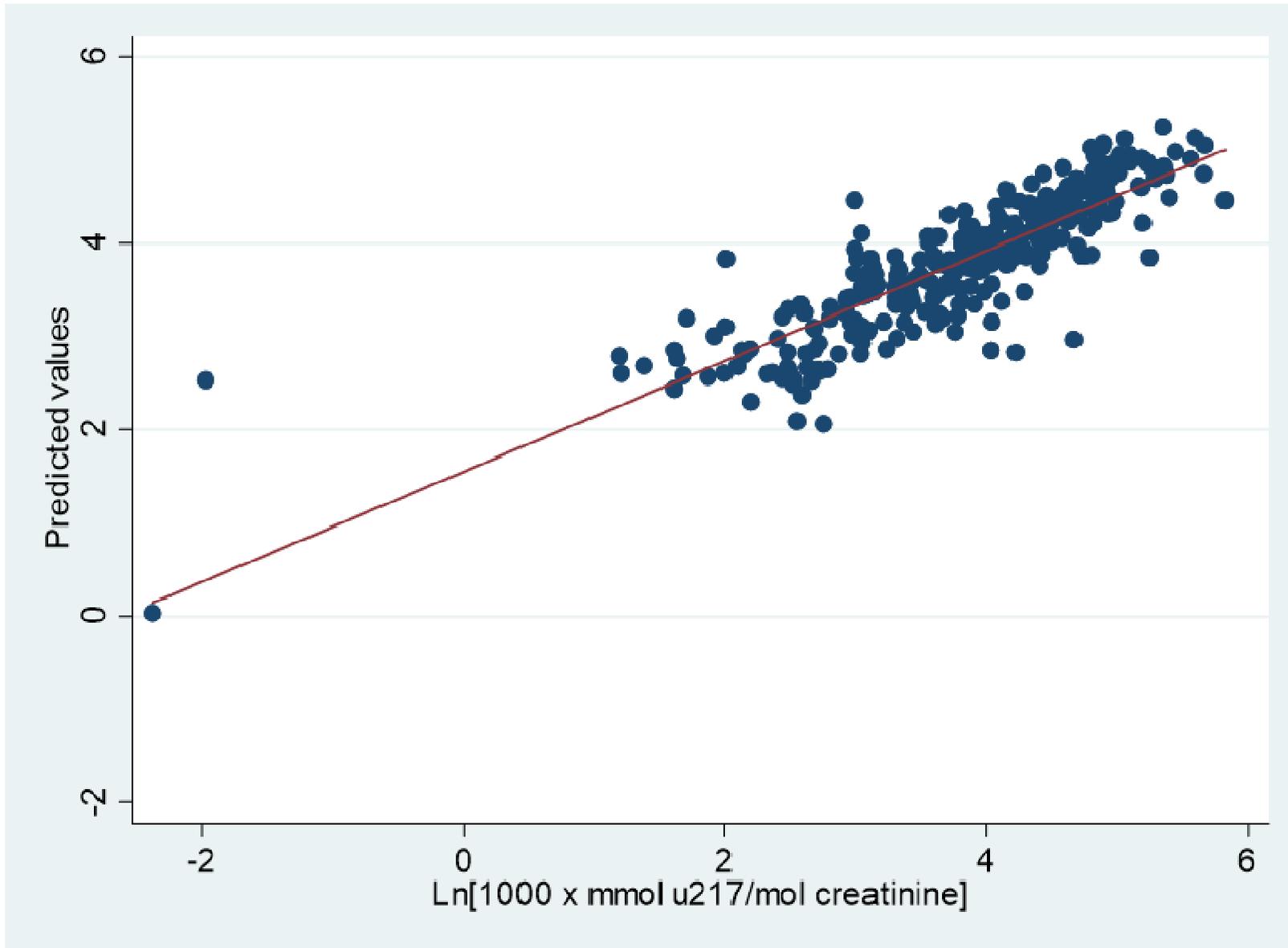
	Intercept	P value	Within individual variance
Cd	0.10*	0.000	25%
Sb	0.032*	0.000	44%
1-Methylnicotinamide	0.0043**	0.000	80%
N-Acetylornithine	0.0060**	0.000	75%
Proline	0.015**	0.000	85%
Pyroglutamate	0.021**	0.000	68%
Sarcosine	0.0025**	0.000	70%
Trigollenine	0.0062**	0.000	37%
Trimethylamine	0.0020**	0.000	41%
U217 (unknown)	0.010**	0.000	57%

\*Concentrations in  $\mu\text{g/g}$  creatinine

\*\*Concentrations in  $\text{mmol/mol}$  creatinine









## **Conclusion**

- **Particulate Sb is a predictor of urinary Sb**
- **The main effect for Cd and metabolites is smoking**
- **Studies with professional welders will help to understand better the effect of welding fumes on metabolite profiles**
- **More data are needed to model particle concentrations in welding fumes**



## Funding

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