PREDICTION OF IONISATION EFFICIENCIES IN COMPLICATED BIOLOGICAL MATRICES

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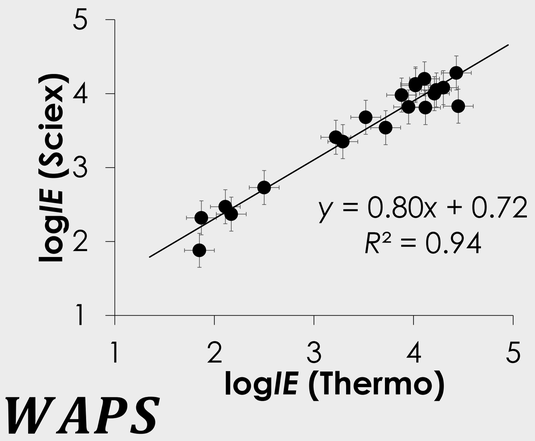
INTRODUCTION

Ionisation efficiency (IE) depends on:

- Structure of analyte
- Solvent
- MS setup

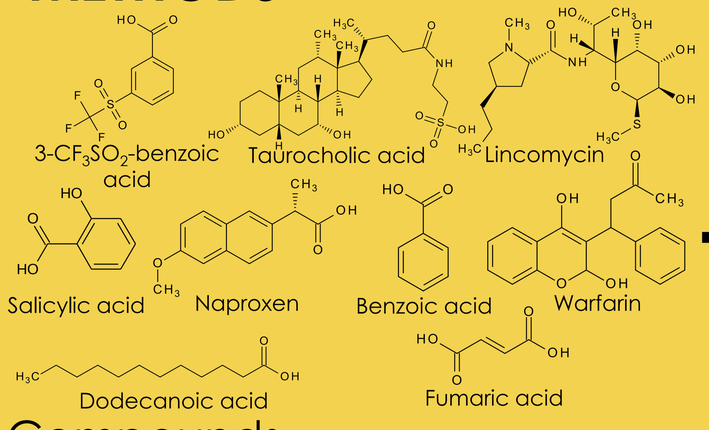
Previously **IE prediction model**:

- ESI+ and ESI-
- Different solvents (org%, pH, MeOH/MeCN etc.)
- Transferable between instruments
- c prediction mismatch 3.7 times



$$\log IE = intercept + coefficient_{\alpha} \cdot \alpha - coefficient_{\mathrm{WAPS}} \cdot WAPS$$

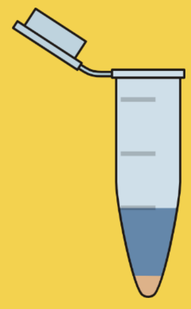
METHODS



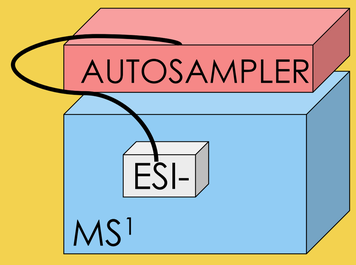
Compounds

- Plasma
- Blood
- Urine
- Cerebrospinal fluid (CSF)
- Brain tissue
- Liver tissue
- Neat solvent: 20/80 0.1% NH_3/MeCN

Matrices



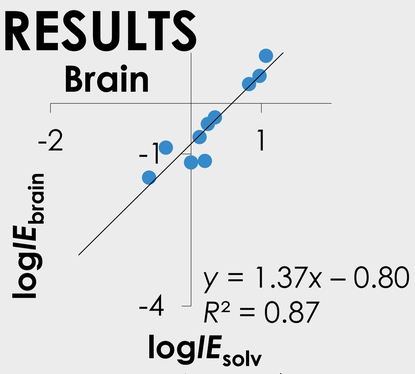
Protein precipitation

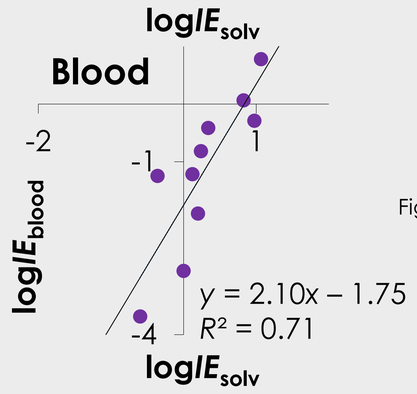


- Flow injection
- Thermo Scientific LTQ

Setup

RESULTS





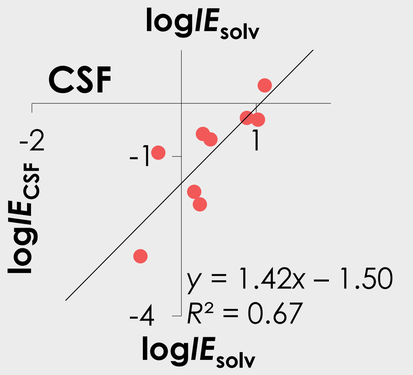


Fig 1: Correlations of log*IE*s measured in neat solvent and in biological matrices. Best correlation with brain, worst with cerebrospinal fluid.

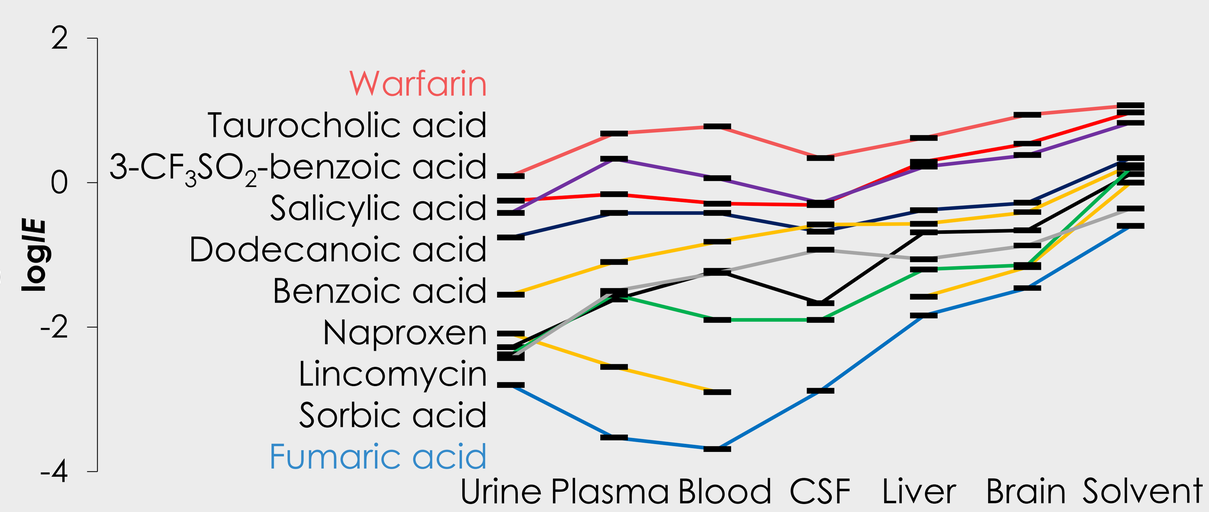


Fig 2: Order of log*IE*s in different matrices. Smallest variation in log*IE*s occurred for warfarin, biggest for fumaric acid.

Tab 1: Coefficients of the log*IE* prediction model in different matrices. The intercept was statistically significant only for urine samples. log*IE* prediction model can be found under the table.

	$coef_{\mathrm{WAPS}}$	$coef_{\alpha}$	*intercept*	R^2	mismatch
Solvent	-0.18	1.18		0.72	2
Urine	-0.31	2.04	-1.93	0.55	6
Plasma	-0.45	1.08		0.77	8
Blood	-0.50	1.29		0.78	8
Liver	-0.32	0.96		0.81	3
Brain	-0.30	1.08		0.73	3
CSF	-0.34	0.66		0.71	7

$$\log IE = coef_{\mathrm{WAPS}} \cdot WAPS + coef_{\alpha} \cdot \alpha + intercept$$

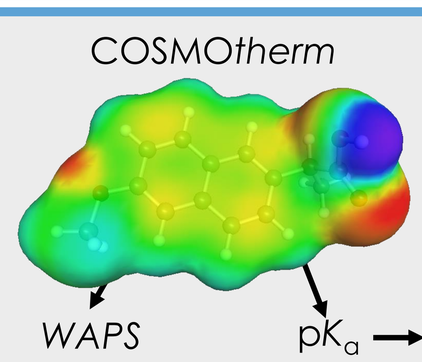


Fig 3: COSMO*therm* was used to calculate physicochemical properties of all the compounds. *WAPS* (weighed average positive sigma) describes the charge delocalisation and α the acidity of a compound.

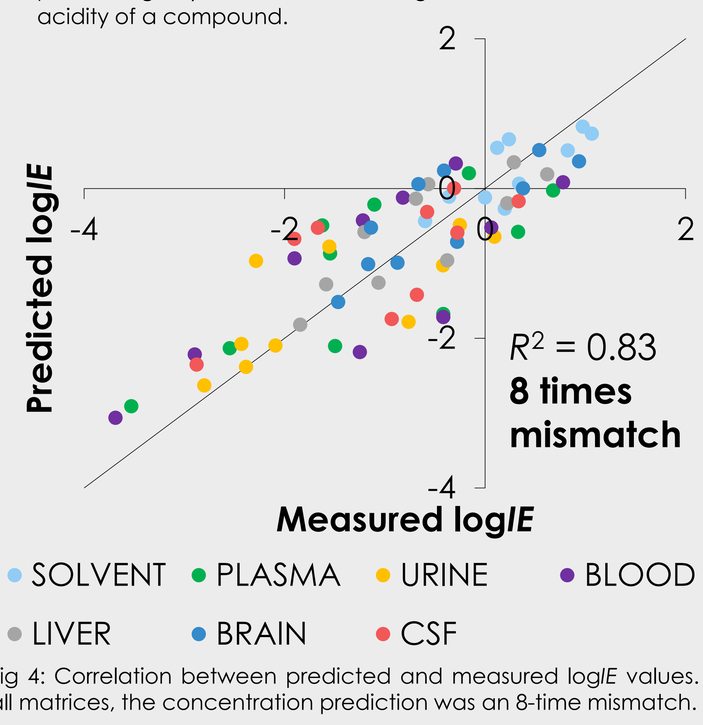
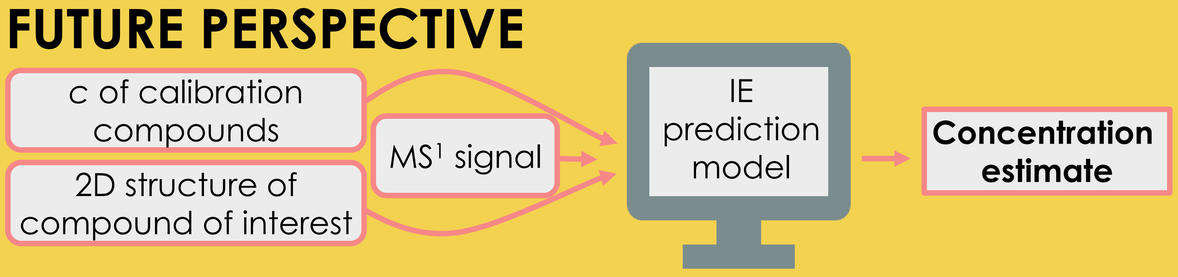


Fig 4: Correlation between predicted and measured log*IE* values. Over all matrices, the concentration prediction was an 8-time mismatch.

FUTURE PERSPECTIVE



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Kruve et al DOI: 10.1021/acs.analchem.7b00595

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Online poster:

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