

etean Project: External validation of Tier 1 tools (Inhalation exposure)

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Aim of external evaluation



1. Determine whether Tier 1 tools are predictive of measured exposures over a range of situations
2. Determine whether Tier 1 tools are sufficiently conservative
 - What is sufficiently conservative?
 - 75th or 90th percentile of the distribution

Exposure measurement



- ❖ Exposure measurement data and descriptive contextual information were collected from a wide variety of data providers
 - Advisory Board members (BAuA, EBRC, HSE, IFA, NIOSH, SECO)
 - Lund University
 - Project team: ITEM and IOM
- Powders/ liquids/ metal processing fumes/ metal abrasion
- Mix of task-based and time weighted average representative samples
- ❖ Individual measurements: $n = 2098$, from 419 situations
- ❖ Aggregated measurements: $n = 1843$ measurements from 148 situations

Coding of situations into the tools



- ❖ Team of experienced exposure scientists
- ❖ Quality control manual
 - “Best” option chosen in first instance
 - Agreed defaults where the description was unclear - “middle” option chosen
- ❖ Coding meetings
- ❖ Data checking
 - ❖ Data checking
 - ❖ Outliers
 - ❖ Consistency checks across tools and scenarios
 - ❖ Blind recoding of 10% of situations

Some differences between tools



❖ ECETOC TRAv2

- Concentration adjustment for liquids only (not for dusts)
- Exposure duration taken into account

❖ ECETOC TRAv3

- Concentration adjustment for solids and liquids
- Exposure duration taken into account

❖ MEASE

- Concentration adjustment for solids, liquids & aqueous solutions
- Exposure duration taken into account

Some differences between tools



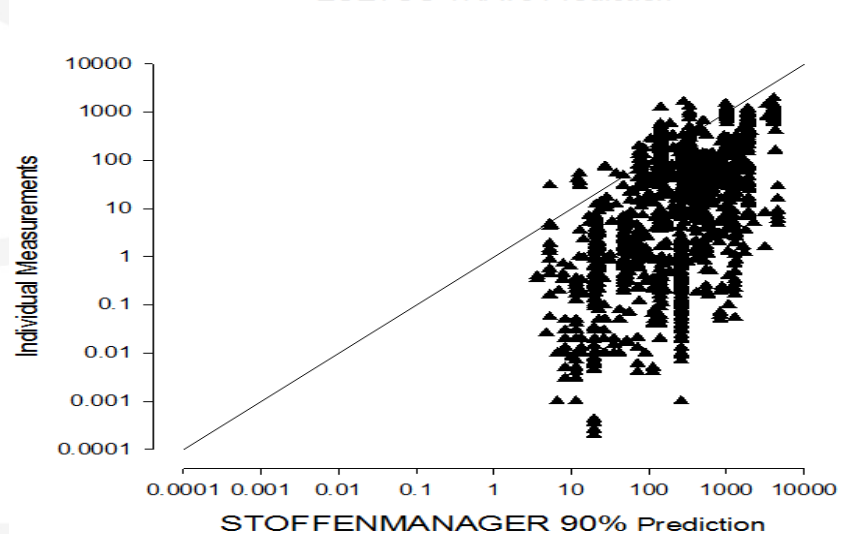
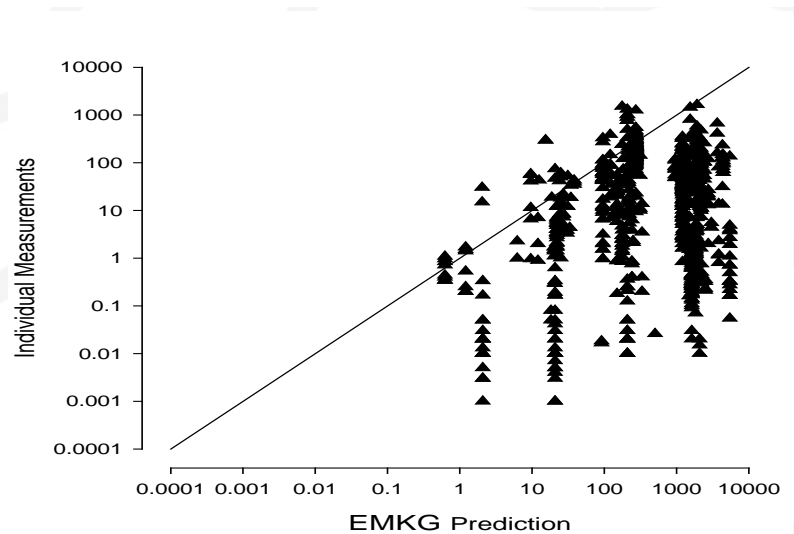
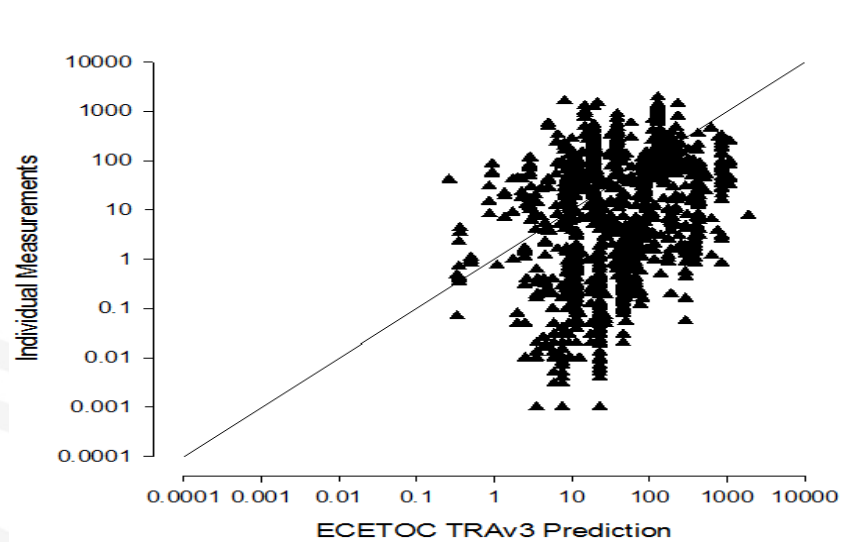
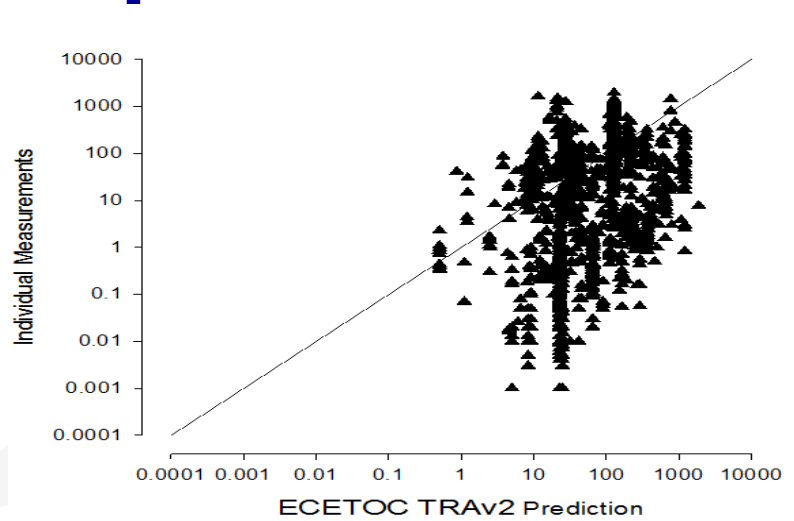
❖ EMKG-EXPO-tool

- No concentration adjustment
- No adjustment duration of exposure
- No option for absence of RMMs. If none present, lowest control approach was chosen (general ventilation)

❖ Stoffenmanager v 4.5

- Concentration adjustment for liquids only (not for dust)
- No adjustment for duration of exposure

Tool comparison for volatile liquids

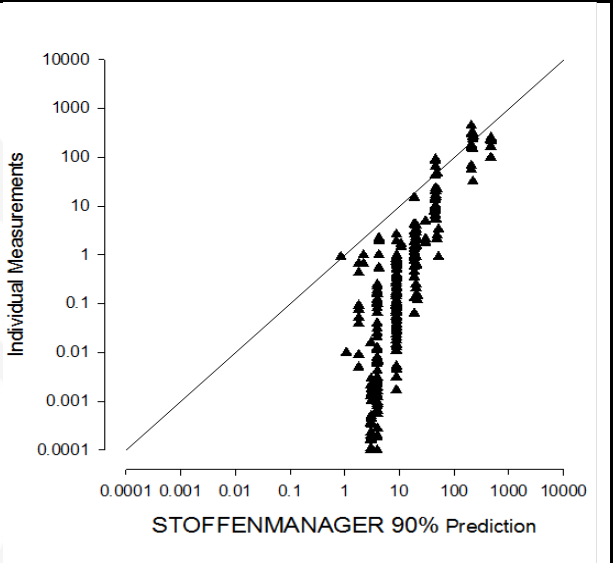
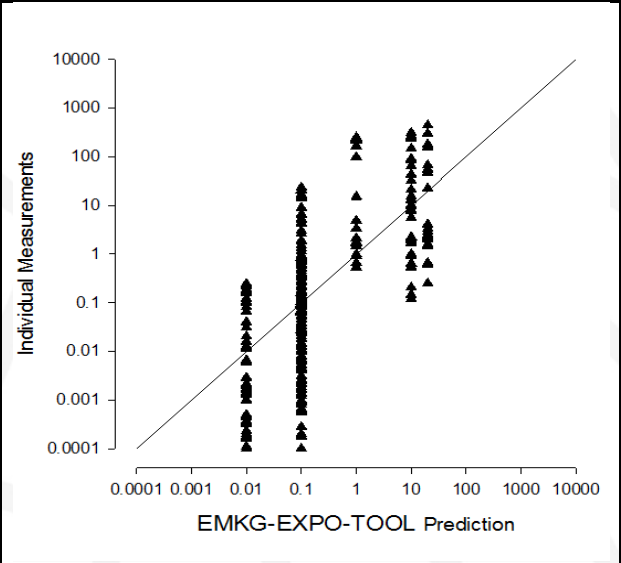
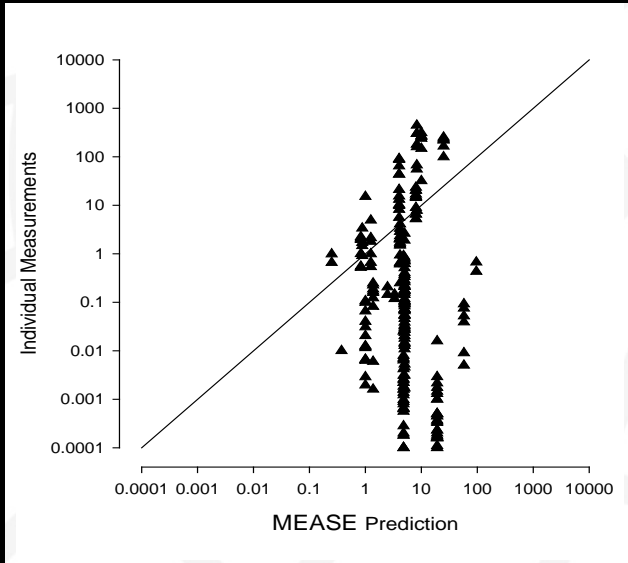
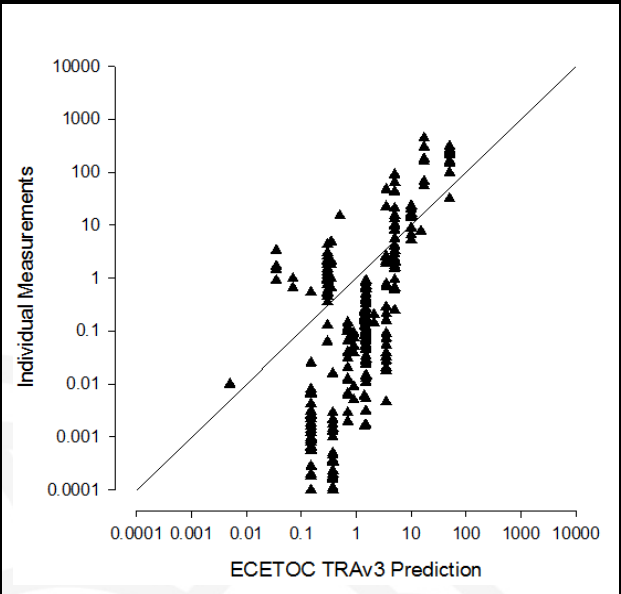
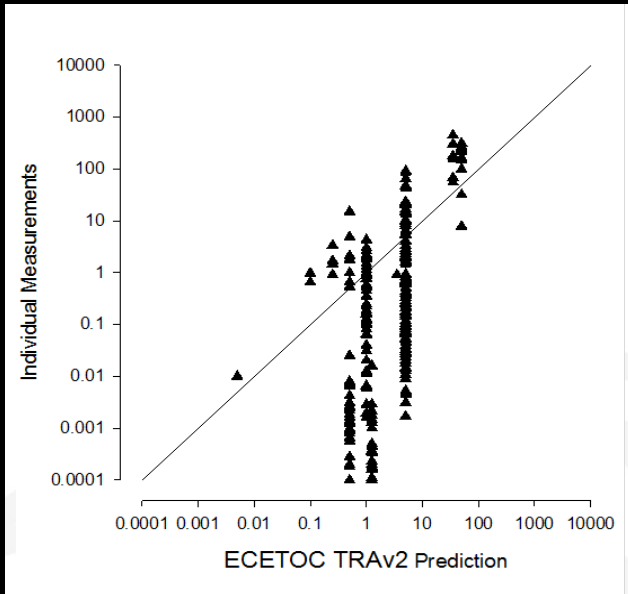


Summary tool performance for volatile liquids



| | Individual data | | Individual and aggregated data | | |
|---------------------|-----------------|--------------|--------------------------------|------|------|
| | R_{ind} | GM_{ratio} | nM | nM>T | %M>T |
| ECETOC TRAv2 | 0.35 | 0.1 | 1842 | 485 | 26 |
| ECETOC TRAv3 | 0.34 | 0.2 | 1842 | 586 | 32 |
| EMKG-EXPO-TOOL | 0.28 | 0.03 | 1372 | 70 | 5 |
| STM 75th percentile | 0.54 | 0.1 | 1854 | 359 | 19 |
| STM 90th percentile | 0.54 | 0.04 | 1854 | 209 | 11 |

Tool comparison for powders



Summary tool performance for powders



| | Individual data | | Individual and aggregated data | | |
|---------------------|-----------------|--------------|--------------------------------|------|------|
| | R_{ind} | GM_{ratio} | nM | nM>T | %M>T |
| ECETOC TRAv2 | 0.59 | 0.05 | 1101 | 180 | 16 |
| ECETOC TRAv3 | 0.69 | 0.1 | 1101 | 231 | 21 |
| MEASE | <0 | 0.02 | 1081 | 115 | 11 |
| EMKG-EXPO-TOOL | 0.7 | 0.6 | 1063 | 184 | 17 |
| STM 75th percentile | 0.83 | 0.04 | 1101 | 90 | 8 |
| STM 90th percentile | 0.83 | 0.01 | 1101 | 33 | 3 |

Conclusions

Are the tools sufficiently conservative?

- Depends on what is considered to be sufficiently conservative
- Volatile agents
 - TRA2 and TRA3 appear to be not sufficiently conservative
 - EMKG and STOFFENMANAGER OK
- Powders
 - If using 90th percentile
 - TRA2, TRA3, EMKG not sufficiently conservative
 - If using 75th percentile
 - Than all tools are ok

Conclusions

Can the tools predict exposure?

- Powders:
 - Reasonable correlation between tool estimates and measurements,
 - except for MEASE
- Lower correlations for volatile liquids

Acknowledgements



- Advisory Board
 - BAuA (funding)
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- ❖ Other data providers (Lund University)
- ❖ Various IOM staff