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Chiral MVOC's – A new tool for studying moulds in building constructions?

(No. 221)

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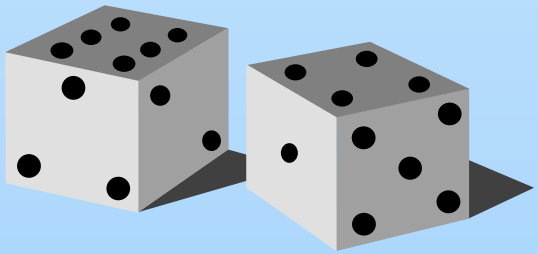
The problem

- Moisture damage may lead to biological activity
- Moulds in building constructions may be invisible
- Moulds emit VOCs



⇒ <u>Moisture is a major risk factor for indoor air quality</u>

Definitions

Picture: Mycoteam as

- VOC =
  Volatile Organic Compounds
- MVOC =
  Microbial Volatile Organic Compounds

Main topics

Picture: Mycoteam as

- MVOCs
  - Presentation
  - Results
- Chiral MVOC –
  - a better indicator?

VOC-sources

- Outdoor air
- Building materials
- Human activity
- Moisture

Picture: Mycoteam as

What about moulds ?

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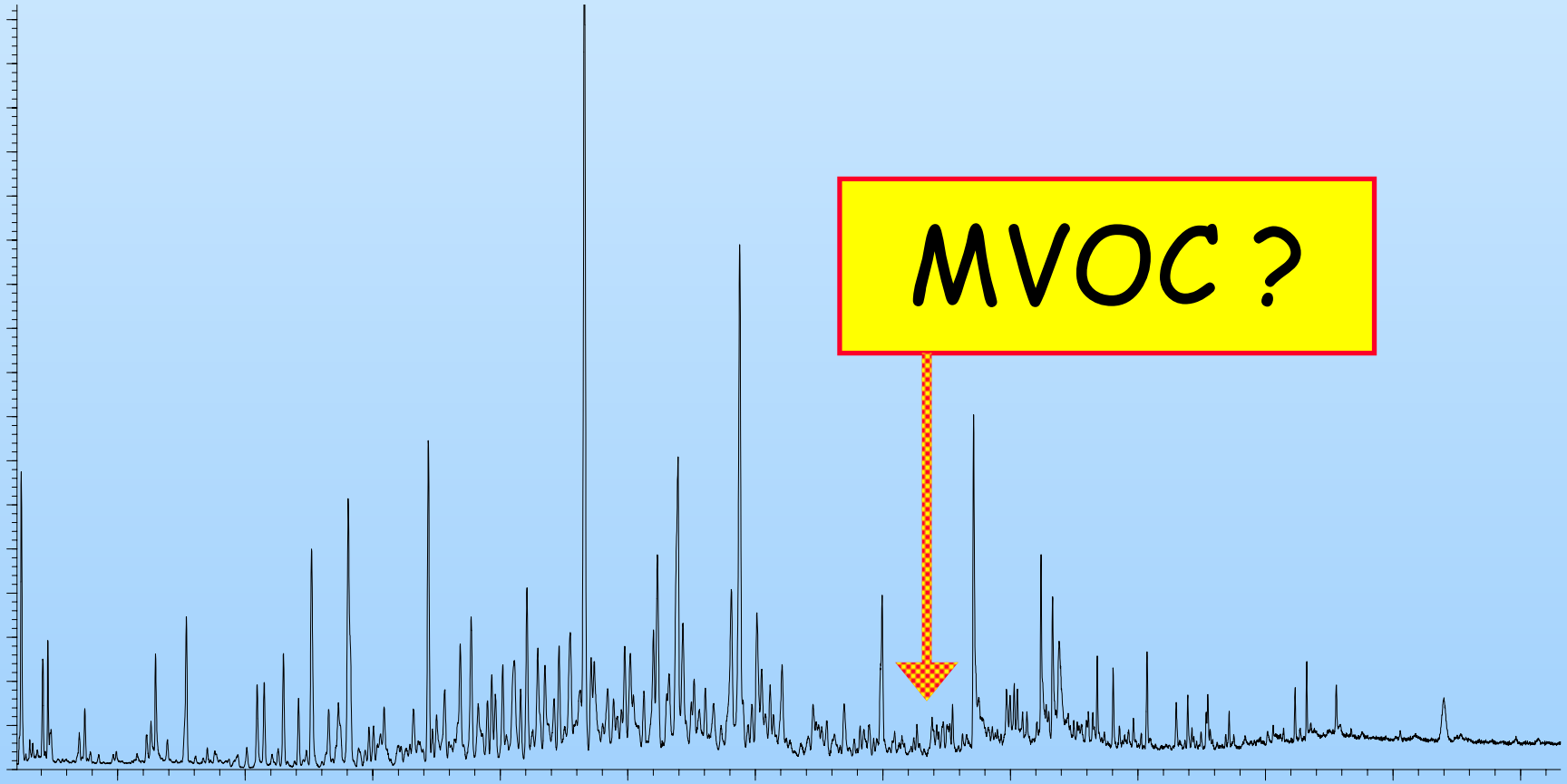
What is hidden?



Methods - MVOC

- Sampling on adsorption tubes (Tenax TA)
- Thermal desorption
- GC-MS analysis
- Quantification → external standard (toluene)

Possible MVOCs

Compound	Compound
Furan	Camphene
2-Methylfuran	2-Heptanone
3-Methylfuran	2-Pentylfuran
3-Buten-2-one	alpha-Terpinene
2-Butanone	2-Oktanone
2-Methyl-3-buten-2-ol	alpha-Terpinolene
Tetrahydro-2-methyl furan	2-Methyl-3-oktanone
2-Ethylfuran	Heksylfuran
2,5-Dimethylfuran	Fenchone
3-Methyl-2-butanone	2-Nonanone
2-Pentanone	D-Fenchyl alcohol
3-Pentanone	Camphor
2-Pentanol	2,6,6-Trimethylbicyclo(3.1.1)heptane-3-one
Pyrazine (1,4-Diazin)	4-Terpineol
4-Methyl-2-pentanone	Estragol
2-Methyl-3-pentanone	1-Borneol
3-Methyl-2-pentanone	alpha-Terpineol
2-Heksanone	6,6-Dimethyl-bicyclo[3.1.1]hept-2-ene-2-carboxaldehyde
Methylpyrazine	apha-apha-4-Trimethylbenzenemethanol
Tetrahydro-2-furanmethanol	2-Pentanoylfuran
(S)-2-S-Butylfuran	6-Undecanone
2-Butylfuran	Verbenone
alpha-Fenchene	

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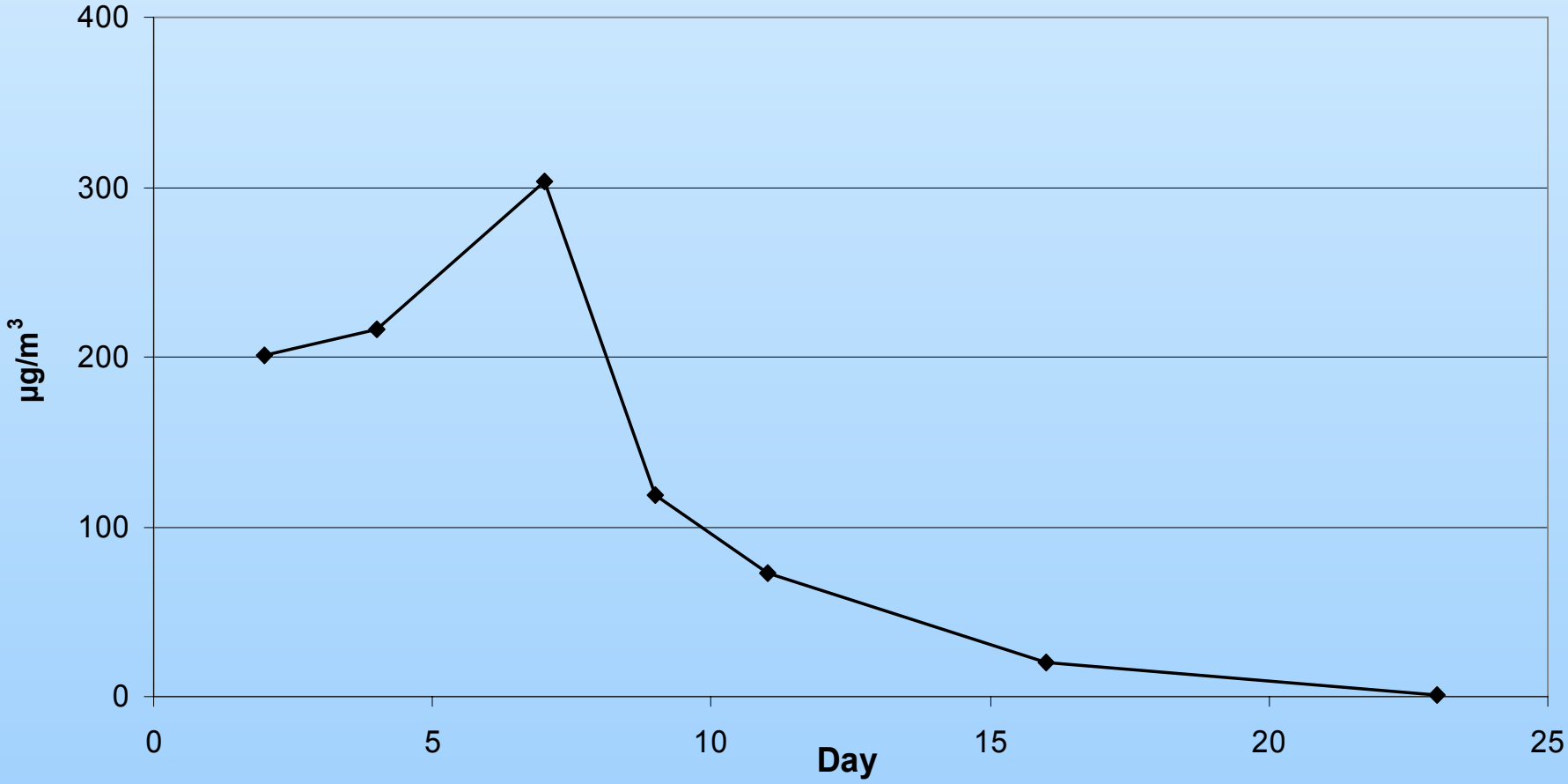
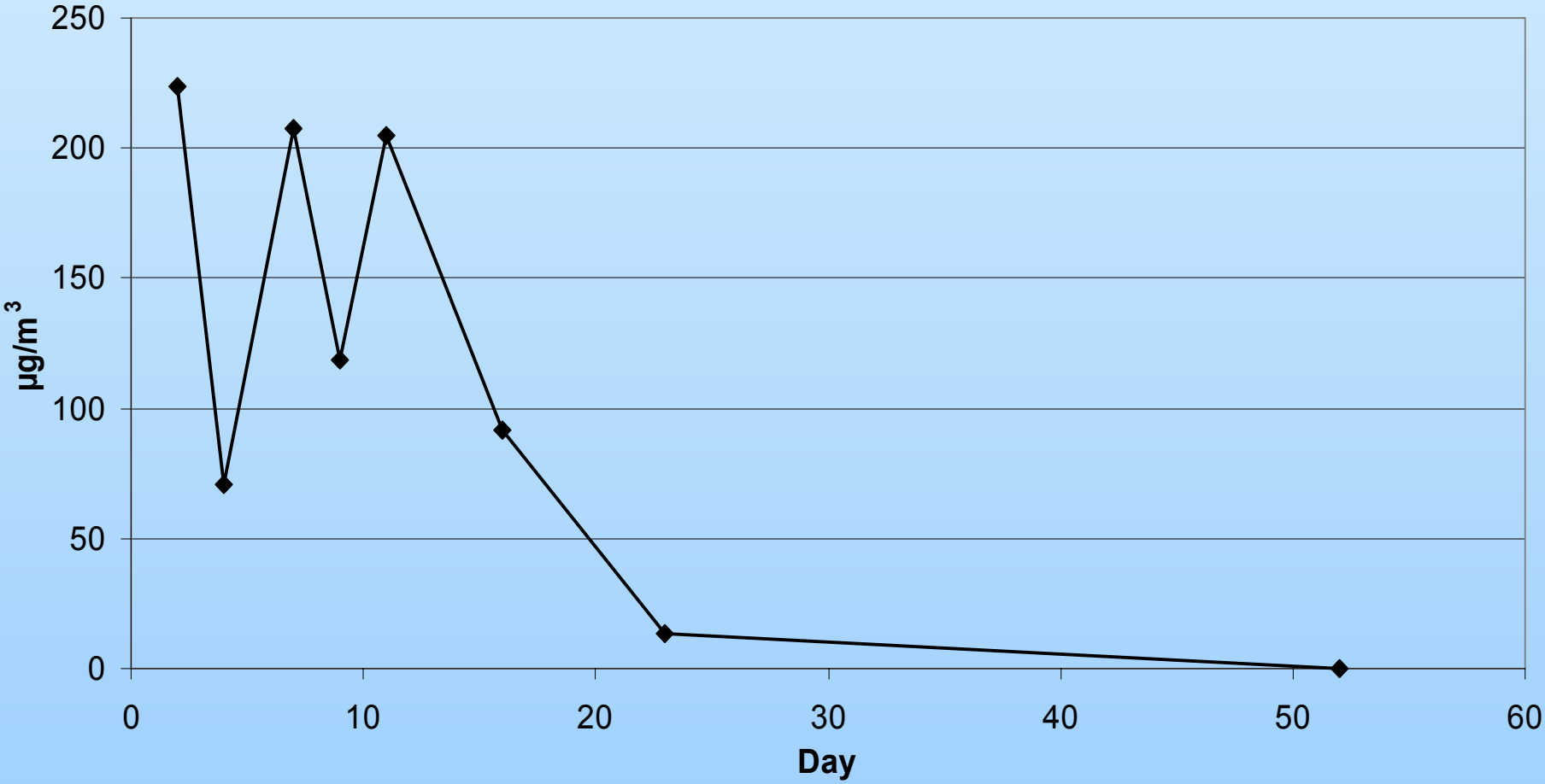
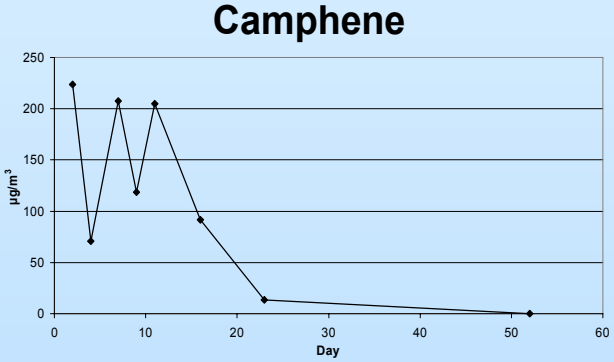
2-Pentanone



Camphene



Results



- Large variations in MVOC-emission through the life cycle –

  Both composition and strength

- 44 possible MVOCs currently included

MVOC

- - measurements are a non-destructive way to indicate the presence of active moulds
- - is an indicator for active mould colonies in building constructions

But is MVOC the best indicator?

Challenges

Picture: Mycoteam as

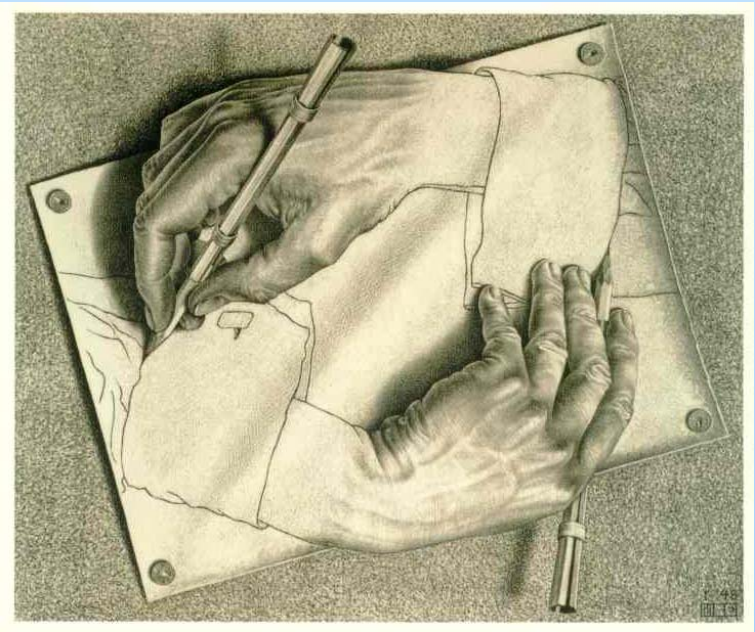
MVOCs may have various sources

⇓

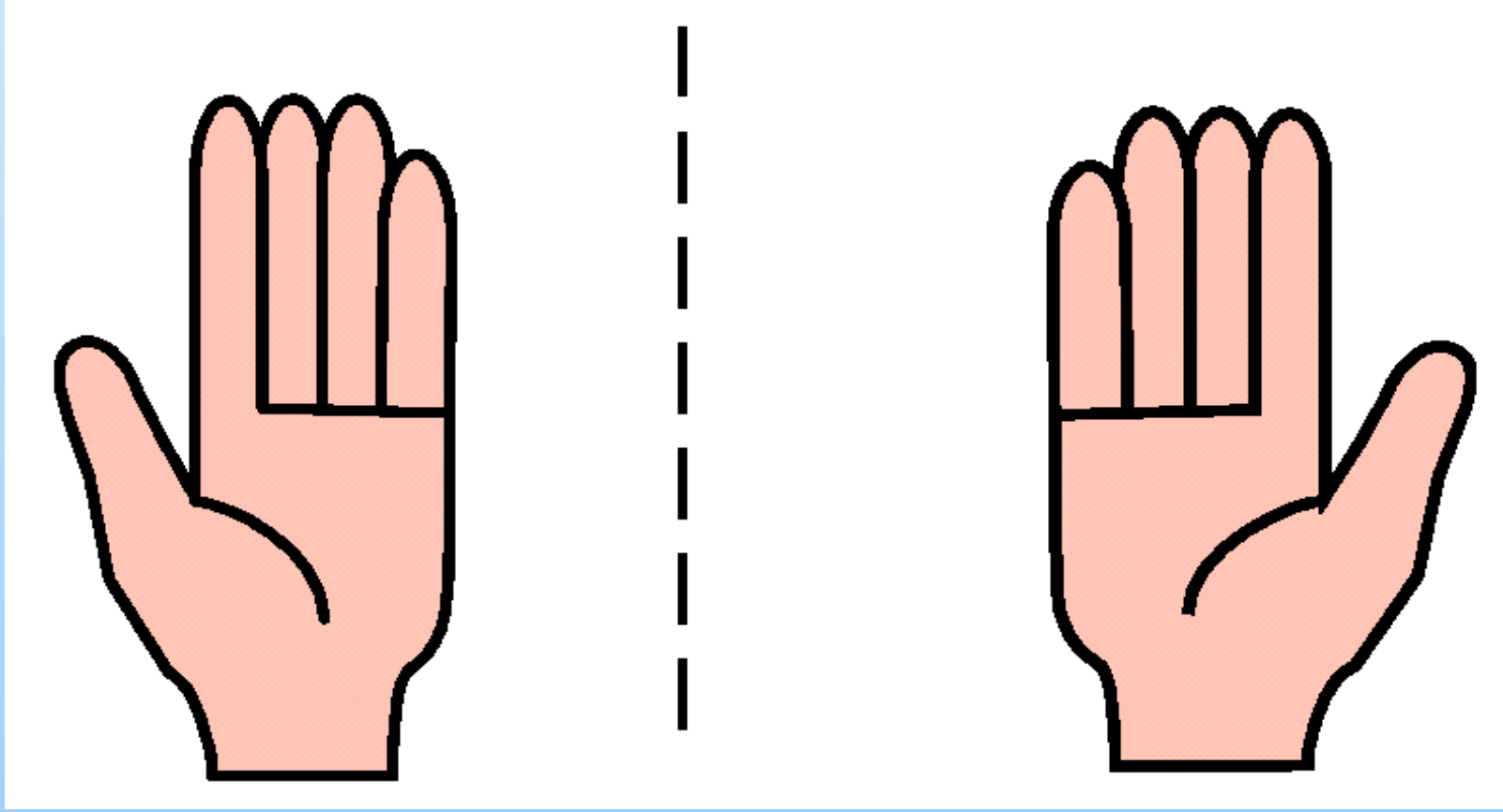
When are moulds the important source?

Chiral MVOC (c-MVOC)

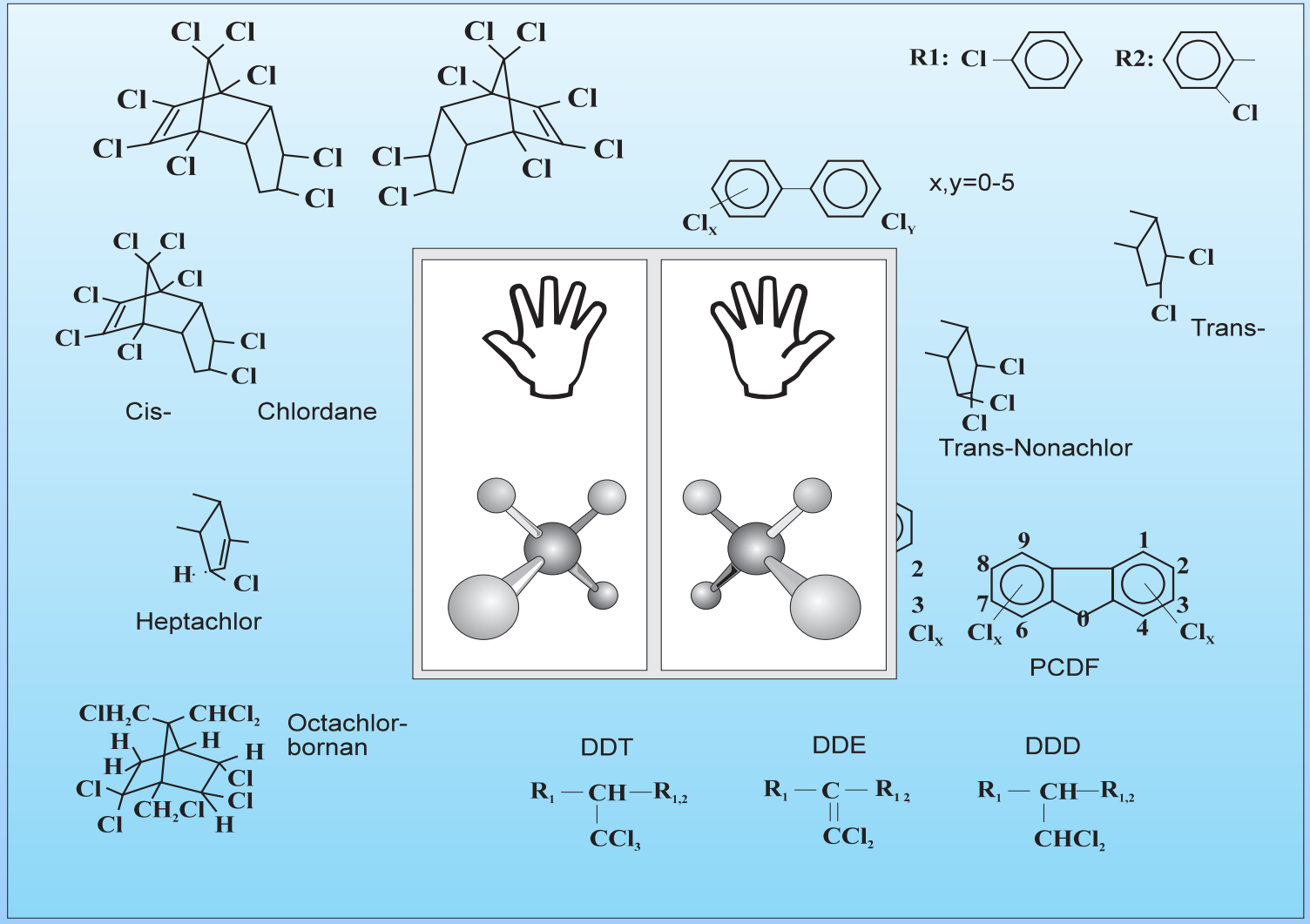
- a better indicator?



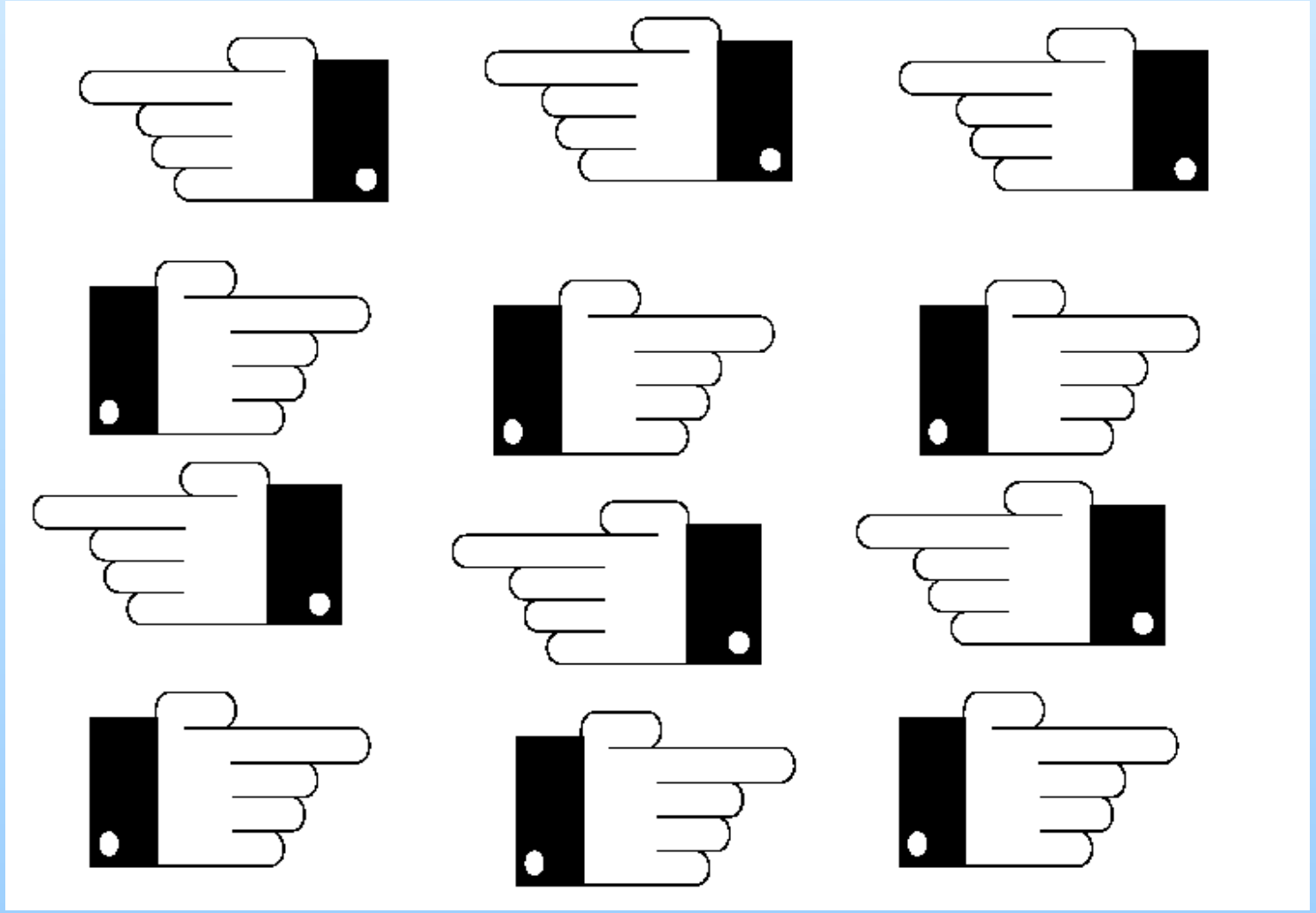
Mirror images (Enantiomers)



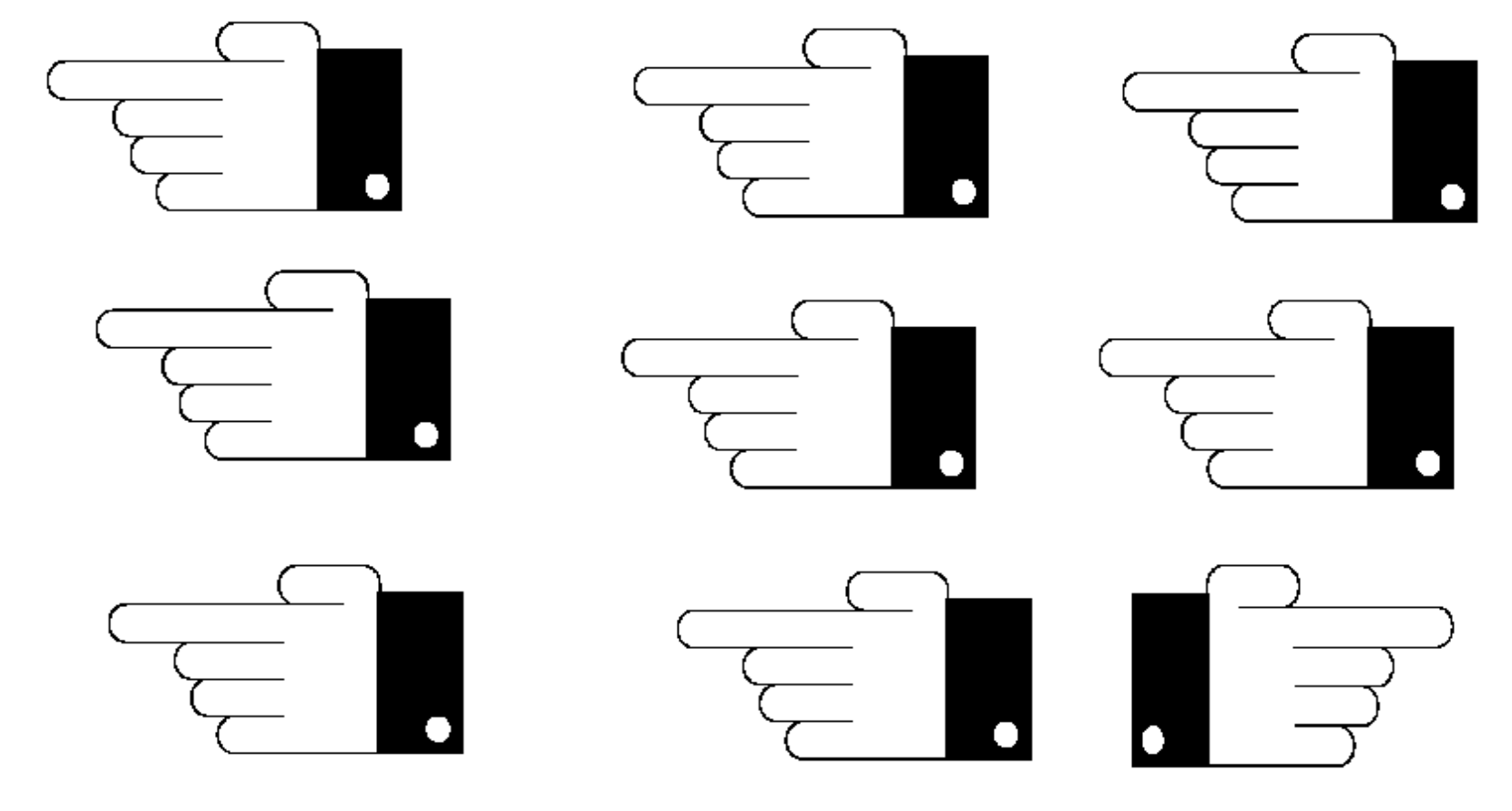
Chemical mirror images



Racemate (1:1)

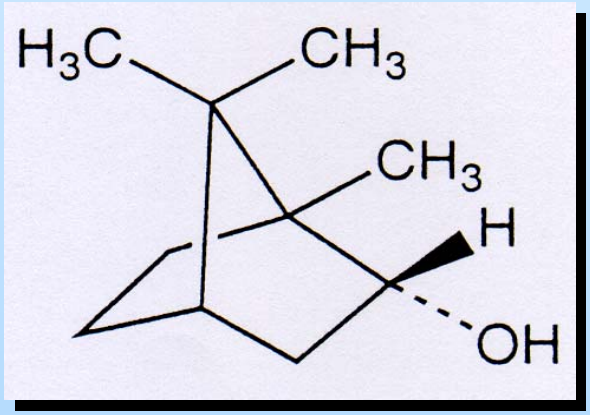


Enantiomer-ratio (8:1)



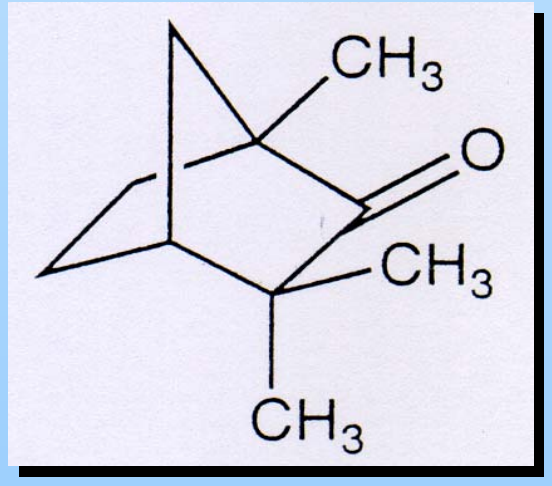
Chiral MVOCs

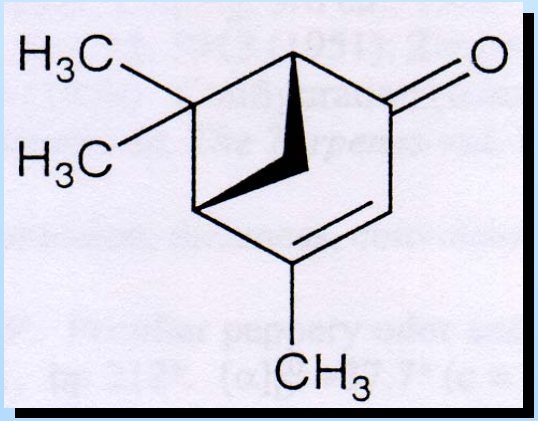
(Terpenes)



Borneol

Fenchone





Verbenone

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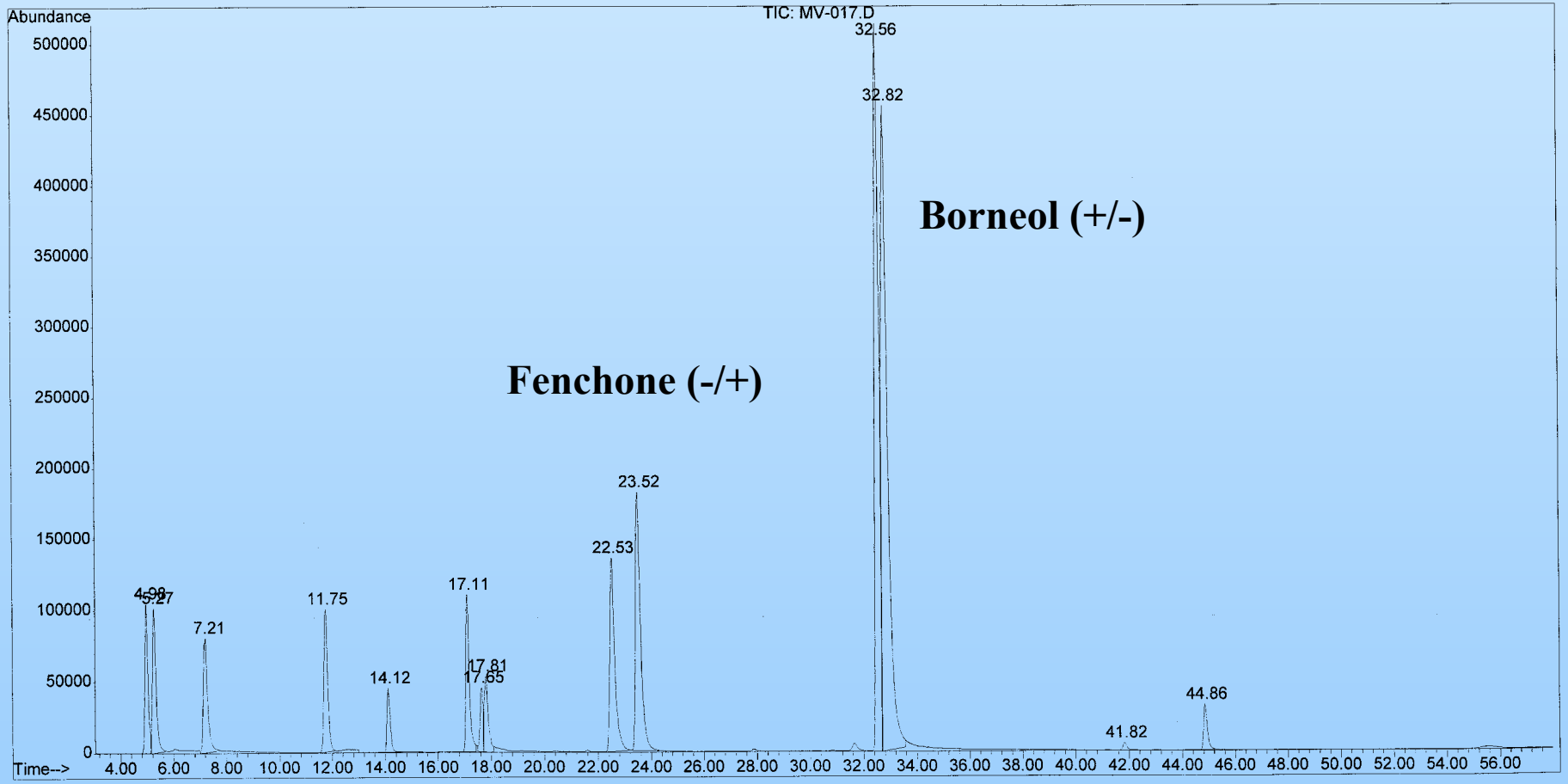
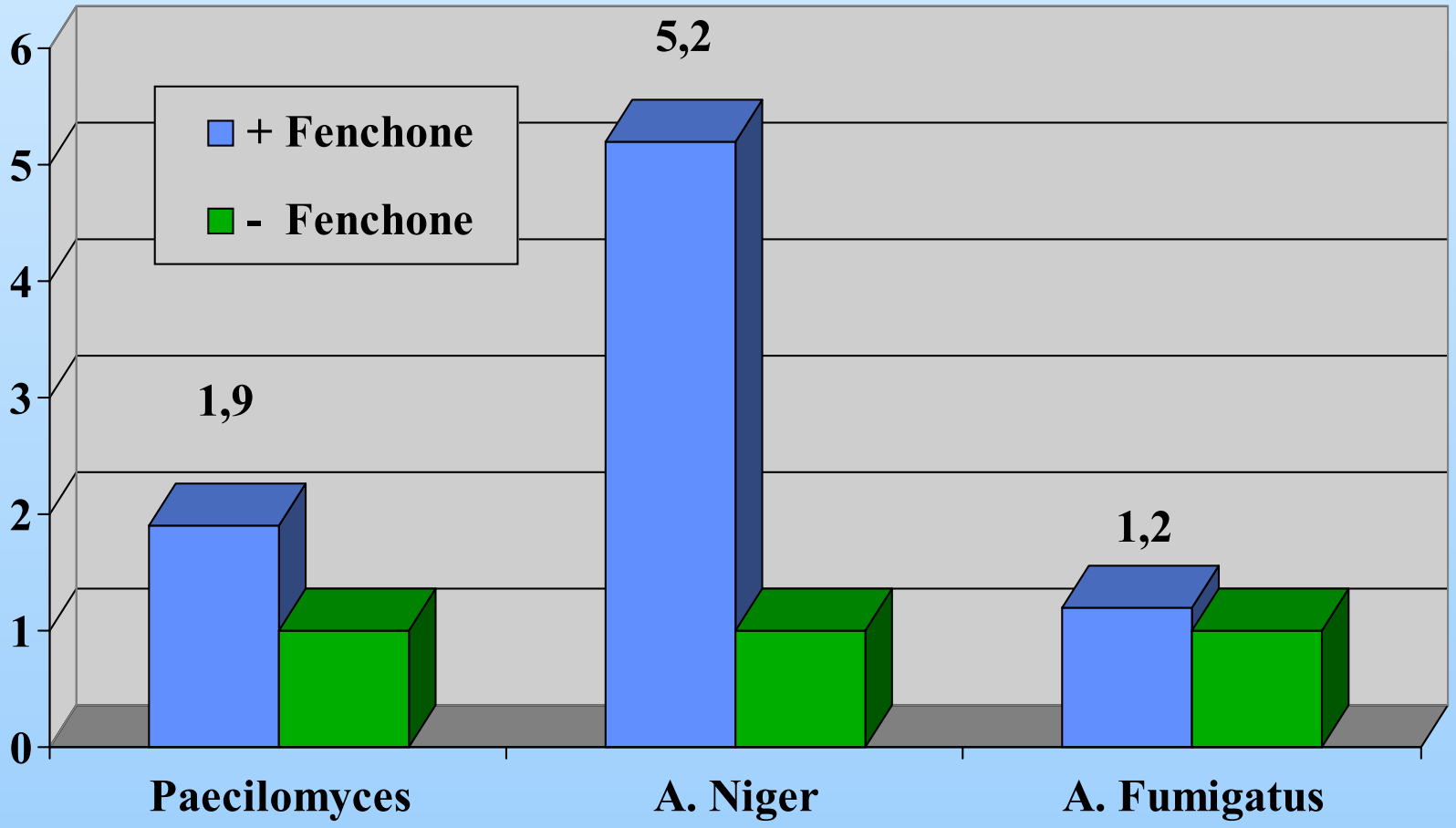
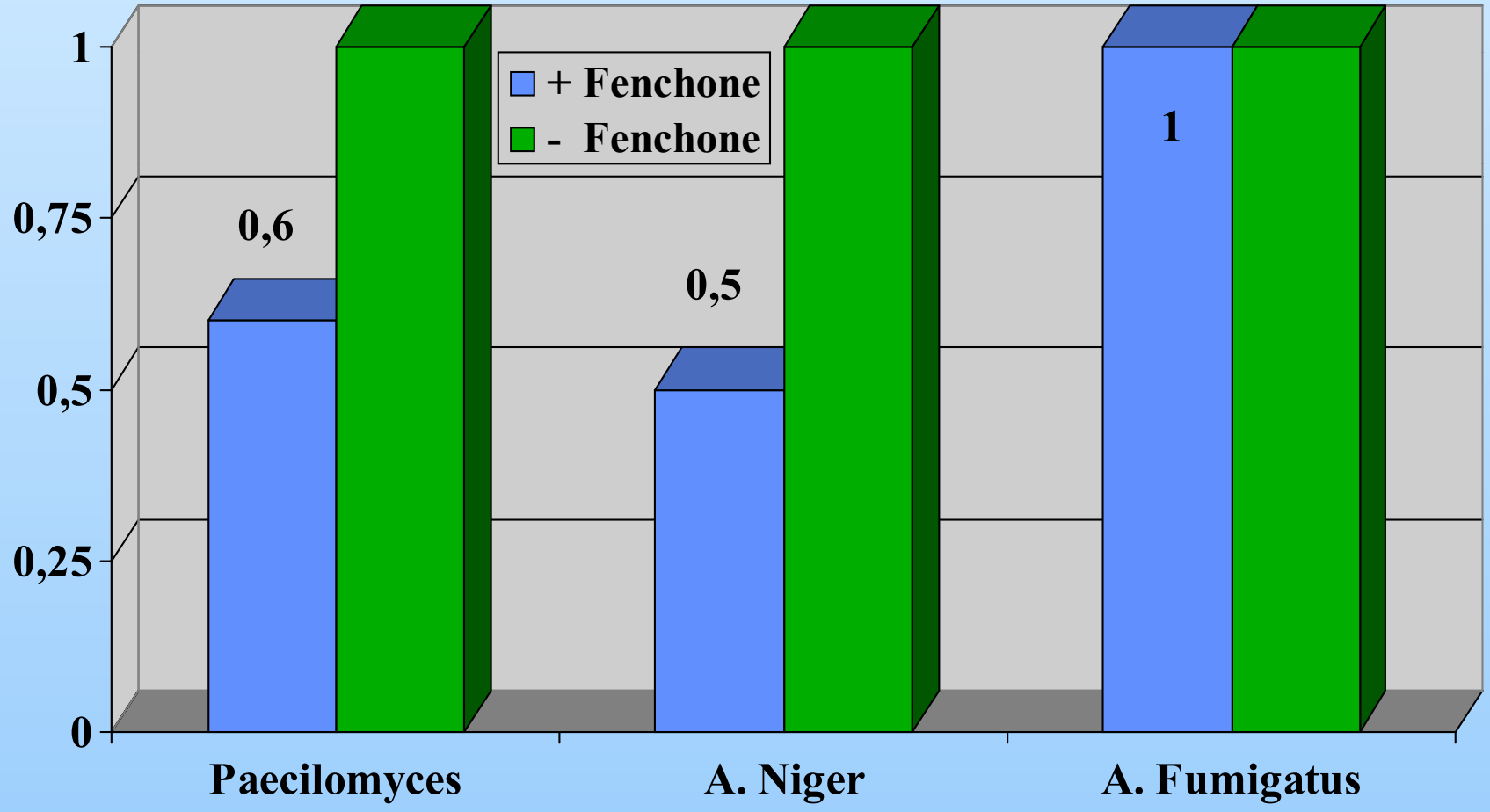
Analysis of chiral MVOC



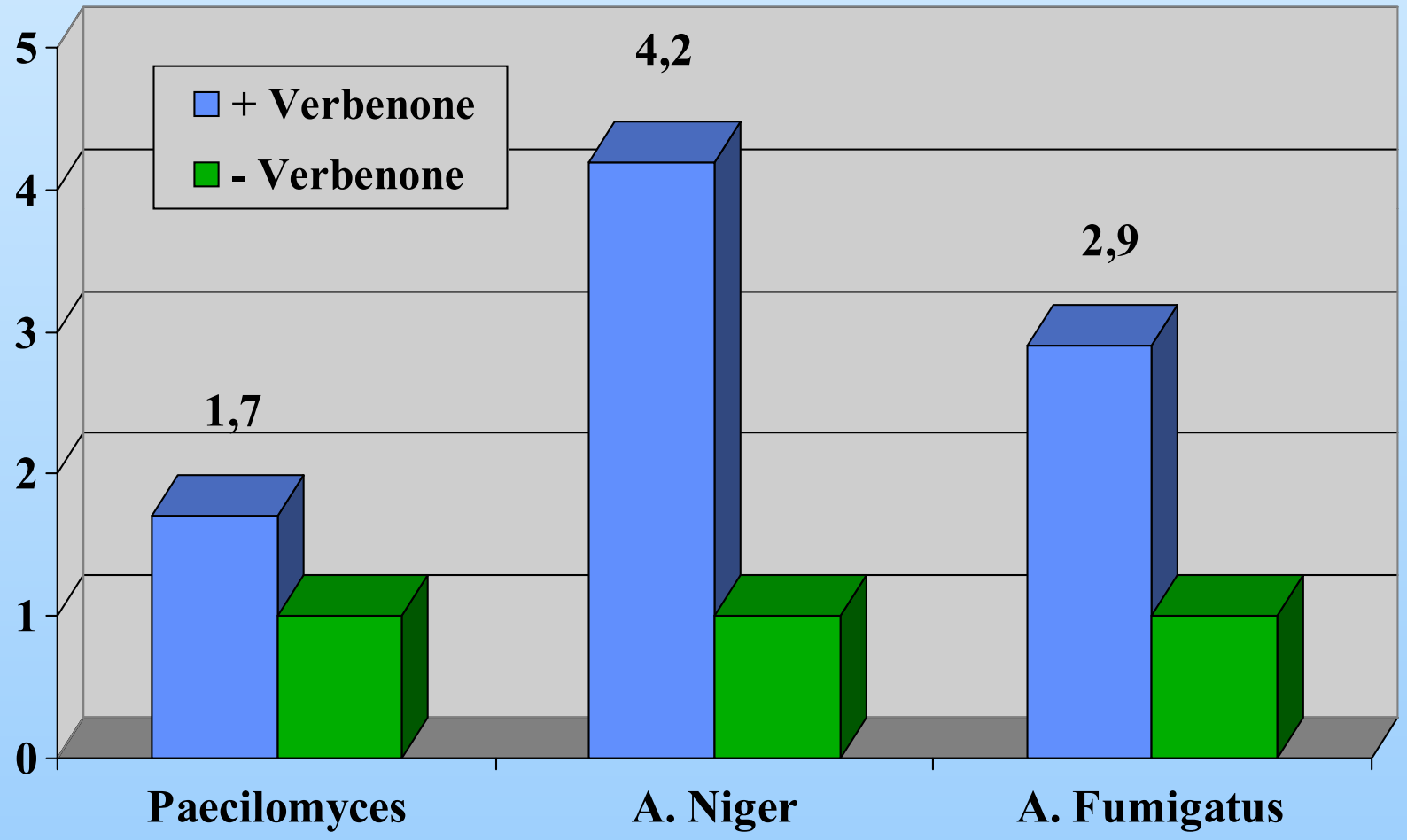
Fenchone, chipboard



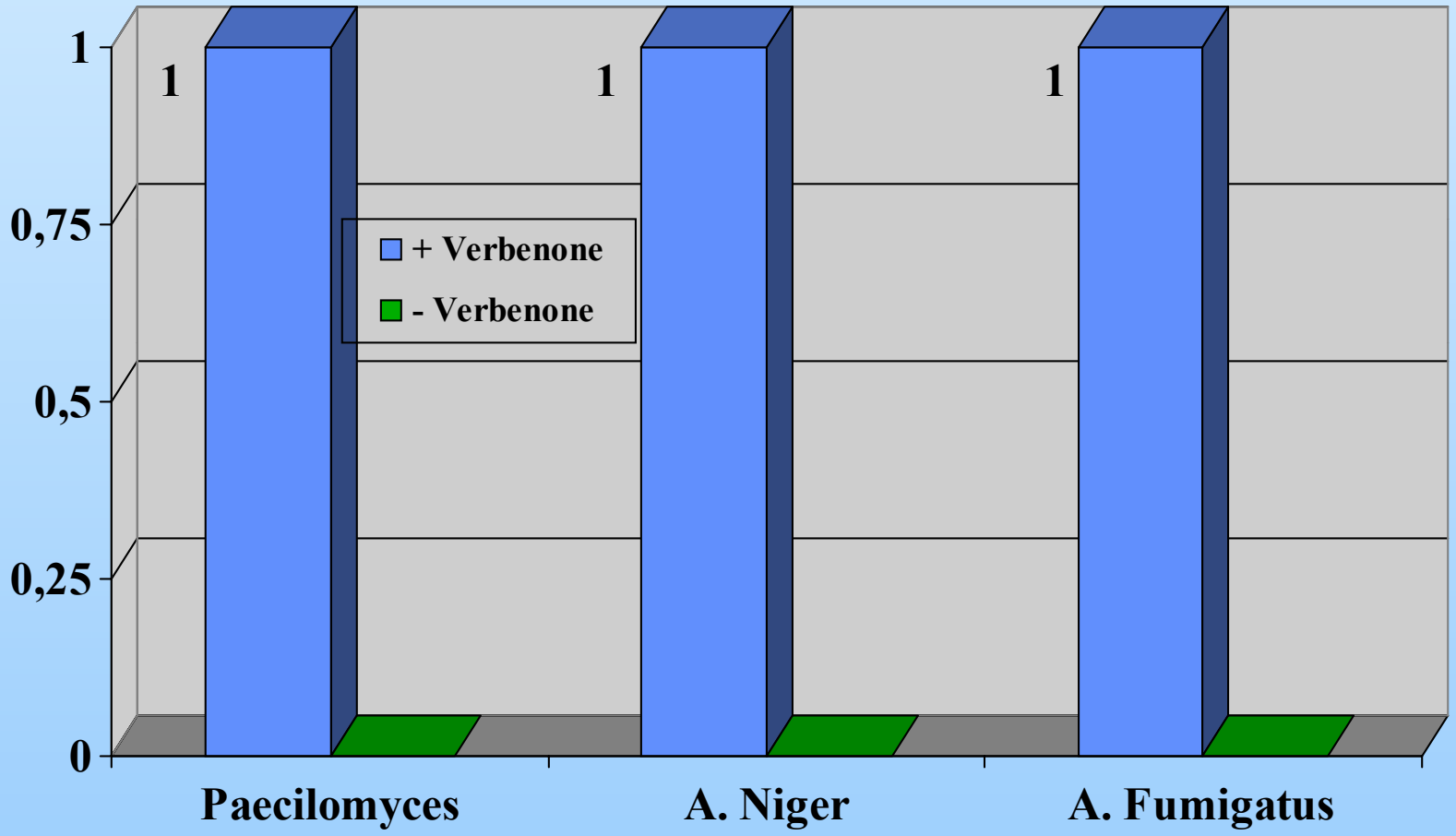
Fenchone, gypsum board



Verbenone, chipboard



1-okten-3-ol, gypsum board



Conclusions

- **Laboratory tests show that microbial activity change the enantiomer-ratio (field tests to be done)**

⇒ **<u>c-MVOC is a better indicator than MVOC</u>**