Volatile Metabolites as Early Diagnostics for Blood-Borne Pathogens

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Summary

Introduction to SIFT-MS

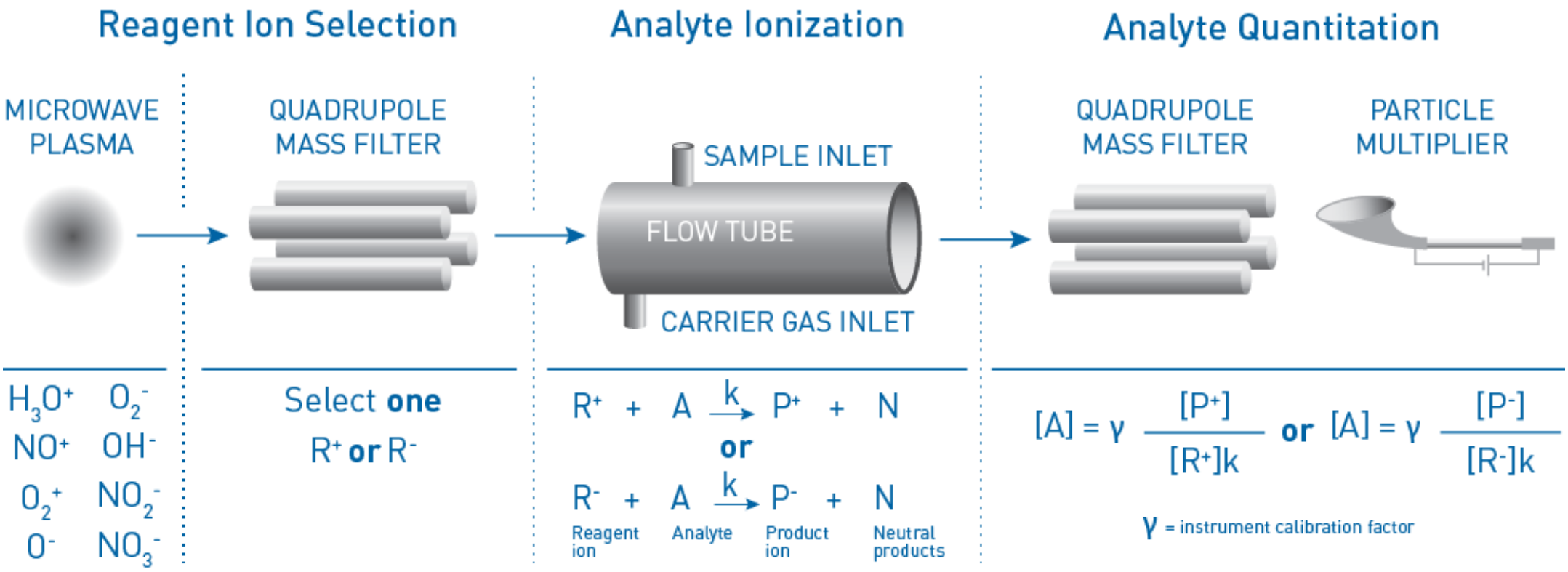
SIFT-MS for the detection of blood-borne pathogens

Conclusion

Selected Ion Flow Tube Mass Spectrometry (SIFT-MS) – Key Attributes

Analytical technique for measuring Volatile Organic Compounds (VOCs)
Rapid and real-time measurement
Selectivity, sensitivity and speed for a diverse range of chemical species
Soft ionization resulting in less fragmentation
Detection limit up to pptv
Easy to operate

SIFT-MS – how this soft chemical ionization technique works



Multiple reagent ions

Pure reagent ion delivery

Ultra-soft sample ionization

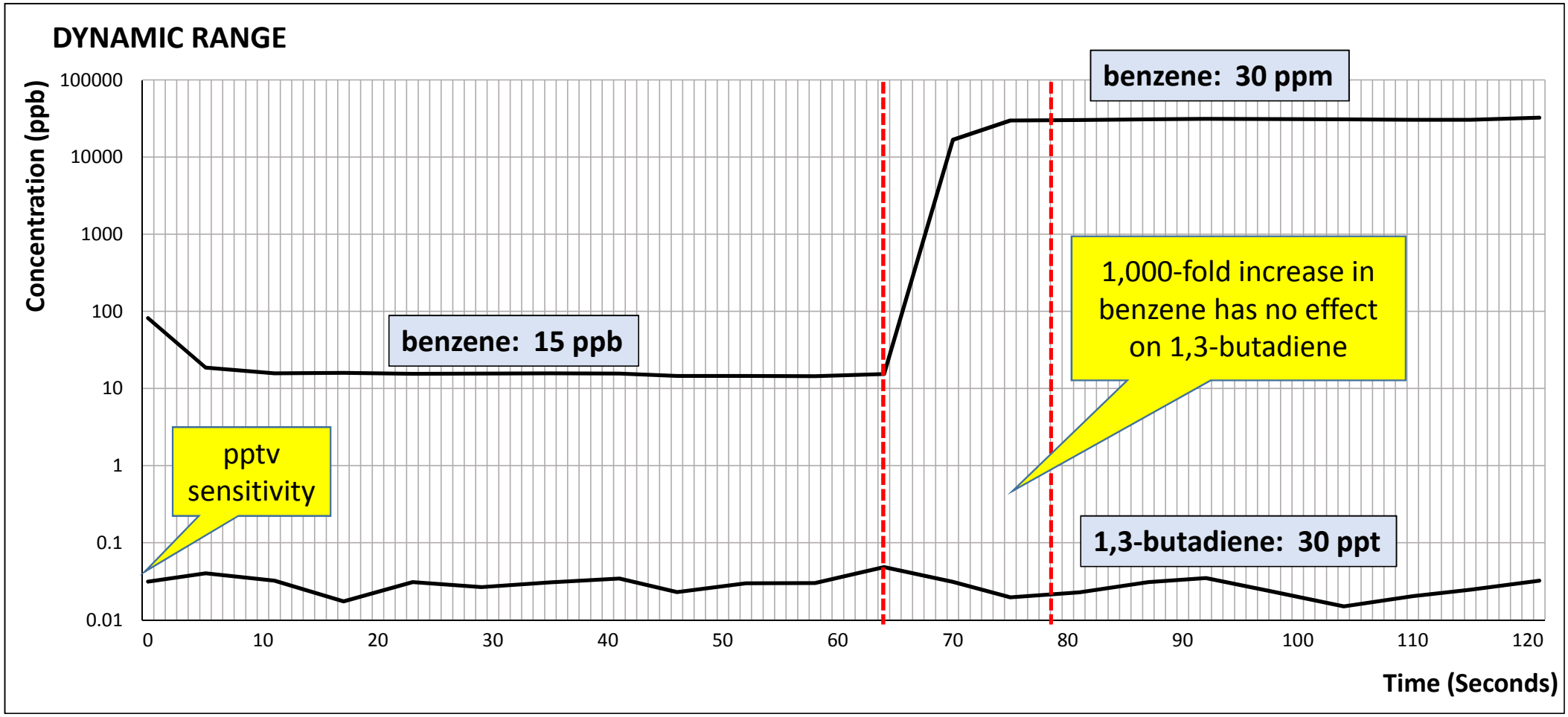
Mass spectrometer

SIFT-MS can measure most VOCs and inorganic compounds

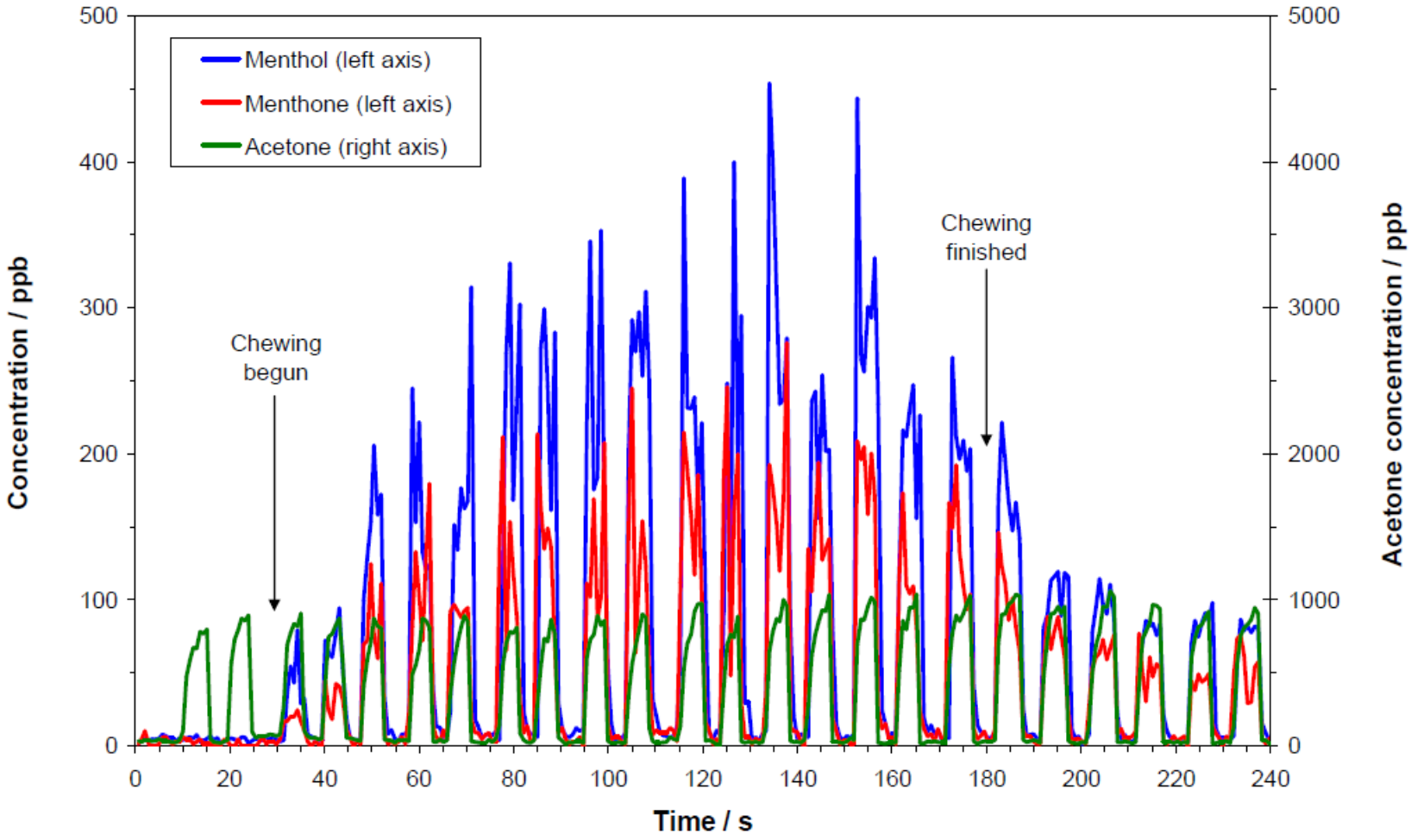
hydrocarbons	alkanes, alkenes, aromatics, monoterpenes
oxygenates	alcohols, aldehydes, **ketones**, esters, ethers, carboxylic acids, formaldehyde
nitrogen compounds	amines, amides, **nitriles**, nitrated organics
sulfur compounds	mercaptans, thioethers, carbonyl sulfide
halogenated compounds	aliphatic and aromatic fluorides, chlorides, bromides and iodides
inorganics	**ammonia, hydrogen cyanide, hydrogen sulfide**, hydrogen chloride, hydrogen fluoride, **carbon dioxide**, sulfur dioxide,

Who is using Syft Instruments

SIFT-MS is extremely sensitive and has a dynamic range of 6 orders of magnitude

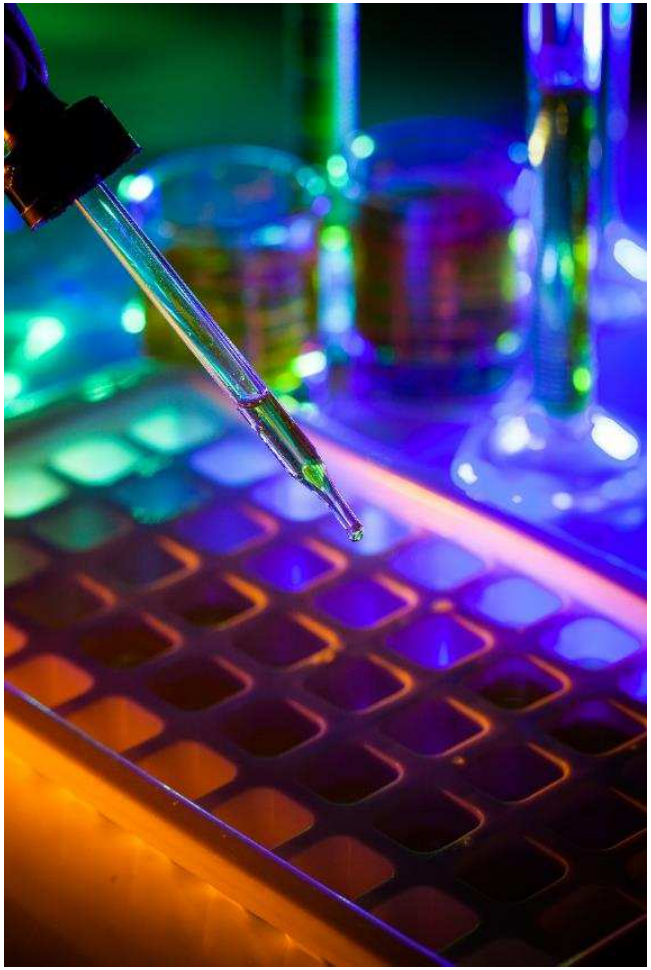


Concentrations can be monitored in real time



SIFT-MS for the detection of blood-borne pathogens

SIFT-MS - Biomedical applications



Breath diagnosis – non-invasive, point-of-care diagnostics and monitoring:

- Diagnosis of Chronic Obstructive Pulmonary Disease (COPD) and asthma.
- Determination of dialysis efficacy
- Diagnosis of acute renal failure and transplant rejection

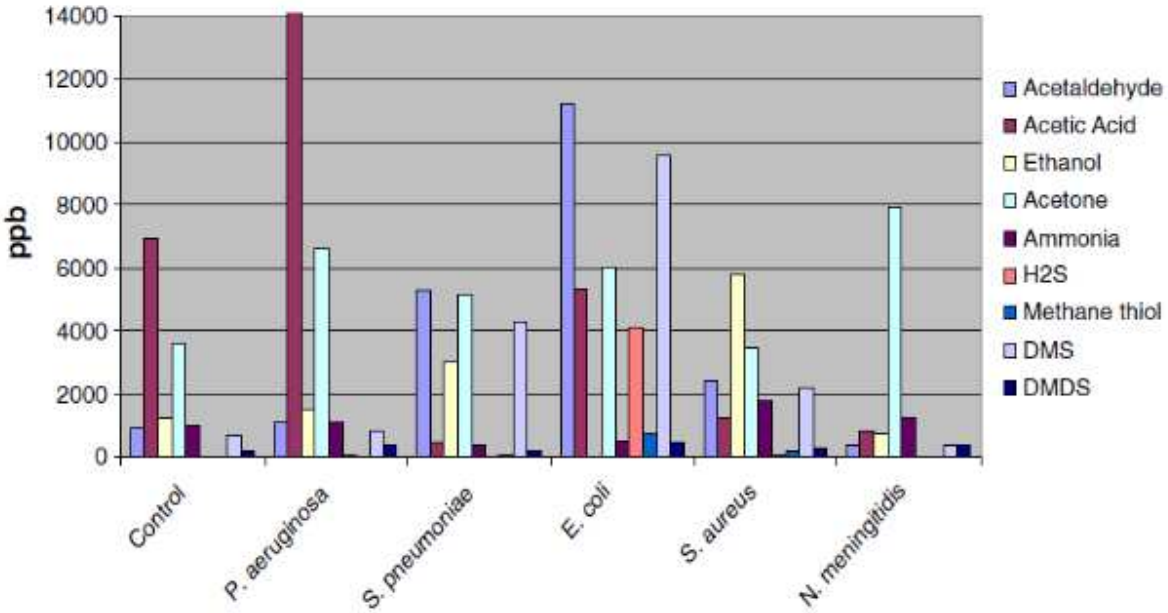
Laboratory – high throughput, low operator skill:

- Detection and identification of bacteremia in blood culture
- Diagnosis of urinary tract infections
- Detection of solvents and toxic industrial chemicals in urine

SIFT-MS application – VOCs from Blood-Borne Pathogens

VOCs present as a result of metabolic or disease processes
Present in breath, or headspace over body fluids or cultures
Conventional automated systems detect CO_2 liberated by growing microbes. (Eg: BacT/ALERT techniques)
Conventional techniques – Time consuming, trained technician
Timely detection enables more accurate treatment
In the current study, 5 bacterial species detected from 10 CFUs

Identification of bacterial pathogens from blood cultures



Bacterial VOCs at 6 hours in BacT/ALERT medium

Bacterial Species
Pseudomonsa aeruginosa
Streptococcus pneumoniae
Escherichia coli
Staphylococcus aureus
Neisseria meningitidis

SIFT-MS decreased time-to-positive result by as much as one half
Enhanced sensitivity enables detection of bacterial growth in blood culture in 6 hrs
VOCs from each bacterial culture headspace completed in 30 s without prior sample preparations
Profiles of MVOCs allows differentiation between different species of bacteria
Potential for integration into automated systems

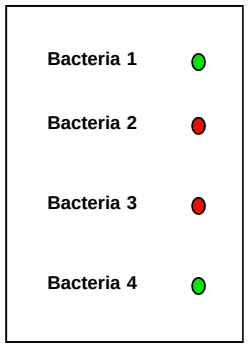
Automated SIFT-MS analysis – VOCs from headspace

Selected Headspace

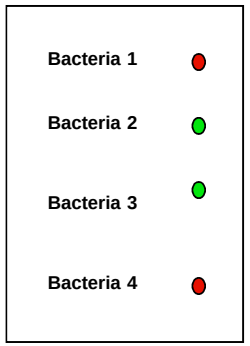
Existing BacT/ALERT culture system

Automated Syft Voice200*ultra* analysis workstation

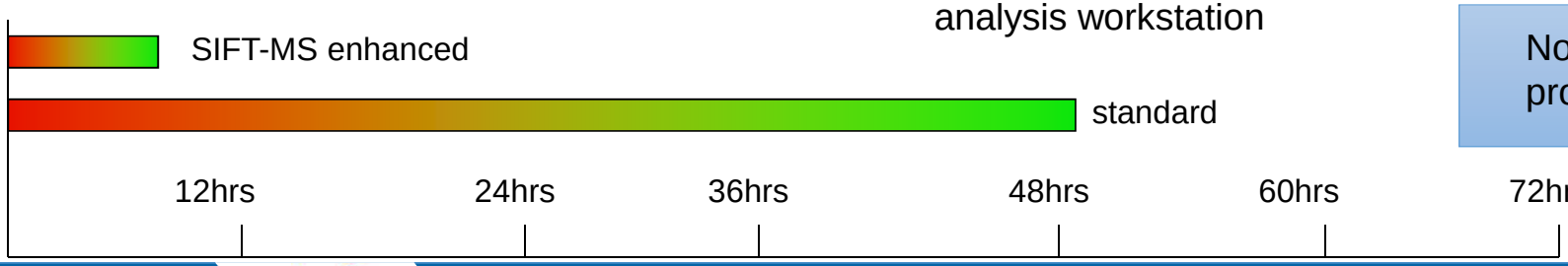
“Real-time” results



identification



Antibiotic response



No change to existing procedure!

Summary

SIFT-MS technology is adaptable, testing a range of body samples (including breath, blood and urine)
Volatile compounds produced by microbes are measured quickly and accurately
Unique set of volatile metabolites indicates particular species of bacteria
Shorter incubation time and rapid analysis – Powerful early screening tool

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Questions?

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Find out more at Exhibition Hall 1 (1F)
Poster No: PA-94