AIHA

CONNECT™

2025

Nano Sampling Badges – Sampling for Nanoparticles & Nanograms of Vapors by Assay Technology

C.R. (Gus) Manning, PhD, CIH, FAIHA
Maria D.R. Peralta, PhD

ACKNOWLEDGEMENTS & REFERENCES

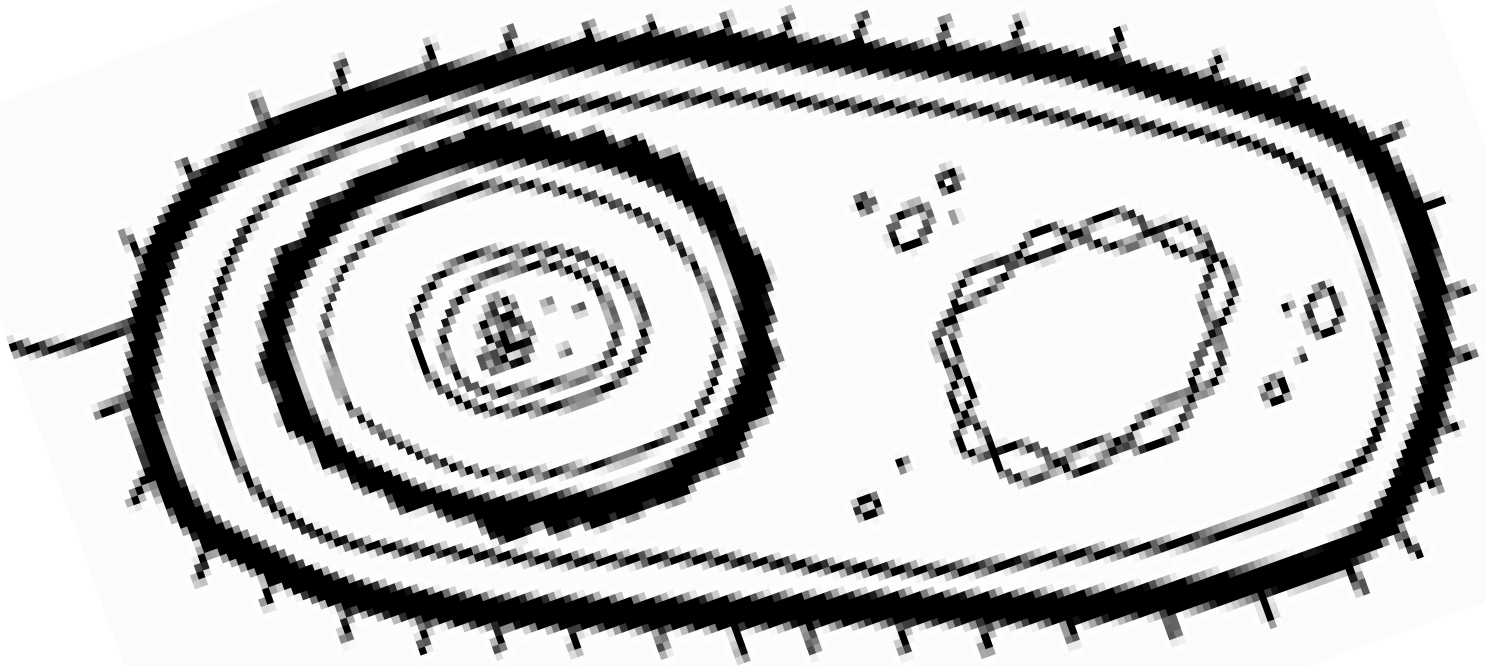
- "*You Can Run, But You Can't Hide from Unidentified Flying Particles (UFP)*" J. Baker, C. Geraci, B. Lippy, K. Sheffield, M. Shepard, D. Singh (***The Synergist***, May, AIHA, 2025)

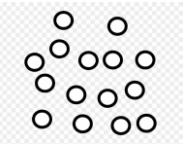
- STAT PEEL® Material Selective Detection System, https://www.statpeel.com

TOXIC NANOPARTICLES

- Nanoparticles (tiny, 1-100 nm in diameter) induce effects that arise from
  - their chemistry
  - small particle size

Bacteria (200 nm)





Nanoparticle
(1-100 nm)

TOXIC NANOPARTICLES

- Since we learned that nanoparticles can enter the body
  - Experts are more worried about their toxic effects
- Tiny size allows nanoparticles to cross barriers
  - that normal dust cannot penetrate
- Nanoparticles can enter and move throughout the body

CARBON NANOTUBES, GRAPHENE, & CARBON BLACK

- Carbon Nanotubes (CNT) *nanoparticles*
  - nanoparticles are persistent in environment
    - **IARC says "possible carcinogenic to humans"**

- Graphene *nanoparticles*
  - nanoparticles are persistent in environment
    - **Toxicity studies ongoing**

- Carbon Black *nanoparticles*
  - persistent in the environment
    - **IARC says: "possiby carcinogenic to humans"**

IARC = International Agency for Research on Cancer

RESPIRABLE CRYSTALLINE SILICA (SIO2)

- Respirable Silica *nanoparticles*
  - Persistent nanoparticles arise from construction
  - Sand storms generate nanoparticles

  - **ALL OVER THE WORLD**

    - **Chronic Lung Disease**
      - **Bronchitis, Silicosis**

NANOCELLULOSE & PLASTIC DUST

- Respirable particles arise from packaging
  - Persistent nanoparticles are respirable
  - **ALL OVER THE WORLD**
    - **Toxicity studies ongoing**

DILEMMA WITH NANOPARTICLES

- **Regulators suggest that carbon nanotubes, graphene, & carbon black are more toxic than other carbon and must be controlled.**

- **Control is impossible without accurate measurement.**

- **(NIOSH & OSHA) analytical methods - unable to determine particle size and chemical nature at the same time.**

- **Something new is needed …**

CARBON NANOTUBES, GRAPHENE, & CARBON BLACK

- Can be Collected on Air Sampling Filter
- Filter Sample Presented to Spectrometer
  - **X-Ray Spectrometer**
  - **Electron Spectrometer**
  - **Raman Spectrometer**
- Spectrometer Can Speciate & Assess

PARTICLE-SCANNING SPECTROMETERS - COSTLY

- Scanning Electron Microscope – ca. $1,000,000
- X-Ray Spectrometer – ca. $1,000,000
- **Raman Spectrometer – ca. $150,000 … “cheap”**

STAT PEEL ® IDENTIFIER SYSTEM

Scanning Raman Spectrometer

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STAT PEEL® IDENTIFIER SAMPLING KIT

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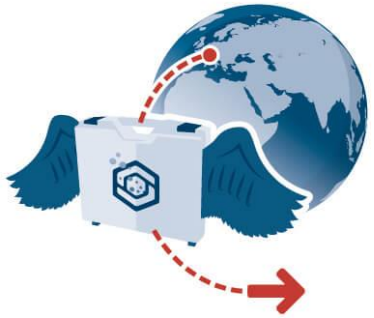
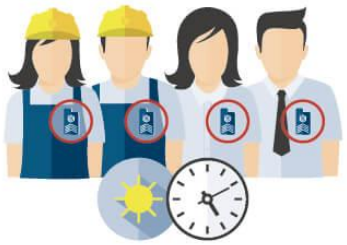
SAMPLING



1. The sampling kit flies from the Stat Peel lab to your location.

2. The user operates the badges with the tablet.



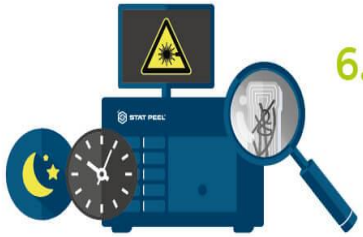
3. The user wears the badge throughout the workday.

The badges can also be placed in different locations in the facility.

4. The badge filters air and collects particles.

SAMPLING & LAB ANALYSIS

5. You send the entire kit back to Stat Peel.



6. The Identifier analyzes the filtration slides and calculates exposure.

Assay Technology Can Be Your Lab

7. Stat Peel generates a detailed exposure report.

All information will remain confidential.

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CARBON NANOTUBES, GRAPHENE, & CARBON BLACK

- Can be Collected on Air Sampling Filter
- Filter Sample Presented to Spectrometer
  - **Raman Spectrometer**
- StatPeel® Spectrometer
  - **Speciate & Assess**

RESPIRABLE CRYSTALLINE SILICA (SIO2)

- Respirable Silica *nanoparticles*
  - Persistent nanoparticles arise from construction
  - Sand storms generate nanoparticles
    - **Chronic Lung Disease**
      - **Bronchitis, Silicosis**

- Lung Disease depends on crystalline form
  - **Speciate & Assess w/ Stat Peel® Identifier**

IARC = International Agency for Research on Cancer

NANOCELLULOSE & PLASTIC DUST

- Respirable particles arise from packaging
  - Persistent nanoparticles are respirable
    - **Toxicity studies ongoing**

- Cellulose & Plastic Dust Are Everywhere
    - **Speciate & Assess w/ Stat Peel® Identifier**

IARC = International Agency for Research on Cancer

TOXIC NANO-VAPORS

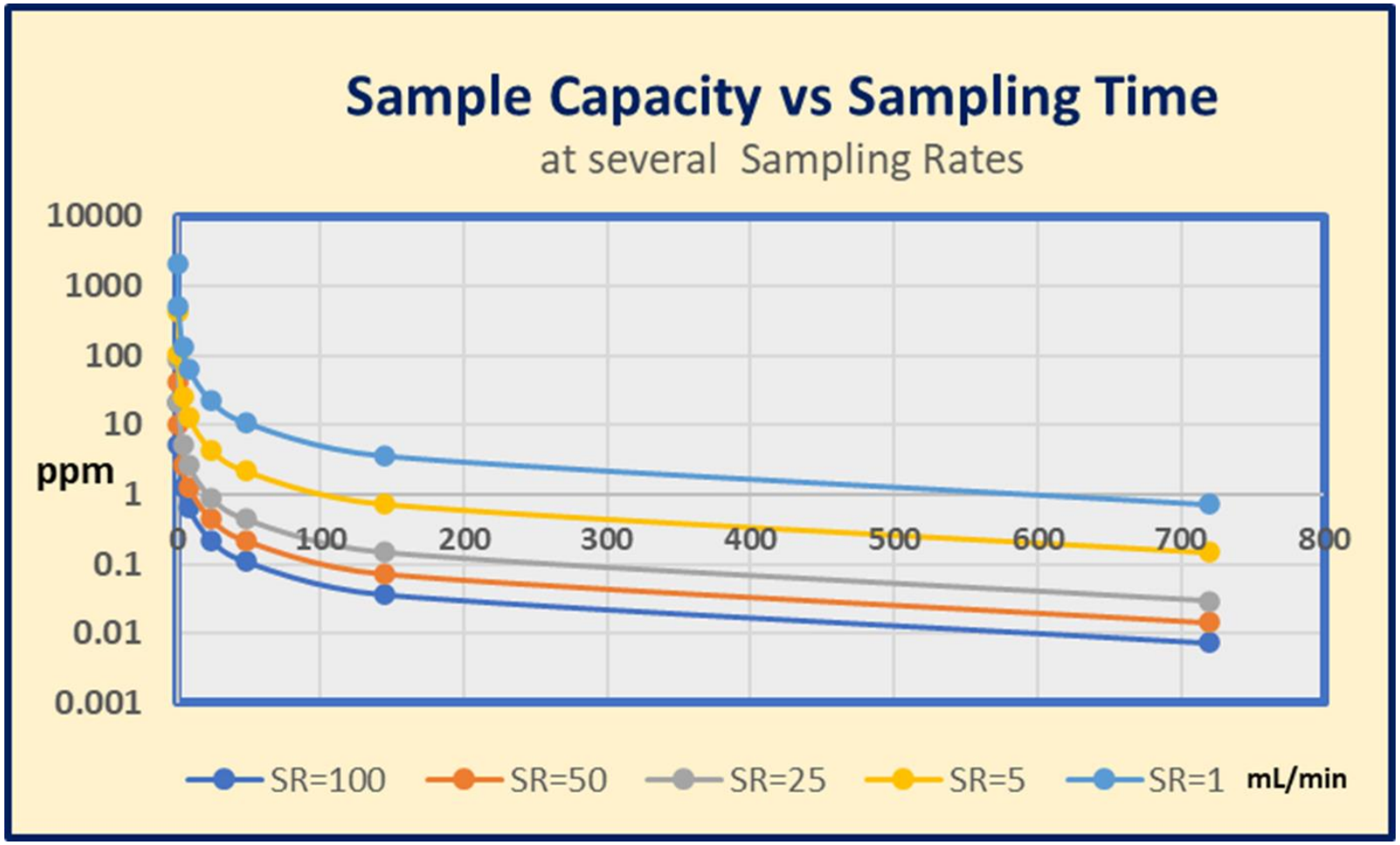
- Nano-Vapors Can Be as Toxic as nanoparticles

- Vapors Can Be Sampled
  - Personal Monitoring Badges

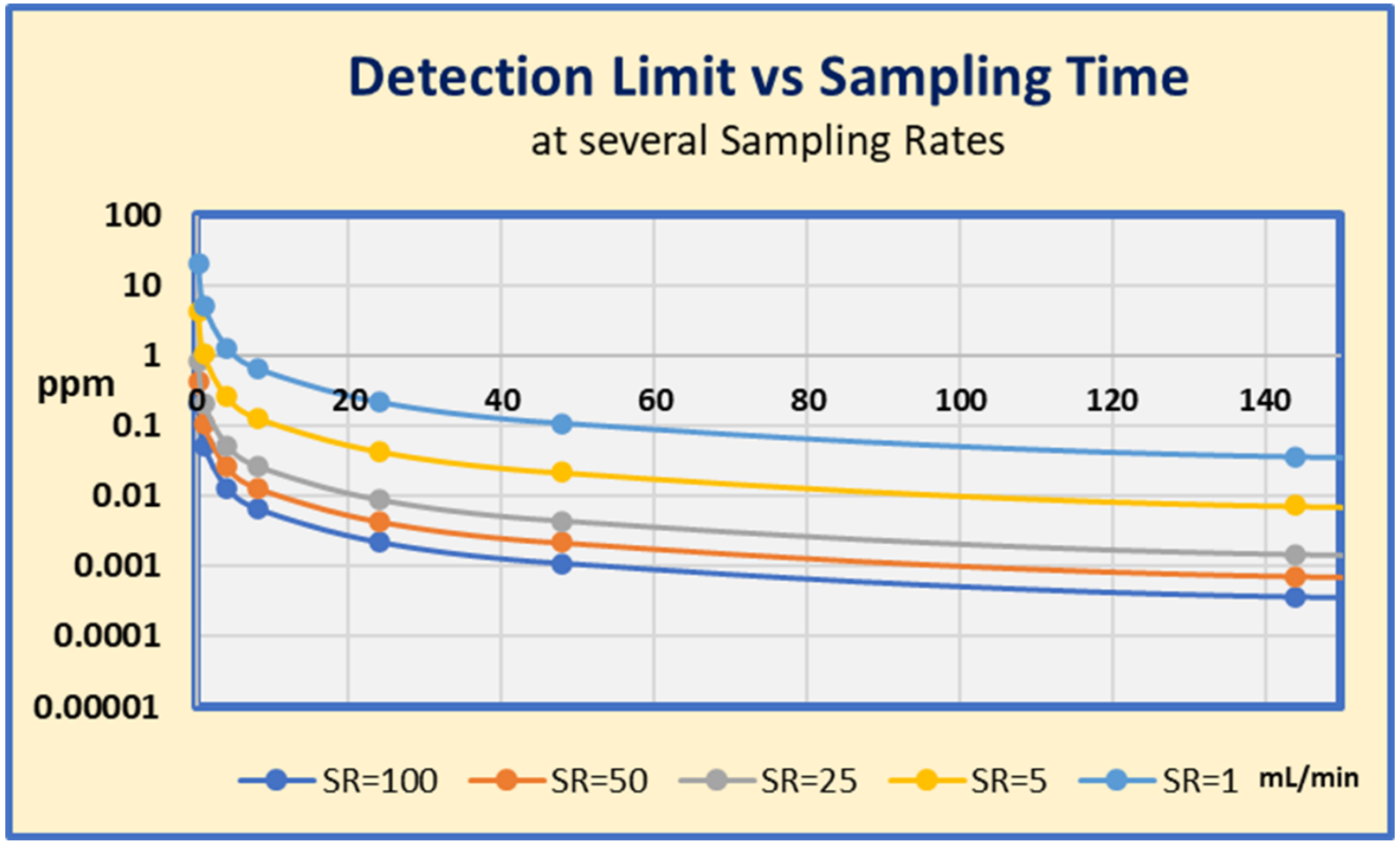
PERSONAL MONITORING BADGES

Provide a Range of Sampling Rates, Sample Capacities, Reporting Limits

LOWER SMPLG RATE – HIGHER CAPACITY



HIGHER SAMPLG RATE – LOWER DETECTION LIMIT



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SEEKING LOW REPORTING LIMITS

- **Indoor Air Quality (IAQ) Investigations**
- **Vapor Intrusion Studies**
- **Ambient (non-workplace) Air Sampling**

LOWER DETECTION LIMITS … QUICK

- **For clients desiring *parts per billion (ppb)* reporting limits**
  - **but who demand short sampling times**

- **Thermal Desorption Analysis (TDA) can detect *ng* of VOCs**
  - **Reporting Limits 1-20 ppb of VOCs**
  - **Speciation & Quantitation by GC/MS**
  - **More Costly Than Conventional Air Sampling**

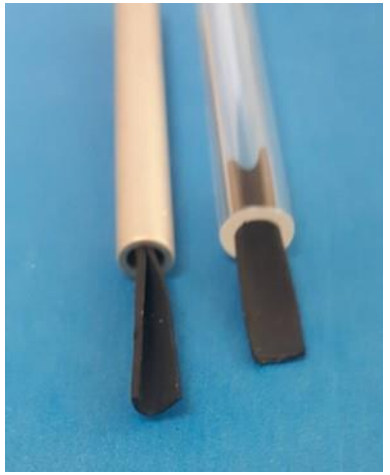
- **Practical Diffusive Samplers utilizing TDA have not been available.**

DIFFUSIVE SAMPLER FOR TDA
(PROTOTYPE)

DESIRED DIFFUSIVE SAMPLER FEATURES

Multi-Sampler Aspect

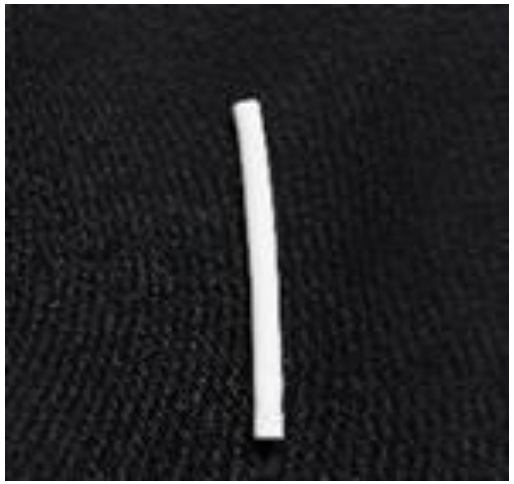
Removable Matrix



Transfer to TDA Tube

ULTRA TRACE AIR® DIFUSIVE SAMPLER FOR TDA

Convenient Sampler



Removable Matrix for TDA

ULTRA TRACE AIR® DIFFUSIVE SAMPLER

- **Featuring ppb Reporting Limits to 1 ppb**
  - **1-8 hr Sampling Time**
  - **100 VOCs**

- available soon from ***Assay Technology***!

THANKS FOR LISTENING1

- gmanning@assaytech.com
- bgreen@assaytech.com
- mperalta@assaytech.com
- 800-833-1258

THANK YOU FOR ATTENDING!

gmanning@assaytech.com

mperalta@assaytech.com

bgreen@assaytech.com 800-833-1258