# Measurement science activities under ICCVAM

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# NIST Practices

- **Measurements**
  - Develop new measurement methods
  - Improve accuracy/precision of measurements
- **Reference Materials**
  - Well-defined materials for use as a reference when making measurements
  - Enables inter-lab comparability
  - Physical artifacts for calibrating instruments
- **Standards**
  - Documentary standards, ASTM, ISO
  - Reference data (chemical spectra)
- **Assay development within ICCVAM**
  - No regulatory responsibilities but supports other agencies with improving the quality of assays potentially useful for regulatory purposes
  - Interlab comparison with EASA method with NIOSH, FDA, and CPSC/NIST coordinated by NIEHS started in 2017 using cuvette based method


**Food-matrix reference materials to facilitate nutritional labeling**

**NIST Synthetic RNA controls (ERCCs) used in sequencing of Ebola virus genomes to characterize patterns of viral transmission**

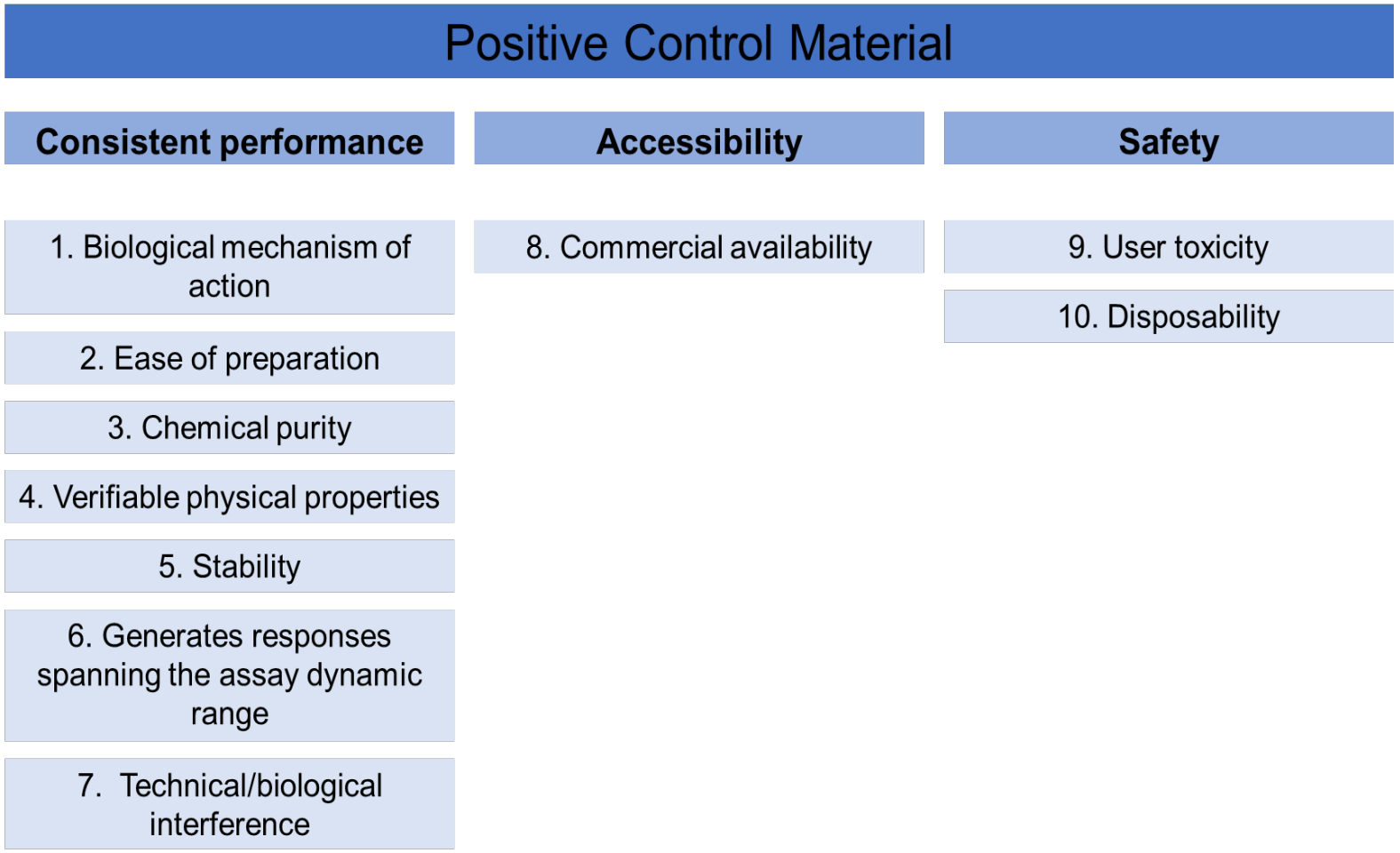
# Characteristics to consider when selecting a positive control material

Collaborative partners: CPSC, NICEATM, EMPA, PETA ISC

- Positive control measurements are a key in process control measurement
- They are designed to reproducibly yield a measurable response that indicates a NAM is performing as expected
- The positive control material is often written into a standard method making it challenging to change at a future time
- Selecting an optimal positive control material supports the long-term usage and robustness of the assay

Petersen, E. J., Nguyen, A. D., Brown, J., Elliott, J. T., Clippinger, A. J., Gordon, J., Kleinstreuer, N., Roesslein, M. **2021.** Altex, 38(2), 365-376.

# Characteristics to consider when selecting a positive control material




Since there may be tradeoffs among different potential positive control materials, a case study is provided with the monocyte activation test

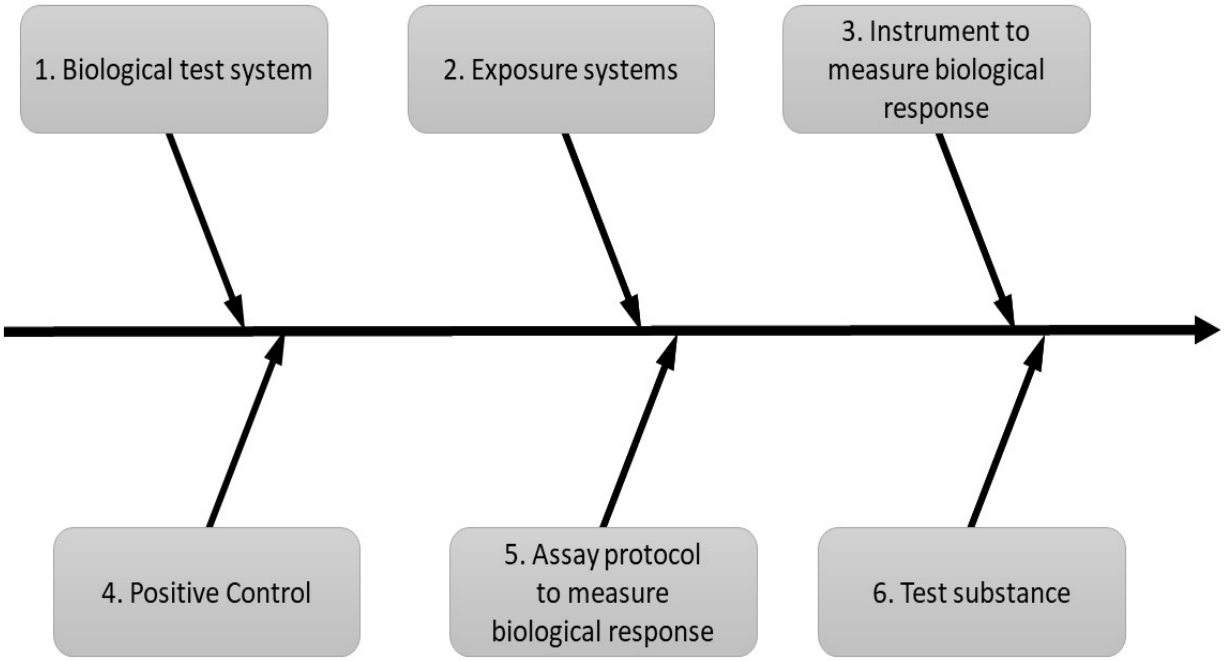
# Use of cause-and-effect analysis to optimize the reliability of *in vitro* inhalation toxicity measurements using an air-liquid interface

Collaborative partners: CPSC, BfR, PETA ISC

- There is a broad range of *in vitro* inhalation assays with different exposure methods, biological test articles, and endpoints
- Cause-and-effect (C&E) analysis is a conceptual approach to identify potential sources of variability and plot them using C&E diagrams
- If different assays have shared steps or components, sources of variability in the C&E diagrams will also be similar

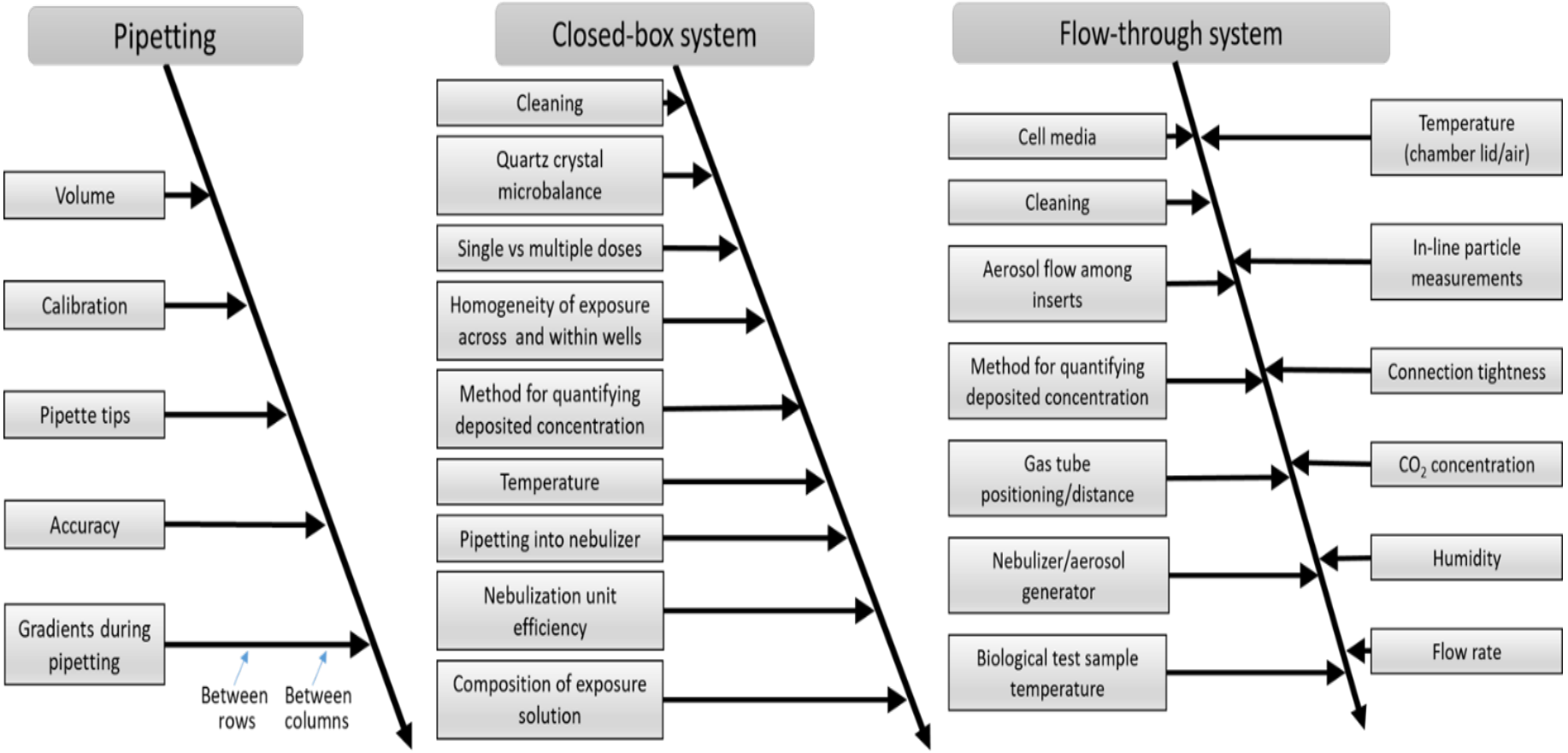
Petersen, E. J., Monita, S., Clippinger, A. J., Gordon, J., Katz, A., Lau, P., Leibrock, L. B., Luch, A., Matheson, J. Stucki, A. O., Tentschert, J., Bierkandt, F. S., Chemical Research in Toxicology, 2021, in press.

# Use of cause-and-effect analysis to optimize the reliability of *in vitro* inhalation toxicity measurements using an air-liquid interface



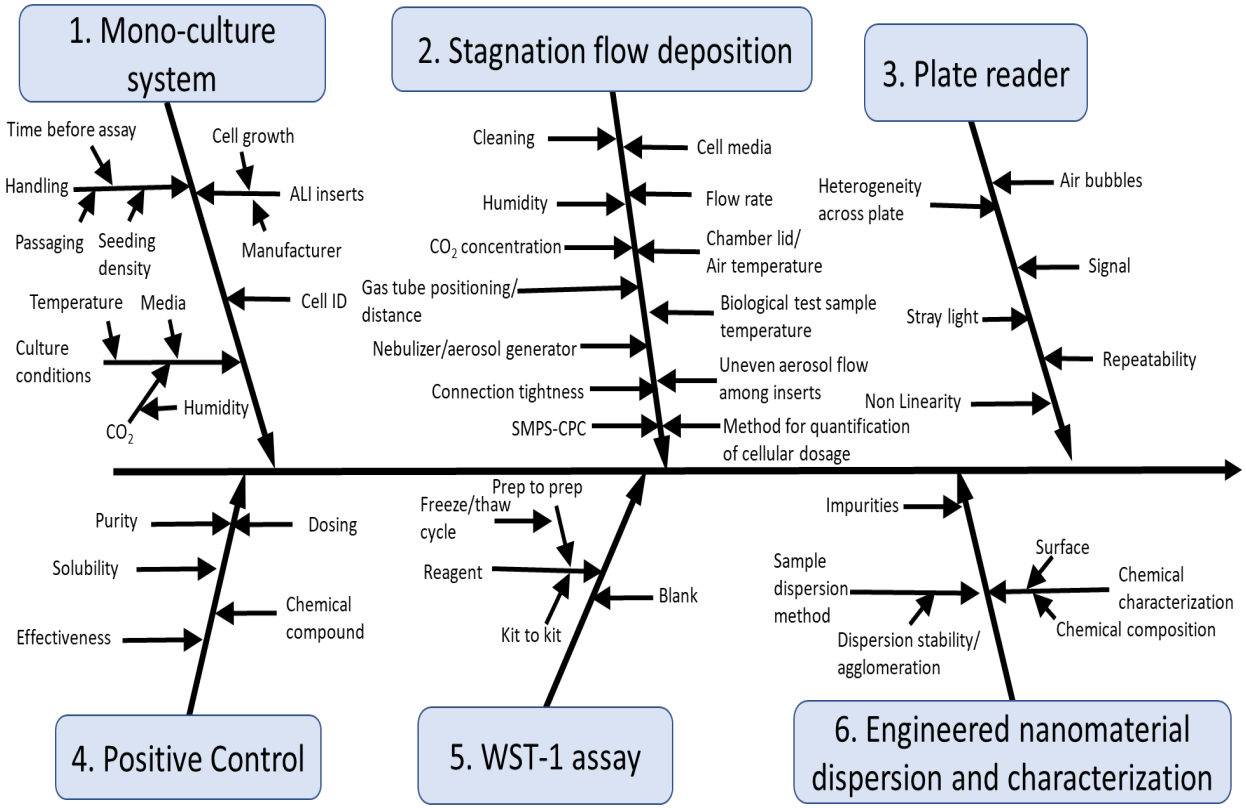

General cause-and-effect diagram of *in vitro* inhalation toxicity assays using an Air-Liquid Interface (ALI)

# Use of cause-and-effect analysis to optimize the reliability of *in vitro* inhalation toxicity measurements using an air-liquid interface




Potential branches for the “Exposure systems” branch

# Use of cause-and-effect analysis to optimize the reliability of *in vitro* inhalation toxicity measurements using an air-liquid interface




Example of a complete C&E diagram for a study that includes exposing an engineered nanomaterial to a mono-culture model at ALI using a flow-through system and assessing cytotoxicity using a plate reader

Leibrock, L. B., Jungnickel, H., Tentschert, J., Katz, A., Toman, B., **Petersen, E. J.**, Bierkandt, F. S., Singh, A. J., Laux, P., Luch, A. **2020**. Nanomaterials, 10(12), article number 2369.

# Postdoc opportunity at NIST

***Predictive Early-Stage Biocompatibility Testing of Dental Materials***

2- to 3-year appointment

~ 72k stipend

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