The performance of a dry powder inhalation product heavily relies on the particle size distribution of its components. The size of particles is commonly determined by laser diffraction methodologies. However, since no technique is free of limitations and drawbacks, inevitable off-sets occur between different laboratories. A convenient way to quantify these inevitable offsets between laboratories is the execution of a round robin test series.

**Methods and materials**
- The Round Robin was conducted utilizing 2 Labs: Lab A and Lab B.
- The design involved 3 batches of Lactohale 200 (Figure 1).
- Evaluation was conducted on d10, d50, and d90.
- At every lab 2 operators performed 6 measurements per batch, i.e. n=12 per batch.
- The evaluation was conducted following guideline ISO 5725.

**Results and discussion**
- Figure 2 depicts the relative differences from the general mean.
- It was found that the inter-lab variation is up to 6 times higher than the intra-lab variation. This indicates that the overall variance is predominantly influenced by location/equipment rather than by sampling and/or repeatability variation.
- The variation at the extremes of the distribution (d10 and d90) is significantly higher than at the center (d50).
- Lab A consistently yields finer PSDs, independent of the level for the majority of the results.
- Lab B exhibits significantly higher variation of up to 10 times the variation of Lab A.

**Conclusions**
- Strong and consistent bias between Lab A and Lab B were found for the extremes of the distribution d10 and d90.
- The worst case critical difference were found to be:
  - d10: 4.1 µm
  - d50: 2.4 µm
  - d90: 11.8 µm
- The PSD variance observed is often too big to be acceptable for registration authorities.

**Precision results of round robin (Std.Dev: standard deviation)**

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<th>PSD</th>
<th>Batch</th>
<th>General mean (µm)</th>
<th>Repeatability Std.Dev. of sr (µm)</th>
<th>Reproducibility Std.Dev. of sr (µm)</th>
<th>Repeatability limit r=2.73sr (µm)</th>
<th>Reproducibility limit R=2.8sR (µm)</th>
<th>(sR/sr)</th>
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</table>

References
3. ISO 13320:2009 - Particle size analysis – Laser diffraction methods
5. ISO 5725 - Accuracy (trueness and precision) of measurements and results
6. Ph.Eur. 2.9.31. – Particle size analysis by laser diffraction
7. USP 429 Light diffraction measurement of particle size