

## Stability of FlexiQuot™: Fracture Strength – Summary of the Trial

### Background

The new FlexiQuot™ cryo tubes shall be tested for their strength to endure falls (“fracture strength”), which unavoidably happen in daily laboratory routine. The risk of cracking of the tube after dropping it on the floor and the ensuing risk of loss of sample shall be addressed. The dependence of fracture strength on storage temperature and freezing volume shall be investigated.

### Hypothesis

It is expected that FlexiQuot™ will show similar fracture strength to standard cryo tubes in dependence of storage temperature and filling volume. However, due to the kinks in the tubes it is expected that any cracks will occur in a controlled way, i.e. in the kinks, thus making it easy to salvage the liquid content of the tube by placing a new lid on the cracked tube.

### Testing

Several test series of 8 FlexiQuot™ were filled with coloured liquid to different levels (from 1<sup>st</sup> kind to lid), stored at 3 different temperatures (4 degrees, minus 20 and minus 80 degrees Celsius) and then dropped from a height of 200 cm to the floor that was covered with a white mat. The fallen tubes were inspected for visible and non-visible damages (as registered by coloured liquid seeping onto the white mat). A quantitative analysis was performed and photographs of the tested FlexiQuot™ were recorded.

### Conclusion

The results confirm the expectations from experience with standard cryo tubes that fracture strength of plastic containers is related to storage temperature and filling volume:

- The lower the storage temperature of a FlexiQuot™ filled with liquid, the more porous it naturally will become.
- The more volume a FlexiQuot™ contains, the easier the FlexiQuot™ cracks.
- If cracks occur in FlexiQuot™ they only occur in the kinks; the body of the tube has no invisible damage after a fall from 200 cm height.
- If cracks occur in FlexiQuot™, adding a new lid can preserve all material inside FlexiQuot™ as well as the material’s full integrity. This is a clear advantage over standard cryo tubes that would crack in random places and following such uncontrolled cracking the material inside can only partially be saved, if at all.

Furthermore these test confirm that tools are not essential for cracking the FlexiQuot™, because it cracks in the kinks with ease. The recommendation of using the tool is based on the need of processing many cracks to reduce the exertion in the workflow.