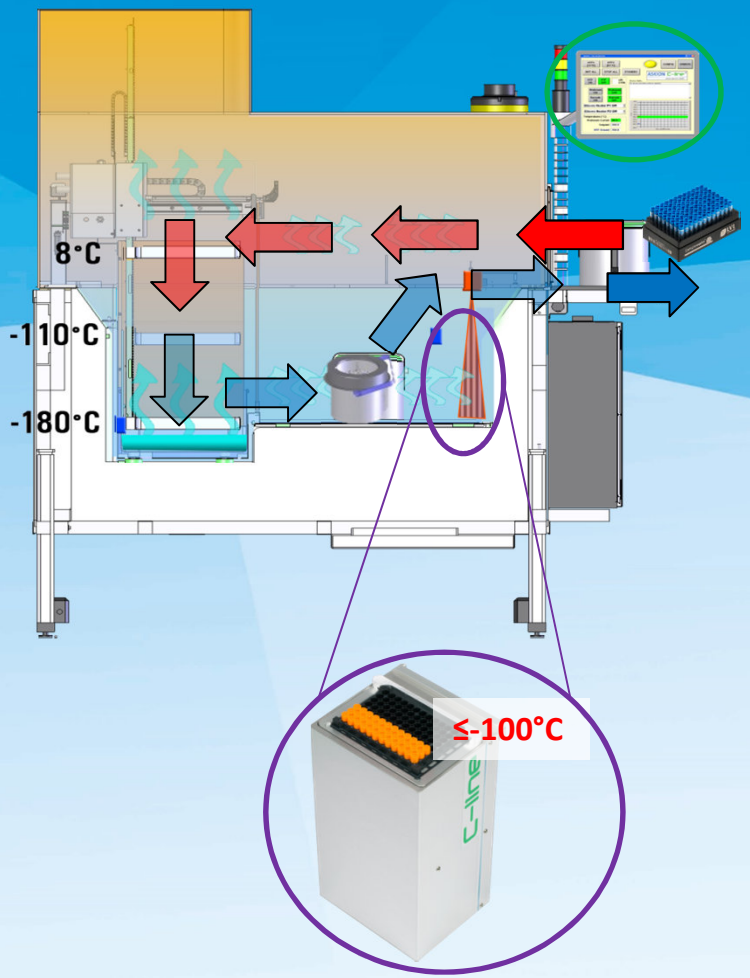
ASKION C-line® work bench

- controlled rate freezer with connected crygenic working area-

ASKION C-line® work bench

How to operate WB? – one example

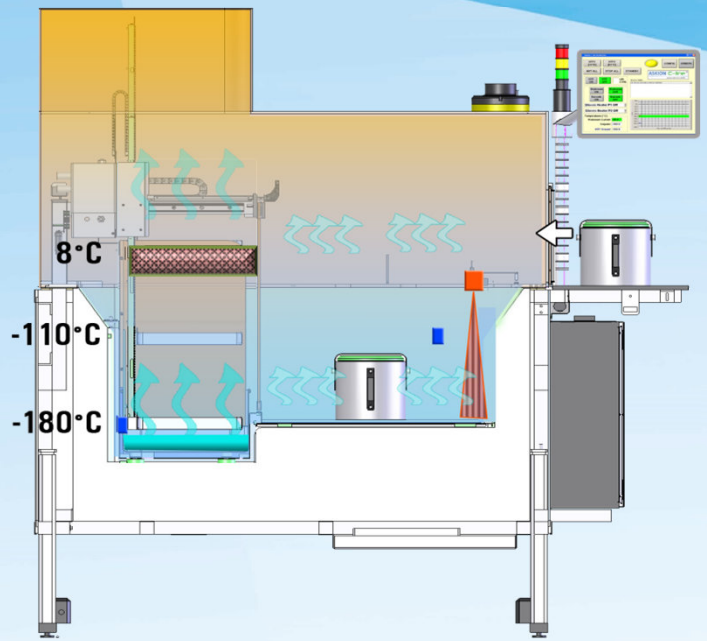
- Bring in samples via site sliding door
- Select freezing curve
- Start freezing process
- Transfer samples into cryogenic handlings area
- Rearrange samples if required and check configuration with ColdEye
- Create storage order
- Transfer frozen samples inside transport container to storage unit



ASKION C-line® work bench

How does the WB works?

- Liquid nitrogen is filled (automatically) below a cover at the bottom of the bowl
- Combined with hood system a dry nitrogen atmosphere is generated Ice free
- Temperature gradient inside WB is stabilized defined freezing
- 2 or 3 independently operating freezer, free programmable
- Sample format independent
- Internal and external barcode reader cryogenic SBS Rack scanner (optional)
- Integrated into C-line® Control for sample tracking
- Ergonomic, motor powered lift system
- Fully automatable (optional)



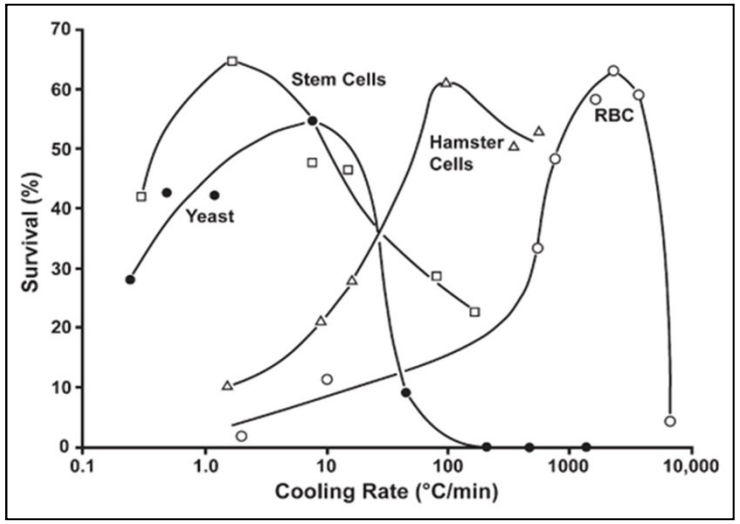
ASKION C-line® system

- Scientific background information-

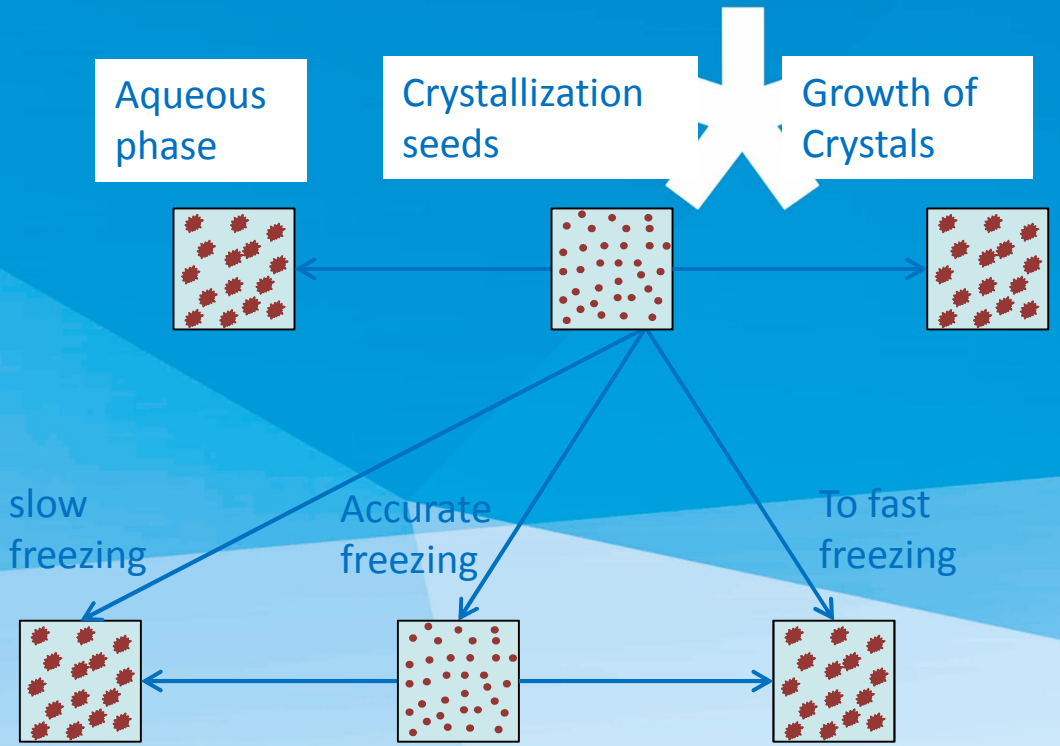
How to achieve high sample quality

Transfer samples from warm to frozen state

Your high quality samples

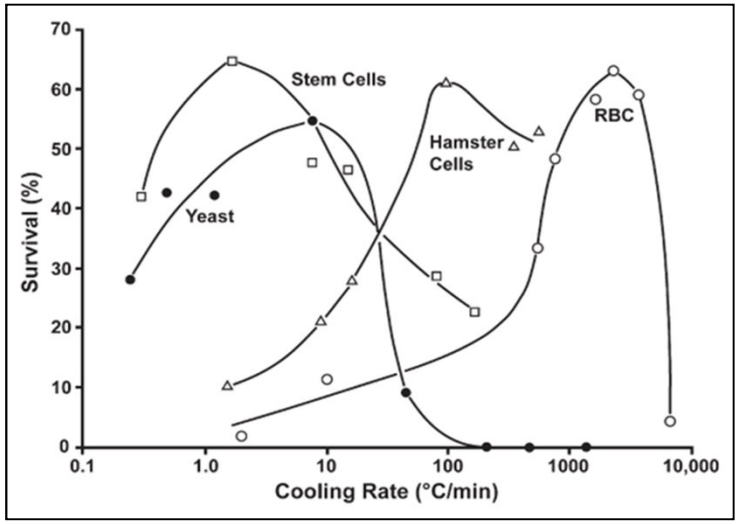


Mazur et al. 2008



Defined freezing to match different sample types

Accurate freezing □ best by sample temperature measurement



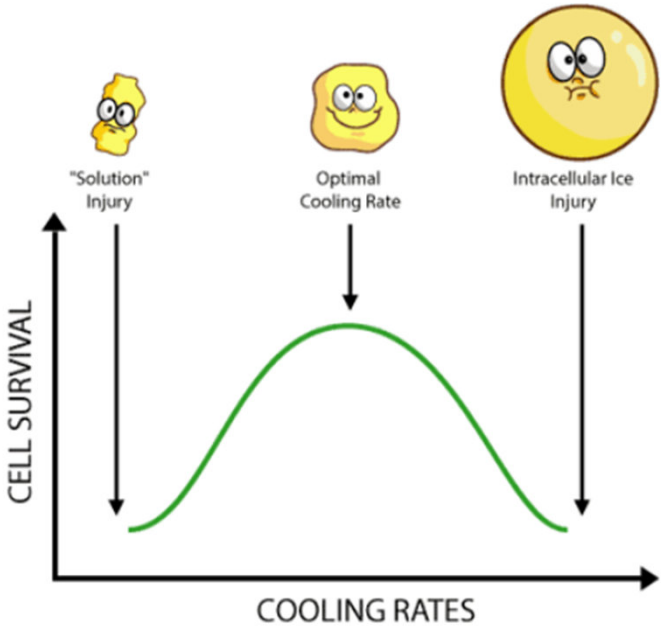
Mazur et al. 2008

Defined freezing to match different sample types

Accurate freezing best by sample temperature measurement

Extracellular ice formation

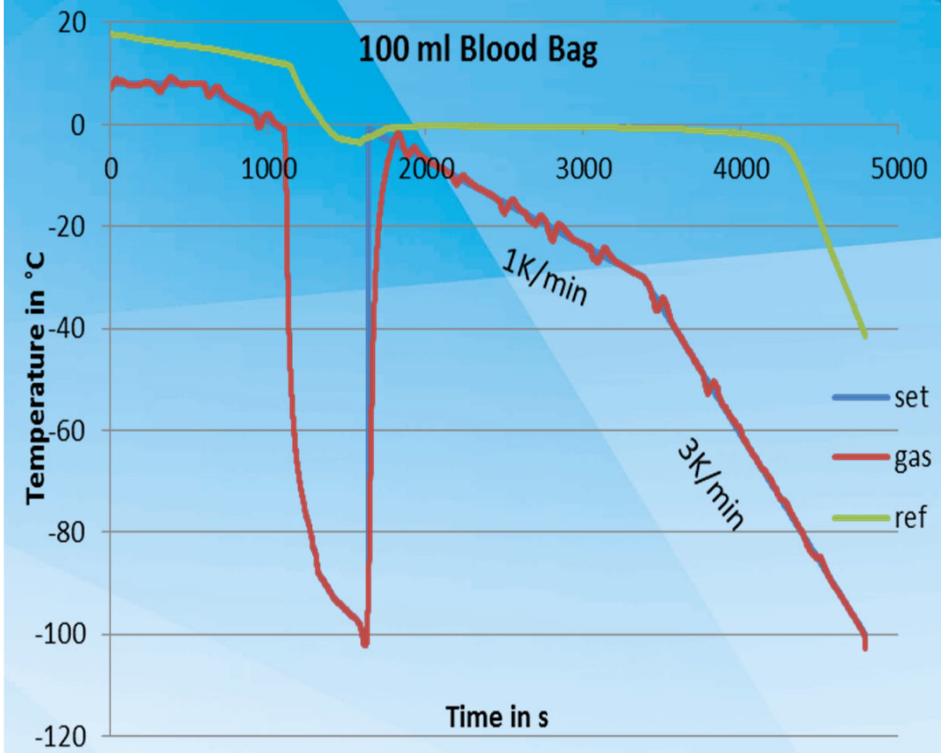
Intracellular ice formation



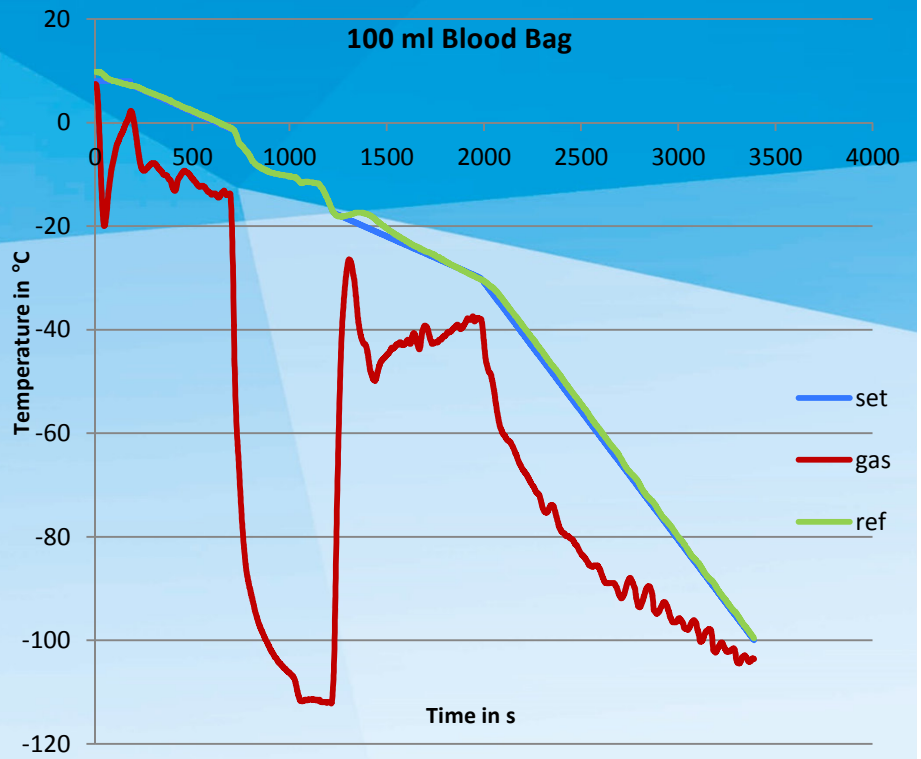
Mechanisms of cell damage during the freezing process

 source: http://intranet.tdmu.edu.ua/data/kafedra/internal/11/classes_stud/en/Med-prof%20faculty/Fts/Combustyology/6/03.%20Preserving%20of%20tissues.htm

Uncontrolled
(by Gas Sensor)



Controlled
(by Reference Sensor)

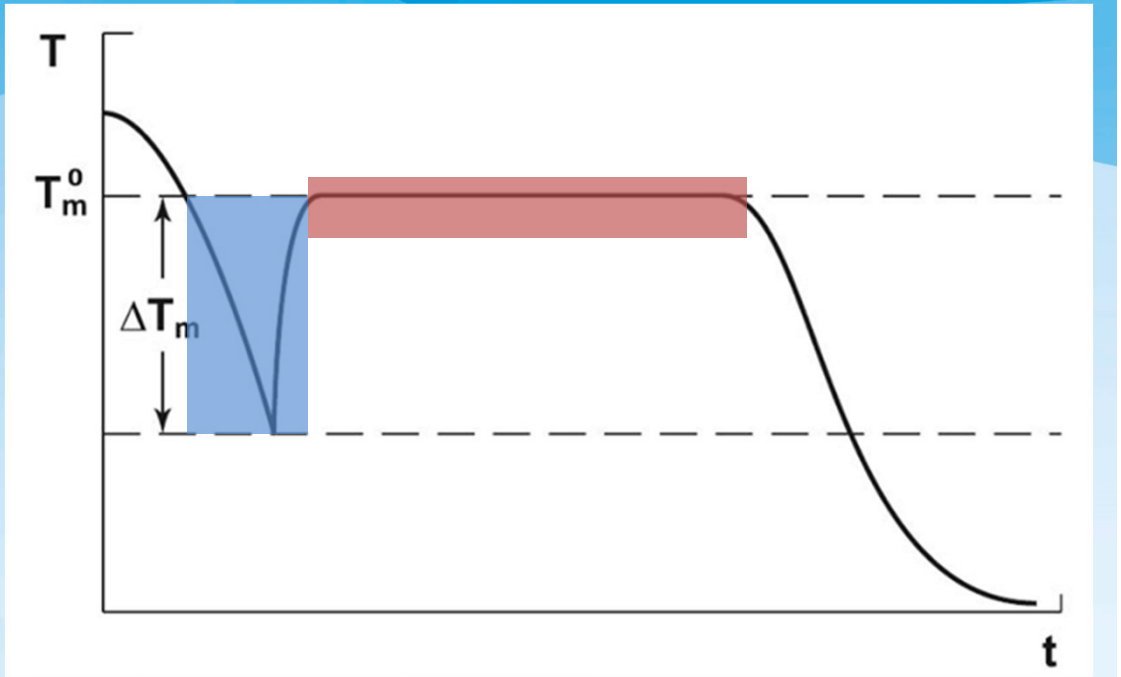


Accurate freezing best by sample temperature measurement

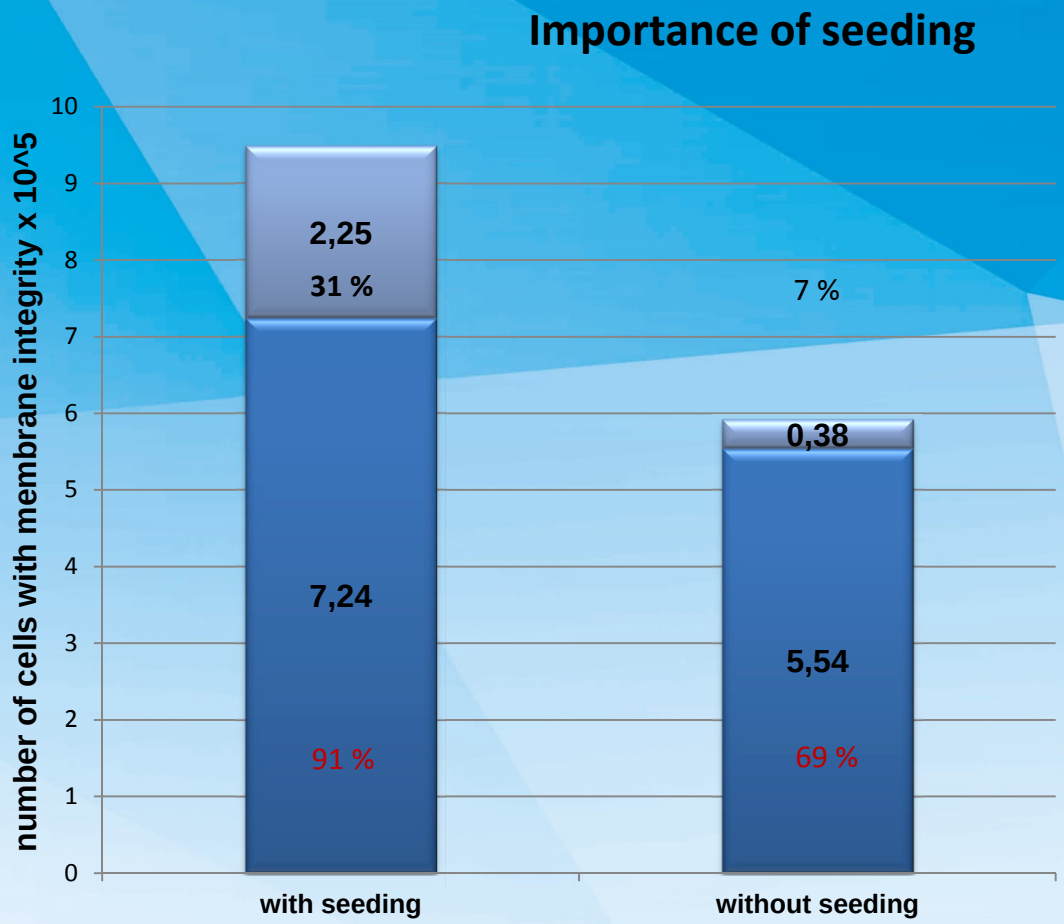
Scientific background – 1. Freezing

Seeding

- Selective initiation of nucleation
- Avoids super cooling
- Avoids release of latent heat



Scientific background – 1. Freezing



Cells: HPMEC

Start Density: $8*10^5$/ml

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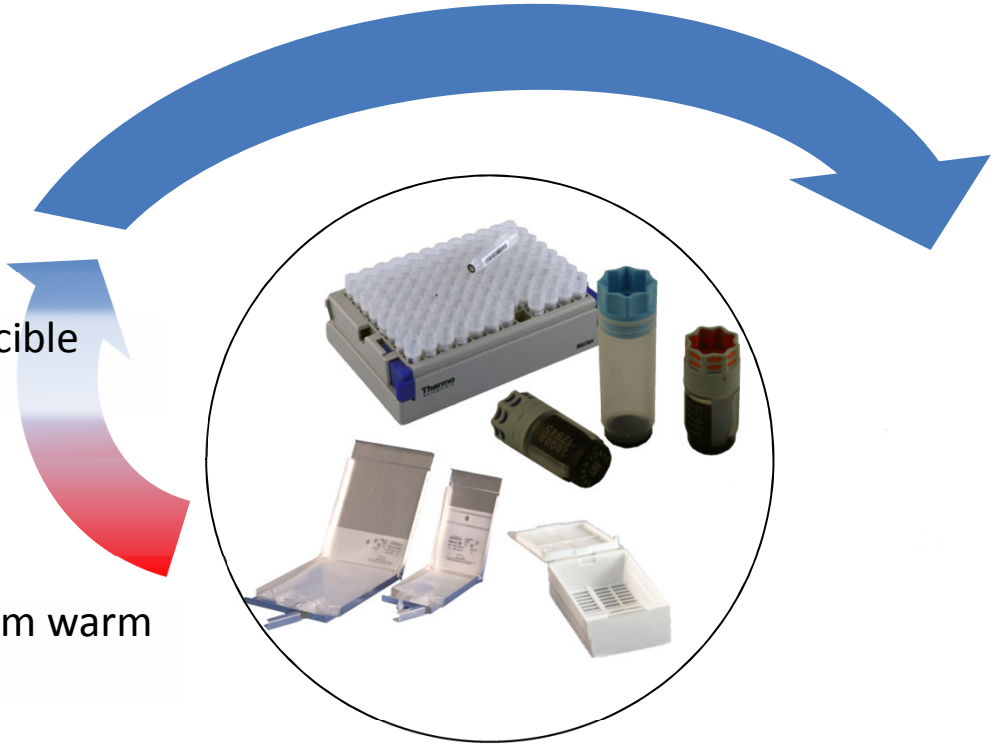
How to achieve high sample quality

Sample handling/transport

Storage

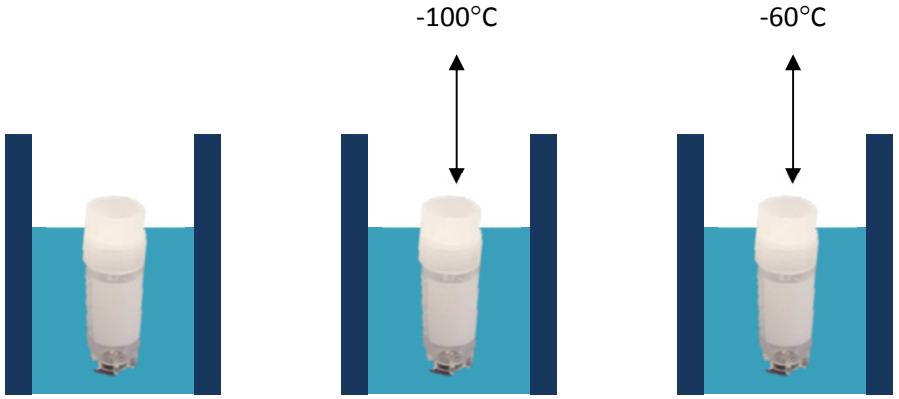


Defined and reproducible freezing

Transfer samples from warm to frozen state

Your high quality samples

3 aliquots of peripheral blood mononuclear cell (PBMC)



1. LN, constantly cooled

2. LN, sample handling -100°C

3. LN, sample handling -60°C

Evaluation after thawing (recovery rate, viability, t-cell response)

++++

Best results

□High sample Quality

++++

Similar results than constantly cooled samples (1)

□High sample Quality

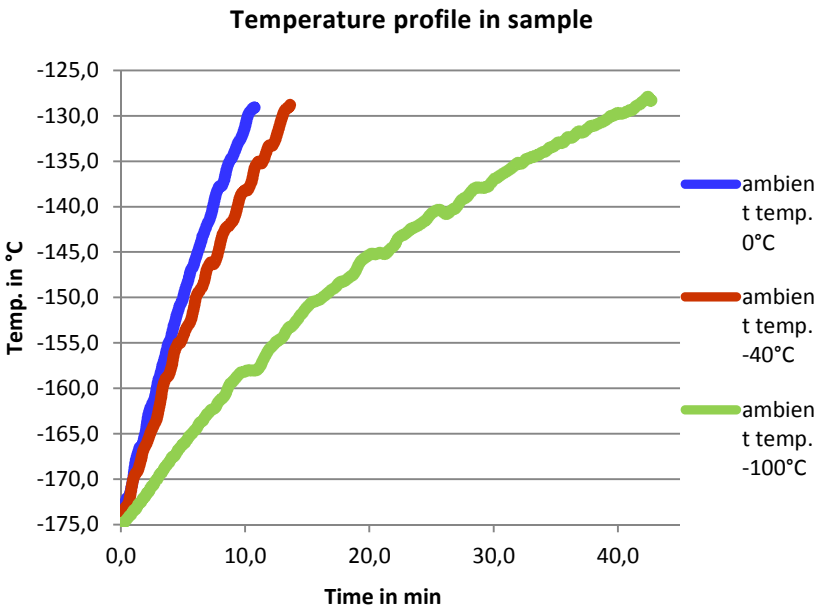
++

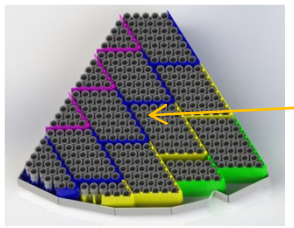
Lower viability and t-cell response than constantly cooled samples (1)

□lower sample quality

Sample quality depending on sample handling, extract from: Temperature fluctuations during deep temperature cryopreservation reduce PBIVIC recovery viability and T—cell function Germann et. al., Cryobiology 67 (2013) I93-200

Sample handling temperature ≠ sample temperature

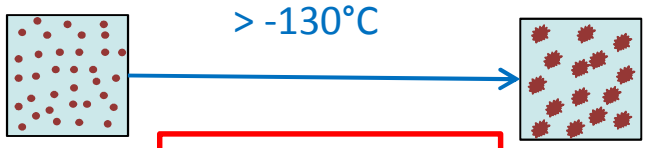




Sensor in 1.8 ml vial filled with 10% DMSO

Sample handling must take place below -100°C at least, at any time

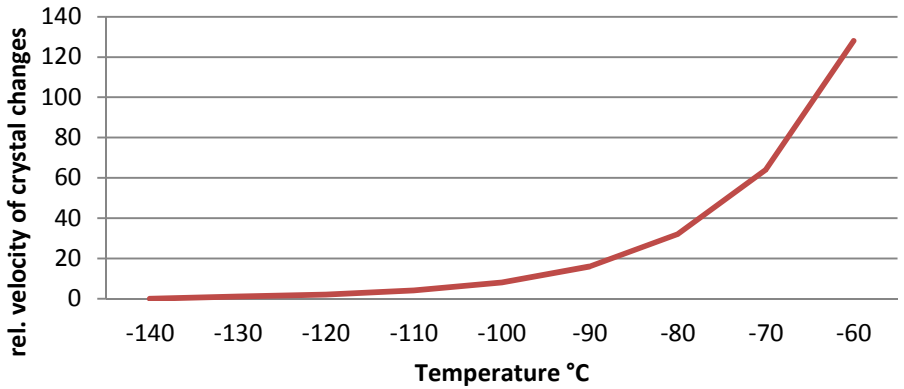
Accurate freezing



Migratory Crystal growth

Thermodynamic driven process
Must be avoided

Velocity of formation changes in relation of temperature

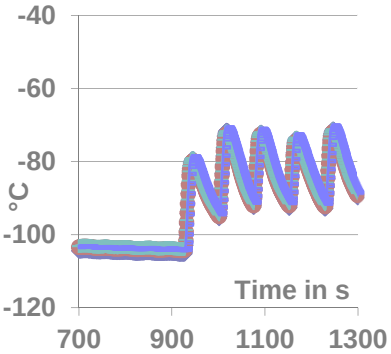


RGT rule Arrhenius equation

Sample must be stored below -130°C at least.

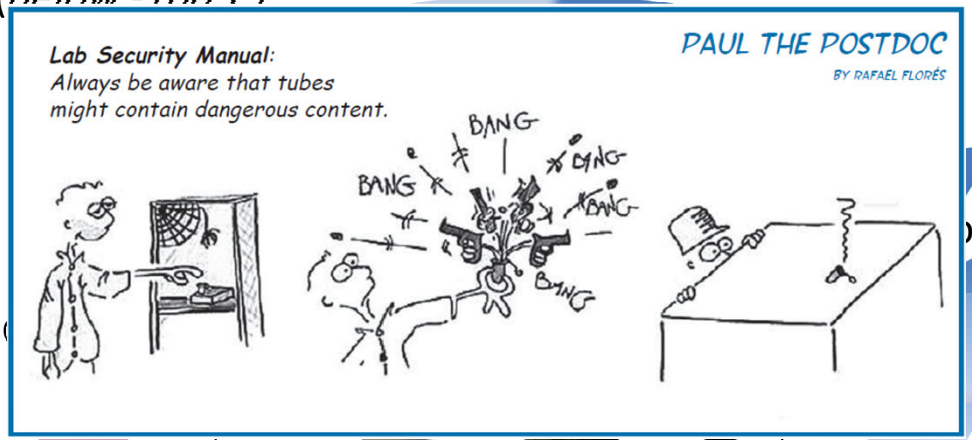
Better to add buffer zone store below -150°C

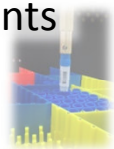
How to achieve high sample quality



Sample handling/transport as cold as possible (below -100°C)

Storage below -150°C





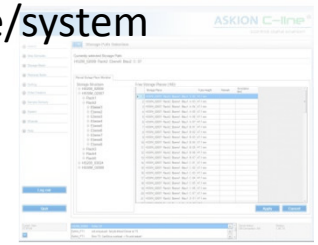
omatable components

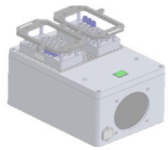
Defined and reproduc freezing

Transfer samples from warm to frozen state

Your high quality samples

Complete documentation for each sample/system

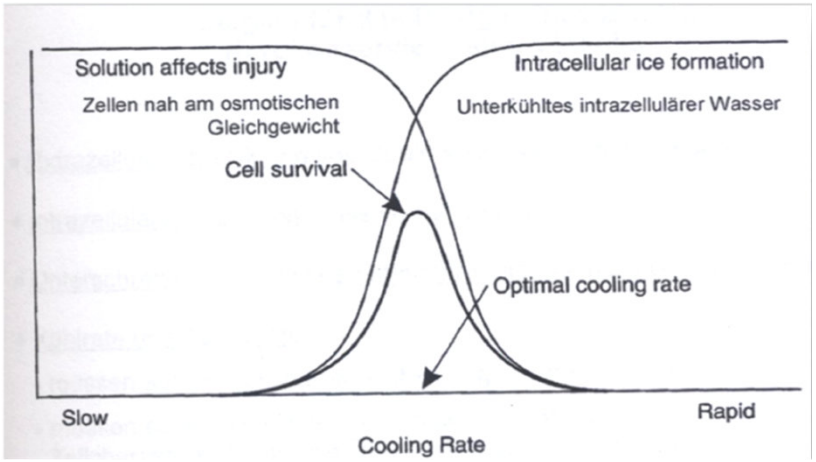




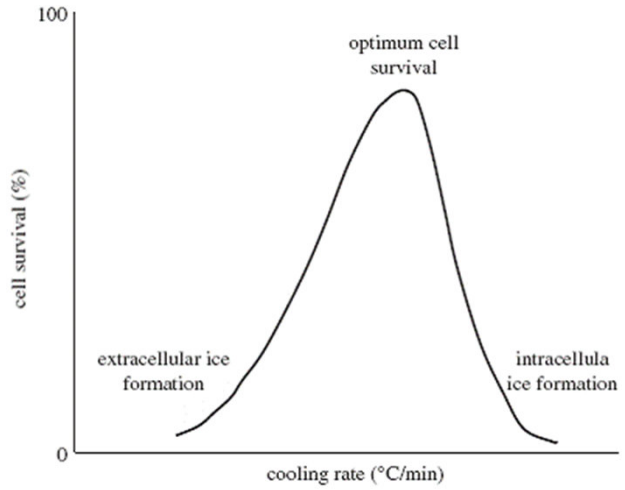
Additional information

Scientific background – 1. Freezing

- Defined and accurate conditions (cooling rate) are needed to reach high survival rates
  - Best via sample temperature measurements



Mazur et al.

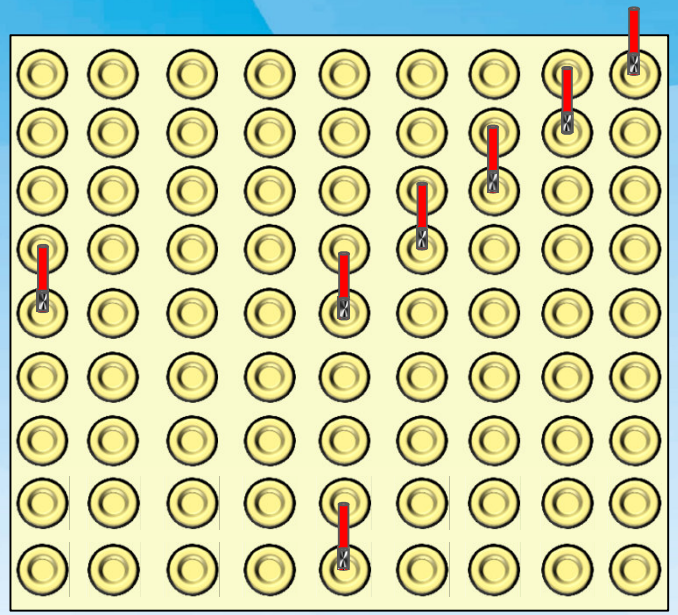


Characteristics shape of a survival curve for frozen cells *From Chua KJ, et al.J Biomech 2007;40:100-116*

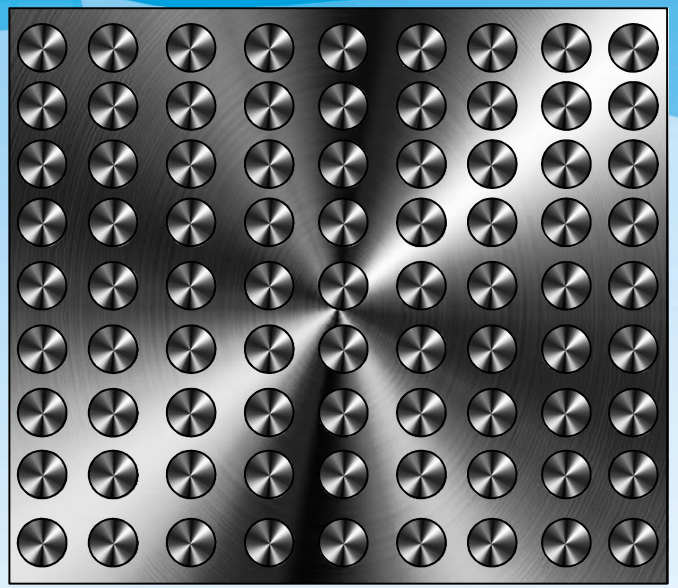
Scientific background – 1. Freezing

Homogeneity within a Batch

Conventional Plastic Box

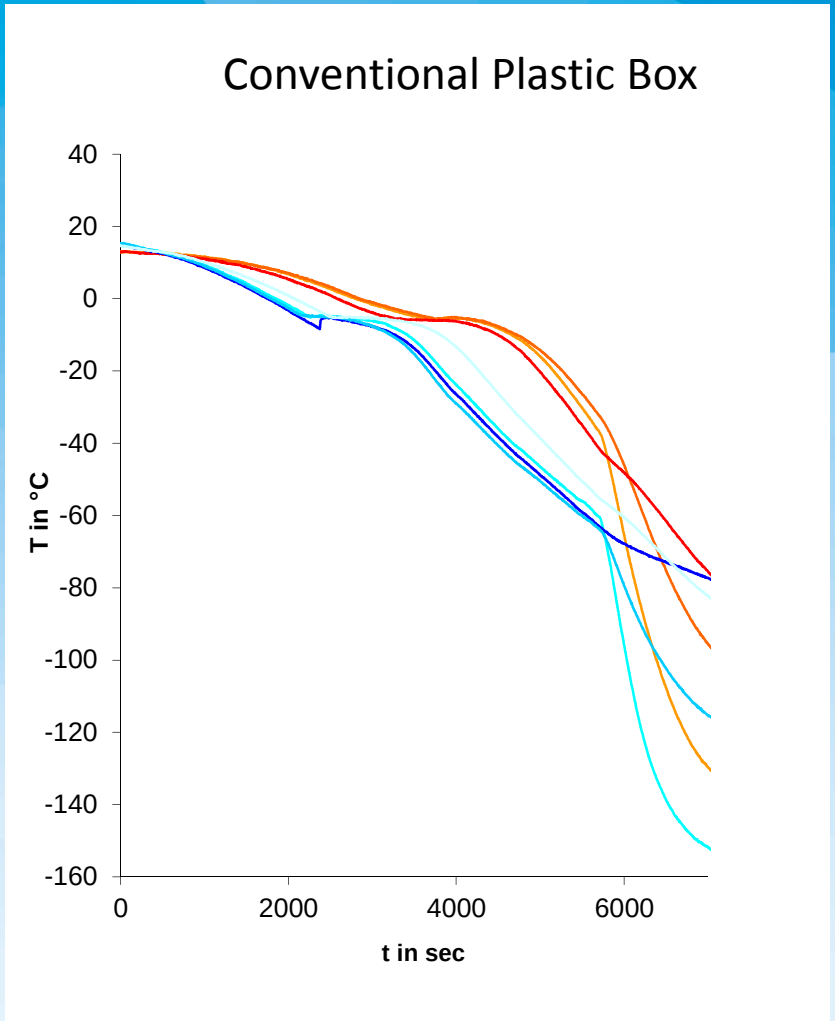


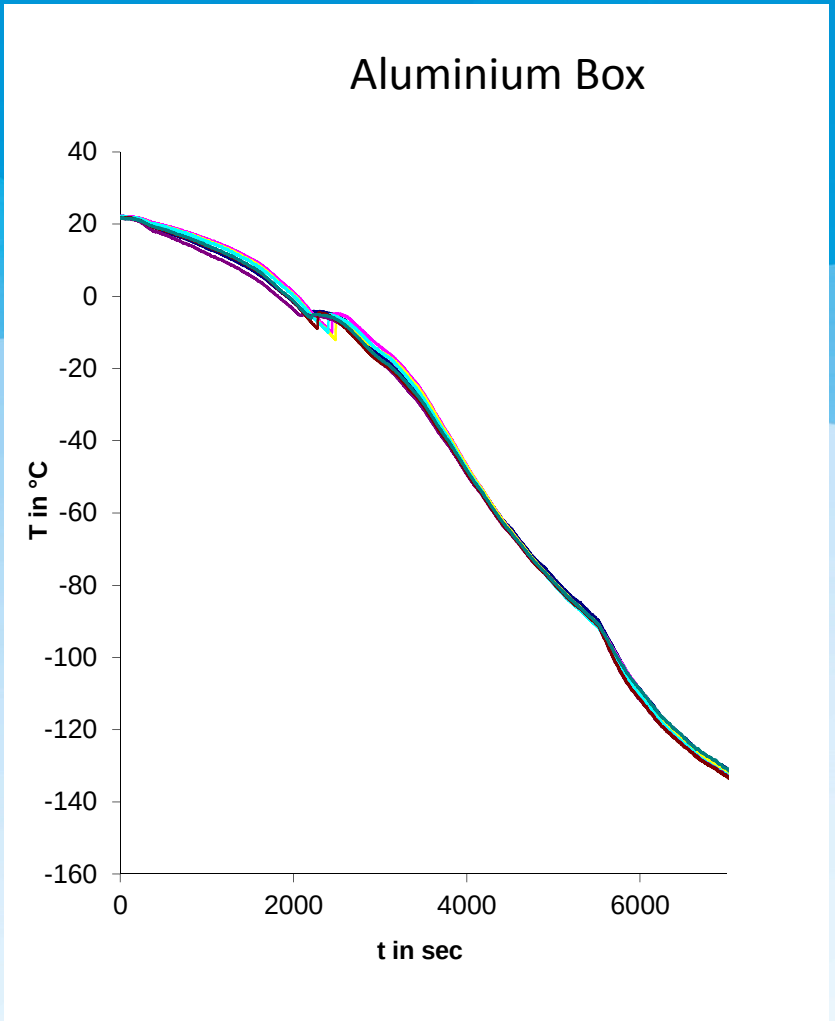
Aluminium Box



Scientific background – 1. Freezing

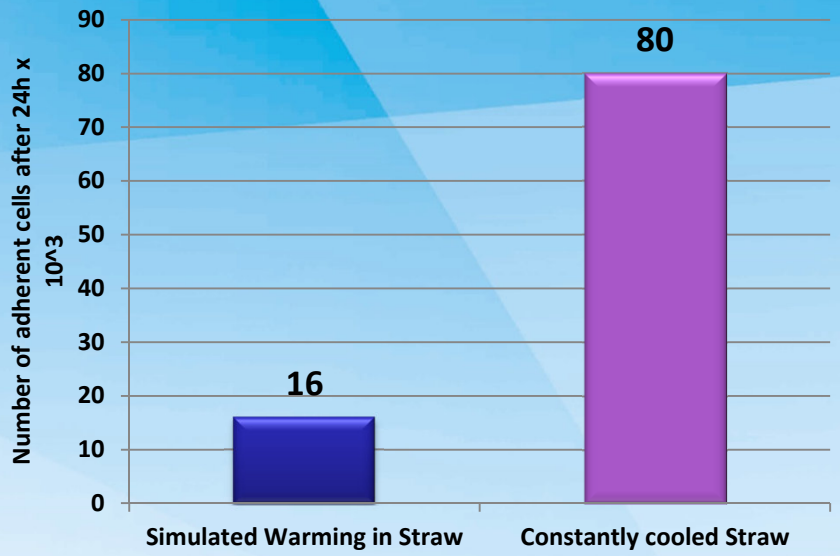
Homogeneity within a Batch





Scientific background – 2. Long term storage

Uninterrupted cooling chain



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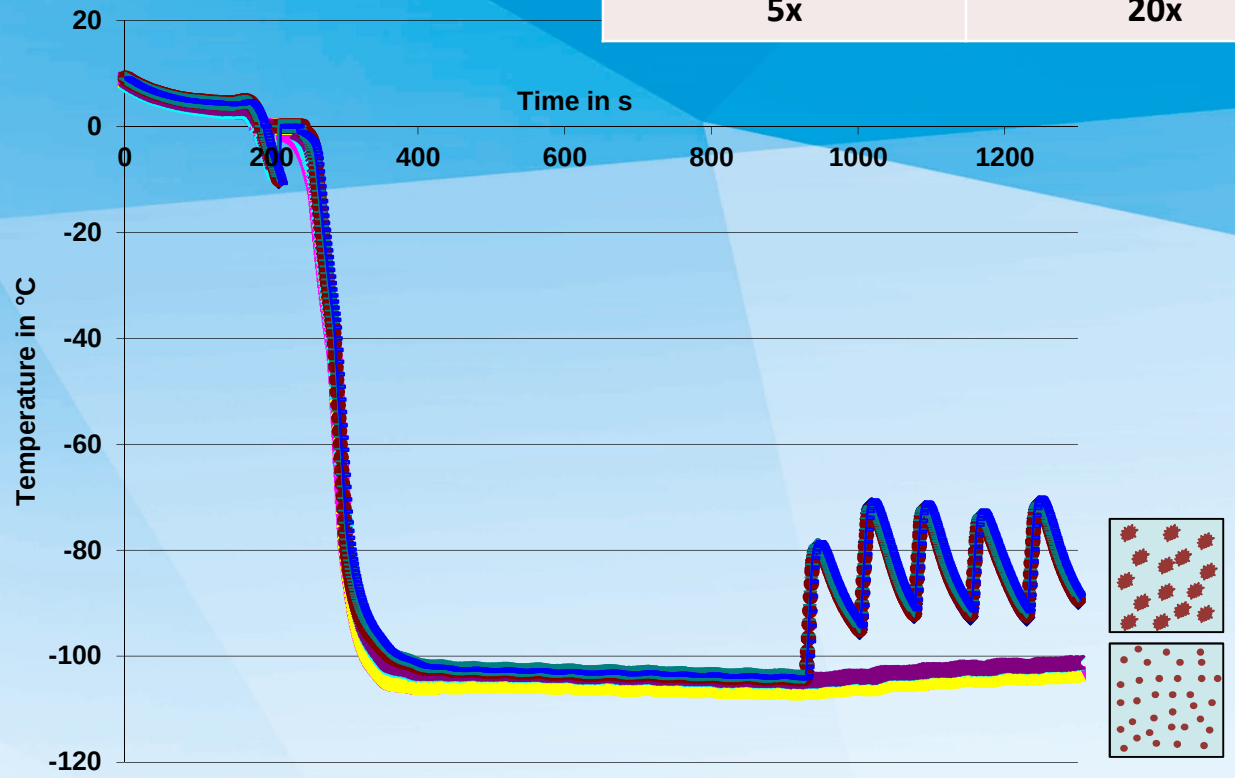
Scientific background – 2. Long term storage

Uninterrupted cooling chain

Vital Cells compared to Warming	
24h after thawing	after recultivation (48h)
5x	20x



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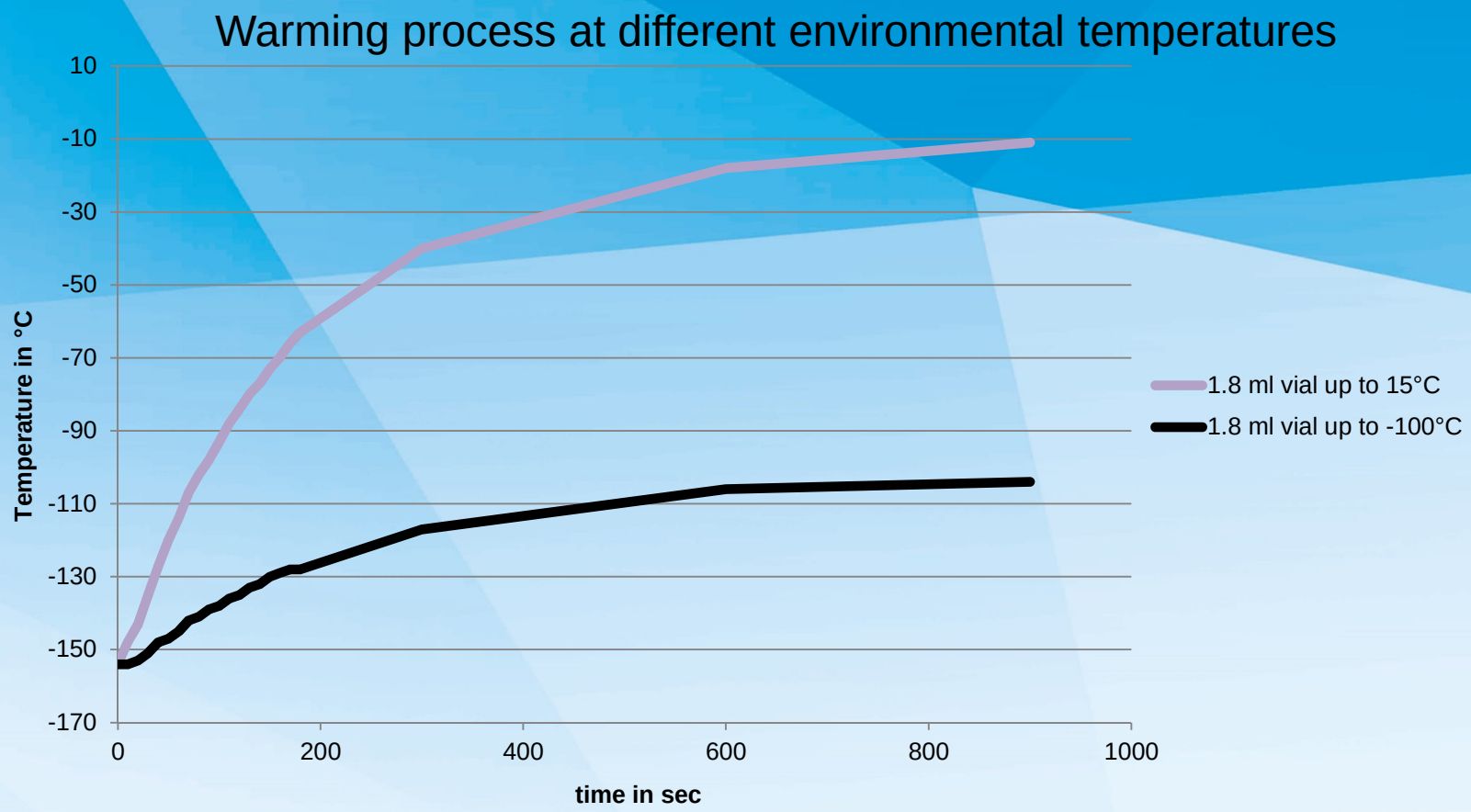
Scientific background – 2. Long term storage

Importance of cooling chain:



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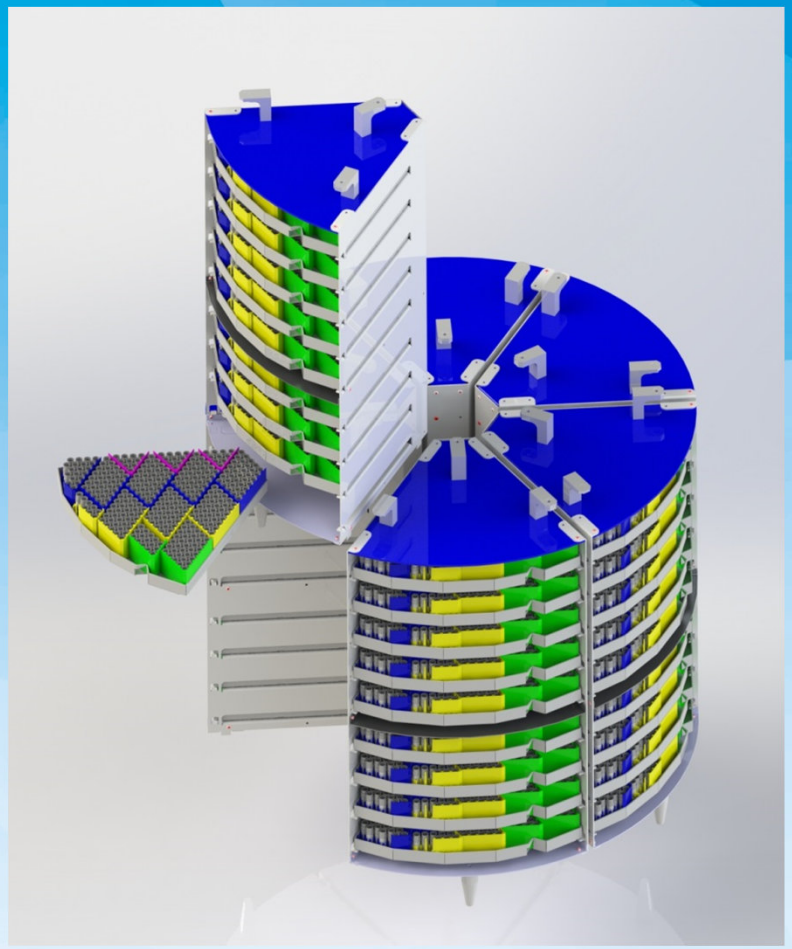

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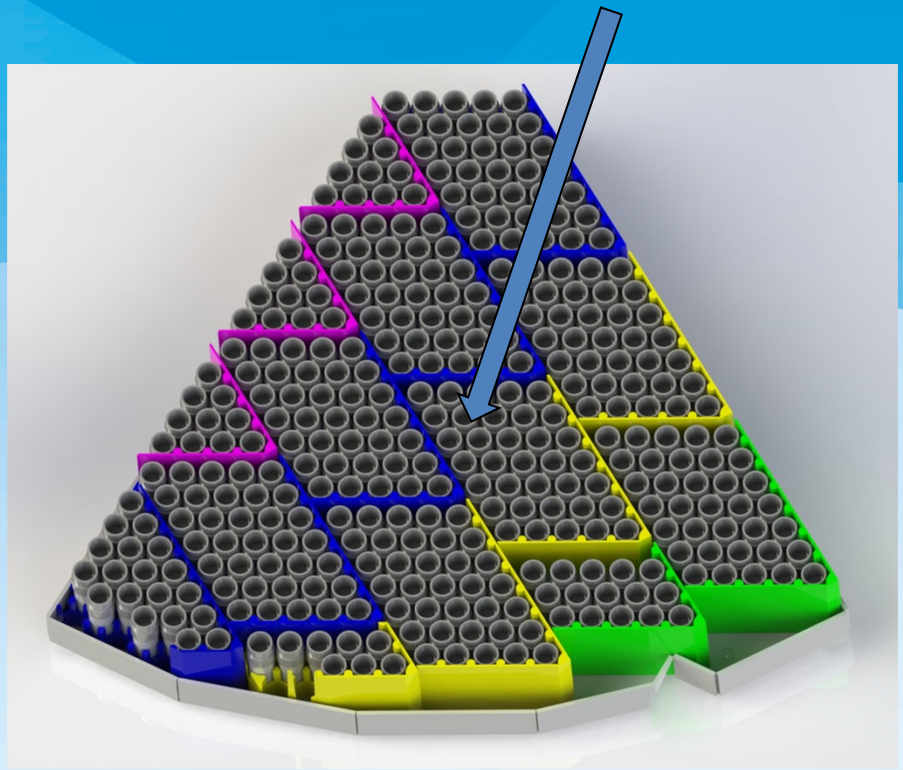
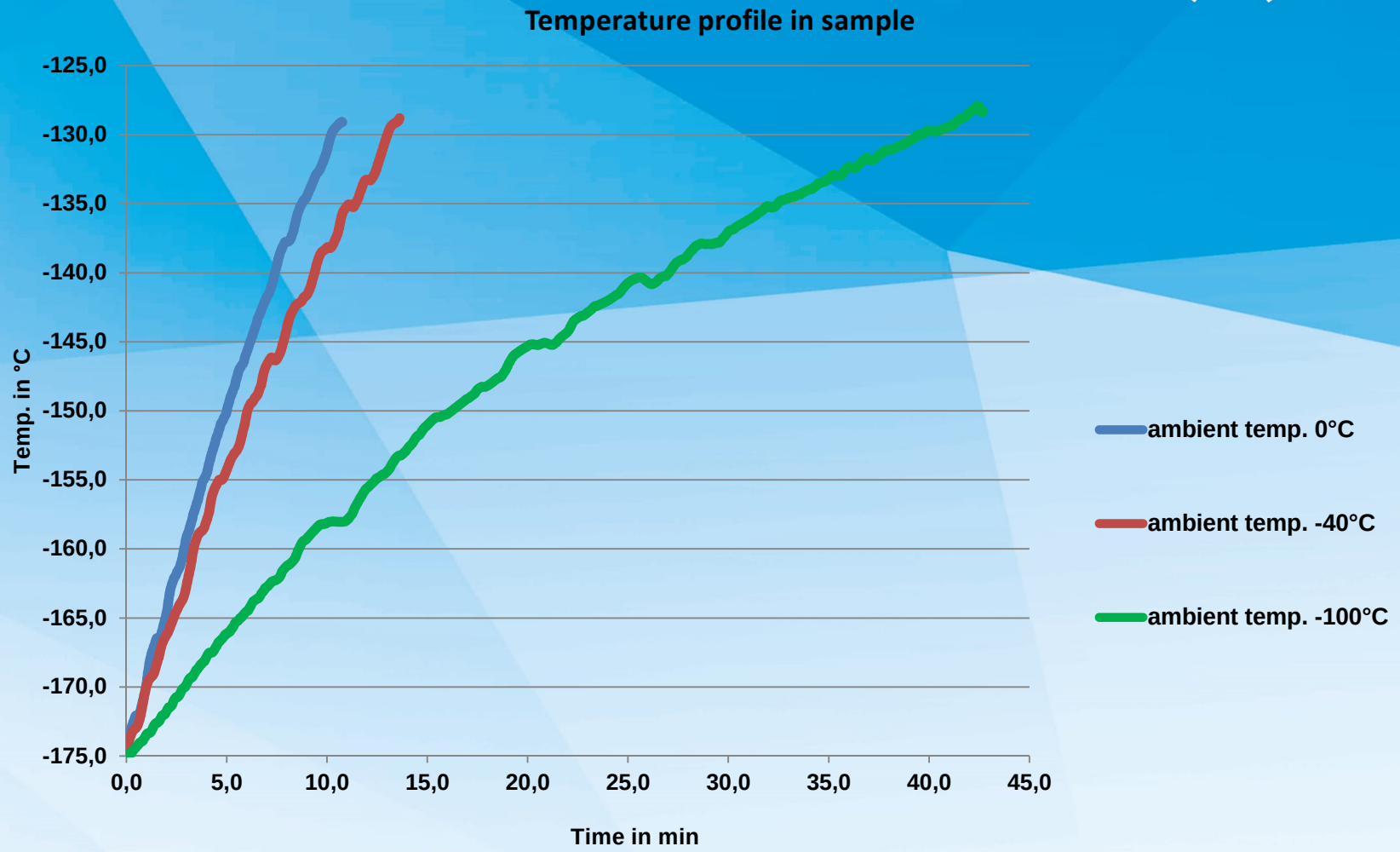
Scientific background – 2. Long term storage