

• APPLICATION GUIDE

Cryovial Thawing Guide

Reducing variability in cell workflows



FEATURING

MACARONI THAW — water-free cryovial thawing

Grant Instruments
Cambridge · UK

A short step with an outsized effect

In cell therapy, regenerative medicine, biobanking and research workflows, thawing is a short but highly influential process step. While much attention is focused on cryopreservation and downstream processing, variability introduced during thawing can affect sample quality, reproducibility and workflow consistency. Traditional methods such as water baths remain widely used, but many laboratories are increasingly looking to standardise the process, reduce contamination risk and minimise operator-dependent variation.

Why thawing matters

CRYOVIALS HOLD VALUABLE MATERIAL

- Primary cells
- Immune cells
- Research samples
- Stem cells
- Cell therapy products
- Clinical materials

SMALL VARIATIONS MAY INFLUENCE

- Cell viability
- Recovery rates
- Functional performance
- Downstream assay reproducibility
- Manufacturing consistency

Because thawing is often performed manually, process variation can occur between operators, laboratories and sites.

Common sources of variability

01

User-to-user differences

Manual processes introduce variability naturally — and even trained users create inconsistencies in repetitive steps.

EXAMPLES

- Agitation technique
- Differences in timing
- Varying endpoint decisions
- Different handling practices

POTENTIAL IMPACT

- ✓ Variable sample temperatures
- ✓ Different exposure times
- ✓ Inconsistent outcomes

02

Water bath challenges

For decades, 37 °C water baths have been the standard — but shared water raises real considerations.

CONTAMINATION

- Cross-contamination
- Maintenance requirements
- Cleaning procedures
- Environmental monitoring

VARIATION DEPENDS ON

- User judgement
- Timing precision
- Sample movement
- Environmental conditions

03

Temperature exposure

Rapid thawing limits time at harmful intermediate temperatures — yet excess heat brings its own risks.

CONTROLLED CONDITIONS REDUCE

- Overheating
- Uneven thawing
- Temperature overshoot
- Unnecessary thermal stress

Rapid, controlled thawing balances speed against thermal stress.

Consistency rarely requires a redesign

Reducing variability does not necessarily call for a major workflow change. A few practical approaches can improve consistency – and documented procedures improve repeatability across teams.

Establish SOPs

Define and document

- Thaw timing
- Handling methods
- Agitation procedures
- Transfer steps
- Acceptance criteria

Minimise manual decisions

Less operator judgement

- ✓ Automatic initiation
- ✓ Controlled endpoints
- ✓ Standardised workflows
- ✓ Simplified operation

Consider automation

Supports

- Reproducibility
- Training consistency
- Reduced handling variation
- Scalable processes

Automation supports – it does not replace – expertise.

Example workflow comparison

TRADITIONAL

Remove sample
↓
Transport to water bath
↓
Monitor manually
↓
Determine endpoint visually
↓
Transfer sample

STANDARDISED

Remove sample
↓
Insert sample
↓
Automated thaw process
↓
Defined endpoint
↓
Transfer sample

EMERGING APPROACHES PROVIDE

- ✓ Water-free operation
- ✓ Automated detection
- ✓ Controlled thermal exposure
- ✓ Reduced operator variability
- ✓ Reproducible thaw profiles

Questions to ask when evaluating a thawing solution

- 01 Can the process be standardised across users?
- 02 Does it reduce contamination concerns?
- 03 Is thermal exposure controlled?
- 04 Can the process scale?
- 05 Will it support reproducible outcomes?
- 06 Does it integrate with existing workflows?

● ABOUT MACARONI THAW

A water-free cryovial thawing system for standardised workflows

Automated operation and controlled thawing – thaw may only take minutes, but reducing variability here supports more consistent downstream outcomes.

[Book a demo](#)

[Contact our team](#)

- ✓ Automated vial detection
- ✓ Hands-free thawing
- ✓ Designed for repeatable workflows
- ✓ Water-free operation
- ✓ Thaw time under 3 min*

*Performance may vary depending on sample conditions and vial configuration.