



Federal Office of
Consumer Protection
and Food Safety

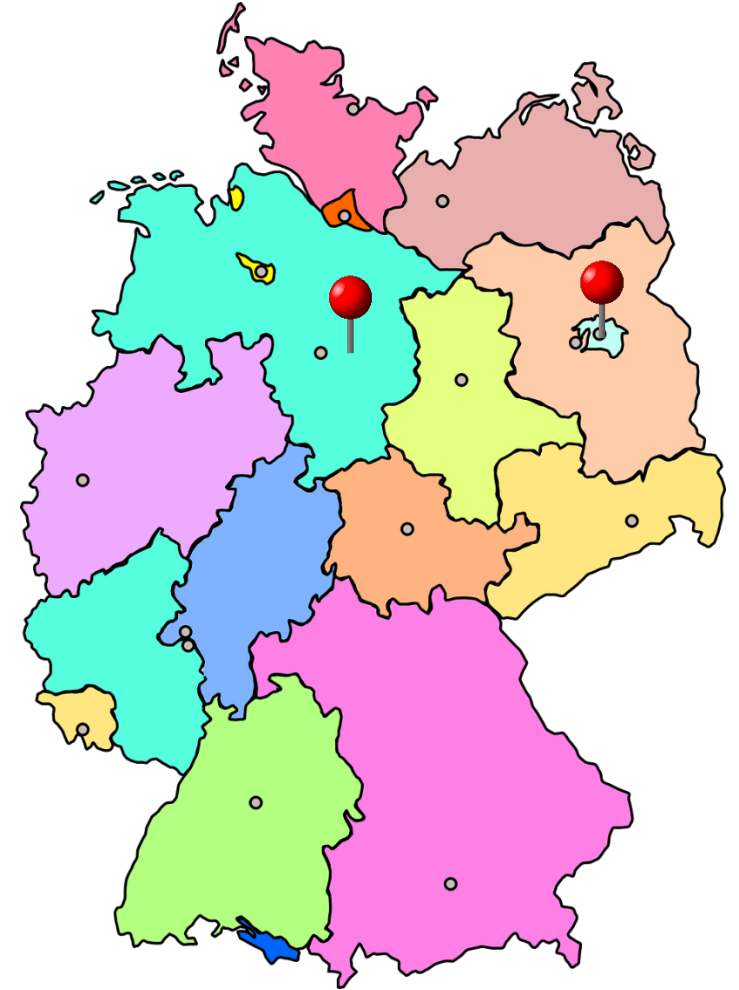


Sustainable Packaging Solutions for Proficiency Testing Materials

28.09.2023 Martin Kaminski

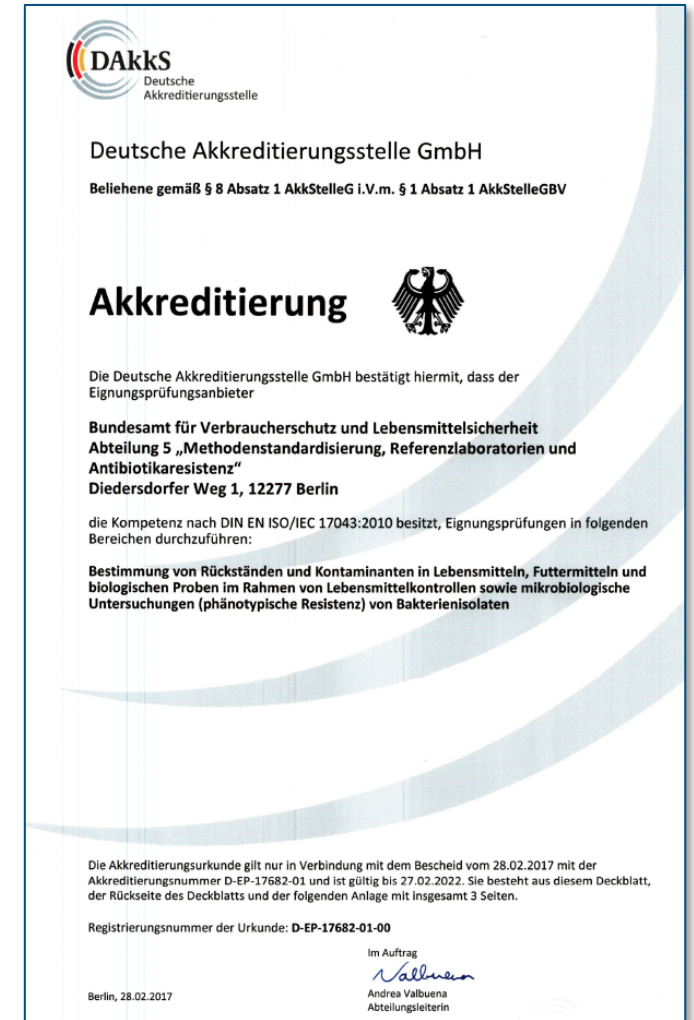
Key facts Federal Office for Consumer Protection and Food Safety

- The BVL is an independent higher federal authority under the jurisdiction of the Federal Ministry of Food and Agriculture (BMEL) with offices in Braunschweig and Berlin.
- Approximately 800 employees at three locations (1x Braunschweig, 2x Berlin)
- BVL is responsible for various approval and administrative tasks in the field of food and feed safety as well as consumer products
- BVL aims to improve coordination between the federal and state governments, to make risk communication more transparent and to manage risks before they become crises.



- **Tasks of the BVL Department 5:**

- Publication of the German official collection of test methods
- Monitoring of antibiotic resistance in animals
- Operation of eight national and one European reference laboratory (NRL and EURL) to promote uniform standards in food and feed control in the EU
- According to the EU Control Regulation 2017/625, the organization of proficiency tests is one of the tasks of the EURLs and NRLs
- BVL Department 5 is accredited according to ISO 17043 since 2017





Proficiency testing procedure

PT preparation

- Material selection
- Material production
- Homogeneity
- Stability

The importance of shipping materials is often underestimated, and errors that occur affect all subsequent steps in the proficiency testing process.

PT conduction

- **Material dispatch**
- Information PT participants
- Sample analysis
- Transmission of results

PT evaluation

- Statistical Evaluation (e.g. determination of the reference value)



Proficiency testing procedure

PT preparation



PT conduction

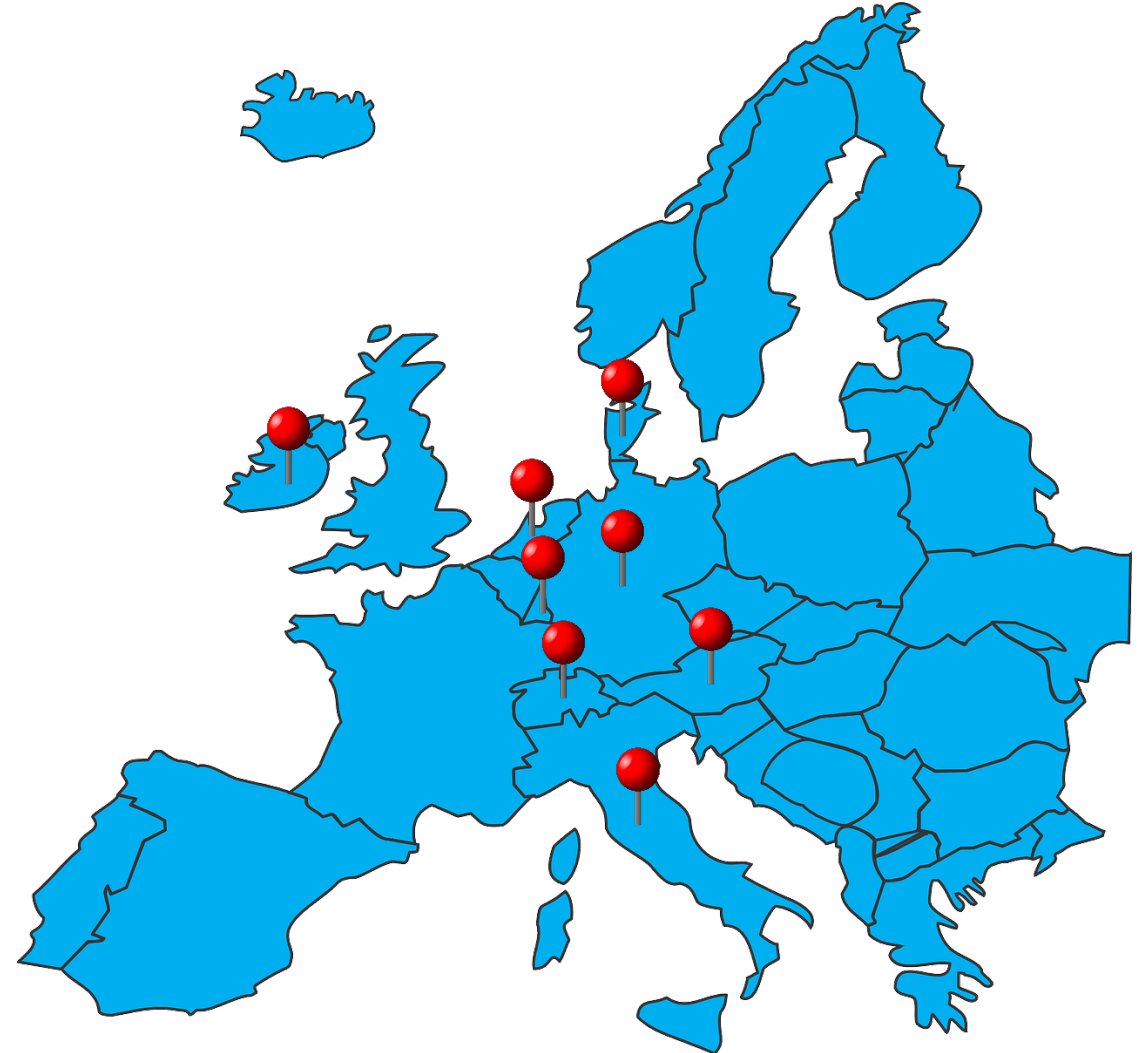


PT evaluation

DIN EN ISO/IEC 17043:2010-05:
4.6.3.2 The proficiency testing provider shall specify relevant environmental conditions for the transport of proficiency test items. Where relevant, the proficiency testing provider shall monitor the pertinent environmental conditions of the proficiency test item during transport and assess the impact of environmental influences on the proficiency test item.

PTs of the NRL for process contaminants

- NRL for Process Contaminants cooperates with about 20 Official Control Laboratories in Germany
- International cooperation becomes more and more important to successfully perform proficiency tests (key point: sufficient number of PT participants)
- Participation of NRL + OCL from 8 European countries in German NRL PT in 2022, further countries planned for 2023
- Logistics of PT will be more demanding due to international shipping
- Particular difficulties with volatile analytes such as furans and benzene and unstable analytes such as glycidyl esters





Optimization of frozen sample shipping



- Space-saving storage of packaging before use
- Easy and flexible shipping preparation



- Samples must remain frozen (> 24 h domestic shipping, > 72 h international shipping)
- Suitability of packaging must be demonstrated

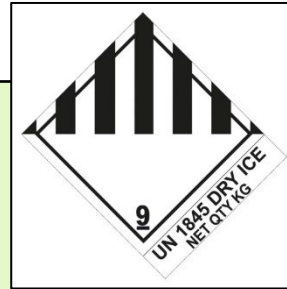


- Avoid hazardous materials in the lab or during transport (e. g. dry ice)



- Packaging must be 100% recyclable
- Avoidance of composite materials

Pros and cons of dry ice shipping



- Temperature of -80°C possible
- Full sublimation = no waste
- Very good cooling performance, so smaller boxes can be used



- Temperature of -80°C may be too cold for some types of samples
- Samples must be additionally secured and padded in the box
- Dry ice is a hazardous material and is subject to special safety requirements for air transport (IATA)
- Dry ice is not transported by all carriers, may be restricted for certain countries
- No unlimited storage, supply chain must be functional, sample reshipment issues
- Special requirements for sample shipment and storage of packages prepared for shipment

PCM cooling elements a dry ice alternative

- Phase Change Material (PCM): a material that releases/absorbs enough energy during a phase transition to provide useful heat or cooling
- The transition occurs from one of the first two basic states of matter - solid and liquid - to the other
- In our case, melting a saline solution keeps the samples frozen
- The application range of PCM cooling elements can be adjusted by the liquid contained
 - Water = samples are kept at 0°C
 - Salt solution = depending on salt content, samples are kept at temperatures below 0°C



500 g



1.000 g

Our setup: easyAkku Freeze 1000 g, phase transition -10 - -15 °C, LDPE bag can be disposed of in the recycling bin, cooling medium tap water + additive to lower the freezing point (harmless to food, can be disposed of in the sink), 100% recyclable



Pros and cons of PCM



- Adjustable temperature
- No additional padding required
- No hazardous materials
- Easy to store, easy to prepare for shipment, easy to send additional samples
- No health and safety issues

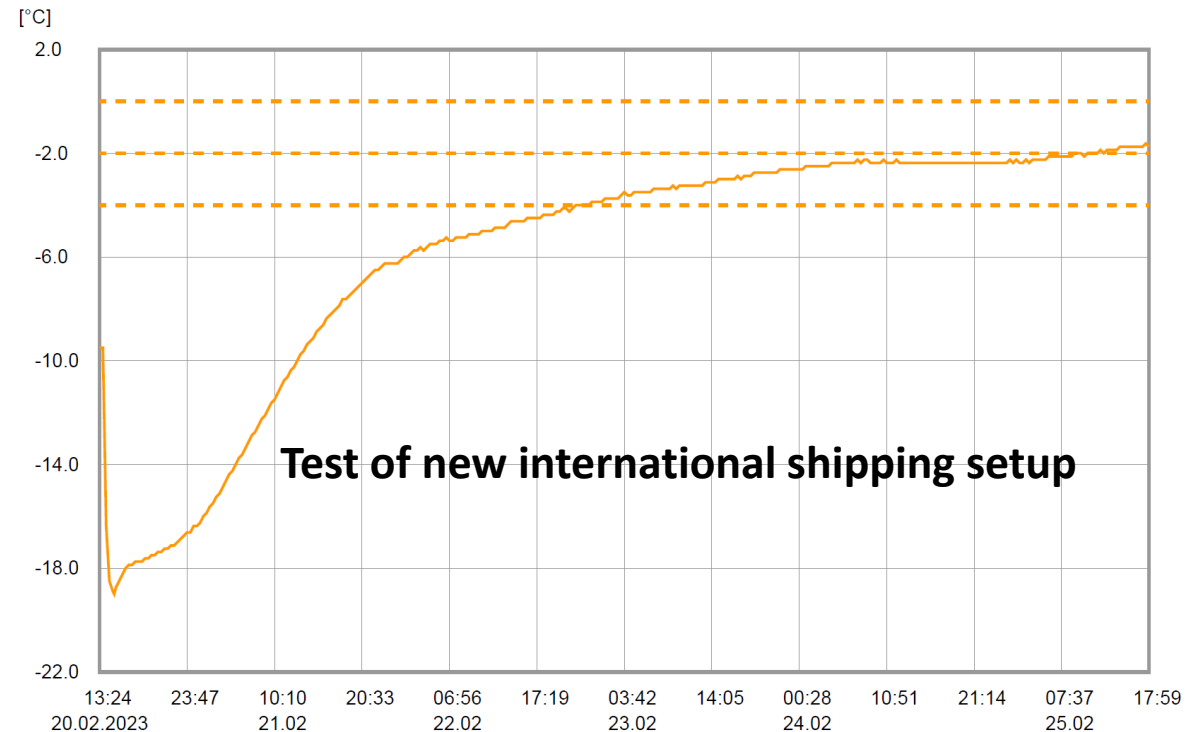


- Lowest possible temperature depending on salt content = -25°C
- Poorer cooling performance than dry ice, more PCM elements required to keep sample at constant temperature
- Packaging waste is generated

Paperfloc packaging system based on cellulose fibres

- Test of the paperfloc packaging system by Licopharm/easy2cool:
 - Insulation for frozen shipping is achieved by loose cellulose fibres
 - paperfloc has insulation properties comparable to EPS
 - paperfloc is 100% recyclable, made from 89% recycled material itself (ground cardboard waste)
 - Paper can be recycled up to 25 times, infrastructure established throughout Europe
 - 97% energy saving and 95% CO2 saving compared to EPS
 - Packaging can be folded for space saving storage

This is how we tested: Test all packaging kits with 2 x 25 mL of frozen water as a surrogate sample in an air-conditioned office at 20°C using a calibrated temperature logger.



New shipping setups

	New domestic shipping setup: Insulated 10 L paperfloc paper bag with outer carton + 4x 1 L PCM cooling elements	New international shipping setup: Insulated 25 L paperfloc paper bag + insulated inner carton + outer carton + 8x 1L PCM cooling elements
Components		
Max. transit time (T < 0°C)	> 30 h	> 120 h
Weight	Approx. 5kg	Approx. 10 kg
Dimensions (l x w x h)	352x312x180 mm	462x386x386 mm

Example of packaging and shipping costs

	Previous domestic shipping setup: EPS box with outer carton + dry ice, transit time max. 24 h	New domestic shipping setup: Insulated 10 L paperfloc paper bag with outer carton + 4x 1 L PCM cooling elements, transit time max. 30 h
Insulated box/ Insulated bag	4.02 EUR	2.30 EUR
Outer Box	0.12 EUR	0.70 EUR
Dry Ice	6.83 EUR (2.5 kg, 2.73 EUR/ kg)	-
Cooling Elements	-	2.00 EUR (4x 0.50 EUR)
Total packaging costs	10.97 EUR	5.00 EUR
Shipping Cost (DHL Express national)	25 EUR	25 EUR

The following objectives were achieved in the pilot project:

- Successful characterization of a shipping setup for domestic and international shipping of frozen samples
- All packaging materials used are 100% recyclable
- No use of environmentally hazardous substances or dangerous goods
- Reduce packaging costs by about 50%
- Significant reduction in packaging storage space as new packaging is foldable





Characterization of other shipping setups using sustainable packaging materials:

- Refrigerated shipping using other PCM elements
- Non-refrigerated shipping using renewable cushioning materials such as hemp, wood wool, straw, recycled cardboard

Testing reusable packaging for sample exchange with long-term customers:

- Use of vacuum-insulated shipping boxes with PCM elements (shipping up to 120 h at constant temperature of -20°C possible).

Thank you for your attention!

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Feedback

