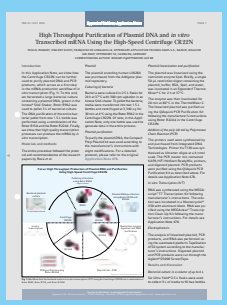
BIO NEWS
No. 61 – 2024

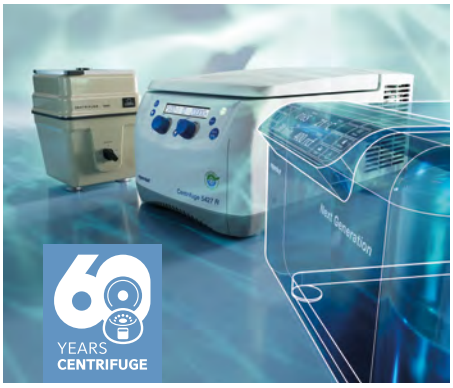
eppendorf

Let's Celebrate: 60 Years of Eppendorf Centrifuges

> Sustainability moves science – and us!
> Growth accelerator: CellXpert® CS220 CO_2 Shaker
> epMotion® 96 Flex: Cost-effective debut to lab automation

Application Notes
High throughput purification of plasmid DNA and *in vitro* transcribed mRNA ·
Fake DNA in your qPCR? Comparative evaluation of leaching levels in PCR plates · etc.





Thank You

for taking the time to read the new issue of BioNews.

First off, we are celebrating 60 years of Eppendorf centrifuges! With our current portfolio of microcentrifuges and multi-use centrifuges as well as high-speed and ultracentrifuges, we now offer comprehensive solutions for every centrifugation task. Find more information on pages 4–5.

Over the past years, the subject of sustainability has become a key topic within the scientific community. On pages 6–7, you will learn more about our engagement, as well as concrete measures.

The time to market-readiness of biotechnological and pharmaceutical research projects depends, among other factors, on the efficiency with which certain applications can be carried out. The new CellXpert® C S220 CO_2 shaker allows processes utilizing these applications to be simplified and accelerated (p. 8).

With the epMotion® 96 Flex, we are introducing a new 96-channel liquid handling system. Whether it will serve as a stand-alone instrument or as a "feeder" system for large automated systems, the epMotion 96 Flex provides you with a cost-effective entry into laboratory automation (p. 10).

This issue's finishing touches comprise more news, alongside eight pages of Application Notes. And of course, as always, great prizes for your laboratory await you in our prize draw (p. 13).

Your Eppendorf BioNews-Team

PS: Would you like to share your thoughts with us about BioNews? Do you have ideas or requests? If so, please send us an e-mail to bionews@eppendorf.de. We look forward to your feedback!

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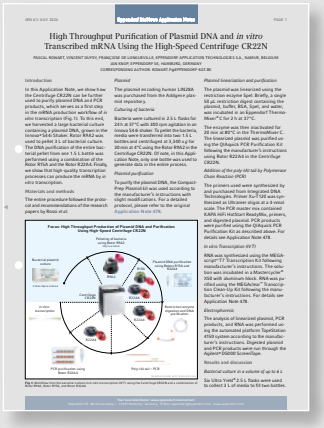
Eppendorf BioNews Application Notes


High Throughput Purification of Plasmid DNA and *in vitro* Transcribed mRNA Using the High-Speed Centrifuge CR22N

MARC-MANUEL HAHN & TIM SCHOMMARTZ, EPPENDORF SE

Always the Right Solution: 60 Years of Eppendorf Centrifuges

Eppendorf introduced its first centrifuge in 1964. The "Model 3200" not only fitted perfectly into the microliter system consisting of piston-stroke pipettes and Eppendorf Tubes®, it also formed the basis for a wide range of centrifuges. With our portfolio of microcentrifuges and multipurpose centrifuges as well as high-speed centrifuges and ultracentrifuges, which has grown over six decades, we now offer comprehensive solutions for every separation task.

Which centrifuge is best suited for which application?

The first step in planning an experiment is to determine which work processes need to be carried out and what equipment is required. In addition to specialist literature and established protocols, colleagues can also provide useful advice.

The challenge is to find a solution that is ideally suited for all laboratory workflows and not just for individual experiments. When choosing which centrifuge to use, it is advisable to consider its versatility and volume range and not just its speed.

Suitable for multiple purposes: Micro- and multipurpose centrifuges

Our microcentrifuges and multipurpose centrifuges are made for centrifugation of smaller volumes in different tubes. Due to their compact size, these devices take up minimum space in the laboratory. Centrifugation of single tubes as well as plates and bottles is possible thanks to a large selection of adapters and rotors.

With speeds of up to 30,000 x *g*, our microcentrifuges are the perfect solution for a broad range of molecular and cell biology applications.

For centrifugation of volumes of up to 4 liters, we recommend our multipurpose centrifuges. Air-cooled or compressor-cooled versions are available for cooling temperature-sensitive samples (e.g. RNA).

For big plans: High-speed centrifuges

In some applications, the focus is on upscaling, such as in the production of cell batches in the liter range in bioreactors. Downstream centrifugation steps are used to isolate, purify, and concentrate target products (e.g. recombinant proteins) from

Centrifuge 5910 Ri: versatile, refrigerated multipurpose centrifuge

Centrifuge 5427 R: high-throughput microcentrifuge with natural refrigerant

Centrifuge CR22N: floorstanding high-speed centrifuge with refrigeration system, ideal for cell harvesting

Centrifuge CP100NX: floorstanding refrigerated ultracentrifuge with broad rotor portfolio

these sometimes very large cell batches. The aim here is to purify the end product in a large number of centrifugation runs at different speeds with different volumes.

High-speed centrifuges are ideal for this purpose as they can reach speeds of up to 110,000 x *g* and support volumes of up to 6 liters as well as continuous flow centrifugation for even higher throughput. The high *g*-forces require a coordinated selection of consumables, rotors, and adapters that are suitable for the requirements of the respective application to achieve optimum results at every step.

For the smallest particles: Ultracentrifuges

In certain cases, purification of the smallest particles is required at particularly high speeds. Eppendorf offers ultracentrifuges that can reach speeds of up to 1,050,000 x *g* for such applications.

These centrifuges are established in the purification of viruses, nanoparticles, and the smallest cell components such as exosomes. Such extreme speeds can only be withstood by using matching systems consisting of a centrifuge, consumables, adapters, and customized rotors, which differ depending on experimental requirements.

The systems we offer are not just efficient for the specific application, they are also characterized by a particularly high level of safety.

Centrifugation made easy: Start Separation at Ease

It goes without saying that a centrifuge is not just about volume and speed. Centrifuges are used for a variety of process steps, which means they need to be as intuitive and easy to operate as possible. Our "Start Separation at Ease" campaign is based on our promise to provide our customers with everything they need to achieve the best performance and the best results every day so that they can focus on what really matters – their research.

To deliver on this promise, we are constantly working on innovative solutions in terms of ergonomics, ease of use, and sustainability.

Examples include our Centrifuge 5910 Ri with touchscreen and Centrifuge 5427 R with sustainable coolant, as well as various digital products and customized service offers.

Find out more at:
www.eppendorf.link/your-centrifuge-solution

Tip

Performance Ensured, Life Span Maximized

Your centrifuge requires proper care to maintain performance and deliver reliable results over time. Unexpected downtime or inconsistent results waste precious time and money. Save yourself from stress and ensure years of productive, reliable operation with regular evaluation and maintenance by our qualified Eppendorf Service team.

The full value

We provide efficient, reliable services for your centrifuge. Our comprehensive selection of carefully designed service solutions are performed by our dedicated Technical Service & Support teams worldwide. Choose from installation and qualification services or service agreement options that suit your needs for consistent performance, safety, and reliability.

Your needs – our solutions

Choose from cost-efficient to all-inclusive care packages and on-demand services:

On-demand Services
> Installation Service
> IQ/OQ GxP
> Preventive Maintenance*

Service Agreements
> AdvancedCare
> PremiumCare
> Extended Warranty plus
> Extended Warranty

*Local availability may vary.
More information

JAN-HENDRIK BEBERMEIER, EPPENDORF SE

Sustainability Moves Science – and Us!

Over the past years, the topic of sustainability has increasingly gained in significance, and it has become a key topic within the scientific community. The demand for information and data with respect to sustainability is rising rapidly, and industrial businesses must meet this demand for information. In this article, you will learn more about our engagement as well as our concrete measures with respect to sustainability.

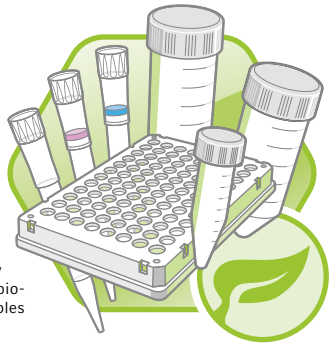
Eppendorf has come a huge step closer towards its goal of reducing the CO_2 emissions in our own operations to zero by the year 2028. Between 2019 and 2022, we have been able to reduce our emissions by 58 %. The switch to 100 % green electricity in almost all production sites was the key to this considerable reduction. The next steps will present a bigger challenge.

Find additional details in White Paper 091 „Our Way to Zero CO_2".

Even though a science-based reporting structure had already been established within the company, in the fall of 2023, Eppendorf decided to join the Science Based Target initiative (SBTi).

Biobased consumables

Following the market launch of the Eppendorf Tubes® BioBased in 2022, Eppendorf has successively expanded its portfolio of biobased consumables – for example, the epT.I.P.S.® BioBased represent a new reload system for pipette tips (with and without filter).



Well received by our customers: biobased consumables

As well, our Eppendorf twin.tec® PCR Plates are now available as a biobased variant. We are very pleased that biobased consumables are well received by more and more users. Additional biobased products are in development.

Science demands evidence – and so, a life cycle analysis was performed on our 5 mL tube. To this end, classic, fossil fuel-based tubes were compared with biobased tubes. This study, which was carried out externally based on the cradle-to-the-gate approach, demonstrated considerable CO_2 savings. The use of a minimum of 90 % biobased material resulted in CO_2 savings of 17.9 %, equivalent to 3.3 g of CO_2 per tube. These results have been published in White Paper 093 "Life Cycle Analysis of a 5 mL Tube".

The results of the analysis of the 5 mL tubes served as the starting point for the estimates of the CO_2 savings for our 15 mL, 25 mL, and 50 mL tubes. The change of raw materials alone effect carbon savings

of 5.6 g CO_2 for 15 mL tubes; of 6.7 g CO_2 for 25 mL tubes; and of 11.1 g CO_2 for 50 mL tubes. A further product-carbon-footprint analysis for the biobased tips is currently in the process of being completed.

Bioplastic versus biodegradability

Despite the success of biobased materials, there remains confusion over their biodegradability. In fact, most bioplastics are not compostable. The biobased consumables by Eppendorf are made from biobased polypropylene (PP), or biobased polycarbonate (PC), respectively, which do not decompose (also see Whitepaper 092: "Bioplastic Explained").

The desire for biodegradability often results in the risk of biohazards and residual reagents being disregarded. This, too, represents a big challenge on the way to a circular economy. The medium-term goal consists of finding a way to close the material cycle as well as develop a reliable, reasonable, and safe recycling system for laboratory consumables.

These goals will demand time and effort from all of us. Supporting the concept of the circular economy is also the goal of the proposed EU guideline for packaging and packaging waste. This will force industry as well as recycling firms to combat packing waste from both directions, prepare for the circular economy, and create the infrastructure needed for the recycling of waste.

Sustainable Eppendorf instruments

One goal of the instruments is the reduction of energy consumption in laboratories. At 0.134 KWh, the new Mastercycler® X40 uses less energy than many other PCR cyclers.

The conversion to hydrocarbon-based coolants is not limited to the CryoCube® ULT freezers. Refrigerated centrifuges, too, require future-proof cooling. The Centrifuge 5427 R is our first centrifuge which meets these requirements, and more will follow.

Independent verification

We see real added value for our customers in an independent validation of the sustainability of our products through third parties.

Energy-saving: Mastercycler X40

For this reason, we are further expanding our partnership with My Green Lab®, which has been in existence since 2017. In addition to freezers, centrifuges, and consumables, in the last months we also received the ACT label within new product categories as dispensing tools, mixers, and cyclers (also see box on the right). In addition, we are a member of the ACT 2.0 steering committee to develop the future of ACT.

Conclusion: The journey continues

One central finding of our sustainability engagement is the fact that life cycle analyses, as well as product carbon-footprint analyses, are complex, and that they demand much time, capacity, and resources. At the same time, progress with respect to sustainability is never finished and complete. Rather, we find ourselves on a continuous, exhilarating journey, in constant discourse with our stakeholders.

www.eppendorf.com/sustainability

Tip

Eppendorf Products with ACT® Label

ACT stands for "**A**ccountability, **C**onsistency, **T**ransparency". ACT labels function similarly to nutrition labels, providing a comprehensive evaluation of sustainability-related aspects. This enables laboratories to easily assess the eco-friendliness of their suppliers. The certification process includes thorough evaluations of manufacturing processes, energy and water consumption, packaging, and considerations regarding product disposal.

So far, Eppendorf has received the ACT label for more than 150 of its products*.

Ultra-Low Temperature freezers:

CryoCube® F740hi/hiw, FC660h, F570h/n, F440h

Centrifuges:

Centrifuge 5427 R, Centrifuge 5910 Ri

PCR cycler/PCR plates:

Mastercycler® X40, Eppendorf twin.tec® PCR Plates BioBased

Temperature control and mixing:

Eppendorf ThermoMixer® C

Pipettes and pipette tips:

Eppendorf Research® plus, Eppendorf Xplorer®/Xplorer plus, epT.I.P.S.® Reloads, epT.I.P.S.® Reloads BioBased, ep Dualfilter T.I.P.S.®, epT.I.P.S.® Motion Reload System

Dispensers and dispenser tips:

Multipette® M4, Multipette® E3/E3x (U.S./CAN: Repeater® M4, Repeater® E3/E3x), Combitips advanced®

Tubes:

Eppendorf Tubes® 5 mL, Eppendorf Conical Tubes 25 mL, Eppendorf Tubes® BioBased, Eppendorf LoBind® Tubes

*Latest detailed information at https://actdatabase.mygreenlab.org/

CHRISTIAN HABERLANDT, EPPENDORF SE

Growth Accelerator: CellXpert® CS220 CO_2 Shaker

The speed at which biotechnological and pharmaceutical research projects will become market-ready depends on a variety of factors. CO_2 shakers take on a key role when it comes to the expression of complex recombinant proteins, the generation of viral vectors in mammalian cells, or the production of bioreactor starter cultures. The new CellXpert CS220 shaker was developed specifically for simplifying and accelerating these applications.

Increasing throughput per unit of time

The more shake flasks can be accommodated within one instrument, the faster a certain number of parallel experiments can be carried out, or a certain total volume achieved. It is also true that the higher the capacity, the more parallel experiments can be performed which can subsequently be compared to one another. Depending on the flask format and the reference device, the new CellXpert CS220 accommodates up to 40 % more shake flasks.

Examples of the capacities of some popular flask formats:

> 8 x 5 L Corning®/Thomson Optimum Growth®
> Erlenmeyer flasks: 25 x 1 L, 42 x 500 mL, or 102 x 125 mL

By the way: In addition to its remarkable capacity, the CellXpert CS220 shaker also offers the highest capacity-to-footprint ratio currently available on the market.

Reducing the risk of contamination and downtime

The warm and moist atmosphere, together with the use of nutrient-rich media during cultivation of mammalian cells, provides ideal growth conditions for contamination – for example, with mycoplasma.

CellXpert CS220: remarkable capacity and the highest capacity-to-footprint ratio currently available on the market

In addition, cross-contamination with eukaryotic cells, which had been previously cultivated in the same instrument, presents an additional challenge. The consequences of contamination can be devastating: sample loss; repetition of experiments; the search for, and the removal of, the source of the contamination, including the temporary cessation of all laboratory activities. Accordingly, contaminations pose a high risk, both financially and with respect to lost time, for the affected projects.

The new CellXpert CS220 replaces the current standard of UV decontamination of surfaces or the airflow inside CO_2 shakers. UV decontamination, which is locally limited, is superseded by the gold standard that has been established for CO_2 incubators for decades – integrated 180 °C sterilization.

Easy-to-clean seamless stainless-steel chamber

In addition, the seamless stainless-steel chamber of the CellXpert CS220 is easy to clean – without the cables, ventilation ducts, or ribbed heating elements which could otherwise create ideal hiding places for contaminations.

What's next?

Learn more about how the CellXpert CS220 can accelerate research in your laboratory with its novel features:

www.eppendorf.link/accelerate-your-growth

In addition, learn what comes next, after cultivation in the CO_2 shaker: with innovative bioprocessing products and high-speed centrifuges by Eppendorf.

High Throughput Purification of Plasmid DNA and *in vitro* Transcribed mRNA Using the High-Speed Centrifuge CR22N

PASCAL ROWART, VINCENT DUFEY, FRANÇOISE DE LONGUEVILLE, EPPENDORF APPLICATION TECHNOLOGIES S.A., NAMUR, BELGIUM
JAN KNOP, EPPENDORF SE, HAMBURG, GERMANY
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Introduction

In this Application Note, we show how the Centrifuge CR22N can be further used to purify plasmid DNA and PCR products, which serves as a first step in the mRNA production workflow of *in vitro* transcription (Fig. 1). To this end, we harvested a large bacterial culture containing a plasmid DNA, grown in the Innova® S44i Shaker. Rotor R9A2 was used to pellet 3 L of bacterial culture. The DNA purification of the entire bacterial pellet from one 1.5 L bottle was performed using a combination of the Rotor R15A and the Rotor R22A4. Finally, we show that high-quality transcription processes can produce the mRNA by *in vitro* transcription.

Materials and methods

The entire procedure followed the protocol and recommendations of the research papers by Rossi *et al.*

Plasmid

The plasmid encoding human LIN28A was purchased from the Addgene plasmid repository.

Culturing of bacteria

Bacteria were cultured in 2.5 L flasks for 24 h at 37 °C with 300 rpm agitation in an Innova S44i shaker. To pellet the bacteria, media were transferred into two 1.5 L bottles and centrifuged at 3,340 x *g* for 30 min at 4 °C using the Rotor R9A2 in the Centrifuge CR22N. Of note, in this Application Note, only one bottle was used to generate data in the entire process.

Plasmid purification

To purify the plasmid DNA, the CompactPrep Plasmid kit was used according to the manufacturer's instructions with slight modifications. For a detailed protocol, please refer to the original Application Note 478.

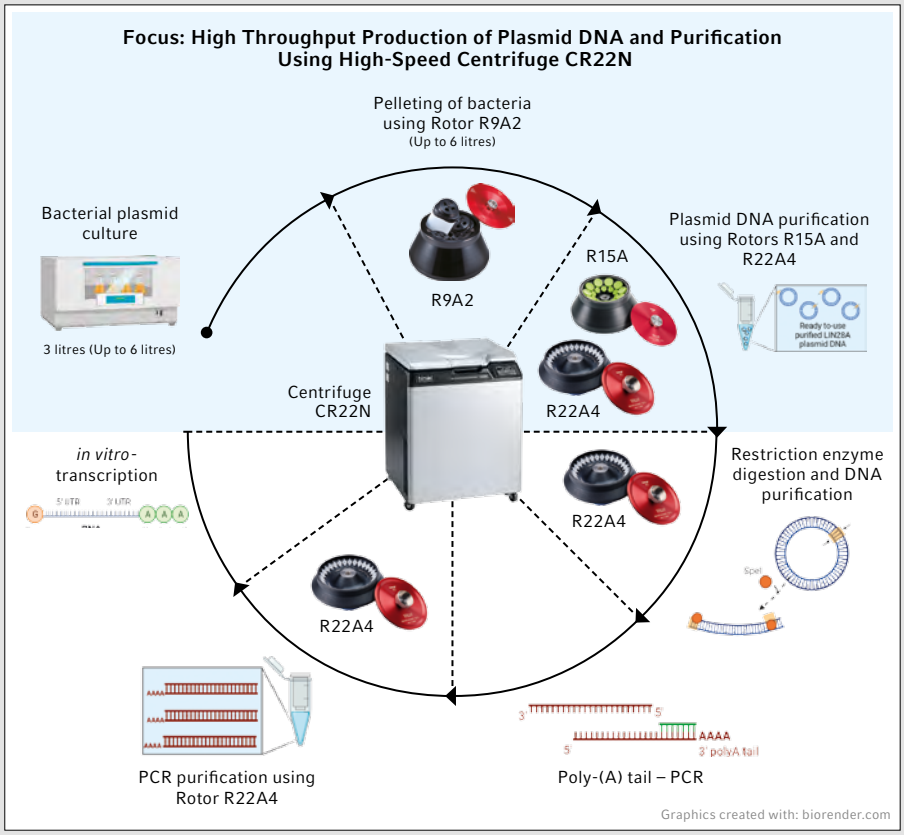

Fig. 1: Workflow from the bacterial culture to *in vitro* transcription (IVT) using the Centrifuge CR22N and a combination of Rotor R9A2, Rotor R15A, and Rotor R22A4

Plasmid linearization and purification

The plasmid was linearized using the restriction enzyme SpeI. Briefly, a single 50 µL restriction digest containing the plasmid, buffer, BSA, SpeI, and water, was incubated in an Eppendorf ThermoMixer® C for 2 h at 37 °C.

The enzyme was then inactivated for 20 min at 80 °C in the ThermoMixer C. The linearized plasmid was purified using the QIAquick PCR Purification Kit following the manufacturer's instructions using Rotor R22A4 in the Centrifuge CR22N.

Addition of the poly-(A) tail by Polymerase Chain Reaction (PCR)

The primers used were synthesized by and purchased from Integrated DNA Technologies. Primer Xu-T120 was synthesized as Ultramer oligos at a 4-nmol scale. The PCR master mix contained KAPA HiFi HotStart ReadyMix, primers, and digested plasmid. PCR products were purified using the QIAquick PCR Purification Kit as described above. For details see Application Note 478.

In vitro Transcription (IVT)

RNA was synthesized using the MEGAscript™ T7 Transcription Kit following manufacturer's instructions. The solution was incubated in a Mastercycler® X50 with aluminum block. RNA was purified using the MEGAclear™ Transcription Clean-Up Kit following the manufacturer's instructions. For details see Application Note 478.

Electrophoresis

The analysis of linearized plasmid, PCR products, and RNA was performed using the automated platform TapeStation 4150 system according to the manufacturer's instructions. Digested plasmid and PCR products were run through the Agilent® D5000 ScreenTape.

Results and discussion

Bacterial culture in a volume of up to 6 L

Six Ultra Yield® 2.5 L flasks were used to collect 3 L of media to fill two bottles.

High Throughput Purification of Plasmid DNA and *in vitro* Transcribed mRNA Using the High-Speed Centrifuge CR22N

Of note, users can increase the bacterial culture to up to twelve Ultra Yield 2.5 L flasks as the rotor can accommodate up to four 1.5 L bottles, which represents 6 L in one run. After the centrifugation, the pellet was easy to collect due to the unique triangular shape and the wide mouth of the bottle (Fig. 2).

Here, two bottles were used to harvest bacteria. Nevertheless, only one bottle was used to generate data for DNA purification, PCR, and IVT. The bacterial pellet weights for both bottles were 8.92 g and 8.55 g. Considering the capacity of Rotor R9A2 and its 4 x 1.5 L bottles, users can harvest around 35 g of total bacteria to proceed to DNA purification and later IVT.

Plasmid DNA purification

The average DNA concentration at the end of the purification in columns was 1.5 µg/µL. Taking into consideration the total elution volume and the number of columns, an estimated amount of 7.23 mg of DNA can be purified from a single bottle.

Plasmid linearization and purification

Linearization of the plasmid was performed using the SpeI restriction enzyme. This enzyme cut the plasmid in two places creating a short (~684 bp) and a long fragment containing the inserted gene (~5,529 bp). The mean DNA concentration was 70 ng/µL (Fig. 3A).

Fig. 2: Workflow from bacterial culture to bacterial pellet

Amplification of the target gene by PCR

To generate the template for the IVT, the addition of a poly-(A) tail to the template DNA by tail-PCR was performed using primers Xu-F1 and Xu-T120 in the Mastercycler X50 (aluminum). The expected length of PCR products was confirmed using Agilent D5000 ScreenTape in the tapestation (Fig. 3B). The mean concentration of the PCR products was 686 ng/µL.

IVT and purification of the mRNA

The final steps, which consist of the production of the mRNA, were carried out using the Mastercycler X50 (aluminum). A single band below 1,000 bp was observed which confirmed the IVT process and the single amplification of the targeted gene. The mean concentration of the mRNA was 1,023 µg/µL. The RIN score here was shown to be 10, meaning pure and intact mRNA was produced (Fig. 3C).

Conclusion

Here, we have shown that the Centrifuge CR22N can be used to consistently produce high-quality DNA from large bacterial cultures. The combination of rotors R9A2, R15A, and R22A4, all compatible with the Centrifuge CR22N, drastically reduces the time of sample handling due to their high capacity. It simultaneously enables fast and efficient DNA purification from a single bacterial culture on a single, versatile device, under consistent conditions, thus reducing variability and inconsistencies between DNA libraries and allowing the production of high quantity and quality mRNA.

Download full **Application Note 478**.

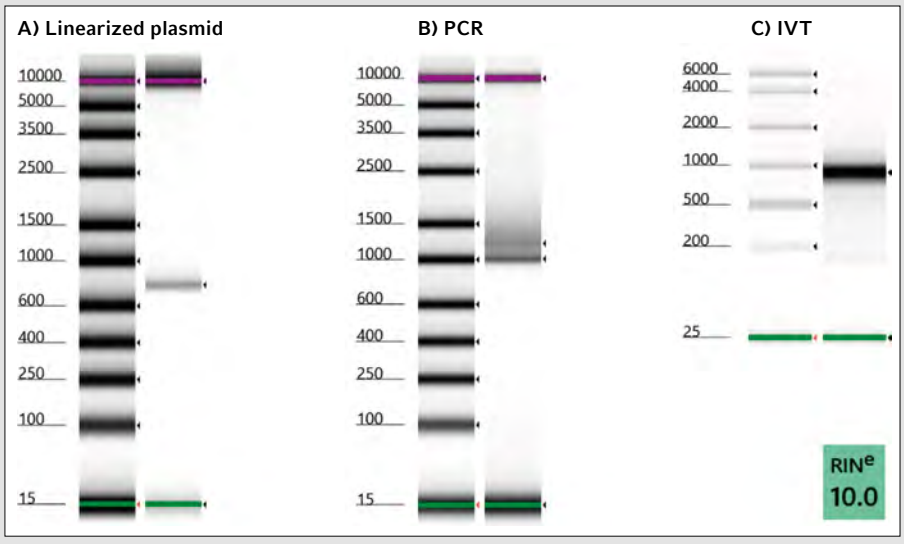

Fig. 3: A) Digested plasmid, **B)** PCR amplifying the target gene, **C)** IVT producing single and intact mRNA

Comparison of Safety Parameters and Leaching Levels of Eppendorf Tubes® BioBased and Eppendorf Tubes Standard

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Abstract

In this Application Note we investigated the performance of Eppendorf Tubes BioBased made of ISCC PLUS certified biobased material and compared key safety parameters (lid tightness and centrifugation stability) with standard fossil-based polypropylene Eppendorf Tubes. In addition, leaching levels were investigated and compared with conical tubes of main competitors.

Overall, the comparative evaluation of the Eppendorf Tubes BioBased 50 mL demonstrates their high safety performance and minimal levels of leachables virtually identical to comparable standard variants. This confirms that the biobased material, regarding its physical and chemical properties, may be regarded equal to fossil-based polypropylene.

Introduction

Eppendorf not only focuses on the development of new products but also on new, more environmentally friendly manufacturing materials. For the first time, Eppendorf offers a generation of Eppendorf Tubes with screw caps in 5.0 mL, 15 mL, 25 mL, and 50 mL formats made from 90 % "bio-circular" renewable-based feedstock (recycled e.g., from food oil wastes and residues) plus 10 % fossil-based feedstock (applying ISCC mass balance approach) [1,2].

The aim of this Application Note was to comprehensively evaluate all safety-relevant features of the Eppendorf Tubes BioBased 50 mL in comparison with fossil-based Eppendorf Tubes 50 mL. In particular, the lid tightness and centrifugation stability were assessed under several challenging conditions.

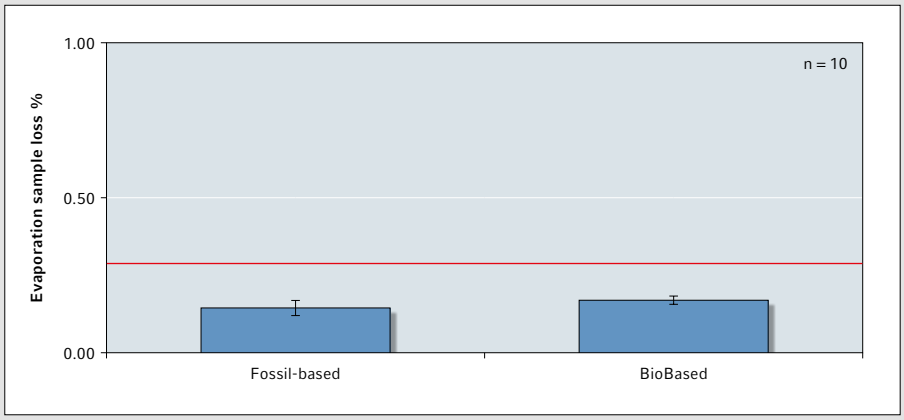

Fig. 1: Lid tightness – steam test. Sample loss (%) due to evaporation after incubation of water samples for 60 min at 70 °C in Eppendorf Tubes fossil-based and Eppendorf Tubes BioBased. Red line represents the test acceptance level

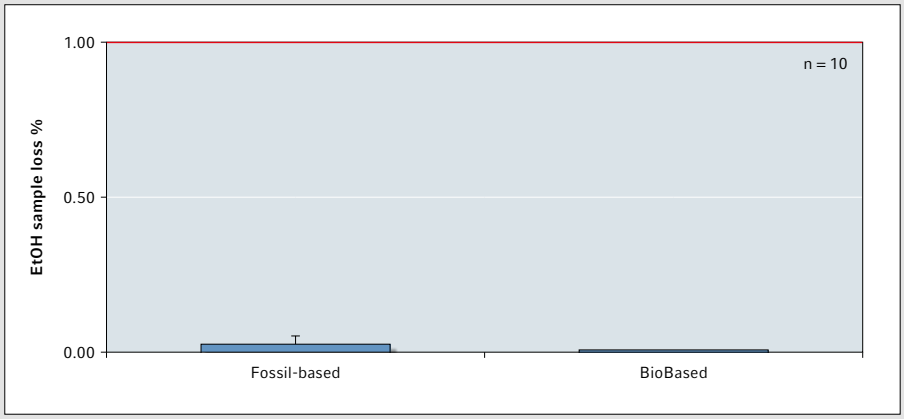

Fig. 2: Lid tightness – low temperature test. Sample loss (%) of ethanol samples stored in horizontal position at –86 °C in Eppendorf Tubes fossil-based and Eppendorf Tubes BioBased. Red line represents the test acceptance level

In addition, leaching levels were investigated and compared with conical tubes of main competitors.

Materials and methods

You find a complete description of the materials and methods in Application Note 469.

Results and discussion

Lid tightness

Tight sealing of the screw cap of a conical tube is the critical prerequisite for sample integrity and necessary to prevent sample loss. Particularly high temperature incubations and long-term storage at very low temperatures may lead to sample loss.

The results of lid steam tightness tests are presented in Fig. 1 and indicate virtually no difference between the performance of fossil-based Eppendorf Tubes and Eppendorf Tubes BioBased with values of 0.14 % and 0.17 % sample loss respectively. Noticeably, the values observed for evaporation loss laid well below the test acceptance level (0.28 %), which assures a very good level of sample and user safety when performing high temperature incubations.

The lid tightness was also tested under extreme low temperature conditions: ethanol samples were stored in horizontal position at –86 °C to increase vapor pressure and lid strain. As shown in Fig. 2, fossil-based Eppendorf Tubes and Eppendorf Tubes BioBased both showed very comparable und low sample loss values of 0.03 % and 0.00 % far below the acceptance level for this test.

Centrifugation stability

In the centrifugation test performed here, a typical application of nucleic acid extraction was simulated by filling the tubes with water : phenol : chloroform (2:1:1) solution and centrifuging the tubes at 18,000 x *g* at 4 °C and subsequently, in order to induce further stress to the tubes, at 40 °C. Under all conditions tested Eppendorf Conical Tubes BioBased showed exactly the same performance as Eppendorf standard tubes: no damage, liquid loss, broken tubes,

Comparison of Safety Parameters and Leaching Levels of Eppendorf Tubes® BioBased and Eppendorf Tubes Standard

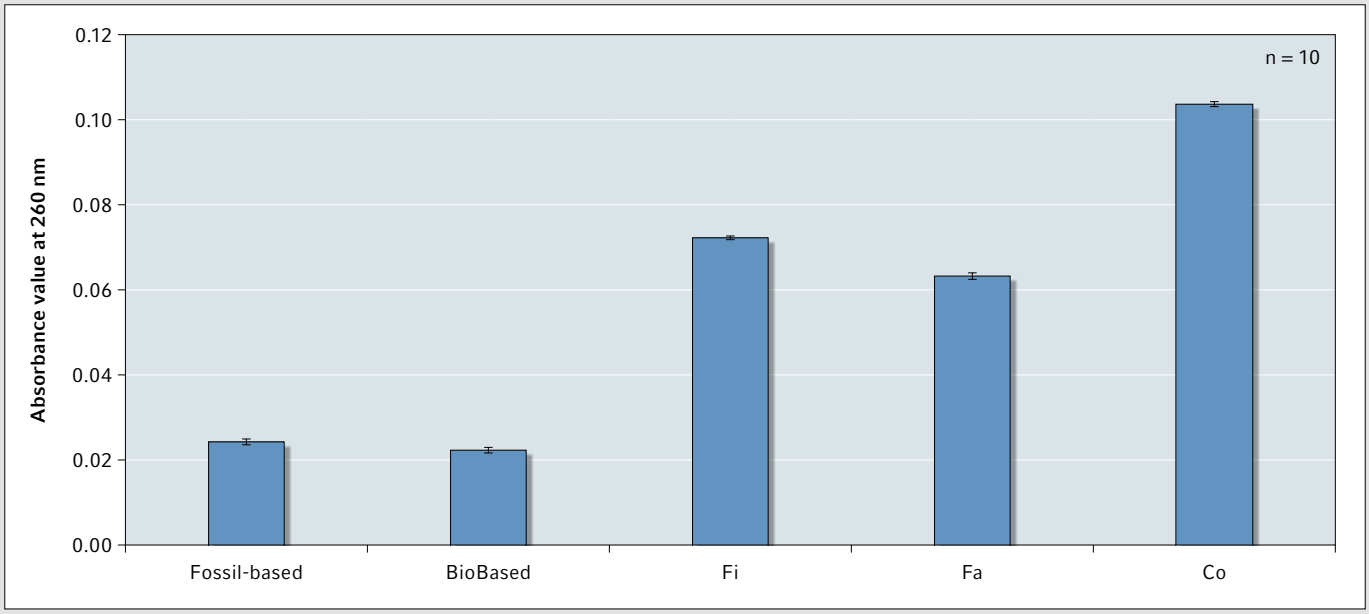

Fig. 3: Leachable test. Absorbance value at 260 nm of water samples incubated 40 min at 95 °C in Eppendorf Tubes fossil-based and biobased, as well as equivalent tubes from other manufacturers

distorted lids, or white cracks were observed (data shown in Application Note 469).

Leachables

Fig. 3 shows absorbance values obtained at 260 nm for water samples incubated at 95 °C for 40 min in various conical tubes. The absorbance values obtained at 260 nm translate to dsDNA concentrations and this may yield false elevated results during photometric analyses of molecules such as nucleic acids and proteins which are primarily conducted at 260 nm – 280 nm.

The absorbance values obtained for Eppendorf Tubes BioBased and fossil-based Eppendorf Tubes were very low: 0.024 and 0.022 respectively.

In contrast, the absorption values of tubes from manufacturers Fi, Fa, and Co were considerably higher ranging from 0.072 to 0.103. These high leaching values may potentially falsify the spectrophotometric measurements and have adverse effects on experiments.

Conclusion

Tested under a range of rigorous and application-relevant conditions, the Eppendorf Tubes BioBased 50 mL showed exactly the same performance as fossil-based Eppendorf Tubes 50 mL, both with respect to lid tightness and centrifugation stability.

Furthermore, comparative analysis revealed consistently low levels of water-soluble compounds (leachables) migrating into samples incubated both in Eppendorf Tubes BioBased and fossil-based Eppendorf Tubes.

This indicates excellent properties of biobased material in respect to leaching and consequently minimizes adverse effects of biobased consumables on experiments. Leachables levels observed for tubes of other manufacturers were considerably higher.

In summary, the comparative evaluation of the Eppendorf Tubes BioBased demonstrates their very high safety performance and minimal levels of leachables virtually identical to fossil-based Eppendorf Tubes. Biobased consumables therefore offer a major improvement of renewable properties of lab plastics, making them more sustainable without compromising product quality and performance.

Download the complete **Application Note 469**

Literature

[1] www.iscc-system.org

[2] Hermuth-Kleinschmidt K, Consumables Made of Bioplastics Enter the Lab, Eppendorf White Paper 078

Fake DNA in Your qPCR? Comparative Evaluation of Leaching Levels in PCR Plates

RAFAL GRZESKOWIAK, EPPENDORF SE, HAMBURG, GERMANY
SANDRINE HAMELS, ERIC GANCAREK, EPPENDORF APPLICATION TECHNOLOGIES, S.A., NAMUR, BELGIUM

Abstract

This study provides a comparative analysis of UV-absorbing leachables and qPCR fluorescence signals of water samples cycled in PCR plates from several manufacturers. The observed leaching levels and resulting false DNA concentrations were considerably high and varied markedly in the majority of the non-Eppendorf plates tested. This indicates that leaching may strongly influence qPCR assays and interfere with both photometric and fluorescence signal quantification leading to poor reproducibility results.

Introduction

The laboratory plastics are an integral part of any PCR workflow and may have a direct and serious impact on experimental outcome and data validity.

An increasing number of studies indicate that a large part of processing additives may be released (leach) from the consumable into the samples and pose a source of error in various assay systems including PCR [1,2,3].

The leaching effects are particularly relevant for plate-based assays, where a high variability in temperature conditions as well as position-dependent leaching can dramatically influence the data validity and reproducibility of a PCR/qPCR assay [4].

Materials and methods

You find a complete description of the materials and methods in Application Note 459.

Results and discussion

UV-absorbing leachables

Fig. 1 shows that during the incubation conditions tested (40 min at 96 °C) the plates of manufacturer "4T" and "Ar" released considerable amounts of UV-absorbing contaminants, which closely mimic the spectrum of nucleic acids.

These UV-active leachables may thus heavily influence DNA spectrophotometric measurements and lead to false DNA readings. Significant reduction of such sources of error and applicational risks might be achieved by using high-quality plates, such as the Eppendorf PCR plates, which exhibit the by far lowest levels of leachables (Fig. 1).

Fig. 2 shows that consistent background signal across different plates and production batches, due to the leachables, is not a given (compare 4T lot 1 and 4T lot 2). While, due to sampling size, the results displayed here might not be reflective to all plates sold in the market it nevertheless should call attention during the assay development phase.

Assays with longer PCR protocol times and environments with a high variability in temperature conditions may boost the leaching effect. Therefore, it is advisable to pay special attention to plate impact here.

qPCR fluorescence signals

To further evaluate if leaching may directly influence qPCR assays, ultrapure water samples were subjected to a standard qPCR thermal cycling protocol and resulting fluorescence

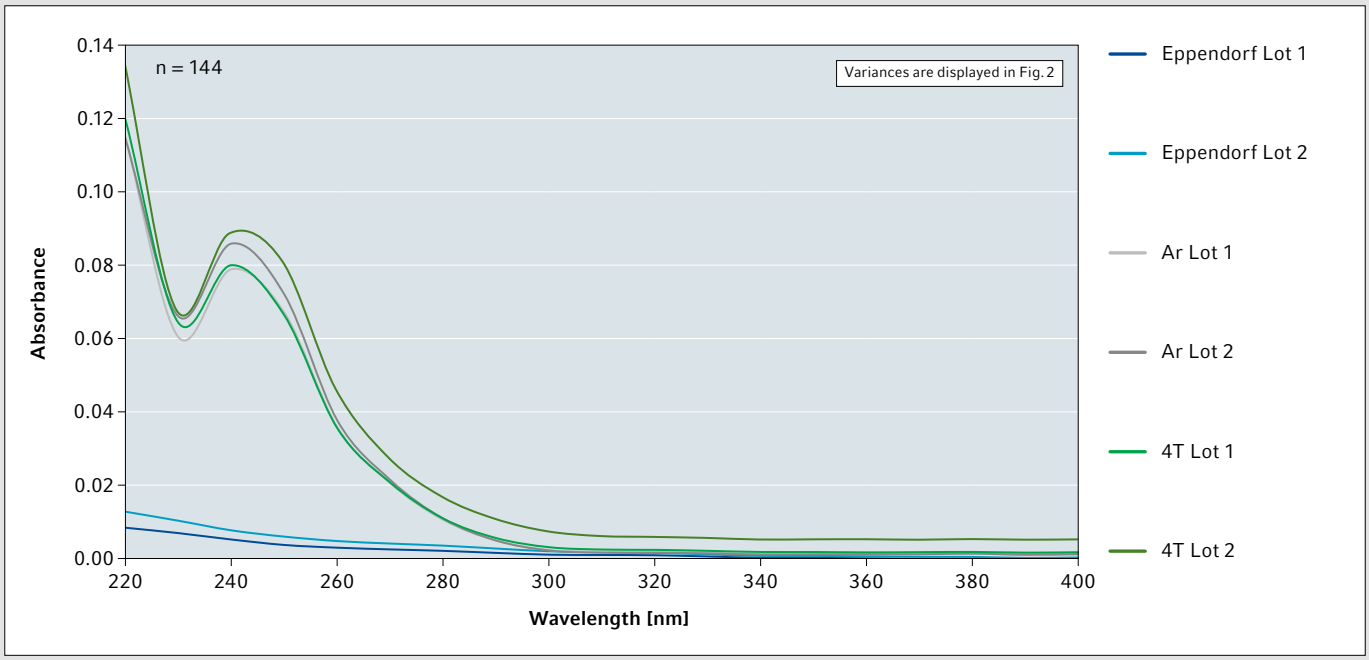

Fig. 1: Absorption spectra of UV-absorbing (nucleic acid-mimicking) leachables. Samples were incubated at 96 °C for 40 min in various PCR plates. Mean values of three standard 96-well PCR plates (48 wells per plate) from two separate lots are depicted

Fake DNA in Your qPCR?
Comparative Evaluation of Leaching Levels in PCR Plates

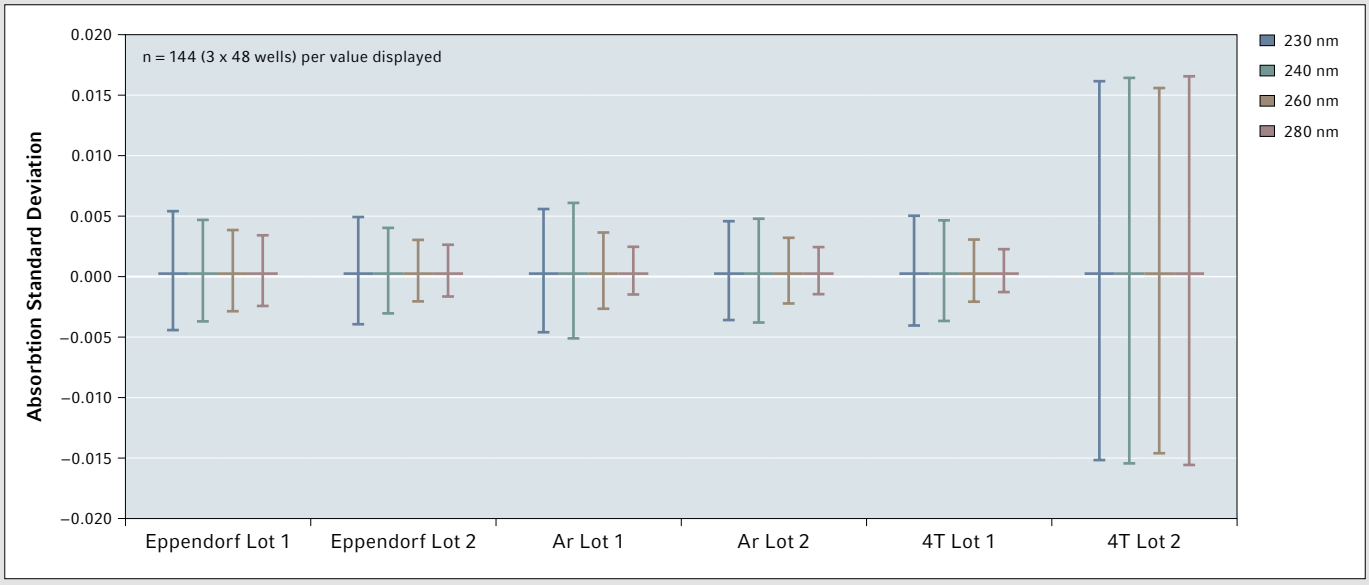

Fig. 2: Inter-plate reproducibility of leachable levels. Standard deviation of absorption values for four different wavelengths are depicted. Three standard 96-well PCR plates from two separate lots per manufacturer (six plates in total per manufacturer) were tested. Every second well of each plate (48 wells per plate) was analyzed. Values of three plates per lot are depicted

signals were assessed (data not shown; see Application Note 459). Specifically for the readings of the plates from manufacturers Ar and 4T, signals can indeed be impacted by released chemical substances. Here the signal interference was most notable for the commonly used SYBR/FAM wavelength, observable through the spread of the set of curves, while CY5, HEX, Texas RED, or CY5.5 were less impacted. Noteworthy, the plates from manufacturer Ar have very transparent wells, which commonly may be perceived as high-quality parameter. Unfortunately, the well clarity often relates to high amounts of clarifying agents used during production, which have been shown as critical and hamper various assay systems including PCR [4].

Noteworthy, relatively constant fluorescence signal variability for Eppendorf plates across the single plates and across the lots have been observed as opposed to the plates of other manufacturers.

Conclusion

This study provides a comparative analysis of UV-absorbing leachables and qPCR fluorescence signals. Using ultrapure water samples incubated in PCR plates from several manufacturers the data shows that PCR plates of some can release considerable amounts of UV-absorbing contaminants, which closely mimic the spectrum of nucleic acids and may interfere with quantification of nucleic acids and downstream applications, such as sequencing or cloning reactions.

Furthermore, both Ar and 4T plates released high levels of chemical substances directly interfering with fluorescence signal measurement during a standard qPCR protocol. In particular, these leachables interfered with commonly used SYBR and CY5 detection channels and they also exhibited high inter-plate and inter-lot variability levels (CV values up to 3.6 %).

This high variation may be particularly relevant, where a position-dependent leaching may dramatically influence both intra- as well as inter-plate reproducibility and thus data validity of a qPCR assay [4].

Amongst others, leachables may interfere with sample isolation, NGS library preparation, the PCR reaction itself, or potentially as an entrained contaminant impacting downstream analysis steps. The exemplary experiment setting (UV-absorbing leachables and qPCR) here has been only chosen in order to quickly visualize and assess the leachable levels.

For more details and the literature list, download Application Note 459

ep Dualfilter T.I.P.S.® Provide Essential Reproducibility for High-Sensitive ELISA

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Abstract

Lab consumables are a frequently overlooked influence on the reproducibility, performance, and experimental results. In this study, four lots of Eppendorf ep Dualfilter T.I.P.S. filtered pipette tips were evaluated regarding their influence on results gained with a high-sensitive ELISA.

No significant differences between any of the results were observed, no matter the lot, storage conditions, age, or shipping routes. This shows the high inter- and intra-lot consistency of Eppendorf ep Dualfilter T.I.P.S. that ensure utmost reproducibility and demonstrates lowest influence of them on assay results.

A full version of this study can be found in Application Note 483.

Introduction

Enzyme-linked immunosorbent assays (ELISA) are a well-established analysis method. Its execution predominantly relies on manual processes. Therefore, it is essential to ensure that the pipetting system used for such ELISA performs accurately and precisely and that the results stay reproducible despite variable parameters. Whilst some parameters like temperature and quality of reagents are usually considered, the impact of consumables like pipette tips is less likely to be so.

In this study, four different lots of ep Dualfilter T.I.P.S. were assessed on their influence on a high-sensitive ELISA that detects the human protein TNF alpha.

In addition to different manufacturing dates, they were also stored and shipped differently to include common factors that could influence the tips performance such as "time" (aging effect) and "space" (storage conditions, shipping routes).

Materials and methods

All tips compared were ep Dualfilter T.I.P.S., 2–200 µL, PCR clean/Sterile from different production lots used in combination with an Eppendorf Xplorer® plus, 15–300 µL, 12-channel pipette.

The commercially available Human TNF alpha Uncoated ELISA (Invitrogen®) was carried out as described in the product information sheet with the respective tips.

The tested tips were consistently employed during any interaction with the sample to ensure a reliable evaluation of their influence. All replicates were executed by the same person and the same pipette was used.

As a sample, a solution of recombinant TNF alpha (Invitrogen) was prepared and diluted to two different concentrations. The concentration determination was done in three independent replicates, each consisting of three technical replicates per tip-type. Each replicate was done within one freshly coated plate. For each plate an individual standard curve was prepared.

To detect the reaction, an xMark™ Microplate Absorbance Spectrophotometer from Bio-Rad™ was used. To compare means, a two-way ANOVA multiple comparison was performed.

Table 1: Different ep Dualfilter T.I.P.S. tested within this study and their according age, shipping, and storage history

Tips	Lot	Age	Location	Shipping	Storage
New	M209954H	1 month	Directly from plant	–	Monitored warehouse
Old	K200587R	24 months	Hamburg, GER	–	Laboratory
USA	L207030P	12 months	From plant to Fresno, USA, back to Hamburg, GER	Sea & air freight; 17,000 km	Monitored warehouse
MY	L202508I	19 months	From plant to Kuala Lumpur, MY, back to Hamburg, GER	Sea & air freight; 19,000 km	Laboratory

Results

Lyophilized TNF alpha was reconstituted and diluted to a low and a high concentration within the detection limits of the kit. Their exact concentrations were then determined with the named ELISA. For each replicate, 14 tips per sample were used so that all liquid handling steps involving the sample and the detecting agents were performed with the tips to be tested.

This way, the influence of different lots, storage conditions, and shipping routes on the reproducibility of results was evaluated (Table 1).

To determine the samples concentration, the absorbance values detected per sample were recalculated to the TNF alpha concentration using the individual plate standard curves ($R^2 \geq 0.998$).

The average resulted in a concentration of (49.9 ± 2.7) pg mL^{-1} for the lower and (344 ± 15) pg mL^{-1} for the higher concentrated sample. A two-way ANOVA confirmed that there was no significant difference between any of the results generated with different tip lots (Fig. 1).

This shows that even when handling very low concentrated protein samples, ep Dualfilter T.I.P.S. deliver accurate, precise, and reproducible results, no matter the lot, age, or storage location.

Looking over all obtained results for one lot, the variance was low and in line with the typical error ranges observed performing a high-sensitive ELISA. This *intra-lot consistency* is visualized with a boxplot. For the TNF alpha concentration determination each box was rather small, and no outliers were found for any lot, for both the high and low concentrated sample (Fig. 2).

To analyse an effect of lot, storage, shipping, and age on the results, the *inter-lot consistency* can be evaluated comparing the boxes generated for each. In doing so it can clearly be seen that both the means and medians result in the same range for either the high or low concentrated sample for all lots tested.

ep Dualfilter T.I.P.S.® Provide Essential Reproducibility for High-Sensitive ELISA

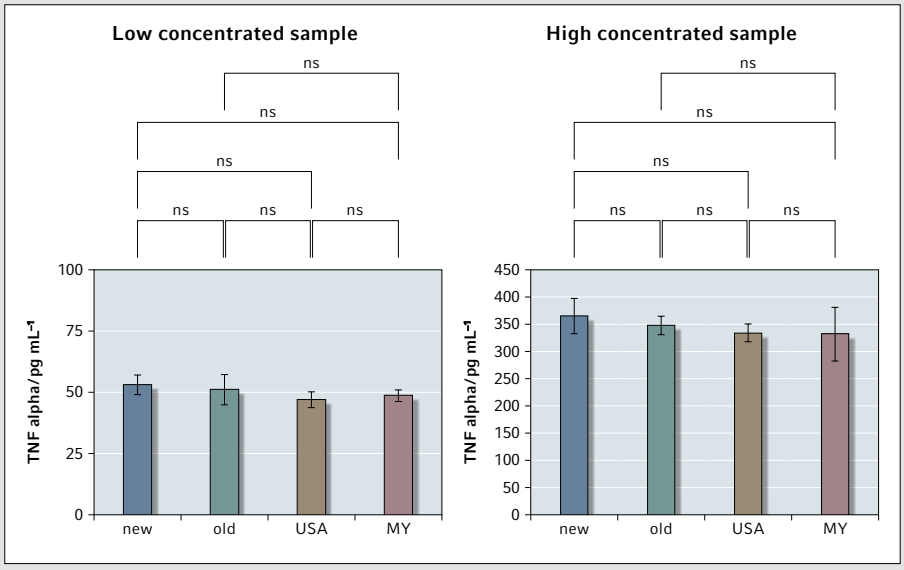


Fig. 1: TNF alpha concentration determination using four different ep Dualfilter T.I.P.S. lots (new, old, USA, MY). For a low (left) and a high (right) concentrated sample, the same results were obtained with each lot, as no significant (ns) differences could be detected between any mean (two-way ANOVA, errors indicate standard deviation)

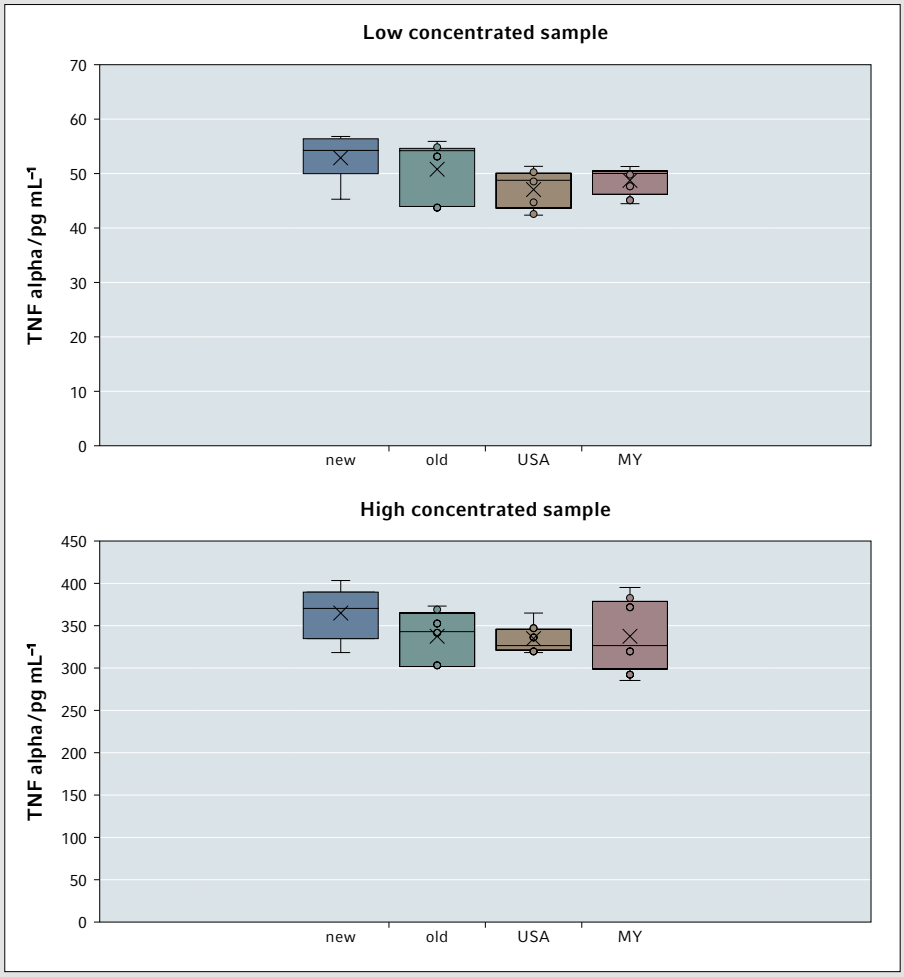


Fig. 2: Boxplots indicating the intra-lot (one box) and inter-lot (box comparison) reproducibility of TNF alpha concentration determination using a specific ELISA for a low (above) and high (below) concentrated sample. Different lots used (new, old, USA, MY) show a comparable mean, median, and variance

Additionally, the box shapes are of comparable sizes. Only the USA lot shows an even smaller box than the rest for the high concentrated sample, indicating lowest variance in data.

Conclusion

In this study, we performed a high-sensitive ELISA with two TNF alpha samples of unknown concentrations. Four lots of filter pipette tips from different age, shipping, and storage conditions were used and results obtained were compared. For each lot of tips used the same results were obtained, as there were no significant differences observed for both samples. No outliers were identified, and equally low variances were found over all lots. This indicates the high inter-lot and intra-lot consistency and thus reproducibility of results when using ep Dualfilter T.I.P.S. filter tips. This also demonstrates Eppendorf's high production standards and quality for consumables.

Download the complete
Application Note 483

SIMON PLATE, EPPENDORF SE

Want to Perfect Your Pipetting Technique?

Pipettes are among the most fundamental instruments used in modern laboratories for a multitude of applications. However, having good pipetting technique is just as essential. With the information in our series of pipetting tutorials, you could drastically improve your accuracy and precision. Ready to perfect your pipetting technique? Check out our tutorial videos – created by the team of Eppendorf pipetting experts.

Episode 1: How to Pipette in 5 Simple Steps

In the first episode, you'll be going back to the fundamental principles underlying good pipetting technique when using mechanical air-cushion pipettes. With five simple and easy to follow steps that can be applied to nearly all pipetting applications, this video is packed full of useful tips and tricks.

Watch Episode 1!

Episode 2: How to Fill Plates Faster

You've mastered the single-channel pipette but your thumbs are getting tired filling 96-well plates? Our multi-channel pipettes make your work faster and more ergonomic. Discover how to choose the best multi-channel pipette and some helpful hints on how to use it effectively to boost productivity in your lab.

Watch Episode 2!

There are more episodes to discover!

Whether you're a pipetting novice wanting to go pro or simply want to brush up on some skills, our video series has got you covered.

Episode 3: How to Increase Pipetting Efficiency

Episode 4: What's Happening Inside Your Pipette?

Episode 5: How to Pipette Challenging Liquids

Episode 6: How to Take Care of Your Pipettes

Episode 7: How to Choose the Right Pipette Tips for Your Experiment

Episode 8: Liquid Handling with Bottle-Top Dispensers

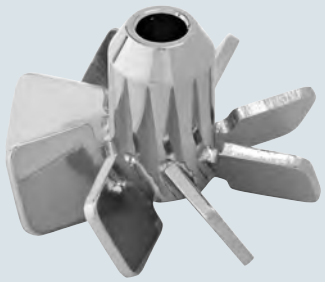
Close-Up

Gentle Agitation of Stem Cells

Are you worried that agitation in the bioreactor can harm your shear-sensitive cells? Then the 8-blade impeller shown here can be a perfect solution for you.

The 8-blade impeller was designed to suit the special needs of stem cells. It ensures reduced cell settling and a very good mixing already at low agitation speeds to reduce the stress for your cells. Furthermore, it was optimized to support cell aggregate formation to allow the cultivation of adherent cells in bioreactors without a growth matrix.

The BioBLU® 0.3sc Single-Use Bioreactor from Eppendorf is equipped by standard with an 8-blade impeller. 8-blade impellers are also available for DASbox® Mini Bioreactors made of glass.



Both bioreactor types facilitate bioprocessing in working volumes from 100 mL to 250 mL.

Find out more about the Eppendorf solutions for stem cell bioprocessing at www.eppendorf.link/bioprocess-stem-cells

TIM SCHOMMARTZ, EPPENDORF SE

epMotion® 96 Flex: Cost-Effective Introduction to Lab Automation

Precise, efficient, groundbreaking – this is the new epMotion® 96 Flex! Eppendorf's new 96-channel liquid handling system optimizes your laboratory processes and gives you maximum flexibility for a variety of applications. Either as a standalone instrument, or as a feeder system for large instruments, the epMotion 96 Flex is an indispensable addition for every laboratory.

The epMotion 96 Flex stands for hassle-free precise liquid handling in 96- and 384-well microplates. With this instrument, you can accelerate the pace of your work while minimizing pipetting errors.

At the same time, the epMotion 96 Flex offers you a cost-effective introduction into the world of laboratory automation. It is capable of taking over parts of sophisticated and demanding applications such as nucleic acid purification, preparation of NGS libraries, and immunoassays – without the comparatively high costs associated with large automated systems. In addition, it can be utilized as a meaningful addition to large automated systems, where it will serve as a "feeder" system on which plates are prepared for further processing on large instruments.

Successful predecessors refined

When it came to the design of the new epMotion 96 Flex, we were guided by its successful predecessors epMotion 96 and epMotion 96xl, and we resolutely refined these designs.

Novel features include exchangeable dispensing heads: they allow quick and easy adaptation of the system to different volume ranges. Your advantage: flexibility in current applications as well as security for future applications.

For launch, two dispensing heads are available: one for the volume range between 0.5 and 300 µL, and one for the volume range between 5 and 1,000 µL.

Quick and easy: exchange of the dispensing head

The dispensing heads can be exchanged by the user, easily and without the use of tools, in a matter of minutes.

epMotion 96 Flex is an asset to every laboratory

Ergonomics and precision were the focus during the development of the epMotion 96 Flex, and it is these features which make it an indispensable addition to every laboratory. Its intuitive touchscreen interface and thoughtfully placed interaction points guarantee easy handling with high precision. Training on operation takes no time at all, and as one of very few instruments in its class, the epMotion 96 Flex can be operated conveniently inside biological safety cabinets. Taken together these features make it attractive for both molecular biology experiments and plate-based cell culture applications.

The epMotion 96 Flex, as the first system in its class, has been calibrated in accordance with the new standard ISO 23783-2, demonstrating the highest pipetting accuracy and precision. This ensures reproducible assays, even when working with small volumes or challenging liquids.

epMotion 96 Flex: where precise liquid handling meets flexibility – for scientific excellence!

www.eppendorf.link/flex

STEVEN KLUGE, EPPENDORF SE

New Digital Solutions for Your Laboratory Documentation

Researchers worldwide have always valued accurate documentation of their work. After all, documentation is the key to successful research work. They are supported in this by a variety of digital solutions from Eppendorf. These make laboratory work safer, more traceable, and at the same time more efficient. Two of these solutions now offer even more advantages: we present the new SafeCode Plates and the completely revised user interface of eLabNext® software.

Clearly coded with the Eppendorf SafeCode system

"Vessels must be labeled" – naturally, every lab member agrees. Although clear labeling is recommended, you often find vessels in laboratories without any labeling or with non-readable labeling. To make reading as easy and as reliable as possible Eppendorf offers the SafeCode system supporting different consumables like tubes and CryoStorage vials as a pre-labeled barcoded version with 3-level-coding and 2D datamatrix codes, that can even be read with up to 25 % damaged code parts.

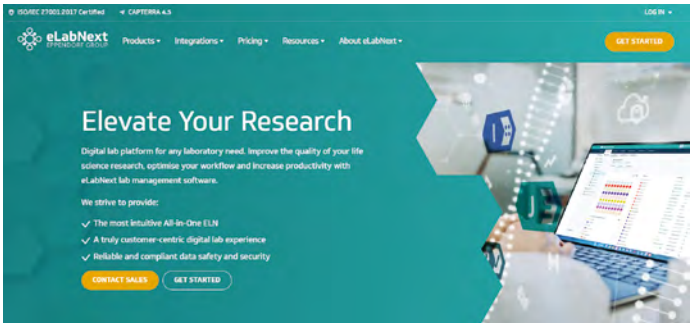
"Keep it Scanned, Keep it Safe."

Now Eppendorf extends the SafeCode system with different plate formats incl. PCR plates, MTP, and DWP. For high flexibility, they are pre-labeled with linear code, 2D datamatrix code, and alphanumeric code for quick visual inspection. The linear codes are printed alongside the "West", "South", and "East" side of the plates for flexible reading.

Of course, the plates ensure the high-quality material and production techniques of any Eppendorf plate – supplemented by the SafeCode system benefits.

Optimized user interface of eLabNext

In 2023, eLabNext redesigned its inventory system to serve laboratories even better. The focus was on user-friendliness and highly requested functions. Based on extensive user feedback, significant improvements were made, and a flexible 3-panel view, customizable sample lists and drag-and-drop management to streamline workflows was introduced. Enhanced search capabilities and a Software Development Kit (SDK) ensure the system's adaptability and fulfillment of Web Content Accessibility Guidelines (WCAG) standards.



For even more convenience: manage your barcoded vessel and your sample with sample management software like eLabInventory or eLabJournal

These upgrades facilitate lab management and demonstrate the commitment to innovative, user-centered design. They are an important step towards a future-proof digital lab experience.

More information

www.eppendorf.com/safecode

www.elabnext.com/eppendorf

CORDULA RICHTER, EPPENDORF SE

Dr. Clemens Plaschka Receives Eppendorf Award 2024

The independent jury chaired by Prof. Laura Machesky selected Dr. Clemens Plaschka from IMP – Institute of Molecular Pathology, Vienna, Austria, as the 29th winner of the *Eppendorf Award for Young European Investigators*.

Clemens Plaschka, born in 1989, receives the € 20,000 award for his work on the molecular machines that generate and export mRNA.

The Jury: "The award is given in recognition of his groundbreaking discoveries revealing the mechanisms by which mRNA is produced and matured. mRNA production involves multiple complex cellular machines that process and guide the maturation and ultimate export of mRNA from the nucleus to the cytoplasm. Plaschka's structural and mechanistic investigations have revealed fundamental insights into how cells express genes and his work has implications for human diseases involving mutations in core mRNA processing machines."

Clemens Plaschka: "I am absolutely delighted to receive the 2024 Eppendorf Award for Young European Investigators. This award is a special recognition for our highly motivated research team, whose efforts have made this possible. I am also very thankful for the exceptional support by the IMP and Boehringer Ingelheim, the ERC, our colleagues at the Vienna BioCenter and beyond, as well as my family.

The award recognizes our contributions to reveal the structural mechanisms by which a human mRNA is made. Yet many questions remain. In the coming years, we look forward to further understanding the molecular processes that regulate how mRNA is made and destroyed."

The award ceremony took place on June 27, 2024, at the Advanced Training Center of the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany.

Further information on application modalities, selection criteria, and previous winners can be found at

www.eppendorf.com/award

Eppendorf & Science Prize for Neurobiology 2024

The winner had not yet been determined at the time of publication.

More information at
www.eppendorf.com/prize

Win a Set of 3 Pipettes

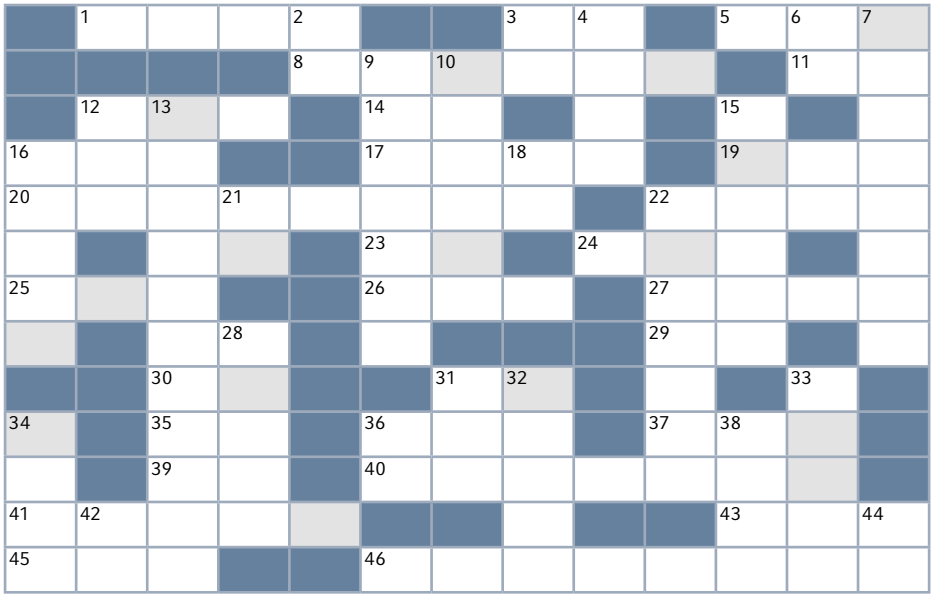
The solution of the prize competition of BioNews No. 59 was "EPPENDORF TUBES BIOBASED". The main prize, an Eppendorf Research® plus 3-pack, went to Jaime F., Germany.

Good luck in our new competition!

Simply arrange all letters in the light gray boxes of the crossword in the correct order. Send us the solution until **October 31, 2024**.

Participate online at **www.eppendorf.com/bn-service** or e-mail the solution to **bionews@eppendorf.de**.

All correct answers will be considered for a prize for use in your lab. Winners will be notified in writing. Cash payment of the prize is not possible. No recourse to legal action. The judges' decision is final. Eppendorf employees and their families may not participate.



1st Prize:

1 Eppendorf Research® plus 3-pack of your choice

2nd to 5th Prize:

1 Amazon® Voucher worth 50.00 EUR

6th to 10th Prize:

500 bonus epPoints® each

(epPoints registration required)

ACROSS

1 Smallest unit of an element
3 11 across x 10 (abbrev.)
5 Used with boots, bindings, and poles
8 Disease that receives no or only little funding
11 0.001 metres (abbrev.)
12 Energy, verve, drive
14 Transportation system of a cell (abbrev.)
16 Someone not transgender (short form)
17 Male given name
19 French street
20 Regain energy or spirit
22 Played on an English billiard table
23 "United in Diversity", political and economic union (abbrev.)
24 Rodent bigger than a mouse
25 Female given name
26 Dakar is the capital (ISO country code)
27 Flower and female given name
29 1 nautical mile per hour (abbrev.)
30 Measure of a person's intelligence (abbrev.)
31 Special PCR process (abbrev.)
35 Between nickel and zinc (abbrev.)
36 The first whole number above zero
37 Makes a product stand out (abbrev.)
39 Home of Lake Balaton (ISO country code)
40 Wood and wool are … materials
41 Make some … (Beastie Boys)
43 Requiescat in pace (abbrev.)
45 Resort providing therapeutic baths
46 Art in public places

DOWN

2 Chemical element with atomic number 42 (chem. Symbol)
3 Famous for cheese, chocolate, watches, and more (ISO country code)
4 Danish queen from Down Under
6 1.60934 of this make a mile (abbrev.)
7 Eppendorf offers models with 8 blades
9 Movement backward to a previous state or condition
10 Place of work of Brahe and Kepler
12 Bye bye, Miss American …
13 The E in *E. coli*
15 Subatomic particle
16 … little thing called love
18 Chemical symbol for element 75
21 High density or hard disk (abbrev.)
22 Athletic training discipline (rather new)
28 Genus of Jolly Jumper, Mr. Ed, and Rosinante (Lat.)
31 Includes C, G, A, U
32 Greek 4
33 Largest city on the Croatian coast
34 Creates a current of air or a breeze (pl.)
36 Preposition
38 Garment of southern Asian women
42 Work number of a musical composition (abbrev.)
44 Mathematical constant

Solution hint for prize competition of BioNews No. 61:

				N								L		T	

Send us the solution until **October 31, 2024**. Participate online at **www.eppendorf.com/bn-service** or e-mail the solution to **bionews@eppendorf.de**.
Information about the use of your personal data can be found at **www.eppendorf.com/gdpr**