

bio

logical

Greiner Bio-One  
customer magazine

Issue N° 2 • March 2018

**BLOOD**

A PRICELESS  
GOOD





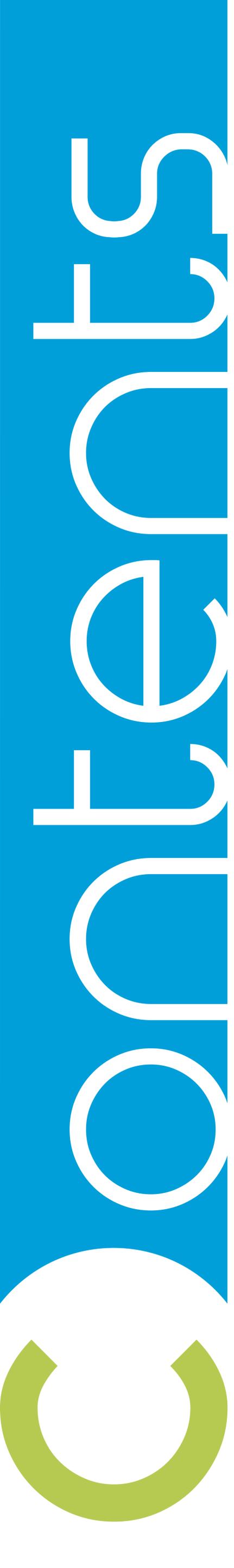
Dear readers,

Did you know that just a few drops of blood are enough to perform a variety of analyses? Our current edition of **biological** therefore focusses on the simplest way of sampling: capillary blood collection. Learn what to pay attention to and how to successfully obtain a high-quality sample.

Especially for this reason, we visited the very smallest of our patients: At the hospital's neonatal ward, where our **MiniCollect**<sup>®</sup> capillary blood collection system is used for sampling in children and neonates.

Since capillary blood is not suitable for all tests and some analyses require larger blood volumes, doctors and nurses sometimes need help to evaluate the most suitable veins – can the **VeinViewer**<sup>®</sup> product range provide a solution? Claire Wiesner and Andreas Mayr have answered interesting questions about a device that will save you a long search.

Happy reading!  
*Doris Gintner*



Imprint

**biological** - Greiner Bio-One customer magazine  
Media owner, editor und publisher: Greiner Bio-One GmbH • Firmenbuch-Nr. 176887D  
Sitz: Bad Haller Straße 32, 4550 Kremsmünster, Austria • [www.gbo.com](http://www.gbo.com)  
Editorial team: Doris Gintner, Sabrina Lumetzberger • Design: Ruth Longodor  
Photos: Greiner Bio-One, Shutterstock

# GOOD QUALITY FOR LESS BLOOD

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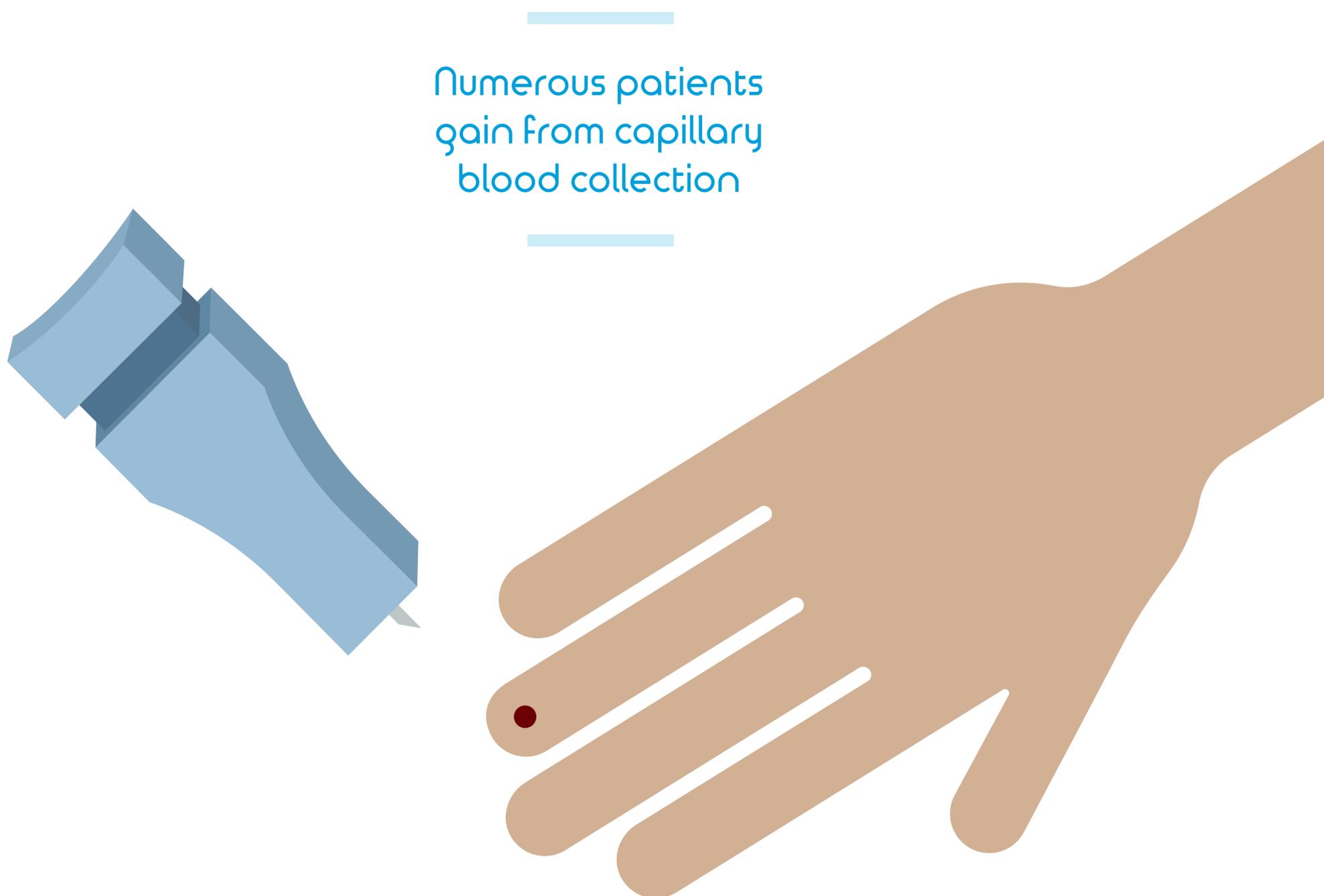
Specialist of Medical  
Biochemistry



## THE CAPILLARY BLOOD COLLECTION

In modern medicine, the capillary blood sample is becoming increasingly popular as specimen material due to its simpler and less invasive sampling procedure.

Further advantages are the low blood volumes required for a large number of laboratory tests and quicker test results due to development of point-of-care analysers.



Numerous patients  
gain from capillary  
blood collection

**S**kin puncture blood sampling is important in paediatric patients as blood volume reduction is critical, thus reducing risk of anaemia. It is also recommended for adult patients with severe burns as well as obese, older and anxious patients and for tho-

se with a tendency toward thrombosis. Also patients whose surface veins need to be spared for intravenous therapy, patients with fragile or inaccessible veins and those who self-test their blood, such as for glucose,<sup>1,2,3</sup> gain from capillary blood collection.

The quality of the capillary blood sample is a key prerequisite for reliable test results and depends on the performance and quality of each of the following four steps in the capillary blood sampling procedure.<sup>3</sup>

Beside the successful performance of capillary blood collection, order of draw and filling are also crucial to ensure high sample quality. Correct closure and mixing of capillary micro-collection devices also contributes to high quality.<sup>3</sup>

The quality  
of the capillary  
blood collection  
is the key

1  
selecting the  
skin puncture site



2  
lancet length and type  
(needle or blade)



3  
micro-collection device  
(i. e. blood collection tube)



4  
manner of skin puncture



# AWARENESS of the limitations is important for SUCCESSFUL SAMPLING

Capillary blood sampling is associated with several disadvantages which can lead to a greater risk of false test results.

Proper handling can  
eliminate incorrect  
test results

# 1

A capillary blood sample consists mainly of arterial blood. It also contains blood from venules, arterioles and capillaries, but their exact proportions are unknown.

# 2

Capillary blood samples can also be contaminated by unknown extents of interstitial and intracellular fluid. It is often sampled into multiple micro-containers at the same time from the same puncture site in order to provide sufficient material for several analyses. During the sampling process, the ratio of the blood from the venules and arterioles changes, and the risk of contamination with interstitial or intracellular fluid increases. Multiple sampling also increases the risk of haemolysis and clotting.



Strong and repeated squeezing of the puncture site or vigorous mixing of the sampled sample may result in hemolysis

# 3

Haemolysis and lipaemia, which can significantly alter blood analysis results, cannot be detected in whole blood capillary samples because some analysis methods (e.g. POCT) can consume the entire sample.

Haemolysis can occur in the sample from strong and repetitive squeezing ('milking') of the puncture site as well as from vigorous sample mixing after collection. Milking poses particular dangers to assay reliability because it can cause not only haemolysis, but also sample dilution with extracellular fluid.

# 4

Differences between venous and capillary blood analyte concentrations are generally minor, though clinically important differences have been reported in concentrations of glucose, potassium, total protein, calcium, electrolytes, lactate dehydrogenase and aspartate aminotransferase<sup>1,2,3</sup>.



# RECOMMENDATION for successful CAPILLARY BLOOD COLLECTION of high QUALITY

## 1

Before performing capillary blood sampling, every workstation needs to be fully equipped.

## 2

All supplies should be within the stated product shelf-life. According to the European Council Directive 2010/32/EU, all blood sampling devices must be engineered to adequate safety standards in order to minimise the risk of occupational injury<sup>4</sup>.





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Label  
according to the  
required tests  
& additions

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3

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Several steps have to be completed before performing a capillary blood collection. Beside the completion of a request form, a set of safety precautions has to be considered. These precautions include hand disinfection, approaching the patient, inspecting the test request form as well as identification and verification of each patients' identity, followed by the preparation of the skin puncture site.

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4

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The next step is to select and label the suitable capillary blood tube according to the requested tests and additives in the micro-collection devices.



Warming the  
puncture site  
is recommended

## 5

After positioning the patient, gloves have to be put on and an appropriate puncture site as well as suitable lancet has to be chosen.

Arterialisation increases the arterial blood flow at the puncture site and should always be per-

formed if the capillary blood sample is being analysed for pH and blood gases. A warm, well vascularised puncture area for other tests doesn't require arterialisation since adequate sample volume can be reached without the need to apply pressure to the surrounding tissue.

## 6

After cleansing the skin puncture site, the skin puncture should be done. A retractable incision device is recommended and incision should be made quickly and appropriately according to the manufacturer's instructions.

A paediatric patient should be immobilised with the assistance of the parent or nurse.





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## The first drop of blood contains interstitial and intracellular fluid

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# 7

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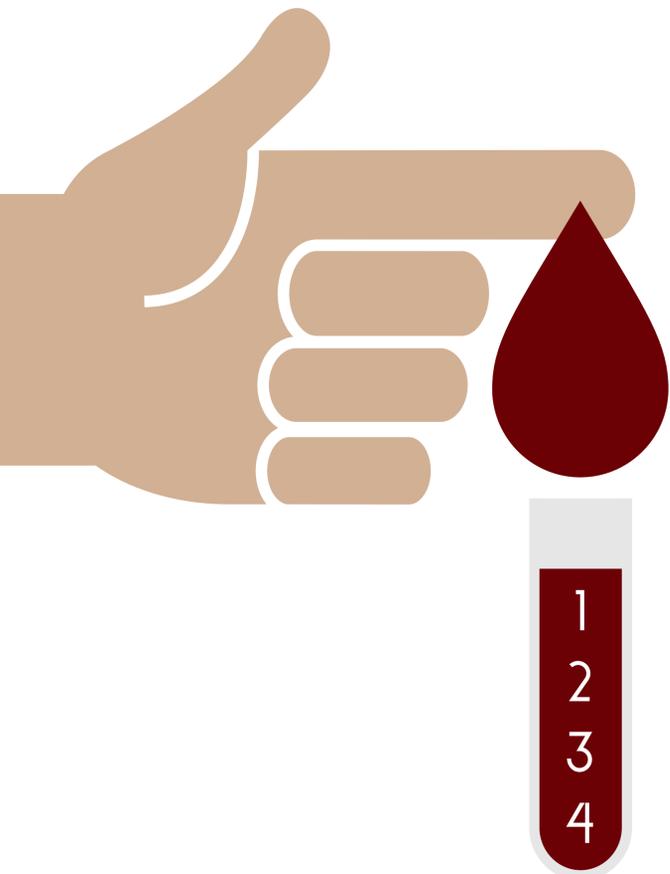
After performing the skin puncture and disposal of the incision device, the first drop of blood is wiped away, except when the manufacturer of a POCT device specifically requires testing the first drop of blood (as is the case for some self-test glucometers).

The first drop of blood contains interstitial and intracellular fluid that can contaminate the blood sample.

## 8

Collection of capillary blood begins when a second drop of blood is formed. When the micro-collection device touches the drop, blood flows and the micro-collection device is filled by capillary action or the gravity-flow principle depending of type micro-collection device. Blood flow can be enhanced

by holding the puncture site downwards and applying gentle pressure to the tissue near the puncture site. Excessive massaging or squeezing of the puncture site should be avoided in order to prevent haemolysis, contamination of the blood with interstitial and intracellular fluid, and obstruction of blood flow.



When collecting more than one capillary blood sample, special attention must be paid to the order of draw, which differs from the standards for venipuncture. Multiple capillary blood samples should be collected in the following order<sup>1,3</sup>:

1  
2  
3  
4

samples for **BLOOD GAS ANALYSIS**

ethylenediaminetetraacetic acid (**EDTA**) samples

samples with **OTHER ADDITIVES**

samples without **ADDITIVES** and/or **CLOT ACTIVATOR** (serum)

Capillaries and micro-containers for capillary blood collection should be filled with blood according to the manufacturer's recommendations. Under-filling can cause sample dilution in the case that the additive is a liquid

anticoagulant, as well as changes in cellular morphology due to excess anticoagulant.

Conversely, over-filling can cause clot formation due to insufficient anticoagulant.

## 9

After sample collection, micro-collection devices should be capped immediately to prevent exposure to the air, especially if the blood sample is going to be used for blood gas analysis.

Capped samples should immediately be mixed to prevent clotting. The mixing procedure should follow the micro-collection device manufacturer's recommendations. Vigorous shaking should be avoided because it can cause haemolysis<sup>1,2,3</sup>.

Capped samples  
should be  
immediately mixed

## 10

The capillary blood sampling procedure is finished when the puncture site is bandaged and relevant information during sampling has been recorded.



## About the Author



### Lenicek Krleza, Jasna, PhD

After studying medical biochemistry, graduating and completing her PhD at Faculty of Pharmacy and Biochemistry, University of Zagreb, and taking further education as professional expert of medical biochemistry, Jasna Lenicek Krleza officially became Specialist of medical biochemistry (or today Specialist of Laboratory Medicine). From graduation to the present, she working at Children's Hospital Zagreb and since 2016 she became the head of Biochemistry and Haematology Department.

She has been active researcher on several research projects that have defined several specific areas of interest but always associated with paediatric laboratory medicine. She is an active participant (and organizer) at various conferences, continuing education courses and she is author of numerous publications ([https://www.researchgate.net/profile/Jasna\\_Lenicek\\_Krleza2](https://www.researchgate.net/profile/Jasna_Lenicek_Krleza2)).

Since 2013, as an active member of Croatian Society of Medical Biochemistry and Laboratory Medicine, she became the head of the Croatian Centre for Quality Assessment in Laboratory Medicine and the head of Working Group for Capillary Sampling. Also, she and co-workers publish National Recommendation for Capillary Blood Sampling (October 2015, *Biochemia Medica* 25(3):335–58).

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# VISITING THE LITTLE ONES

A day at the neonatal unit

**T**he lift doors open to reveal a pleasant scene. "Neonatal Ward" is written in brightly coloured let-

ters on the sunny yellow wall. Colourful cardboard fish and starfish dangle from the ceiling above the nurses' station.

In the treatment room, the doors to the cabinet containing the capillary blood collection equipment are standing open. Lisa, a qualified paediatric nurse, is collecting supplies for her first rounds of the day. The cabinet is piled high with boxes full of the new **MiniCollect**<sup>®</sup> tubes as well as lancets and Lancelino lancets of various sizes and penetration depths.





With the blood collection scoop, the pediatric nurse can catch blood samples in no time.

The first patient on her list is little Tobi. Lisa gets out her disinfection tools, plasters, lancets and the appropriate **MiniCollect**<sup>®</sup> tube. She puts on her gloves and starts to warm Tobi's finger tips to increase the blood flow. She thoroughly disinfects the puncture site, then gently presses the lancet to his finger tip. The blade does its work before disappearing automatically and irreversibly back into the casing. One after the other, **MiniCollect**<sup>®</sup> Complete tubes are opened and filled with just one small movement. Thanks to the new blood collection scoop, the nurse is able to collect the blood samples with the **MiniCollect**<sup>®</sup> tube and close it again in just the blink of an eye. Tobi gets a cheerful plaster on the puncture wound, and he's soon forgotten all about it.

"My colleagues from the other wards are very pleased with the new **MiniCollect**<sup>®</sup> tubes too," Lisa tells me on the way back from her rounds. "For patients with difficult veins, capillary blood collection with the **MiniCollect**<sup>®</sup> system is a great alternative to venous blood collection. Especially for patients who have to have their blood taken regularly, but also for people with difficult veins or severe burns."

For people with difficult vein conditions or severe burns.

For difficult venous conditions, **MiniCollect**<sup>®</sup> is a rewarding alternative to venous blood sampling.



At the nurses' station, Lisa gives the blood samples to her colleague from the lab for analysis. I ask her colleague about the advantages in the lab of using Complete tubes over alternatives without PREMIUM carrier tubes. The biomedical analyst answers: "The Complete tubes are primary tubes – this saves us having to transfer the samples into secondary tubes, which would lead to an unnecessary loss of material. Plus, thanks to the 13 x 75 cm standard format, they fit into commercially available racks and can be put straight into the analytical equipment. You don't even have to change the device settings especially for them."

The complete tubes are primary tubes and save us a transfer step of the sample into a secondary tube.





The handling for the blood-removing person as well as the analysis in the laboratory are significantly simplified and so daily business is way more relaxed.

And with that an exciting morning on the neonatal ward drew to a close. The benefits of the new **MiniCollect**<sup>®</sup> tubes for the daily routine are plain to see. Not only are they easier to handle for the person taking the blood, but they also greatly simplify the analysis in the lab, taking some of the stress out of the staff's busy day-to-day life.



# A look under the skin

with the VeinViewer® Flex

Knowledge and experience  
combined with the  
latest technology  
create optimal conditions  
for greater safety  
and comfort  
when dealing with  
difficult veins.

**T**he VeinViewer® Flex is a helpful, technical innovation for highlighting venous blood vessels. Equipped with the latest technology, the device helps medical staff to assess veins. It is useful for venous blood collection, the positioning of venous cath-

eters and any other procedure that may benefit from highlighting blood vessels on the surface of the skin. Claire Wiesner and Andreas Mayr have answered some interesting questions about the function and use of the VeinViewer® Flex and also know, what makes it something special. >>



## How does the VeinViewer® Flex operate?

Claire Wiesner

- » The device uses harmless near infra-red (NIR), which is shone onto the skin. The haemoglobin in the blood absorbs the light and is reflected by the surrounding tissue. This information is processed by the VeinViewer® device, and is converted into an image which is then projected directly onto the skin in real time as a digital image by the LED light source. Unlike laser light, the LED light source is completely safe for the eyes.

*harmless  
near infra-red*



The course of the veins is projected as a digital image in real time by the LED light source directly onto the skin.



How can the device support users?

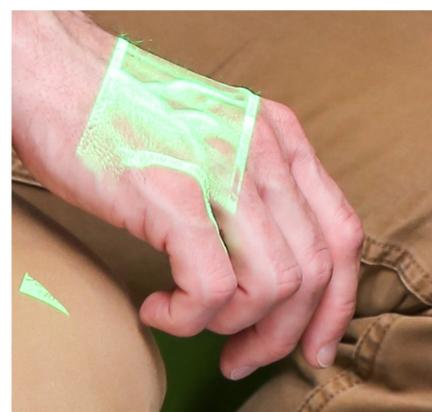


Andreas Mayr

» The size and course of the individual veins can be portrayed using **VeinViewer®**. The appropriate size of needle can then be selected for the vein to be punctured, for instance.

As an ICU nurse, I am fascinated by the fact that I can assess blood flow through the vein and accurately locate the venous valve. If fluids are introduced via a venous catheter, the correct position can be confirmed via the diluting effect towards the heart. The possible range of potential applications is enormous.

The range of potential applications is enormous



*i. e. the venous valves can be located exactly*



In your opinion, what would be the specific benefits for routine daily practice?

Andreas Mayr

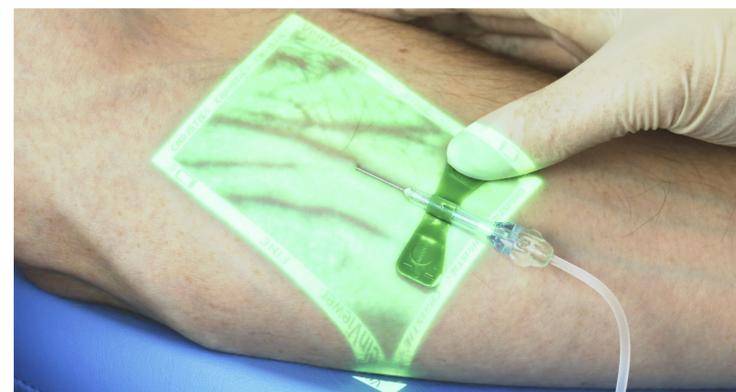
» Patients benefit from the use of the **VeinViewer®**. Not only is it possible to avoid painful repeated punctures by targeting the puncture site but the risk of serious injuries can also be minimised.

On rare occasions, a vein may be punctured and a drug administered into the peripheral circulation – with fatal consequences for patients.

With the support of the **VeinViewer®**, this type of accident can be avoided simply by inspecting the position of the needle/capillary.

The correct positioning of a venous catheter can be verified quickly and easily by visual inspection using the **VeinViewer® Flex**.

Irreversible injuries to a venous valve can also be avoided by showing the blood flow in real time.



*injuries can be avoided through visual inspection*

Do you see any other avenues for the future use of VeinViewer® apart from highlighting venous puncture sites?

Andreas Mayr



Although our focus is essentially on the collection of blood, the VeinViewer® device is extremely versatile. It's all up in the air at the moment, but I have discussed the VeinViewer® with specialists in various disciplines.

Interestingly, everyone sees a potential use for this device in their area. Dermatologists would consider using it to assess varicose veins whilst emergency physicians would use it to assess blood flow through the vessels. It has great potential.

Interestingly,  
everyone sees a  
potential use for this  
device in their area

*Firmly in the present  
and a yet a part  
of our future ...*

Claire Wiesner



New technologies that make life easier have become indispensable in all areas of life. Satellite navigation systems in the car are a typical example. Despite the initial scepticism surrounding this technology, sat navs have now become part and parcel of everyday life.

*new technologies  
are an  
indispensable part  
of everyday life*



Every available resource should be used to give patients the best possible treatment. I see it as our responsibility to explore all potential avenues in order to offer patients optimum safety and comfort during treatment.

*It is about  
providing patients  
the highest level  
of safety and comfort  
during treatment.*

# About

Claire Wiesner has been with Greiner Bio-One for over 20 years. After around 14 years in marketing, Claire joined the product management department, where she is responsible for IVD accessories. Amongst others, **VeinViewer®** is one of her product groups. Claire launched the product on the market in 2015 and has taken care of it since then.



Claire Wiesner

Product Manager

at Greiner Bio-One



Andreas Mayr

Application Specialist

at Greiner Bio-One

Before Andreas Mayr joined Greiner Bio-One, he worked for many years as a nurse in intensive care as well as an emergency paramedic. He came to GBO in 2011, where he is application specialist for preanalytics. As a trained healthcare professional, Andreas provides training on venous blood collection to medical staff. The **VeinViewer®** is a great help in making essential learning material easier to explain and serves to provide students with more in depth detail.

VeinViewer  
can also  
take away  
fear from  
patients

My son Diego, who unfortunately due to a serious illness has to deal too often with doctors, hospitals and medications is - as all kids his age - very much afraid of needles and injections, but with the support of Greiner Bio-One and the vein finder he got a - by far - better and less painful experience.

Lorena Ariis

Linz (Austria)



find out more about VeinViewer  
on our website [www.gbo.com](http://www.gbo.com)



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