The bottles used for doping tests. On the left of each color is the original bottle from Berlinger, on the right is the copy. The laboratory name, barcode and athlete number have all been covered to protect our sources. Laurent Burst/Republik

Bad bottles

High-tech security bottles from Switzerland are a key component in the fight against sports doping. We tested, copied and opened them. In several different ways.

By Sylke Gruhnwald, Carlos Hanimann, Grit Hartmann, Jürgen Kleinschnitger, Hajo Seppelt, Florian Wicki and Edmund Willison. Translated by Charles Hawley, February 21, 2018

At the moment when the disturbing truth came out, when it became clear that the Swiss anti-doping kits were unable to thwart the Russian secret service, Andrea Berlinger told the «New York Times»: «We're all a bit speechless.»

She continued: «No one can believe it.»

Andrea Berlinger, is the sixth generation of her family to head up Berlinger. It was originally founded as a cotton weaving mill, but today the company specializes in «temperature monitoring devices and tamper-proof closure systems.» Those closure systems are key components of bottles and caps used, for example, to transport urine samples taken in the effort to elimi-

nate sports doping. Those bottles must remain sealed at all costs because they contain evidence that could cost an athlete a gold medal.

For many years, nobody doubted the impermeability of the high-tech bottles made in Switzerland. Berlinger supplied the anti-doping kits for urine samples taken at the football World Cup in France in 1998 and has supplied test kits to Olympics anti-doping officials since the Sydney games in 2000.

But then came Sochi. Then came the revelations that Grigori Rodchenkov, the official head of the anti-doping laboratory there, was in fact one of the architects of Russia's state-sponsored doping program. At night, Rodchenkov would sneak into a hidden chamber next to the official doping lab and exchange the samples provided by Russian athletes. He was supported by the Russian secret service, which had succeeded in opening the high-security bottles provided by Berlinger. Even today, almost two years after news of the scheme first broke, it still isn't clear how the agents managed to do so.

Without secure bottles, the fight against cheating in sports is impossible. They are at the core of the anti-doping system – and the cap is the most important part. It must be designed in such a way that it can only be screwed shut once – and cannot be forced open no matter how clever the ruse or how great the effort. Only a special tool provided by Berlinger, which cracks the cap in half and renders it useless, should be able to open the bottles. In theory, at least.

After Sochi, Berlinger quickly made improvements, developing the BEREG-Kit® Geneva in «around 12 to 18 months», and introducing it in June 2017. Previously, the bottle's security ring was made of metal. Now, it is made of green plastic. Another change is that, similar to a banknote, each cap now includes a hologram of the company's logo. If it is held up to the light, the hologram reflects the colors of the rainbow.

In short, the company's website promises: «With its tamper-evident bottles, the BEREG-Kit® Geneva provides secure transportation and storage of the urine samples between the collection point and the laboratory.» The company urges potential customers to «put your trust in a system tried and tested worldwide.» The Berlinger tagline? «Feel safe.»

The first test kits from this new generation were delivered to the more than 30 WADA-certified testing laboratories around the world in September 2017. WADA is the World Anti-Doping Agency based in Montreal. Around 60,000 kits are already in use.

But the bad news is: The bottles aren't tamper-proof.

We have managed to cut apart and copy the bottles, ultimately reverse engineering them. And we managed to unscrew and then reseal the bottles after simply refrigerating them. We are a team of journalists that includes members of the anti-doping desk at German public broadcaster ARD in addition to reporters from the «Sunday Times» in Britain, the Swedish broadcaster SVT and Republik.

And that is extremely bad news for the Winter Olympics, which begin in just a few days on Feb. 9, 2018, in Pyeongchang, South Korea. How can fair competition be guaranteed?

«I'm speechless,» says Heidelberg-based sports lawyer Michael Lehner. He has defended over 200 East German doping victims in court along with several professional cyclists under suspicion of doping. «I can't even com-

prehend an error of this magnitude.» Particularly, he adds, given that the new Berlinger system has been touted as being completely secure. It opens up the possibility that athletes accused of doping on the basis of urine samples could now mount a legal challenge to penalties they might receive by claiming that their samples have potentially been tampered with. And it is an argument that can no longer be refuted. «It's over,» says Lehner. «Urine tests can now be suspended. The anti-doping system has been destroyed.»

And how does one go about copying a BEREG-Kit® Geneva so precisely that even experienced anti-doping officials can't detect a difference? There are three aspects that must be addressed: the cap, the bottle and the label.

1st Trial: Original Cap on a New Bottle

At a family operated glass equipment manufacturer located in Germany's industrial Ruhr region, the factory head picks up a glass saw of the kind that is often found hanging on the wall of such facilities. He uses it to cut open the Berlinger bottle just below the cap. «So, that's it,» he says drily. The cap is completely undamaged.

«It looks to me like the mechanism can be reused,» he says, adding that you just have to remove the glass remnants from the cap. It's a simple procedure, after which he says the cap could then be screwed onto a different bottle. And he's right.

Getting ahold of a glass container that is virtually identical to the one used by Berlinger presents no problems at all. All you have to do is order square laboratory bottles like the ones used by pharmacists to store liquids and powders. They can be purchased for a few euros on the internet and arrive in the mail after only a couple of days.

But the labels are missing. The originals from Berlinger appear to be the product of silk-screen printing; they are hard but can be scratched. When tested, each athlete submits two bottles, the A sample and the B sample, affixed with an orange and blue label, respectively. Each label is marked with the same seven-digit code and the name of the laboratory responsible for the test. Above it is a white sticker with a barcode.

Copying the labels isn't difficult either, though this is not the place to describe how it was done. Suffice it to say that the copies look exactly like the originals. And the Berlinger cap, which we sawed off at the beginning, fits perfectly. The barcode isn't a hurdle at all: a commercially available sticker printed with a standard barcode.

What, though, do the experts say? Can a specialist tell the difference between our copy and the original? Would our bottle stick out to an anti-doping official like a fake passport at the border?

We find a tester, a man who works at a European anti-doping laboratory and has opened thousands of such bottles himself. He is extremely familiar with Berlinger kits (and he has asked that his real name not be used). Can he tell the difference between the copy and the original?

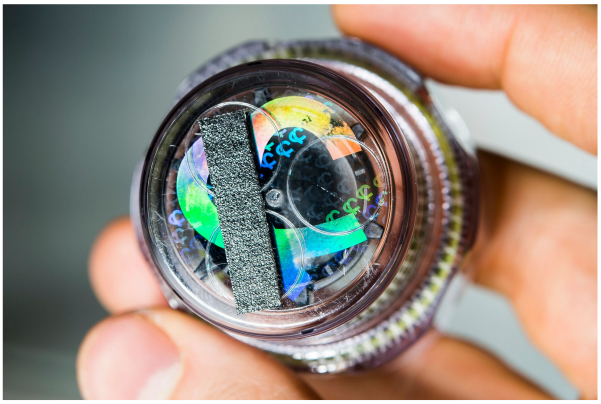
«I examined it for several minutes and am unable to determine which is the original and which is the fake. Only when I knocked the bottles against each other did I notice that the tone was slightly different. Normally, though, it's not standard practice to examine the bottles so closely. The difference wouldn't be noticed.»

We wanted to be sure, so we repeated the experiment at anti-doping laboratories in several different countries. All of the testers came to the same conclusion: In day-to-day laboratory operations, they wouldn't recognize the bottle we made as a copy.

2nd Trial: Copying the Newly Developed Cap

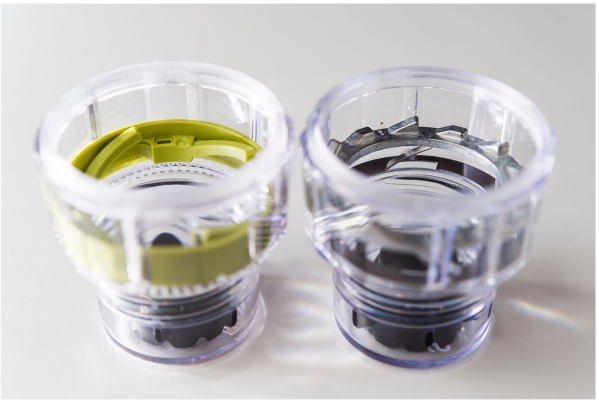
A few weeks ago, we turned to a specialist, who would also like to remain anonymous. She undertook a close examination of the BEREG-Kit® Geneva and was surprised by what she found: The new security cap is much more simply constructed than she thought it would be. «I was unable to find a single insurmountable safety feature,» the woman says, saying that it would be unproblematic to construct a copy. «I'll put it this way: The degree of difficulty in counterfeiting a banknote is 10. This cap here is around a 0.3.»

The black element seals the bottle opening so that no fluid can escape.



Improvement over the Sochi bottles: A hologram was added to the cap as an additional security feature.

The red ring must be removed when sealing the bottles while the green ring locks into place.



Improvement over the Sochi bottles: A plastic ring (left) instead of a metal ring. Laurent Burst/Republik

Back in her workshop, it took her just a few days to produce a cap of the kind the Berlinger engineers took many months to develop. Including the hologram. How did she do it? We can't reveal that here.

While she was at it, though, she took one of the square laboratory bottles we had purchased and stuck a label on it that was indistinguishable at first glance from the original. «Within 12 minutes, I am able to put any number I want on an unused kit – on both the cap and bottle.» Such a thing, she says, presents no problem at all to experts. «And experts are a dime a dozen.»

The result is our second copied BEREG-Kit. And this time, we've reproduced everything: the bottle, the label and the cap.

Once again, we approach experts working at official anti-doping laboratories to ask if they can tell that the cap is a fake. One expert pulls out her magnifying glass while another undertakes a precise examination of the cap. Neither, though, can tell the difference between the original and the copy.

It would be no problem to emulate our project on a large scale. We sent a 3D scan of the bottle we had produced to a company in China to ask for a production estimate. It didn't take long for them to respond, saying we could immediately order 150,000 bottles for about 14 euro cents each, with the costs for the lid and labels on top of that. In total, each complete bottle copy would cost just a few euros. It would, in other words, be simple to produce tens of thousands of Berlinger test kits from the new Geneva generation. And nobody in China seemed bothered by the fact that the bottle is patented.

3rd Trial: The Original Kit, Stored in a Refrigerator

In summer 2016, when Grigori Rodchenkov told his story to the «New York Times», a Berlinger spokesperson said: «We have absolute confidence in the bottles if you use them in a normal way, not with illegal methods or a criminal system like C.S.I. Miami.»

But that's not true. It's enough to just put them in the refrigerator.

In early 2018, we began receiving several phone calls from experts who carry out doping tests. All of them said the same thing: That you don't have to go to great lengths to open the Berlinger kits. Some of them can simply be unscrewed after they've been refrigerated for a few days. The same is true if they have been frozen, which is standard practice for the B samples, since they must be preserved for confirmation tests if the A sample tests positive.

«But that's the very essence of an anti-doping system!» fumes one of the sources. «The urine could be exchanged, just like it was in Sochi!»

The next source says: «That's crazy! And just before the Olympics start!»

We acquire 24 original Berlinger kits, fill them with a liquid and close each one carefully in accordance with company instructions. We «turn the cap gently» until it can move no further and then we perform the three checks. «1: Try to turn the cap anti-clockwise. 2: Try to lift the cap off. 3: Turn the bottle upside down.»

We then set the bottles in a refrigerator and leave them there for three days. Seventy-two hours.

None of the bottles are supposed to open, but bottle No. 15 can easily be unscrewed – and there is no damage to the bottle at all. It's not the only one: Two additional bottles can be opened by hand as well, and it's easier than unsealing a jar of baby food.

The bottles can even be closed again afterwards, and two of three bottles don't open again once we have done so. It would have been simple to exchange the urine inside or to contaminate it. And nobody would have been the wiser.

What Now?

The Olympic Games in Pyeongchang begin in just a few days. Myriad doping officials stand at the ready, outfitted with thousands of bottles. It is their job to ensure that the games are fair and clean.

Who is ultimately to blame? The International Olympic Committee (IOC) points to WADA, WADA points to Berlinger and Berlinger points to its instruction manual.

A few weeks ago, we asked the IOC about the new anti-doping sets. They responded by saying: «Berlinger and their kits have been used by the majority of Anti-Doping Organisations since their launch in 1994 including the IOC.» Plus, the statement continued, the tests are under the jurisdiction of WADA. «Please contact WADA on all related issues concerning Berlinger and BEREG-Kits.»

On Jan. 23, 2018, we submitted our questions to WADA to inquire about problems and irregularities with the new bottles. WADA answered that they were unaware of any issues and suggested that we contact the producer. Berlinger.

Berlinger, meanwhile, referred to its instruction manual. Yes, a spokesperson wrote to us on Jan. 25, 2018, their product is extremely well known, and they had thus «recently registered a slightly higher degree of nervousness at some laboratories.» That nervousness, the spokesman continued, has led to «isolated cases of handling errors with our bottles.» The company, he wrote, is investigating and has reiterated that the kits must be used in accordance with the instructions. «We are emphasizing to all BEREG-Kit users that the instruction manual must be followed precisely and that no problems will arise if the bottles are handled correctly in accordance with those instructions.»

But then it began to trickle out that the bottles aren't actually secure at all. The anti-doping laboratory in Cologne informed both WADA and Berlinger – and Berlinger again referred to the instruction manual. WADA, meanwhile, published a press release on Sunday evening: «The World Anti-Doping Agency (WADA) has initiated an investigation into a potential integrity issue with the new generation BEREG-Kit Geneva security bottles and will recommend appropriate measures, if needed, in order to maintain the integrity of the doping control process.»

There's not much time left for the investigation. In Pyeongchang, the pre-Olympic doping tests have already begun.

When the cheating that took place in Sochi was revealed, when it became clear that the anti-doping kits could, in fact, be manipulated, Andrea Berlinger said: «We're all a bit speechless.»

And the commissions and the engineers got to work. But that apparently wasn't enough.

The editorial resources for our participation in the «Covert Doping» project were made possible by funding from the Project R Cooperative's budget for big reporting projects, big stories and big ideas.

The cooperation

Reporting for the «Covert Doping» investigative project has been conducted by journalists with German public broadcaster ARD, Swedish television station SVT, the British newspaper «Sunday Times» and Republik. ARD is broadcasting the two-part documentary film «Covert Doping: The Olympic Conspiracy. The Sanctimonious Battle Against Sports Fraud.» (Part 1, part 2) The film was made by Hajo Seppelt, Grit Hartmann, Edmund Willison and Jürgen Kleinschnitger Republik is publishing its reporting in several parts

about state-sponsored Russian doping and its ties to Switzerland in conjunction with its partners.