BactoScore

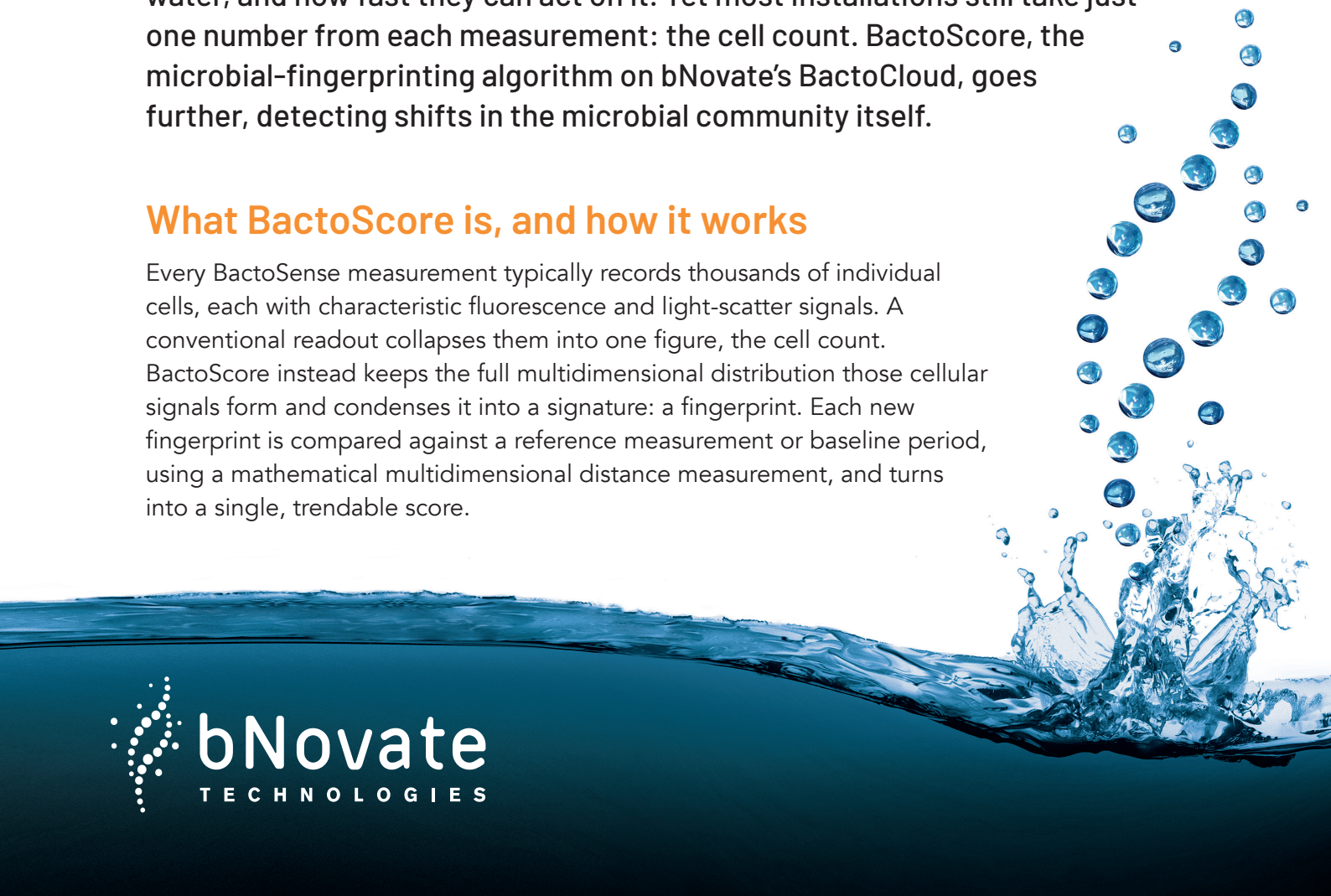
Unlocking microbial community surveillance.

Beyond the cell count: detecting microbial community shifts with BactoScore

For more than a decade, online flow cytometry has transformed what water utilities and industrial operators know about the microbiology of their water, and how fast they can act on it. Yet most installations still take just one number from each measurement: the cell count. BactoScore, the microbial-fingerprinting algorithm on bNovate's BactoCloud, goes further, detecting shifts in the microbial community itself.

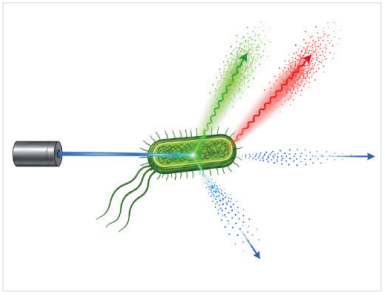
What BactoScore is, and how it works

Every BactoSense measurement typically records thousands of individual cells, each with characteristic fluorescence and light-scatter signals. A conventional readout collapses them into one figure, the cell count. BactoScore instead keeps the full multidimensional distribution those cellular signals form and condenses it into a signature: a fingerprint. Each new fingerprint is compared against a reference measurement or baseline period, using a mathematical multidimensional distance measurement, and turns into a single, trendable score.



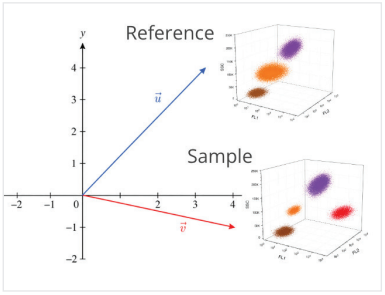
bNovate TECHNOLOGIES

1. MEASURE SAMPLE



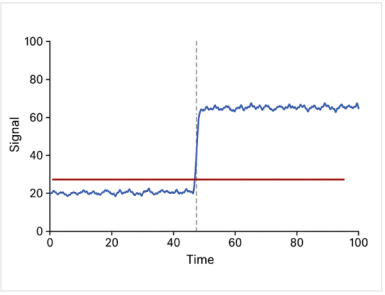
FL1, FL2, SSC, FSC for each measured cell

2. COMPARE TO REFERENCE



Represent whole sample as **vector** and compute **mathematical distance** to reference

3. TREND AND ALARM



BactoScore indicates "dissimilarity" = **shift in microbial composition**

Two samples with an identical cell count can produce very different fingerprints, and BactoScore makes that difference measurable. It flags abnormal changes in the microbial community the moment the water stops resembling its normal self. It won't identify which organisms are present; that still needs the lab. But knowing, that fast, that the mix has changed is often the decisive information.

From cell counts to fingerprints

Flow cytometry entered drinking-water microbiology as a fast, culture-free complement to plate counting: reproducible, instrument-independent, and sensitive not only to changes in microbial abundance but also to the balance of high- and low-nucleic-acid (HNA/LNA) subpopulations (Prest et al. 2013).

Over the following decade, it matured into a discipline. Flow-cytometric counts were shown to challenge plate counts for routine monitoring, diversity metrics were computed straight from the multidimensional cytometric data, and fingerprints were used to detect operational events in full-scale systems (Props et al. 2016; Van Nevel et al. 2017; Safford & Bischel 2019; Favere et al. 2020; Claveau et al. 2024).

bNovate contributed to this progress with key developments: first a computational method to flag abnormal microbial events was developed (Sadler et al. 2020), later bNovate's fingerprinting algorithms were applied in collaborative studies of domestic hot and cold water systems and of alpine karst springs (Egli et al. 2024; Campostrini et al. 2026).

One catch still held broader adoption back: these methods ran offline, in custom R or Python pipelines that demanded data-science expertise. The science was proven; the practice stayed in specialist hands.

With the launch of BactoCloud, microbial fingerprinting became accessible to everyone: waterworks operators, water system engineers and scientists alike. BactoScore, one of BactoCloud's advanced analytics, is the turnkey route to understanding microbial community shifts: no scripting, no pipeline, no data-science experience required. What once took a research group now takes a few clicks.

What community shifts tell you

A microbial community shift is a change in which organisms are present and in what proportions, whether or not the cell count moves.

Tracking that composition matters:

- **It signals instability and loss of control.** When water no longer shows its characteristic fingerprint, the system is no longer in its usual state of control.
- **It is a sensitive indicator of contamination ingress.** A small intrusion can reshape the community while barely moving the count, so the fingerprint reacts first.
- **It helps assess risk.** If a rising count is accompanied by a community change, something new or abnormal has entered the system. This helps refine a risk assessment, particularly for waters that naturally show strong cell count fluctuations.

How BactoScore complements cell counts

	Total Cell Count (TCC)	BactoScore
Reads	One number: cells per mL	The full cytometric distribution, as a change (%) from a reference composition
Answers	How many cells are present	How much the community composition has changed
Does not	Describe composition	Identify individual species
Sensitivity to a community change	Low: a stable count can hide a changed community	High: flags change even when the count holds steady
Time to result	20 minutes	Same measurement

Both metrics are important, as they give complementary and independent information. And both can be extracted from the very same measurement, so no additional reagents or delays. For your setup, keep the cell count as the quantitative anchor; and add BactoScore to tell you whether the community behind that number has changed

A practical example: spring water monitoring

Catching community shifts matters a lot in raw spring and groundwaters, and this is exactly where the Swiss utility WWZ put BactoScore to work. Since 2025, BactoSense has been monitoring all four raw water sources at the utility's springwater works, providing cell counts and BactoScores through BactoCloud. After rainfall the counts typically climb, and a steady BactoScore reassures operators that the microbial communities haven't changed.

Then, in summer 2025, both metrics shifted at once. Days later, the lab confirmed: a faecal contamination of the raw water. With the combination of cell counts and BactoScore, WWZ can detect abnormal changes immediately. Read the full story in Aqua & Gas (Zimmermann et al. 2026, German and French).

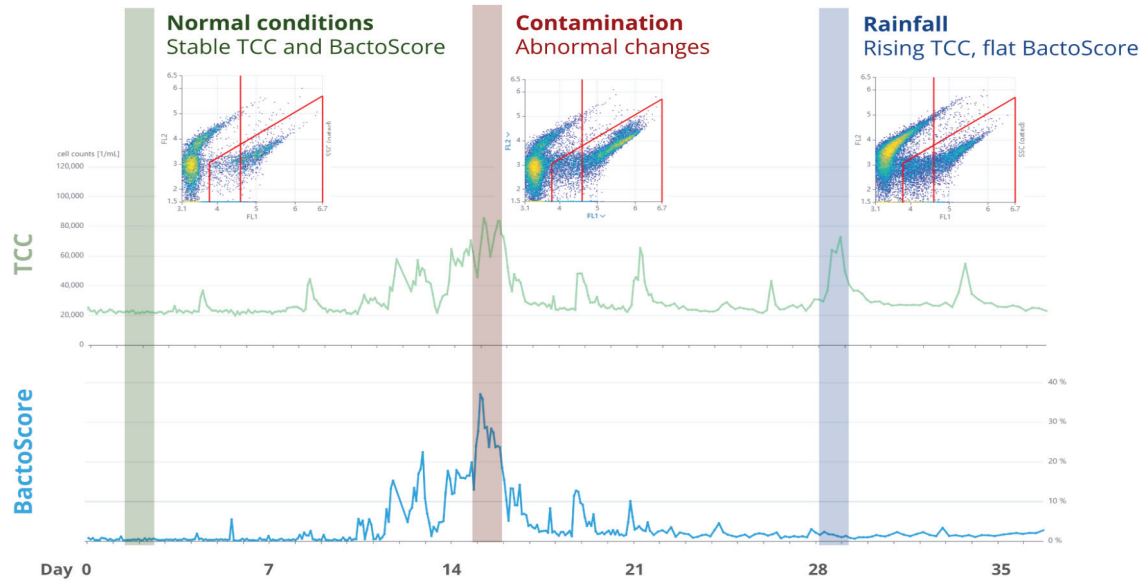


Figure: Spring water monitoring using Total Cell Counts (upper graph) and BactoScore (lower graph), showing different responses to contamination and rainfall events.

«No abnormal change»: what BactoScore actually speaks to

The regulatory picture reinforces the point. Under the recast EU Drinking Water Directive (2020/2184), colony count at 22 °C is an indicator parameter (Annex I, Part C) with no fixed numerical limit, the expectation is simply that there be no abnormal change, set for monitoring rather than pass/fail compliance.

Cell counts complemented by BactoScore give that expectation operational substance: a defined baseline for both metrics, and a continuous, objective measure of departure from it, in minutes, not the days a culture takes. With BactoCloud's encrypted transmission, data capture and audit trails, it becomes an auditable everyday workflow.

Getting started with BactoScore

The fingerprint is already in every BactoSense measurement; BactoScore just turns it into an actionable signal. No new hardware, reagents or programming:

1. **Register for BactoCloud at bactocloud.com/register.** The base tier is free; BactoScore comes with BactoCloud Pro.
2. **Connect your BactoSense.** Give your analyser internet access and enrol it in BactoCloud.
3. **Activate BactoScore** in a few clicks.

For decades the cell count has told us *how many*. BactoScore finally answers the question that matters just as much: Is the water still the same? And for every BactoSense already in the field, that answer is only a few clicks away.

REGISTER FOR BACTOCLOUD

BOOK A BACTOSENSE DEMO

Frequently asked questions

Is BactoScore affected by the cell count?

No. BactoScore is derived from the shape of the cytometric fingerprint (the relative distribution of fluorescence and scatter signals) not from the absolute number of cells. Because the underlying comparison (multidimensional distance measurement) is independent of magnitude, a sample's cell count can rise or fall while its BactoScore stays flat, and vice versa. That independence is exactly what lets BactoScore reveal community shifts a cell count alone would miss.

Is BactoScore compatible with all instruments and cartridges?

Yes. BactoScore runs on the data from any BactoSense connected to BactoCloud Pro, regardless of instrument model or cartridge type. The fingerprint is already contained in every measurement, so no special instrument, cartridge or reagent is needed.

How do I get alerted when the microbial composition changes?

The same way you would for any other parameter in BactoCloud: set an alarm threshold on BactoScore and choose how you want to be notified: email, SMS, or via the API for integration into your SCADA or control system.

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