

Direct Microbiology for the Beverage Industry

Insight | Analysis | Control



Test Kits | Lab Services | Microbiological Consulting

The complete package for monitoring and control
of microorganisms in the beverage industry

Preface

Microorganisms play a major role in today's beverage industry. They can either be essential in the production of a beverage or spoil the product. Thus, control of the microorganisms is crucial. Their detection, however, is hindered considerably by one of the microorganisms' specific characteristics. The majority of bacteria range from 0,5 to 5 µm in size, which makes a detection without technical aids impossible. In addition, differences regarding morphological features are so minor and limited to only a few basic shapes like cocci, rods etc., that even with suitable visualization, they do not lead to an exact identification.

The "Golden Standard" of conventional microbiology, introduced by the German microbiologist Robert Koch, targets the problem of small size: an artificial nutrient medium stimulates growth of individual cells. The emerging bacterial colonies are identified and quantified according to their nutrient requirements and appearance. This method was developed more than a 100 years ago and is the basis for the German legal regulations regarding mineral and table water even today.

The "Golden Standard" has a crucial disadvantage, though: it relies on the assumption that basically all bacteria are able to grow on artificial nutrient media. During the last two decades, modern microbiology has conclusively proven that only a small fraction of microorganisms can be forced to grow on artificial nutrient media*. The majority of bacteria occurring in the beverage industry can not be detected by the "Golden Standard", either.

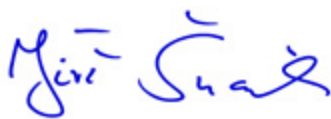
But especially if it is necessary to assure the highest quality of the products or to analyze a problem in the process chain, the direct look into the microbial community is essential.

vermicon's approach of a comprehensive microbiology offers the perfect opportunity to gain control over the microbiology in every step of the production chain.



Dr. Jiri Snaidr

Founder and CEO
of vermicon AG



Dr. Jiri Snaidr

Munich, October 2018

* Amann, R. I., W. Ludwig, and K.-H. Schleifer (1995). *Phylogenetic identification and in situ detection of individual microbial cells without cultivation*. *Microbial. Rev.* 59(1):143-169.

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Patent information

Proprietary technologies of vermicon AG are under patent protection or have patents pending.

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Cultivation: The industry's "Golden Standard"



Cultivation of microorganisms introduced by Robert Koch is still the „Golden Standard" in the industry. It is applied without any major changes and is fixed in legal regulations:

- ▶ the same procedure since 1876
- ▶ bacteria grow to colonies
- ▶ is still being applied in the German "Mineral- und Tafelwasserverordnung" (mineral and table water ordinance)
- ▶ identification of microorganisms according to their nutrient requirements and appearance of colonies

>> Conventional Microbiology



Share of microorganisms in an average sample actually detected by **conventional** microbiology.

Share of microorganisms **to be detected.**

Conventional microbiology always makes a detour over grown colonies – and for this reason, only provides an indirect view into samples.

ADVANTAGES OF CULTIVATION

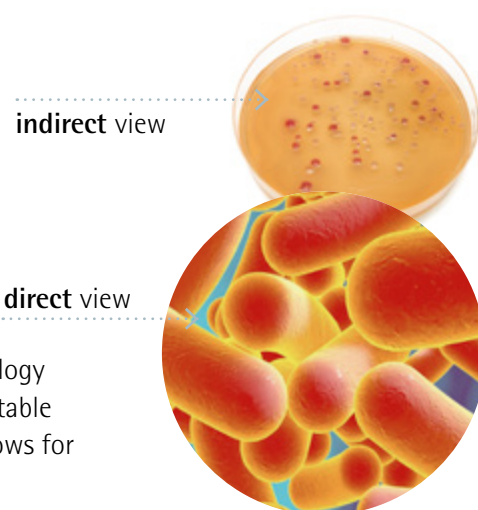
- ✓ **Golden Standard:** is often required by legislative authorities

DRAWBACKS OF CULTIVATION

- ✗ **slow:** microorganisms have to grow to colonies
- ✗ **unspecific:** identification is based on nutrient requirements
- ✗ **insufficient:** the majority of microorganisms is non-cultivable
- ✗ **population shifts:** fast-growing microorganisms can overgrow slow-growing ones

VIT®: The Tool for Direct Microbiology

Direct microbiology considers the complete microbial population in a sample and provides a causal correlation between environmental parameters and occurring microorganisms.



Only direct microbiology can deliver a comprehensive view of the microbiology present in the sample material. With the VIT® gene probe technology, a suitable tool meeting all requirements of direct microbiology is available, which allows for direct insight into the microcosm.

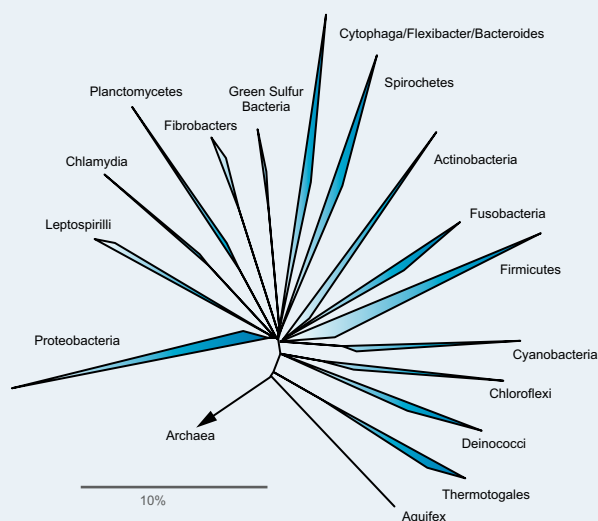
>> VIT®: Scientifically Valid and Legally Safe



- ▶ VIT® is based on the FISH technology (Fluorescence in Situ Hybridization)
- ▶ successful application in the industry for more than 20 years
- ▶ applied in national and international beverage industry
- ▶ numerous studies and publications
- ▶ ultimate quality: due to the acceptance of FISH into the European Pharmacopoeia, this method is being used in the highly sensitive pharmaceutical industry

A LOOK BEHIND THE TECHNOLOGY

The VIT® gene probe technology is based on the phylogenetic tree of life. Over billions of years, unique target structures which are specific for single microorganisms or whole microbial groups, have developed within the microorganisms. These target structures are accurately detected by the tailor-made gene probes applied. The microorganisms start to shine and can not only be visualized, but also identified and quantified.

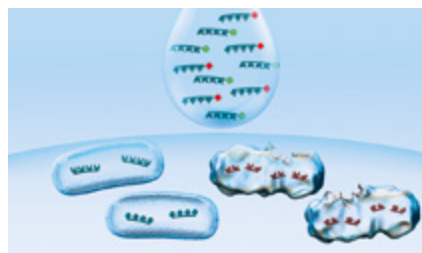


The Origin of VIT®

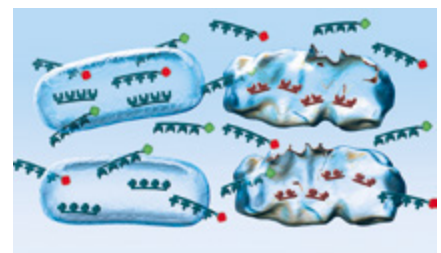
VIT® is based on the FISH technology, which was developed in the early 1990ies by the Department of Microbiology at the Technical University of Munich. In 1997, vermicon AG was founded as a spin-off of the Department of Microbiology. VIT® represents the consistent improvement of the FISH technology to a standardized and industrial format and makes this cutting-edge technology available for users in the industry.

The great advantage of this method and what sets it apart from other molecular methods is the fact that the gene probes don't target the stable DNA of the cells but the instable ribosomal RNA (rRNA). Sufficient amounts of rRNA are only present in living cells. Thus, only living cells are detected by the VIT® gene probe technology.

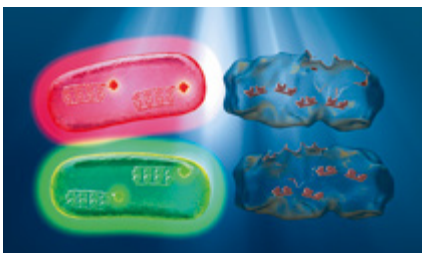
How VIT® works



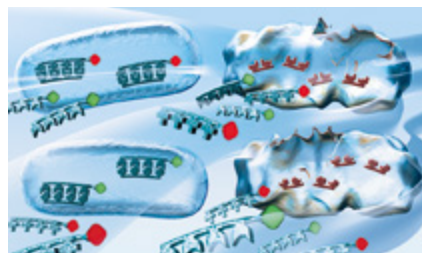
1) Dye-marked gene probes get in contact with the sample.



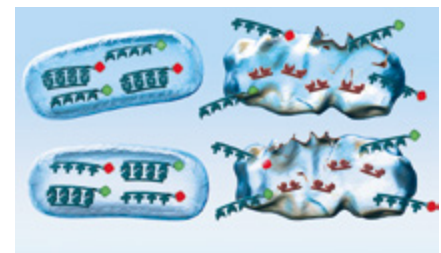
2) Gene probes penetrate all cells.



5) The dyes are excited by external high energetic light and the cells begin to shine.



4) Surplus gene probes are washed off.



3) Gene probes bind to specific and intact target sequences.

ADVANTAGES OF VIT®

- ▶ **living bacteria only** ▶ dead bacteria are not detected
- ▶ **fast** ▶ ultra-fast detection of population shifts; provides quick feedback in case of changed process parameters
- ▶ **specific** ▶ exact differentiation of bacteria independent on their morphology
- ▶ **robust** ▶ no application of enzymes; disturbance-free; applicable in every on-site laboratory
- ▶ **reliable**
- ▶ **highly precise localisation and analysis of the contamination:**
 - detection in a spatial and temporal context (*where* is the process malfunction located and *since when* has it been it present?)
 - identification
 - quantification

>> Direct Microbiology with VIT®

With VIT® as the tool for direct microbiology, you will receive concrete information about your sample's real microbiological status. A precise localization and analysis of the contamination will be performed.

Who is causing the contamination?

Discovered microorganisms are identified specifically.



How massive is the contamination?

Discovered microorganisms are quantified revealing the real numerical extent of the contamination.



How long does the contamination exist?

Samples from a variety of process steps are analyzed and compared. Retained samples are also included. This allows to analyse precisely the duration of contamination.



Where does the contamination originate from?

Samples from a variety of process steps are analyzed and compared. This allows for an exact localization of the contamination's source.



>> VIT® Profiling makes use of all 4 "Dimensions" and therefore provides amazing results. For more information about this microbiological consulting, please see our application examples starting from page 12 and on page 28.



Application of VIT® allows for a comprehensive view of the microbiology in beverage production:

- ▶ fast identification of known and unknown microorganisms
- ▶ fast identification of cultivable and non-cultivable microorganisms
- ▶ absolute quantification
- ▶ monitoring of microorganisms in the process chain
- ▶ evaluation and comparison of population profiles

Economical advantages of direct microbiology



- ▶ Prevention of recall campaigns (open and quiet)
- ▶ Increased product quality
- ▶ Increased customer satisfaction
- ▶ Process optimization > reduction of reject batches
- ▶ Risk minimization
- ▶ Clarification in court disputes

SUMMARY

1. A comprehensive approach is necessary for understanding microbiology
2. Direct microbiology allows a comprehensive understanding
3. VIT® is the tool for direct microbiology
4. Direct microbiology leads to increased product quality and customer satisfaction
5. Direct microbiology saves costs



Application Examples

VIT® Test Kits | Services | VIT® Profiling



Every day, vermicon's direct microbiology is applied in many different application fields. The following section contains several anonymized examples. Reference customers are available upon request.

Special applications for breweries can be found from page 15 onwards.

Detection of *Alicyclobacillus* in Fruit Juices and Concentrates



Alicyclobacilli are commonly occurring as beverage spoilage organisms. Aseptic sensory interferences in fruit juice beverages can be caused by members of the genus *Alicyclobacillus* and in particular by *A. acidoterrestris*. The resulting economical losses are enormous. *Alicyclobacillus* enters the process chain via raw materials, mainly via fruit concentrates. As *Alicyclobacillus* is a spore-forming organism, heat treatment of the products is insufficient and there is a high risk of a long-term contamination of the production facility.

With VIT®, all kinds of sample materials can be examined: bottled beverages as well as concentrates and water samples.

Detection of the genus *Alicyclobacillus* and specific identification of *A. acidoterrestris* is performed in one test.

- ▶ results are available up to 8 days earlier than with conventional methods
- ▶ applicable in all stages of production
- ▶ the method is internationally recognized:



Erwähnt in:
ACB Best Practice Guideline

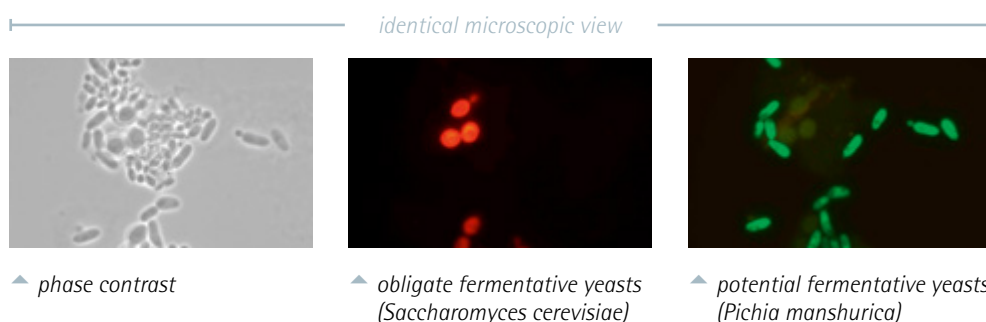
Detection of Obligate and Potential Fermentative Yeasts



Obligate and potential fermentative yeasts can cause a lot of damage.

The range of problems is considerable: regarding sensory qualities, olfactory as well as flavor deviations of the beverage are to be expected. In addition, already bottled products can develop dangerous bombages, potentially leading to a destruction of the bottle, which represents a significant risk to staff and consumers. Yeasts are often introduced into the production facility via raw materials (e.g. sugar, concentrate). VIT® is the perfect tool for locating the contamination and eliminating the source:

- ▶ visible at a glance: Are fermentative yeasts present?
What is the risk potential?
- ▶ differentiation between obligate and potential fermentative yeasts
- ▶ for in-house application during quality control or as a service
- ▶ time saving of several days compared to conventional



Microbiological Assessment of Well Water

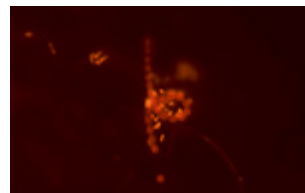
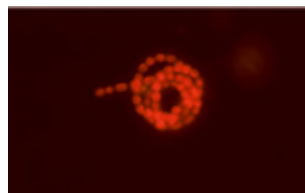


The quality of well water is extremely important for the mineral water producer. Proper water quality has to be guaranteed. Starting directly at the well, the microbiology of the spring water should be monitored and evaluated constantly. If population changes occur in the course of this screening, important data in regard to comprehensive microbiology are provided.

By screening all wells of one producer, the following analyses were performed with VIT® gene probe technology:

- ▶ detection of all bacteria present in the well water; significant discrepancy between a cultivable and non-cultivable bacteria was detected
- ▶ assessment of the real cell count in the well water
- ▶ monitoring of organisms along the entire process chain

Images of non-cultivable bacteria in well water – specifically identified and visualized by VIT® gene probe technology ▶



Floc-forming Microorganisms in Mineral Water



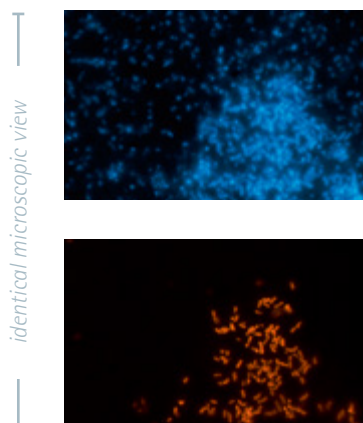
Specific microorganisms in mineral water can cause visible precipitations in the product. In some cases, these can be accompanied by sensory deviations.

Frequently, it is not clear whether the cause is of chemical or microbial nature, as these bacteria are usually non-cultivable and the conventional microbiological result is "negative".

In such cases, a quick screening with the VIT® gene probe technology is recommended, in order to either confirm or exclude a microbial cause. If the cause is of microbial nature, bacteria are identified with specific gene probes and are traced over the process chain.

Process malfunctions e.g. leaking filtration devices might be the cause and can be eliminated. Tasks performed:

- ▶ screening of affected products for non-cultivable bacteria
- ▶ identification of floc-forming microorganisms
- ▶ specific monitoring of problematic microorganisms from source water to end product



◀ *Figure above: all living and dead cells in a mineral water sample
Figure below: specific detection of living floc-forming bacteria*

Back Tracking with VIT® Profiling

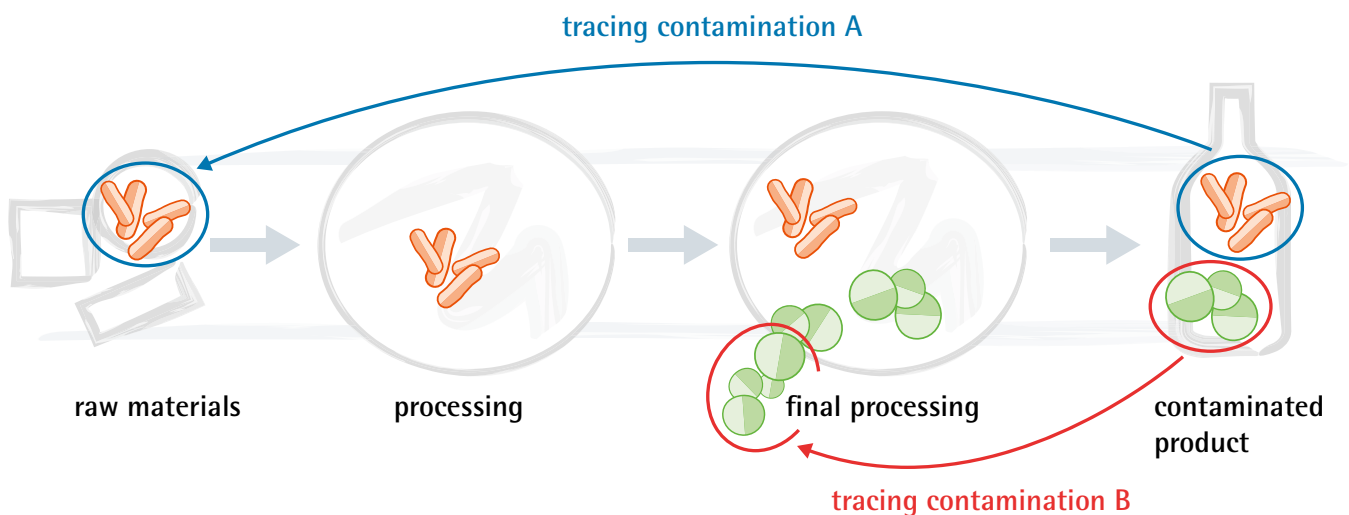


VIT® Profiling is the tool used for extensive microbiological consulting by vermicon AG.

In order to track contaminations in the process stream, a thorough analysis and an examination along the process steps is essential.

By applying modern, cutting-edge technologies and with the help of an experienced team of specialists, the complete production process is surveyed and analyzed in trust-based collaboration with the client. Contaminations are detected quickly and can be eliminated effectively and sustainably.

>> *Process workflow for the backtracking of contaminations*



Detection of a Contamination Source in the Bottle Cleaning System

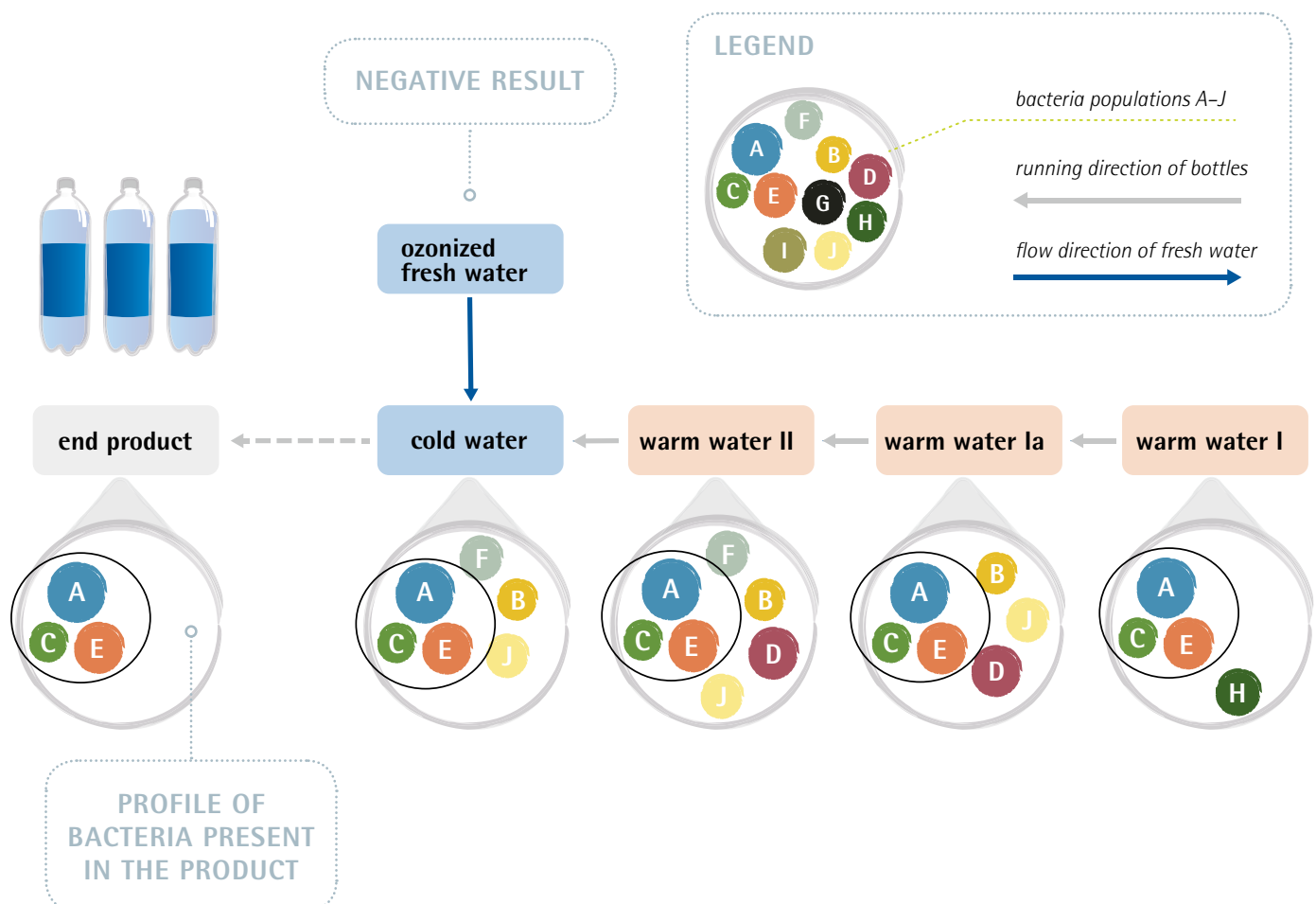


In many cases, an end product contamination is not caused by incoming fresh water, but occurs along the process chain.

In the case at hand, the microbial populations present at different sampling points along the bottling process in a mineral water company were analyzed. By comparing the profiles, the origin of the contamination was identified to be the bottle cleaning system. Thus, the cause of the problem could be eliminated, preventing further contamination of the product.

- ▶ examination of the entire production process
- ▶ evaluation of comprehensive microbiological profiles
- ▶ identification of the contamination source

>> Development of bacterial populations along the process chain



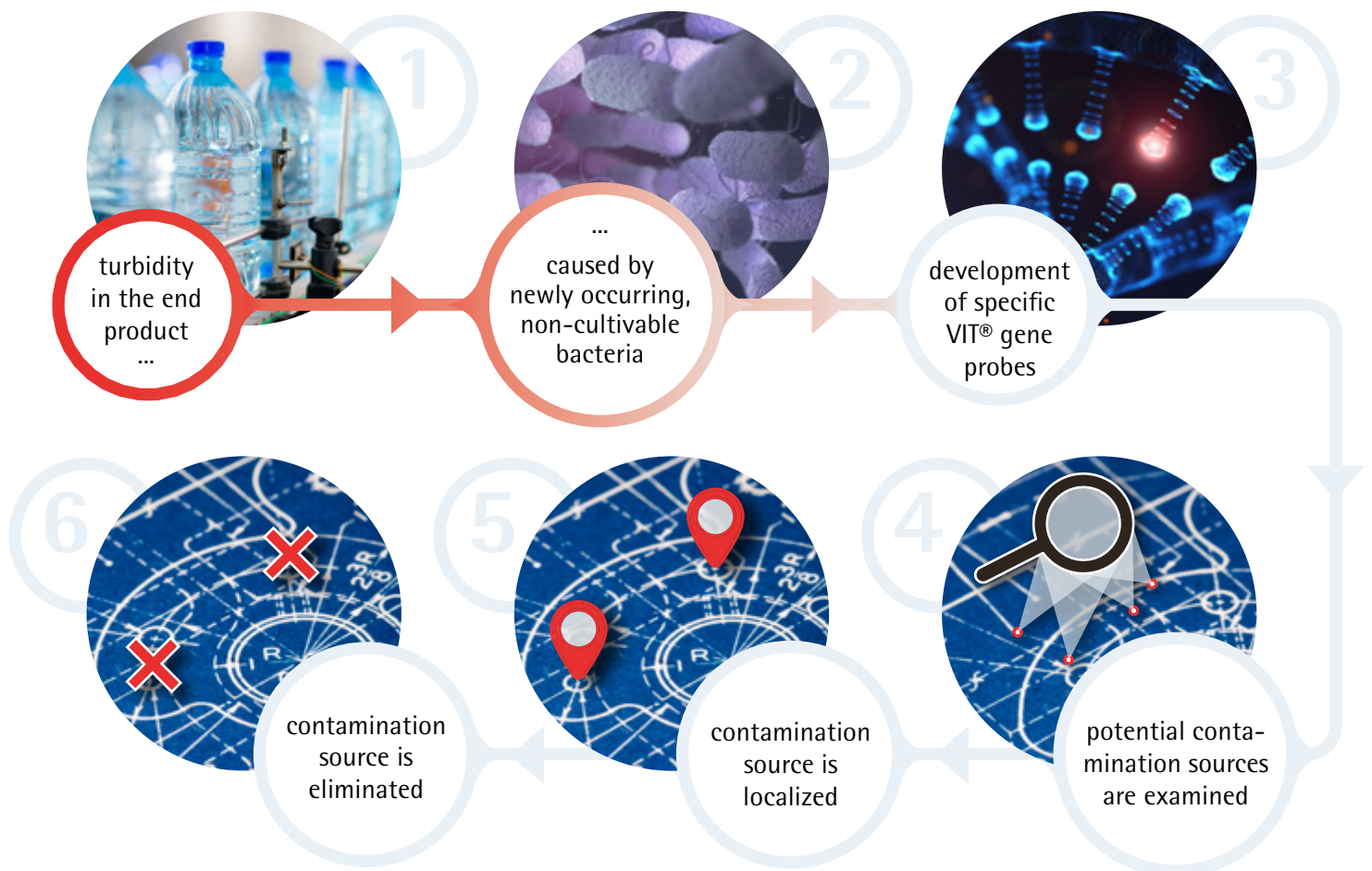
Selective Search for Unknown Bacteria



Turbidity of unknown origin in the end product of a beverage producer could be traced back to particular uncultivable bacteria via VIT® Profiling. Specific VIT® gene probes were developed for those bacteria, enabling an exact screening of the entire production process. The origin of the contamination was located and eliminated.

>> For more information about microbiological consulting by vermicon AG see page 28.

>> VIT® Profiling Workflow



Control at Every Stage of Production



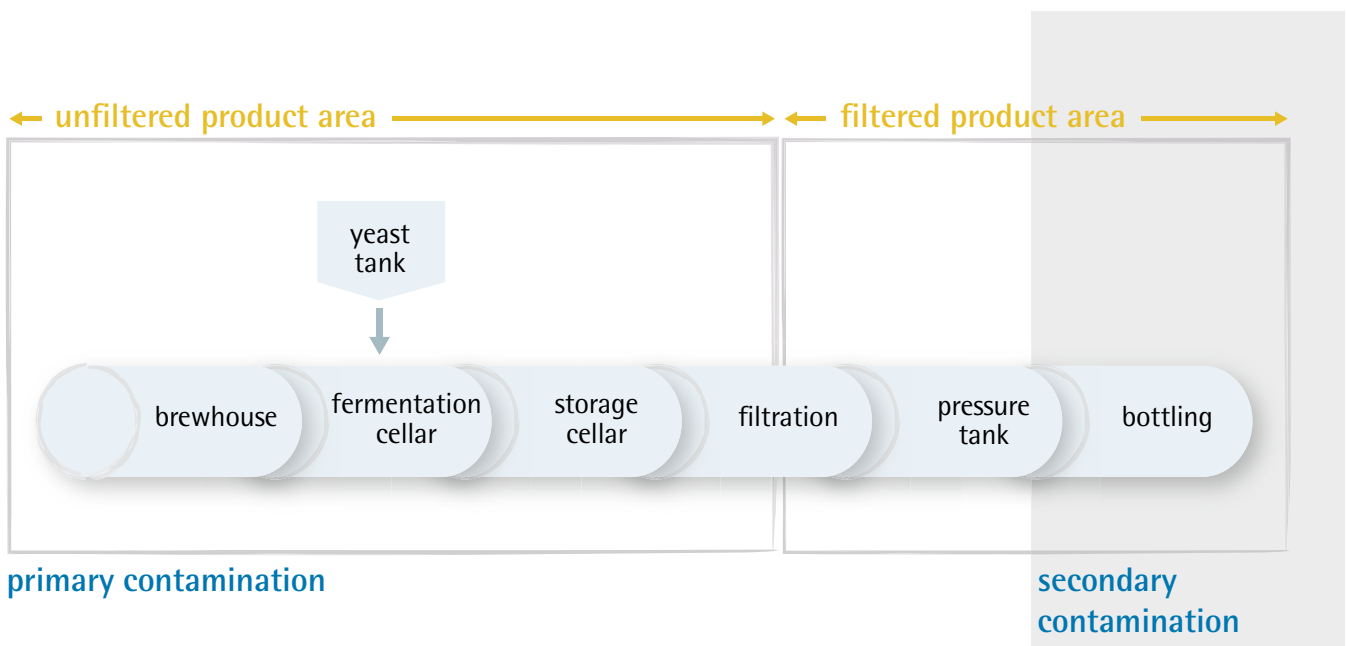
Beer spoilage bacteria are a great risk factor in the brewing process. In the end product, they lead to turbidity and/or unpleasant changes in taste and smell and can cause considerable economical damage to the brewery.

The comprehensive microbiology of vermicon offers an ideal opportunity to gain complete control over the microbiology in every stage of production.

The VIT® System provides all breweries with:

- ▶ direct insight into all processes and steps of production
- ▶ a fast and optimized stage control
- ▶ certainty within very short time

>> Fields of Application for VIT® in Breweries



VIT® ADVANTAGES FOR THE BREWING INDUSTRY

1. Allows direct **visual** control
2. Applicable in every **on-site laboratory**
3. **Robust** and **reliable**
4. Only **living** microorganisms are detected

Stage Controls: Direct Insight into the Process



If contamination is suspected or end product contamination has occurred, a check of the entire process chain is required. With VIT®, all stages of the brewing process can be examined quickly and specifically in order to locate the origin of the contamination. The detection includes also non-cultivable or slow-growing microorganisms. Compared to conventional methods, VIT® stands out due to its speed, specificity and independence on the cultivability of the microorganisms. The contamination source can thus be located and eliminated swiftly.

VIT® provides answers to the following questions:

- ▶ specific identification: Which microorganisms are present?
- ▶ localization: Which stage of the production does the contamination originate from?
- ▶ tracing of populations across the entire process: How does the contamination get into the end product?

Yeast control



A pure yeast culture is an important pillar for the brewing process. A contamination of the yeast or the recycled yeast can lead to a contamination of complete production batches. The fast and reliable VIT® results enable a swift yeast release, converting it from a risk factor to a safety factor in the production process.

VIT® helps to safeguard processes:

- ▶ continuous control of yeasts prior to their addition to the brewing process
- ▶ prevents end product contamination
- ▶ protects the entire production process

Protecting the End Product



Prior to releasing a batch, the final product has to be tested for beer spoilage bacteria. With VIT®, this can be performed quickly, specifically and effortlessly. The result is a clear release decision. This is of particular importance for export batches, as a recall of these batches would cause considerable economical damage. The covered range of beer spoilage bacteria is continuously updated and adjusted according to the latest scientific findings.

With VIT®, you can be sure about:

- ▶ batch release of final products
- ▶ prevention of expensive recall campaigns
- ▶ safety over the entire process

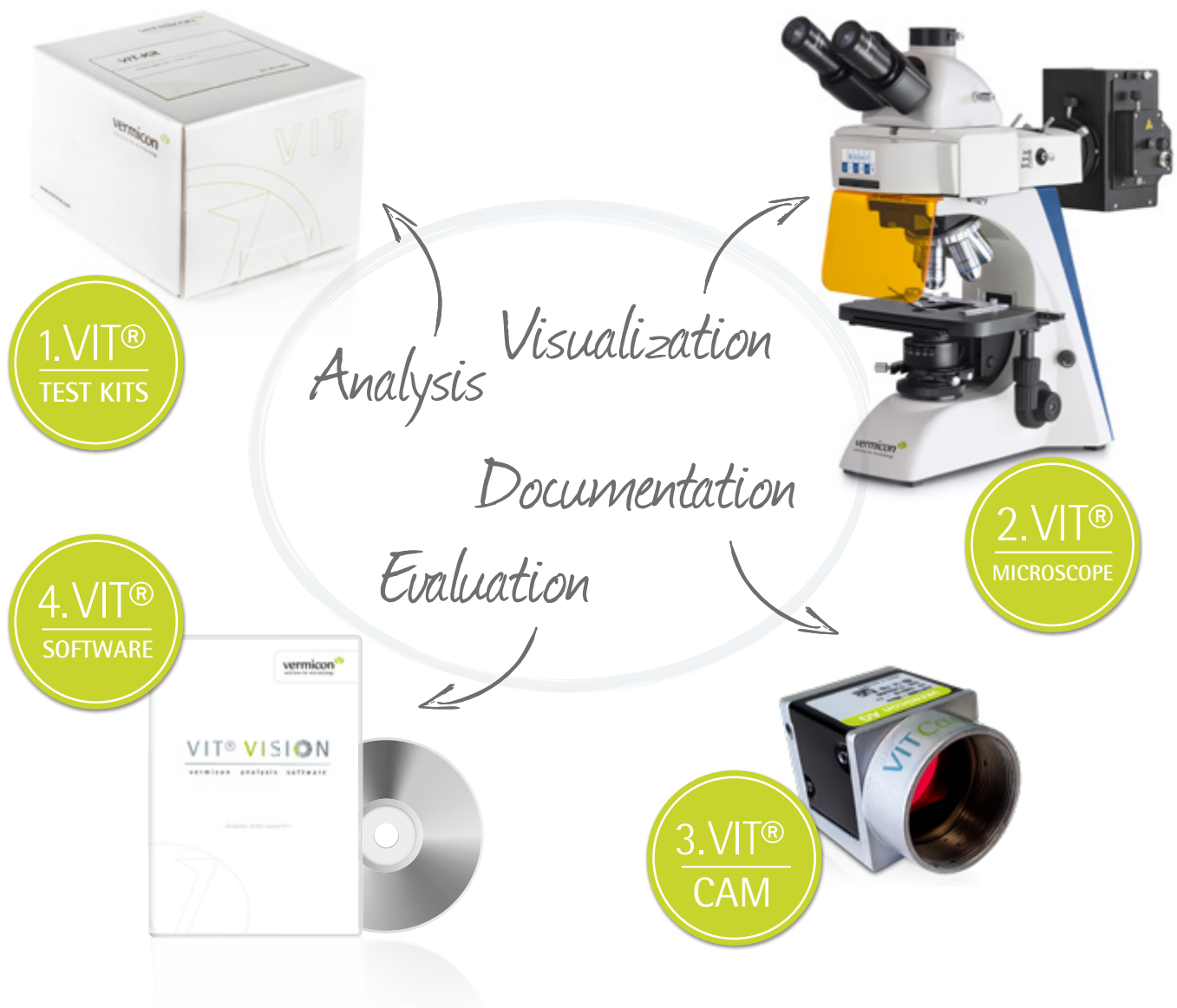
Products and Services



Please address all price enquiries directly to: sales@vermicon.com
We are looking forward to advise you in case of any individual requests.

The VIT® System

Analysis, visualization, documentation and evaluation of microbiological samples: The VIT® System allows for a highly specific, innovative and future-oriented analysis of microorganisms in all areas of industrial microbiology.



MICROBIOLOGICAL MONITORING WITH THE VIT® SYSTEM

- + Matched components and interlocking technologies
- + Intuitive handling
- + User-oriented functionality
- + Developed and optimized for daily laboratory routine in microbiological quality control

We will be happy to provide you with a non-binding, individual offer.
Just contact us at: sales@vermicon.com

VIT® Test Kits for In-House Quality Control

Analyze your samples directly at your laboratory – whenever you want and without any major effort. VIT® test kits contain the VIT® gene probe technology in a form that is very easy to use. The implementation of the system is uncomplicated and you will not require any special sterile rooms. The test kits contain all consumables required. Even for small companies, VIT® test kits are a valuable contribution to their quality management.



- ▶ **Easy handling** of the test kit
- ▶ The system is **very robust**
- ▶ Results are available within a **very short time**

1. Fixation

Sample material is fixed on the supplied slide.



2. Contact

The VIT® solution is added.



3. Incubation

For a reaction, put the slide into the supplied VIT® Reactor.



5. Evaluation

With a VIT®-adapted microscope.



4. Washing



Advantages of the VIT® Test Kits

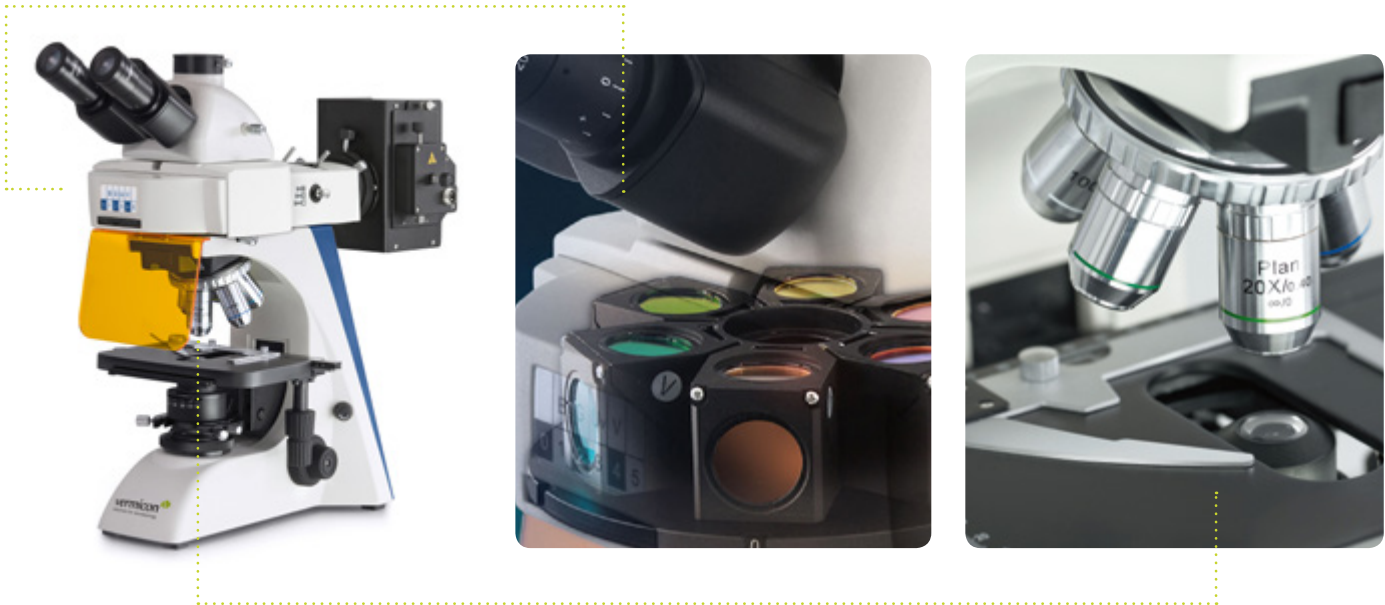
vermicon's VIT® test kits set new standards: fast | specific | reliable | robust.

Especially regarding time requirements, the difference to conventional technologies becomes clear:

- + VIT® applied directly on the sample material: 3 hours
- + VIT® if pre-enrichment is required: 1–3 days

VIT® Microscope

The VIT® Microscope is an evaluation device specifically adapted for application with our test kits. In combination with our product, we can offer a complete system for an easy and convenient analysis of microbiological samples. With the VIT® microscope, you receive a high-end microscope that is reliable and perfectly adapted to the VIT® test kits. And all of this at an absolutely fair price.



>> The Setup of the VIT® Fluorescence Microscope:

- ▶ Trinocular microscope with 30W Halogen Koehler illumination including 5 position nosepiece
- ▶ Objectives Plan Achromat 4x/0,10; 10x/0,25; 20x/0,40; 40x/0,66; 100x/1,25
- ▶ Optional: Objective 100x Ph Plan Achromat, suitable for phase contrast mode
- ▶ Eyepieces WF 10x20
- ▶ Condenser for brightfield mode
- ▶ 2 VIT®-adapted filter systems mounted on the filter module (red and green)
- ▶ 100W HBO Epi Fluorescence unit, 5 position filter wheel incl. centering objective
- ▶ 2 mercury vapor short-arc lamps HBO 100

Advantages of the VIT® Microscope

- + **High optical quality:** reliable evaluation
- + **Easy handling:** no training effort
- + **Robust and durable:** suitable for routine analysis
- + **Attractive price:** high cost effectiveness

VIT® Cam: The vermicon Camera

Visualize your results in a modern way and with high quality – directly from the microscope to a connected monitor. With the VIT® Cam, imaging becomes even easier and more comfortable. The extremely fast transmission of live images allows for a continuous visual control of the analysis directly on the monitor.



Advantages of the VIT® Cam

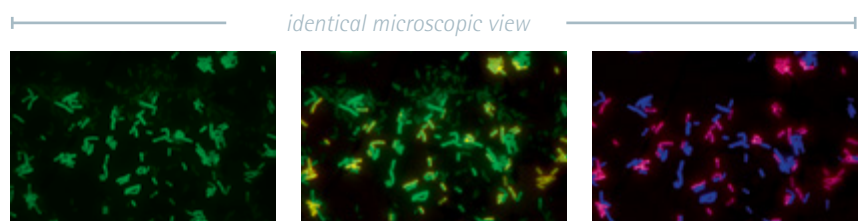
- + Excellent price-performance ratio
- + High quality image material
- + Combination with vermicon's proprietary analysis software VIT® Vision makes for uniquely fast live imaging
- + Easy handling
- + Compact size
- + Perfectly matched to the other components of the VIT® System



VIT® Vision Evaluation Software

The VIT® Vision Software perfectly complements the VIT® Cam as a tool for the evaluation of analyses. Ingenious algorithms guarantee superior image quality. In combination with the imaging system, a variety of different overlays can be visualized and used for evaluation and documentation purposes. Many other functions like e.g. size measurement or image optimization facilitate analyses and data management without overloading the

software. A simple and intuitive user interface helps to achieve optimal results in a minimum of time.



▲ Detection of different bacteria populations in a sample

Advantages of VIT® Vision

- + Extremely fast live image
- + Up to 5 color channels can be freely defined for different images
- + Intuitive user interface
- + Easy data management
- + Measurement mode: for live and already documented measurements
- + Auto-optimization of imaging parameters
- + Wizard for a quick adjustment of exposure parameters
- + Up to **7 populations** can be evaluated simultaneously in one sample

The Flow VIT® Solution

The Flow VIT® Solution is the ideal combination of flow cytometry and VIT® gene probe technology. The detection system consists of specific Flow VIT® test kits and the VIT® adapted flow cytometer CyFlow Cube 6. Its components match perfectly and combine the specificity and speed of the VIT® gene probe technology with the convenient automatic evaluation of flow cytometry.

The Flow VIT® Solution detection system has been created in close cooperation with Sysmex. Sysmex Partec GmbH, a subsidiary of Sysmex Corporation, has been developing modern, high-performance flow cytometers for about 50 years and, as a global expert and market leader, has pioneered the establishment of this measurement technology.

NEW!

Combining VIT® technology with flow cytometry raises microbiological quality control to the highest level and paves the way for a fast and cost-effective microbiological monitoring of production processes.

Flow VIT®
Test Kit



CyFlow Cube 6

Legal manufacturer of the
CyFlow Cube 6: Sysmex Partec GmbH
www.sysmex-partec.com

MAXIMUM QUALITY CONTROL WITH FLOW VIT® SOLUTION

- + Specific detection of single populations
- + Fast and safe release decisions
- + Parallel specific detection of different species
- + High sensitivity
- + Automated read-out of results
- + Reliable results even in difficult samples
- + Only living microorganisms are detected
- + Perfectly suited for routine analyses
- + Easy to handle
- + Installation and operation qualification protocols (IQ / OQ)

Flow VIT® Features

Flow VIT® technology has been specifically developed to meet the requirement of industrial microbiology. The Flow VIT® Solution can be applied in all steps of juice and beverage production that require a fast microbiological quality control.



SPECIFICITY

VIT® gene probes are highly specific for individual species or whole groups of microorganisms. The design of the gene probes and their highly specific and reliable application concentrates all of our know-how from over 20 years of research and development in the field of gene probe technology.



OBJECTIVITY

By the use of flow cytometry, evaluation is no longer affected by "the human factor". Target cells shining due to VIT® are detected and evaluated quickly and reliably.



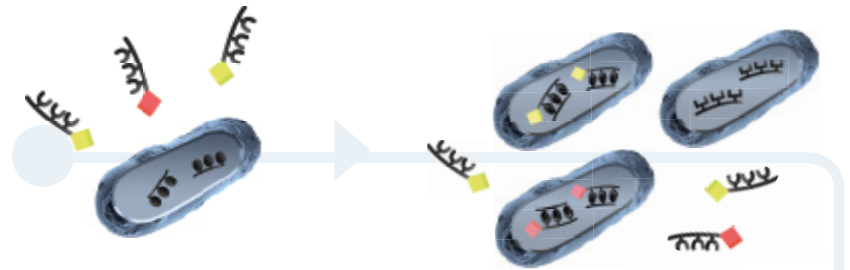
SPEED

Thanks to the Flow VIT® test kits, which are extremely easy to use and have a radically simplified workflow consisting of only a few steps, and the automated evaluation with the aid of the flow cytometer CyFlow Cube 6, results are available within a very short time.



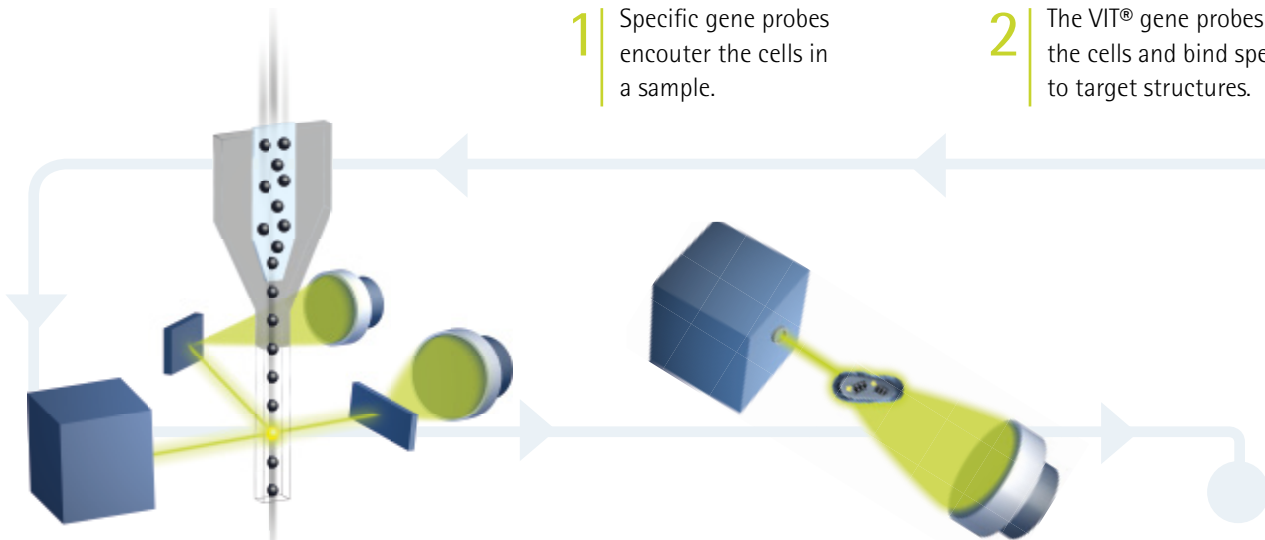
Flow VIT® Workflow

The workflow is fast, simple and allows for a highly specific detection of living micro-organisms in a very short time, including an automated evaluation!



1 Specific gene probes encounter the cells in a sample.

2 The VIT® gene probes enter the cells and bind specifically to target structures.



3 The sample is inserted into the flow cytometer.

4 Cells labeled with VIT® gene probes are detected specifically.

5 Automated evaluation of results via flow cytometer.

>> Analysis Workflow for Test Kits

1. Individual sample preparation and pre-enrichment, if necessary

2. Fixation



Sample material is transferred into a sterile vessel.

4. Washing step



3. Contact

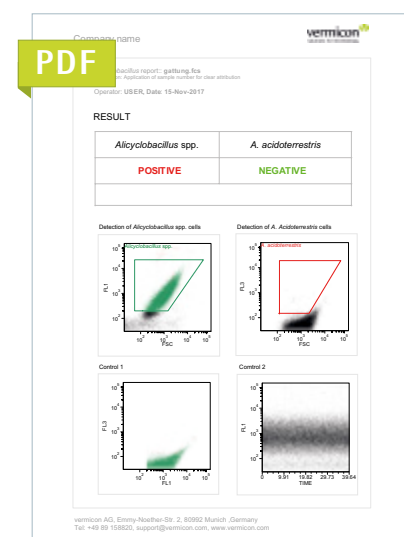


Application of the VIT® gene probe solution.

5. Evaluation



6. Report



Flow VIT® Alicyclobacillus

Alicyclobacilli are frequently occurring thermophilic and acidophilic beverage spoilers and are able to cause off-flavors, often due to the production of guaiacol or halophenolic compounds. In addition, alicyclobacilli are able to form heat-resistant spores. Therefore, it is almost impossible to eliminate these bacteria without damaging the taste and vitamin content of the product.

Flow VIT® Alicyclobacillus enables a fast and reliable quality control in all stages of production of fruit juices, mixed drinks and fruit juice concentrates. Economically damaging product recalls due to contaminated products can thus be prevented in a timely and sustained manner.

The rapid test kit detects all members of the genus *Alicyclobacillus* as well as *Alicyclobacillus acidoterrestris* unambiguously in a sample. The flow cytometer evaluates the sample automatically and thus contributes to a fast and reliable quality control.



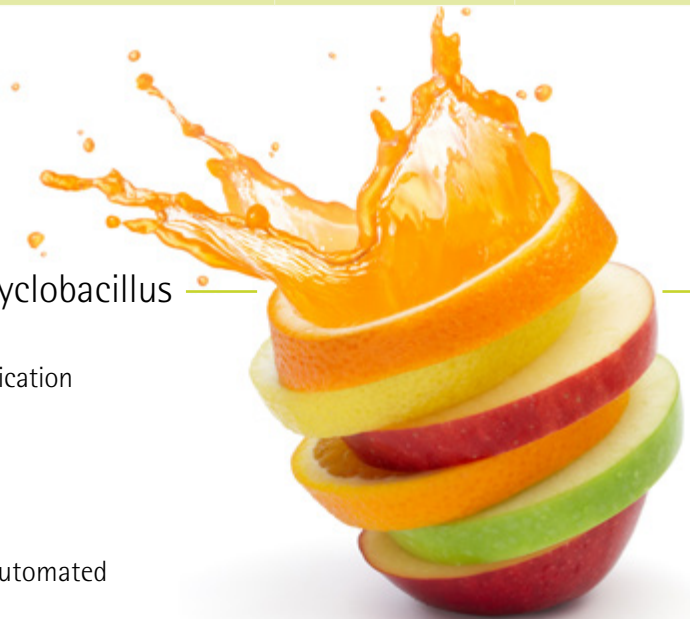
>> Analysis methods for Alicyclobacillus

	IFU Methode Nr. 12	Guaiacol Test	PCR	Flow VIT®
Method	Cultivation	Cultivation + Guaiacol Test	Pre-enrichment + PCR rapid test	Pre-enrichment + Flow VIT® Rapid Test
Detection limit	100 cfu/ml	-	1 – 10 cells / ml	1 – 10 cells / ml
Detection time	7 days	8 days	4 – 6 days (for reliable results)	3 – 4 days
Specificity	not specific confirmatory tests necessary	not specific , no detection of halophenolic compounds	specific	specific
Robustness	✓	✓	✗	✓
Automated Evaluation	✗	✗	✓	✓

Soon available for
further applications!

Advantages of Flow VIT® Alicyclobacillus

- + Detection of *Alicyclobacillus* spp. and identification of *A. acidoterrestris*
- + Only living Alicyclobacilli are detected
- + Automated read-out of results
- + Swift and safe release decisions including automated generation of PDF reports



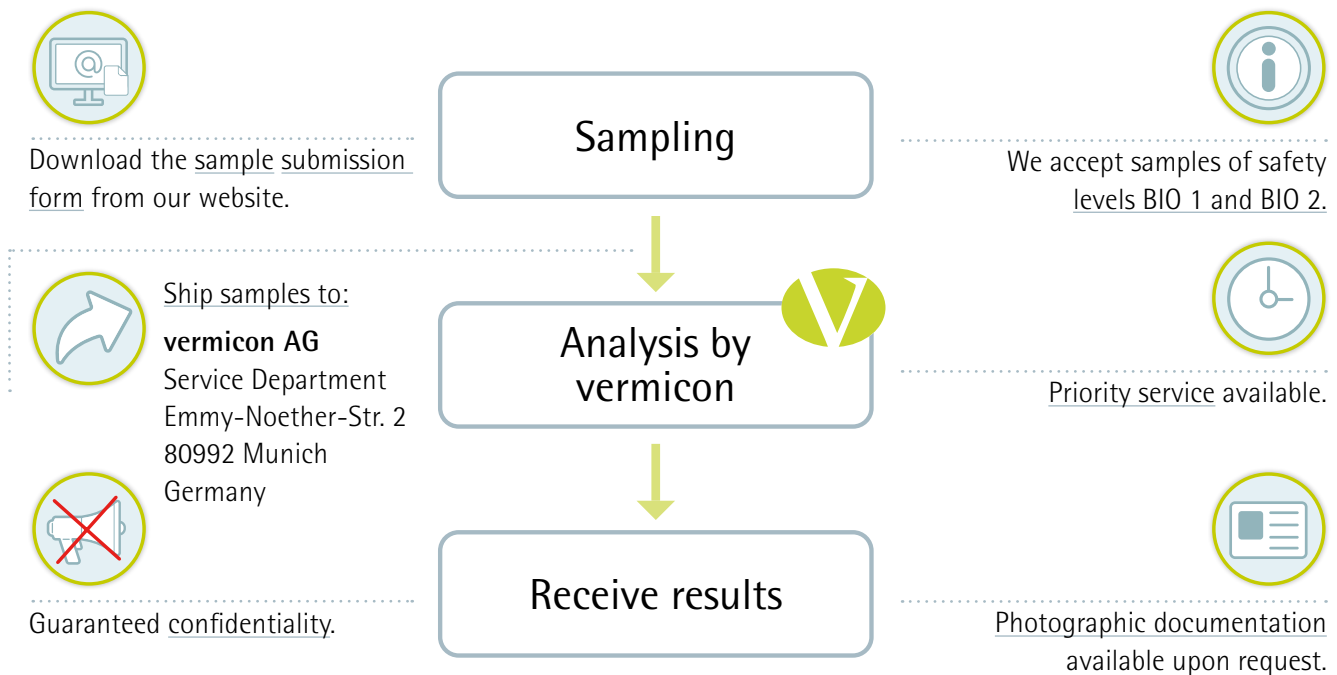
Lab Services – Unique and Innovative

If you make use of vermicon services, you can expect utmost flexibility and professional processing. Send us your sample – we will perform the analysis. We work in trustful collaboration with our clients. A team of microbiologists and chemists will solve your problems in the best way possible. In addition to quality, speed is our priority.

Our service portfolio offers a broad range of possibilities. Our standard-services cover a large proportion of analyses that are relevant for the beverage industry. In case you prefer an individualized analysis, we will be happy to consult you.

>> For a list of our standard lab services, for the beverage industry, please see pages 33–35.

>> Simple workflow



Advantages of our Lab Services

1. Fast and specific results
2. Comprehensive reports
3. Analysis of a large variety of sample material (raw material, in-process samples, end products, pre-enriched samples, isolates etc.)
4. Use of high-tech microbiology
5. Access to vermicon's microbiological know-how
6. Individual and personal advice and support by vermicon AG's experts

General information/specifications for sample submission

Sample collection: In order to avoid contamination, please collect samples sterily, if possible. Please ship the samples as quickly as possible after their collection. vermicon AG accepts only biological material of safety levels BIO 1 and 2.

Sample submission form: Please include a completed sample submission form in every shipment and email the completed form in advance to: support@vermicon.com

You can download the sample submission form at our website: www.vermicon.com/support

Sample shipment: Please ship samples in break-proof containers, close them tightly and seal with tape/parafilm, if necessary. Each sample should be labeled clearly and unambiguously. To prevent damage to the containers, please use packing material (bubble wrap or other padding material) to pad out the transport box.

Sample receipt: All samples received after 3:00 PM are automatically considered as received on the next working day.

Priority service: A surcharge of 100 % will be added to the standard price for weekend oder public holiday service. Samples submitted for priority service require prior notification. Please call +49 89 1 58 82-0 or send an email to: service@vermicon.com

Report: By default, you will receive reports via email. A photographic documentation of results is available upon request. Please note that a surcharge will be charged for documentation.

Confidentiality: All information will be kept strictly confidential. Formal confidentiality agreements can be provided upon request.

Please send your samples under refrigerated conditions to:

vermicon AG

Service Department
Emmy-Noether-Str. 2
80992 Munich
GERMANY

Pre-enriched samples:

Enrichment bouillons or agar plates with colonies:

This leads to shorter time-to-result for services.

Confirmation of colonies and agar plates: Please label the colony chosen for confirmation clearly on the agar plate and state on the sample submission form how many colonies are to be identified.

Biofilm: Please ask for our sampling protocol for biofilm samples.

Mixed cultures/environmental samples: Isolation and purification of samples can be performed subject to an extra charge. Please request a quote for this service.

Identification: Please specify in the sample submission form whether you want the submitted cultures analyzed for bacteria, yeasts or moulds. Please note that identification requires pure cultures. Alternatively, we will be happy to perform a purity streak for an extra charge.

CERTIFICATION AND QUALITY

Microbiological analytics are a highly sensitive area. In order to provide our customers with maximum safety, our services have been certified according to the GMP standard. Our services are continuously tested and evaluated in independent international studies. Thus, we make sure that our customers receive exactly the solution they require for meeting their specific demands. In addition, as a consequence of our continuous participation in scientific research projects, new services and products are being constantly developed and existing products and services are being constantly measured against new challenges. New scientific findings are always examined regarding their practicability and have to pass a rigorous challenge process before they are integrated into our existing portfolio.

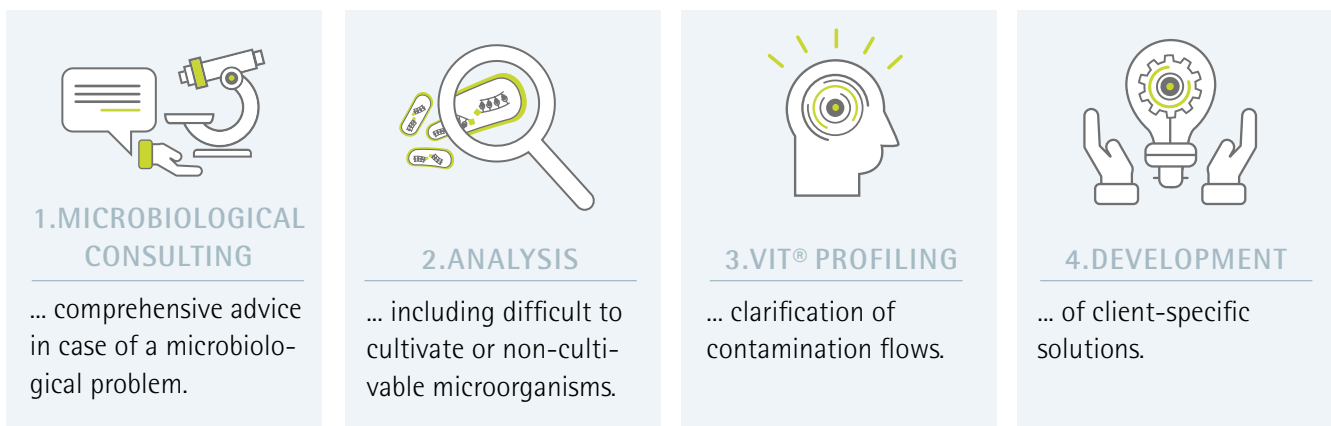


Comprehensive, solution-oriented, successful ...

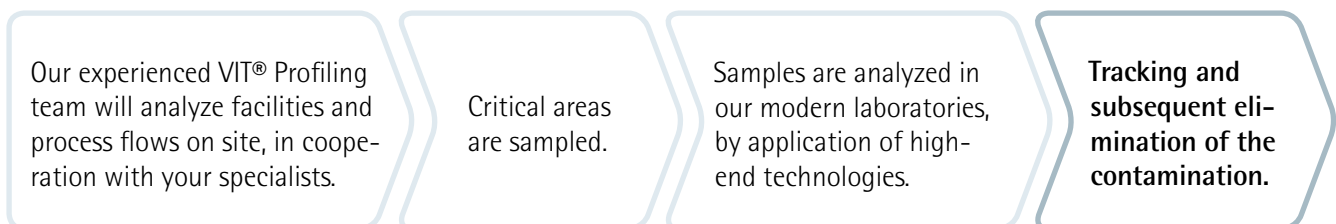
... that's microbiological consulting by vermicon. Our starting points are particularly where other, conventional methods and approaches fail. In trustful cooperation with our clients, we find convincing and practicable solutions. Successful strategies as well as innovative technical solutions are our tools. Combined with our experience, gathered in more than 20 years of market activity, we answer even highly complex, interdisciplinary microbiological questions. Our goal is, after the cause of a microbiological contamination has been identified and eliminated, to provide you with the tools and know-how to prevent a re-contamination in the future.

>> *Microbiological Consulting and VIT® Profiling are already being successfully applied in the industry. For examples, please see page 12.*

>> Solving problems by finding their cause – our services



>> VIT® Profiling Workflow



OUR COMPETENCE

- + Individual, successful solution approaches
- + Field-proven, cutting-edge microbiological expertise
- + Experienced team of microbiologists, chemists and computer scientists
- + Highly professional, targeted processes
- + Patent protected, highly innovative technology

- + Transparent and close collaboration with the client
- + Guaranteed confidentiality

We will be happy to introduce you to our consulting concept in person. Discuss your microbiological issues with us, in confidence and non-bindingly. Quotes and price informations will be provided in combination with an individual concept.

Product Portfolio



Contact us for further information and individual offers, e.g.
yearly packages: support@vermicon.com

VIT® Test Kits

VIT® test kits for the beverage industry are the basis for a reliable quality control and complement each other perfectly. We will be happy to advise you regarding the implementation of a holistic monitoring system or regarding individual solutions.

- **Relevance:** only living microorganisms are detected, dead cells have no influence on the results
- **Hands-on time:** only a few minutes
- **Results:** are already available within 3 hours
- **Evaluation:** via fluorescence microscope, e.g. the VIT® Microscope
- **Consumables:** included in the test kit
- **Package size:** 25 analyses



Detection kits	Description / Application	Item no.
Detection of Alicyclobacillus		
VIT® Alicyclobacillus  Erwähnt in: A.I.J.N. ACB Best Practice Guideline	Fast and specific detection of <i>Alicyclobacillus acidoterrestris</i> and of the complete genus <i>Alicyclobacillus</i> in one analysis. Not only vegetative cells, but also spores are detected. Detection in beverage and fruit juice samples as well as in concentrates and sugar solutions. Also for confirmation/identification of isolates and colonies.	01210013
Detection of Beer Spoilage Bacteria		
VIT® Beer Megasphaera/Pectinatus	Fast and specific detection of the genus <i>Pectinatus</i> and of <i>Megasphaera cerevisiae</i> in parallel in one analysis. Detection is performed in beer and mixed beer beverages pre-enriched under anaerobic conditions as well as in hygiene samples. Also for direct detection in biofilms and for confirmation/identification of isolates and colonies.	01210007
VIT® Beer plus L. brevis	Fast and specific detection of all beer spoilage lactic acid bacteria and concurrent identification of <i>Lactobacillus brevis</i> , the most important beer spoiler. The analysis can be performed with samples from all stages of the brewing process: filtered and unfiltered product area including yeast recycling as well as hygiene and water samples. Also for confirmation/identification of isolates and colonies.	01210006
VIT® Beer Screening	Fast and specific identification of individual beer spoilage lactic acid bacteria in pre-enrichments. Suited for analysis of finished products, yeast propagation tanks and all steps of the brewing process. The following bacteria species are identified: <i>Lactobacillus brevis / brevisimilis,</i> <i>Lactobacillus backi,</i> <i>Lactobacillus (para-)collinoides,</i> <i>Lactobacillus plantarum,</i> <i>Lactobacillus rossiae,</i> <i>Lactobacillus coryniformis,</i> <i>Lactobacillus (para-)buchneri,</i> <i>Lactobacillus perolens / harbinensis,</i> <i>Lactobacillus paucivorans,</i> <i>Lactobacillus acetotolerans,</i> <i>Lactobacillus (para-)casei,</i> <i>Lactobacillus lindneri,</i> <i>Pediococcus clausenii,</i> <i>Pediococcus inopinatus,</i> <i>Pediococcus damnosus</i>	01210033
Detection of Spoilage Yeasts		
VIT® Spoilage Yeasts	Fast detection and specific differentiation of obligate and potential fermentative yeasts. Detection in alcoholic and non-alcoholic beverages, fruit juices and concentrates, sugar solutions. Also for confirmation/differentiation juices, concentrates and sugar solutions.	01210016
Detection of Lactic Acid Bacteria		
VIT® Lactococcus lactis	Fast and specific detection of <i>Lactococcus lactis</i> in beer, beverage and environmental samples. Also for confirmation/identification of isolates and colonies.	01210027

Detection kits	Description / Application	Item no.
Detection of Lactic Acid Bacteria		
VIT® <i>Leuconostoc/</i> <i>Lactococcus lactis</i>	Fast detection and specific identification of <i>Leuconostoc</i> spp. and <i>Lactococcus lactis</i> in beer, beverage and environmental samples. Biofilm samples can be analyzed directly, without enrichment. Also for confirmation/identification of isolates and colonies.	01210028
VIT® Lactic Acid Bacteria	Fast and specific detection of beverage spoilage lactic acid bacteria of the genera <i>Lactobacillus</i> , <i>Leuconostoc</i> and <i>Pediococcus</i> . Detection in sweet beverages, fruit juices and sugar solutions. Also for confirmation/identification of isolates and colonies.	01210018
Detection of Pathogens		
VIT® <i>Pseudomonas aeruginosa</i>	Fast and specific detection of <i>Pseudomonas aeruginosa</i> in drinking water, rinsing water and biofilms. Also for confirmation/identification of isolates and colonies.	01210001
VIT® <i>E. coli</i> / Coliforme	Fast and specific detection of <i>Escherichia coli</i> and coliform bacteria in parallel in one analysis. Finished products, water, rinsing water and process water can be analyzed. Also for confirmation/identification of isolates and colonies.	01210008

You did not find what you were looking for? We also offer a customer-specific development of test kits. Contact us: support@vermicon.com

VIT® Microscope, VIT® Cam and VIT® Vision Software

Product	Description	Item no.
VIT® Microscope		
	▶ Trinocular microscope with 30W Halogen Koehler illumination incl. 5 position nosepiece ▶ Objectives Plan achromat: 4x/0,10; 10x/0,25; 20x/0,40; 40x/0,66; 100x/1,25 ▶ Optional: Objective 100x Ph Plan suitable for phase-contrast ▶ Oculars WF 10x20 ▶ Condenser for bright field mode ▶ 2 VIT® adapted filter sets, mounted on a filter module (red and green) ▶ 100W HBO epifluorescence unit with 5-position filter wheel incl. centering objective ▶ 2 mercury vapor short-arc lamps HBO 100	01990001
VIT® Cam		
	VIT® Cam S1c For technologically up-to-date, high-quality visualization of analysis results. Images are transmitted directly from the microscope to a connected monitor.	01991001
VIT® Vision		
	Image overlays, object measurements and optical optimization for a conclusive documentation.	01992001

Microscopes by Zeiss and Leica

In addition to the VIT® Microscope, we offer high-quality microscopes by Zeiss and Leica as an authorized specialist dealer. If desired, they can also be specifically adapted to our VIT® test kits. You can choose between a variety of different configurations. Select additional components according to your individual requirements.

Product	Description	Item no.
Zeiss Microscope		
	e.g Axio Scope.A1 Can be equipped with the following extra features: ▶ Fluorescence ▶ Bright field ▶ Phase contrast ▶ Dark field	01990002
Leica Microscope		
	e.g Leica DM750 Can be equipped with the following extra features: ▶ Fluorescence ▶ Bright field ▶ Phase contrast ▶ Dark field	01990003

Flow VIT® Test Kits

Flow VIT® test kits for the beverage sector feature a combination of specific gene probe technology and a fast automated evaluation by flow cytometry. They are the basis for a cutting-edge, high-throughput-ready and reliable quality control.

- ▶ **Relevance:** only living bacteria are detected, no detection of irrelevant dead cells
- ▶ **Easy handling:** the workflow is reduced to a minimum
- ▶ **Hands-on time:** only a few minutes
- ▶ **Evaluation:** via flow cytometer
- ▶ **Consumables:** included in the test kit



Soon available
for further
applications!

Detection kits	Description / Application	Item no.
Detection of Alicyclobacillus		
Flow VIT® Alicyclobacillus	Fast and specific detection of <i>Alicyclobacillus acidoterrestris</i> and of the entire genus <i>Alicyclobacillus</i> in parallel. Not only vegetative cells, but also spores are detected. Detection in beverage and fruit juice samples as well as concentrates and sugar solutions. Also suited for identification of isolates. Evaluation of results is performed automatically via CyFlow Cube 6 flow cytometer. Clear positive/negative results and automatic generation of PDF reports.	01150001

CyFlow Cube 6

Please contact the appropriate sales consultant.

Authorised Representative: Sysmex Europe GmbH

Bornbarch 1, 22848 Norderstedt, Germany | Phone +49 40 52726-0 | Fax +49 40 52726-100
 info@sysmex-europe.com | www.sysmex-europe.com

Sysmex Corporation: 1-5-1 Wakinohama-Kaigandori, Chuo-ku, Kobe 651-0073, Japan
 Phone +81 78 265-0500 | Fax +81 78 265-0524 | www.sysmex.co.jp

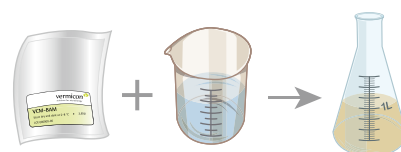
Nutrient Media

For some analyses a pre-enrichment is necessary in order to meet the requirements regarding sample volume and detection limit. For optimal results, we recommend the use of our own nutrient media. In a very short time, you will receive well-grown cultures excellently suited for the easy analysis with vermicon products. What makes nutrient media by vermicon AG special are the VCM dosage units. You will receive the media already portioned and just have to dilute them with a suitable amount of water in order to reach the appropriate concentration level. This makes dosage very easy and, if sealed sterile, the remainder of the medium has a long shelf-life.

Package sizes are 10 dosage units. 1 dosage unit is sufficient for 1 liter of bouillon (single concentration).

Application:

Depending on the required concentration level (single, double), just add a VCM dosage unit to a defined volume of distilled water. Then, autoclave it – done!



Product	Description	Item no.
Nährmedien		
VCM-Fast Y1B	For fast enrichment of yeasts for subsequent analysis with VIT® Spoilage Yeasts . Depending on the concentration of the prepared medium (single/double), beverage samples as well as concentrates can be enriched.	01270003
VCM-BAM	For fast and targeted enrichment of the genus <i>Alicyclobacillus</i> incl. <i>Alicyclobacillus acidoterrestris</i> for a subsequent analysis with VIT® Alicyclobacillus or Flow VIT® Alicyclobacillus . Depending on the concentration of the prepared medium (single/double), beverage samples as well as concentrates can be enriched. See also BAM liquid nutrient medium in: Baumgart, J., 2003: Media for the detection and enumeration of <i>Alicyclobacillus acidoterrestris</i> and <i>Alicyclobacillus acidocaldarius</i> in foods, in: Handbook of Culture Media for Food Microbiology, ed. by J.E.L. Corry, G.D.W. Curtis, R.M. Baird, Elsevier Verlag, Amsterdam, 161–166.)	01270004

Lab Services

With every lab service, you will receive a comprehensive report. Results are available within 1 to 3 working days after sample receipt. In case of pre-enriched samples or grown colonies, we can provide the result already on the first working day.

Analyses are performed with the **VIT® gene probe technology** and, if necessary, using other reliable microbiological analysis methods. Analysis of alcoholic and non-alcoholic beverages: beer, wine, juices and soft drinks, as well as juice concentrates, water samples and enrichments.



Service	Description	Item no.
Detection of Beverage Spoiling Bacteria		
<i>Alicyclobacillus</i> – Identification	Fast and specific detection of <i>Alicyclobacillus acidoterrestris</i> and of the entire genus <i>Alicyclobacillus</i> in beverages, fruit juices, concentrates, sugar solutions and rinse water.	01220001

Service	Description	Item no.
Detection of Beverage Spoiling Bacteria		
<i>Alicyclobacillus</i> – Quantification	Fast and specific quantification of <i>Alicyclobacillus acidoterrestris</i> and of the entire genus <i>Alicyclobacillus</i> in beverages, fruit juices, concentrates sugar solutions and rinse water. Detection is quantitative in colony-forming units per 10 g (ml), depending on the required specification.	01220002
<i>Alicyclobacillus</i> according to IFU Method No. 12	Detection of <i>Alicyclobacillus</i> (qualitative/quantitative) according to IFU method No. 12. Nutrient media: BAT, YSG. Quantitative detection in colony-forming units per 10 g (ml), depending on the required specification.	01220025
TAB-Analysis	Quantitative detection of thermophilic and acidophilic bacteria (TAB) in beverages, fruit juices, concentrates, sugar solutions and rinse water. Quantitative detection in colony-forming units per 10 g (ml), depending on the required specification.	01220021
Acetic Acid Bacteria	Fast and specific detection of acetic acid bacteria <i>Acetobacter</i> , <i>Asaia</i> , <i>Gluconacetobacter</i> and <i>Gluconobacter</i> as a group in alcoholic and non-alcoholic beverages, concentrates, biofilms, rinse water etc.	01220003
Lactic Acid Bacteria	Fast and specific detection of beverage spoilage lactic acid bacteria of the genera <i>Lactobacillus</i> , <i>Leuconostoc</i> and <i>Pediococcus</i> as group or individually. Detection in alcoholic and non-alcoholic beverages, concentrates, biofilms, rinse water etc.	01230014
<i>Leuconostoc</i> spp and <i>Lactococcus lactis</i>	Fast and specific identification of <i>Leuconostoc</i> spp. and <i>Lactococcus lactis</i> in beer, beverages and environmental and biofilm samples.	01220023
Beverage Spoiling Bacteria – Screening	Fast and specific detection of beverage spoilage lactic acid bacteria, acetic acid bacteria and yeasts. Bacterial parameters are detected as two separate groups, yeasts are additionally identified as potential and obligate fermentative yeasts.	01230033
Detection of Beer Spoilage Bacteria		
Beer Spoilage Lactic Acid Bacteria	Fast and specific detection of all beer spoilage lactic acid bacteria as group and specific identification of <i>Lactobacillus brevis</i> .	01230003
Beer Spoilage Bacteria – Screening	Fast and specific identification of individual beer spoilage lactic acid bacteria in a sample. Results are available within one working day, if enriched samples or agar plates are submitted. The following bacteria species are identified specifically: <i>Lactobacillus brevis</i> / <i>brevisimilis</i>, <i>Lactobacillus backi</i>, <i>Lactobacillus (para-)collinoides</i>, <i>Lactobacillus plantarum</i>, <i>Lactobacillus rossiae</i>, <i>Lactobacillus coryniformis</i>, <i>Lactobacillus (para-)buchneri</i>, <i>Lactobacillus perolens</i> / <i>harbinensis</i>, <i>Lactobacillus paucivorans</i>, <i>Lactobacillus acetotolerans</i>, <i>Lactobacillus (para-)casei</i>, <i>Lactobacillus lindneri</i>, <i>Pediococcus clausenii</i>, <i>Pediococcus inopinatus</i>, <i>Pediococcus damnosus</i>	01220005
Beer Spoilage Bacteria – Screening PLUS	Fast and specific identification of beer spoilage lactic acid bacteria according to the service "Beer Spoilage Bacteria – Screening". In addition, the beer spoilers <i>Pectinatus</i> spp. and <i>Megasphaera cerevisiae</i> are identified specifically. Results are usually available within one working day, if enriched samples or agar plates are submitted.	01220012
<i>Megasphaera cerevisiae</i> and <i>Pectinatus</i> spp.	Fast and specific identification of the beer spoilage organisms <i>Pectinatus</i> spp. and <i>Megasphaera cerevisiae</i> in beer, mixed beer beverages and biofilms.	01230004
Detection of Spoilage Yeasts		
Spoilage Yeasts – Identification	Fast detection and specific differentiation of obligate and potential fermentative yeasts. Detection in alcoholic and non-alcoholic beverages, fruit juices and concentrates and sugar solutions.	01230017
Spoilage Yeasts – Screening	Fast identification of fermentative yeasts with the VIT® gene probe technology. The following genera and species are covered by the screening: <i>Saccharomyces cerevisiae sensu strictu</i> , <i>Zygosaccharomyces</i> spp., <i>Candida parapsilosis</i> , <i>Candida intermedia</i> , <i>Candida krusei</i> , <i>Pichia membranifaciens</i> , <i>Pichia fermentans</i> , <i>Torulaspora delbrueckii</i> , <i>Dekkera bruxellensis</i> , <i>Dekkera naardenensis</i> .	01230034

Service	Description	Item no.
Detection of Bacteria in Water, Rinsing and Cooling Water		
Viable and Total Cell Count	Fast quantification of viable and dead bacteria in filterable samples without cultivation. Analysis is particularly useful if it is uncertain whether the contamination is of micro-biological origin or not.	01230001
Total Cell Count	Determination of the total bacteria count (Plate Count).	Spatula method: 01320009 Poured plate method: 01320015 Yeasts and Moulds: 01320005
Floc- and Odour-forming Bacteria	Fast and specific quantification of non-cultivable floc- or odour-forming bacteria in mineral water, well water etc. Samples are filtered and analyzed by use of specific gene probes. In addition, the total cell count and total viable count per ml are measured.	01220019
Sulphate-reducing Bacteria	Identification: Fast and specific detection of sulphate-reducing bacteria in water samples, in raw materials and in biofilms.	01220006
	Quantification: Fast and specific quantification of sulphate-reducing bacteria in water samples. In addition, the total bacteria count and total viable count per ml are determined.	01220008
<i>Pseudomonas aeruginosa</i>	Identification: Fast and specific detection of <i>Pseudomonas aeruginosa</i> in drinking water, rinsing water and biofilms.	01230002
	Quantification: Fast and specific quantification of <i>Pseudomonas aeruginosa</i> in water samples (mineral water, rinsing water, cooling water etc.). Quantification in colony-forming units (CFU) per ml, depending on the specification.	01230015
E. coli / Coliforms	Identification: Fast and specific detection of coliform bacteria and of <i>Escherichia coli</i> . Analysis results are usually available within one working day. Detection in beer, wine, juices and soft drinks, powders and water (mineral water, rinse water etc.).	01230002
	Quantification: Fast and specific quantification of coliform bacteria and <i>Escherichia coli</i> in filterable samples. Quantification in colony-forming units (CFU) per ml, depending on the specification.	01230032
Legionella	Quantification of <i>Legionella</i> spp.: in cooling water samples according to ISO 11731:2015.	01230027
	Quantification of <i>Legionella</i> spp. and <i>Legionella pneumophila</i>: Fast quantification of <i>Legionella</i> and specifically of <i>Legionella pneumophila</i> in cooling water samples via Scan VIT® Legionella. Analysis takes ca. 72 hours. Quantification in colony-forming units (CFU) per mL, depending on the specification.	01230012
Specific Identifications		
Submit your isolates, colonies or enrichments. Please note our regulations concerning the classification of microorganisms on page 27. We will be happy to perform the cultivation for you. We will sequence the corresponding rDNA genes and perform sequence similarity comparisons (blast), in best case down to the species level. Calculation of phylogenetic trees is also possible. This kind of molecular identification takes 3 to 5 working days.		
Bacteria – Identification	Grown colonies or pure cultures are analyzed down to species level via partial or complete sequence analysis of the 16S rDNA gene.	partial: 01350001 complete: 01350002
Yeasts – Identification	Grown yeast colonies or pure cultures are analyzed down to species level via sequence analysis of the 26S rDNA gene.	01350003
Moulds – Identification	Grown mould colonies or pure cultures are analyzed down to species level via sequence analysis of the 26S rDNA gene.	01350005
Other Services		
Individual Detection of Bacteria	You would like to detect a specific genus, species or an entire group of bacteria directly in the sample material? No problem. Just name the microorganism and we will screen our large gene probe database for a suitable gene probe. With this gene probe, we will analyze beverage, process and raw material samples for the presence of this bacterium. If possible, detection will be performed without pre-enrichment directly in the sample material.	01220017

Visit us at: www.vermicon.com

Visit our website for more information about our continuously updated portfolio or just request further information about our products and services. On our website, you will also find current microbiology-related articles as well as studies and scientific papers we are providing for you.

Visit us and immerse yourself in the world of microbiology – vermicon's world!



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We make bacteria shine 