ACARYON

2026 CATALOGUE

R&D Services For Innovation In Pre-/ Post-/ Probiotics, Plant-Extracts & Functional Ingredients

The Broadest Analytical Platform On The Market

Human & Animal Systems

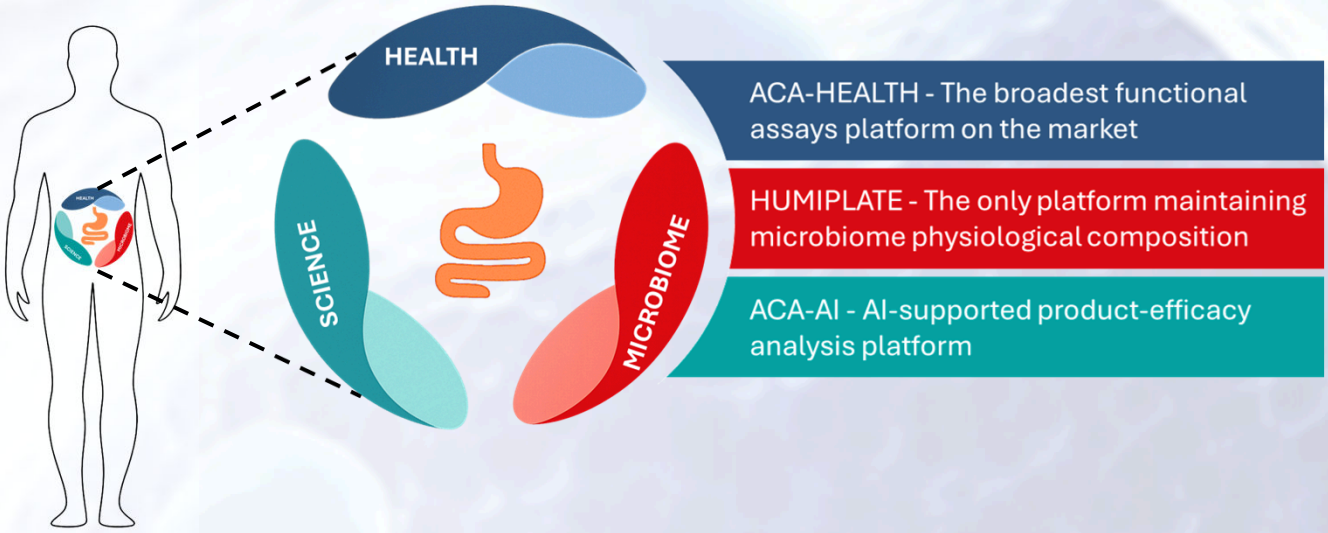
Trusted by Global Leaders - Powered by Scientific Excellence

RESEARCH TAX CREDIT CIR ACCREDITED 2024 - 2026

BSL-2 ACCREDITED Biosafety LEVEL 2

BSL-3** ACCREDITED Biosafety LEVEL 3**

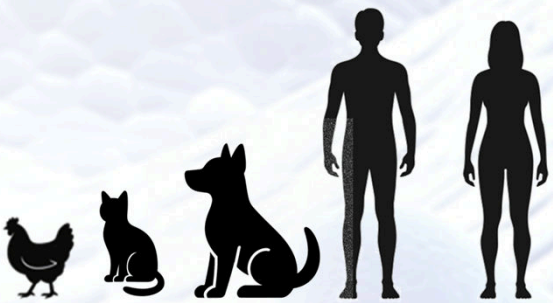
ACARYON's ENVIRONMENT



Unique technology platforms as standalone or combined, to identify and understand the full health potential of your product(s).

- Probiotics
- Prebiotics
- Postbiotics
- Ingredients
- Supplements
- Plant extracts
- Drugs

Product's health properties
Product's microbiome modulation properties
Product's health properties related to microbiome modulations



Human and Animal Systems

2026 CATALOGUE

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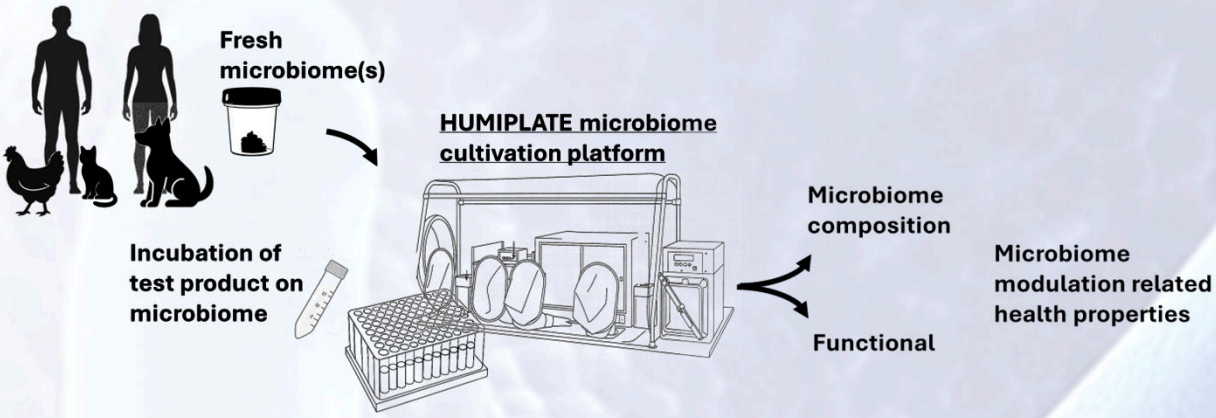
Additional assays and/or in-depth analyses can be tailored upon request. Please contact us for a detailed discussion of extended options.

HUMIPLATE and VETPLATE

A unique platform to provide comprehensive insights into the microbiome-modulating health properties of your product(s).

- High-throughput (up to 150 wells at once)
- Time and cost effective
- Maintains the physiological composition of the microbiome, ensuring high *in vivo* translatability
- Real native microbiomes



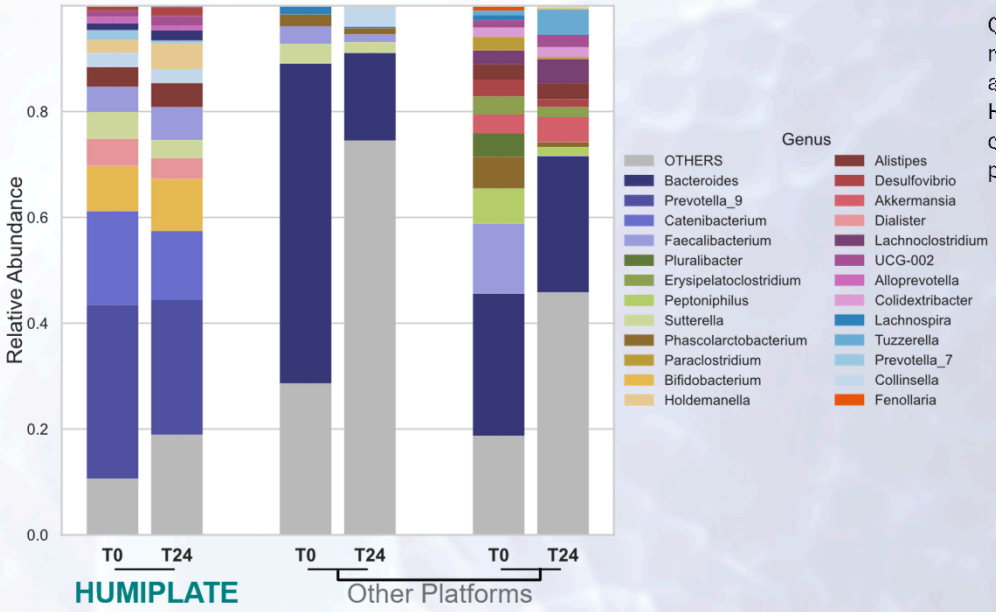
We uncover how your product shapes:

- Microbiome composition
- Metabolic activity
- Physiological functions (thanks to our broad assay platform p. 9 to 34)

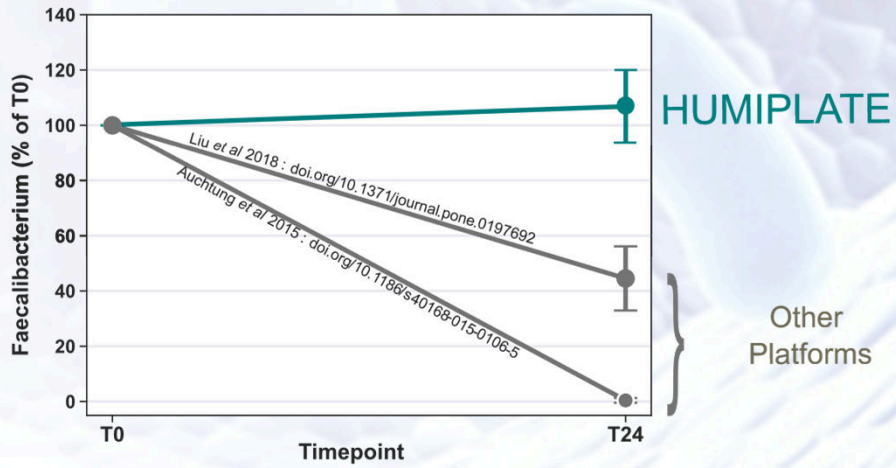
We use unique AI-supported bioinformatic tools to relate the results to real biologically relevant insights.

HUMIPLATE vs. Other Platforms

HUMI-VETPLATE uniquely maintains native gut microbial integrity to the genus level, enabling biologically meaningful insights and true translational relevance.



Compositional plots showing microbiome profile at start (T0) and after 24 h cultivation in HUMIPLATE (left) and other commercially available platforms.



Preservation of sensitive taxa *Faecalibacterium* in HUMIPLATE vs other commercially available.

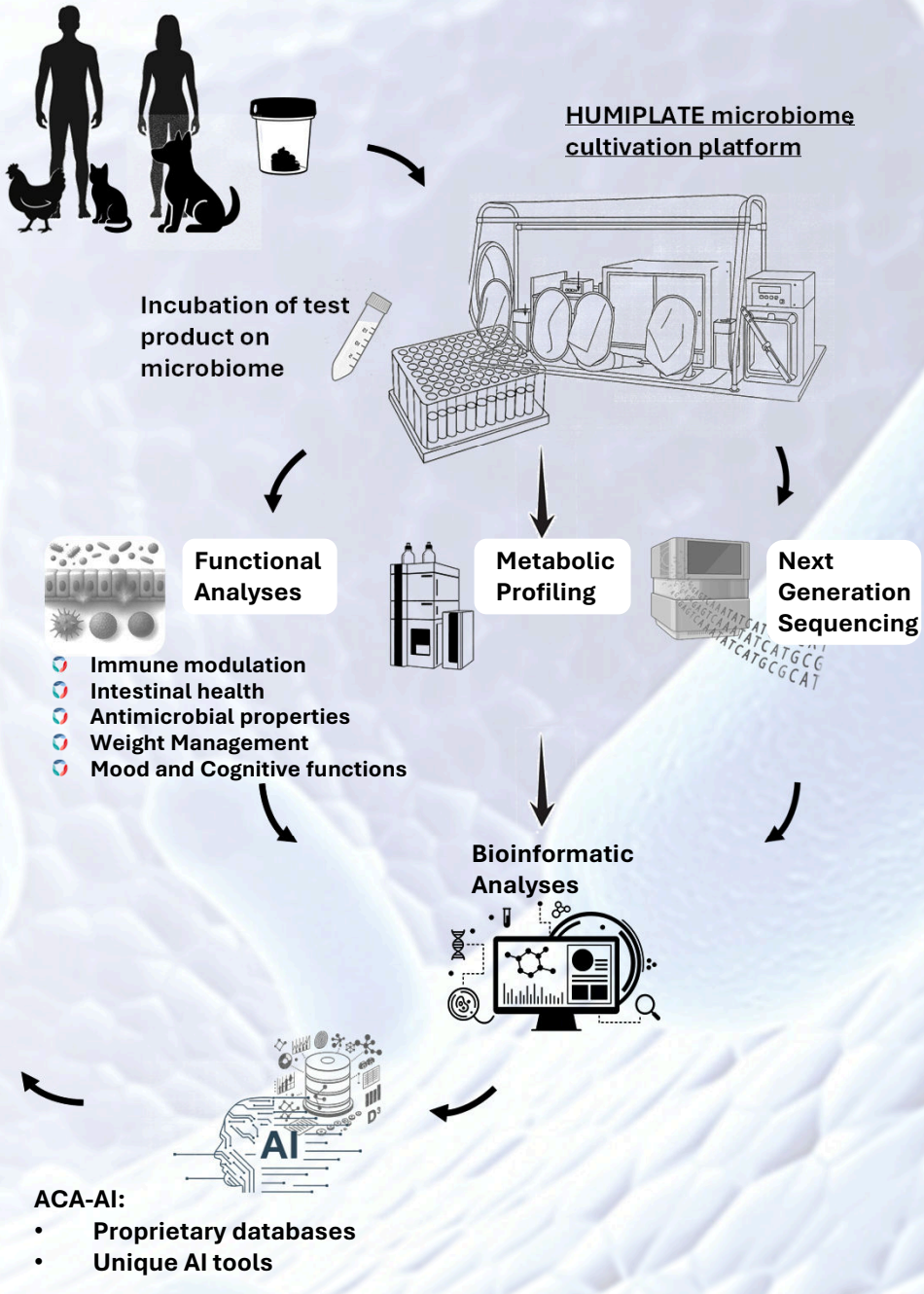
HUMIPLATE and VETPLATE

HUMI-VETPLATE delivers unparalleled, actionable data on the health-promoting potential of your product.

Unique in HUMIPLATE:

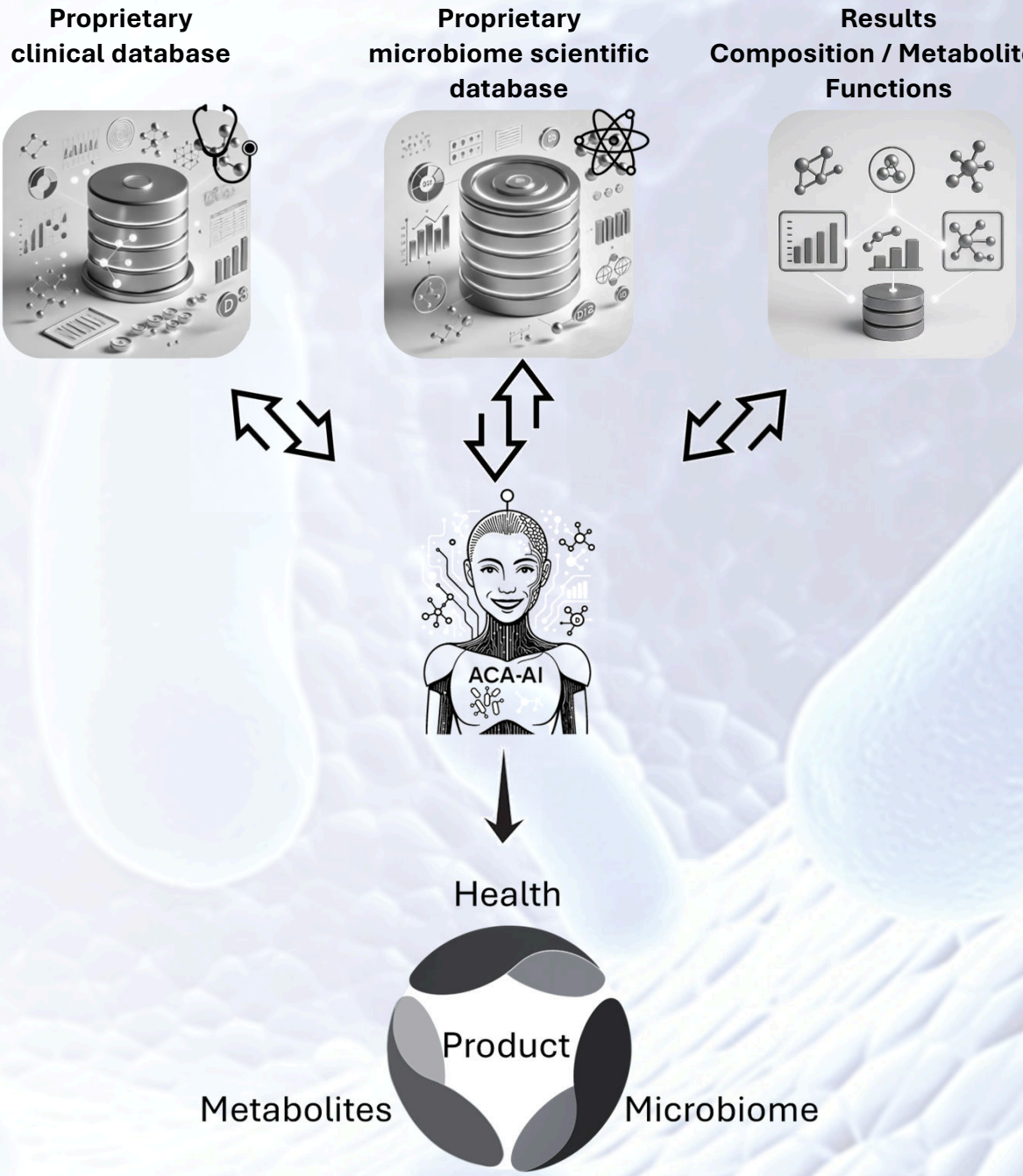
1. Keep the integrity of the gut microbiome.
2. Unique functional-analysis platform
3. Unique functional databases
4. Biology informed AI for biologically relevant insights

Publication: doi: 10.3389/fphar.2025.1569052.



ACA-AI

Our AI-driven analytical tools, powered by proprietary microbiome databases, provide unique and biologically relevant insights to guide product development and differentiation.



Metabolic Profiling

Beyond the ability of probiotic strains to produce health-promoting metabolites, probiotics, postbiotics, plant extracts and other bio actives can modulate the composition and activity of the gut microbiome, shaping its metabolic output.

By promoting a balanced microbial community and enhancing the production of beneficial metabolites. These ingredients can influence key physiological processes, ultimately contributing to improved overall health and disease prevention.

Metabolic Pathway	Key Microbial Metabolites	Associated Health Outcomes
Carbohydrate fermentation (saccharolytic fermentation)	Short-chain fatty acids (SCFAs): acetate, propionate, butyrate	↓ Inflammation, improved gut barrier, enhanced insulin sensitivity, energy metabolism
Protein fermentation (putrefaction)	Ammonia, indoles, phenols, p-cresol, hydrogen sulfide	↑ Colorectal cancer risk, gut inflammation, neurotoxicity
Bile acid metabolism	Secondary bile acids (deoxycholic acid, lithocholic acid)	Modulate lipid/glucose metabolism, carcinogenesis risk
Choline & L-carnitine metabolism	Trimethylamine (TMA) → TMAO (liver)	↑ Cardiovascular disease risk (atherosclerosis)
Polyphenol metabolism	Urolithins, phenolic acids	↓ Oxidative stress, ↓ inflammation, neuroprotection
Vitamin biosynthesis	B-vitamins (B12, folate, biotin, riboflavin, K2)	Supports energy metabolism, neurological function
Amino acid metabolism	Tryptophan metabolites (indole, indole-3-acetic acid, kynurenine)	Modulates mood, gut permeability, immune balance
Methanogenesis & hydrogen metabolism	Methane, hydrogen, hydrogen sulfide	IBS symptoms, constipation, altered fermentation balance
Lactate utilization & cross-feeding	Butyrate (from lactate cross-feeding)	Enhanced mucosal health, reduced inflammation
Neurotransmitter metabolism (gut-brain axis)	GABA (γ-aminobutyric acid), Serotonin (5-HT), Dopamine , Histamine, Acetylcholine	Regulates mood, stress, cognition, gut motility, and immune–neural signaling

Antimicrobial Properties

From Pathogen Elimination to Barrier Protection

Prebiotics, postbiotics, probiotics, plant extracts and other functional ingredients are well recognized for their antimicrobial potential, offering promising solutions to support the fight against pathogens.

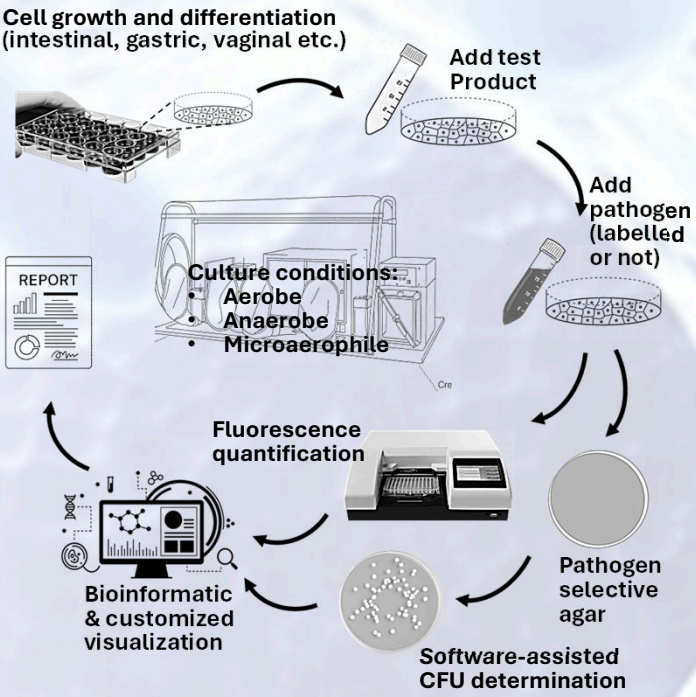
At ACARYON,

- We offer a comprehensive portfolio of in vitro screening and analytical assays designed to identify and characterize the antimicrobial properties of your products.
- Our expertise spans a wide range of bacterial pathogens, toxins and viruses, providing deep insights into modes of action and application potential.
- In addition to human intestinal cell line models, we employ gastric and vaginal epithelial models, as well as animal intestinal epithelial cell models (including porcine, feline, canine and equine models).

ACARYON is an accredited S2 laboratory, authorized to work with pathogens of risk classes 1, 2, and 3**.
We are committed to ensuring the integrity, reliability, and traceability of all data. Our Quality Management System is based on ISO 9001:2015 standards.

01 Anti-Adhesion Assay

The Anti-Adhesion Assay evaluates the ability of a test compound to inhibit pathogen attachment to host epithelial cells.
In this assay, host cells are co-incubated with the pathogen and the test compound, and a reduction in the number of adherent pathogens reflects the compound's anti-adhesive activity.
Quantification of attached pathogens can be performed by colony-forming unit (CFU) counting or, when using fluorescently labeled pathogens, by fluorescence measurement.
The assay can be conducted in exclusion, competition, or displacement formats, enabling the distinction between mechanisms of adhesion inhibition.



The anti-adhesion assay serves as a valuable first-line screening tool for assessing antimicrobial properties. It reflects a product's ability to prevent pathogens from binding to host epithelial cells, regardless of the underlying mechanism.
Whether through direct antimicrobial activity, competitive exclusion, receptor blocking, or pathogen aggregation.
Follow-up assays can then be applied to further elucidate the mode of action.

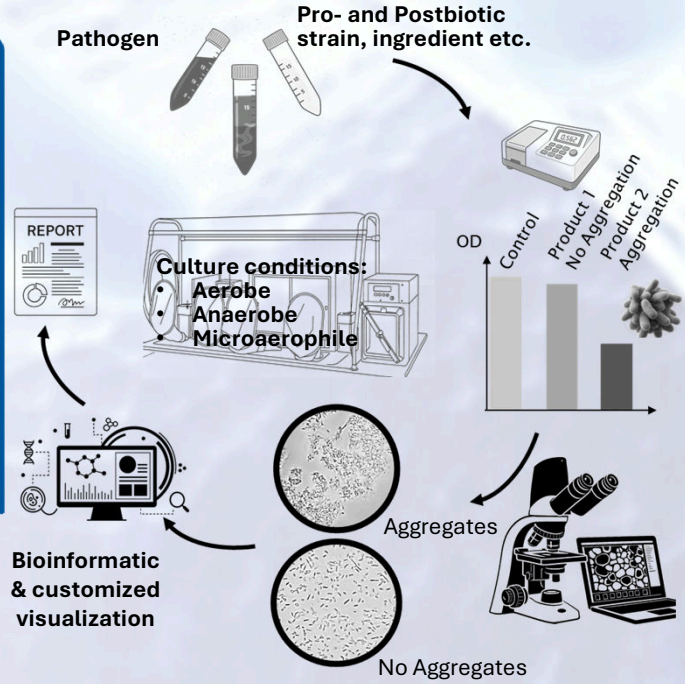
Example of available cells:

- Human intestinal cells line (Caco-2, HT29, HT29-MTX, T84)
- Human Gastric cell line (MKN-45),
- Human vaginal cell line (VK2/E6E7)
- Human skin cells (HaCaT, sebocytes SZ95, Dermal fibroblasts NHDF)
- Porcine intestinal cell line (IPEC-J2)
- Feline intestinal cell line (immortalized intestinal cells)
- Primary cells (intestinal canine cells

NEW OPTION: Now also available for protozoan parasites!

02 Aggregation Assay

The Aggregation Assay evaluates the ability of a test compound to induce clumping (aggregation) of pathogenic microorganisms.
In this assay, the test product is mixed with a suspension of the target pathogen, and the degree of aggregation is monitored visually and quantified spectrophotometrically over time.
This assay provides valuable insight into the product's ability to bind and immobilize pathogens, thereby reducing free and potentially infectious forms.



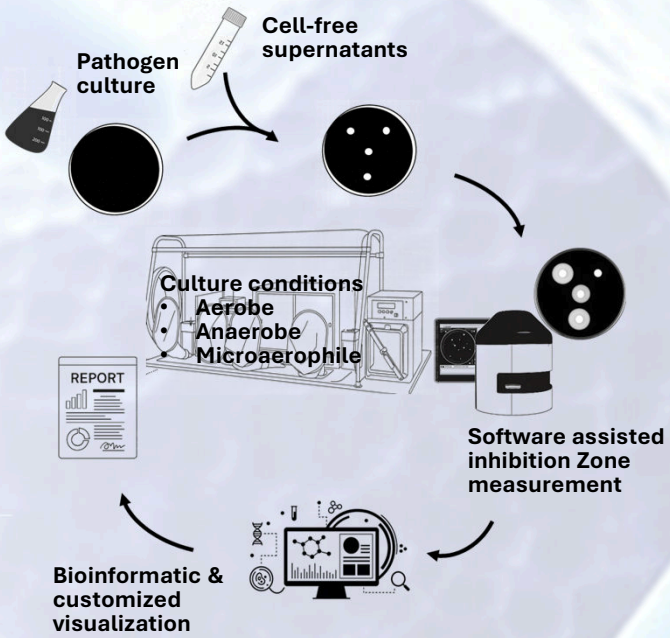
03 Overlay Assay

The Overlay Assay is a robust and versatile method for evaluating the antimicrobial activity of probiotic strains, independent of their specific mechanisms of action.
In this assay, probiotic colonies are first generated on an agar plate. The plate is overlaid with a soft agar layer containing the target pathogen, enabling direct interaction between the live probiotic cells and the pathogen.
Antimicrobial activity is visualized as inhibition zones surrounding the probiotic colonies, and the antimicrobial potential is quantified by calculating the ratio of inhibition zone diameter to colony diameter. This provides a standardized and comparable measure of efficacy.

Direct antimicrobial (e.g., bacteriocin production) and antagonistic effects (pH shifts, nutrient depletion etc.) can be tested for probiotics, supernatants of probiotic cultures cultivated with or without additional product (pre-, probiotic, plant extract, functional ingredients).

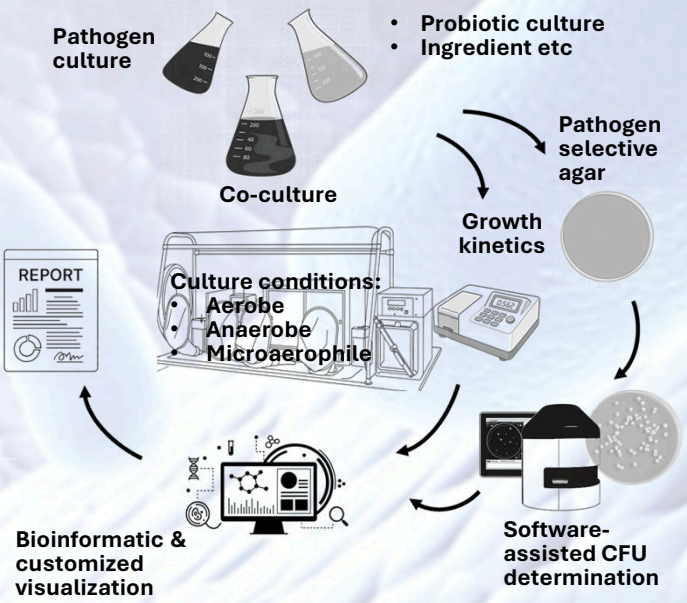
04 Disk/Well Diffusion Assay

This assay evaluates both classical antimicrobial activity (e.g., bacteriocin production) and indirect antagonistic effects of probiotic strains.
Cell-free supernatants (with or without pH adjustment) are collected from probiotic cultures.
A suspension of the target pathogen is uniformly spread onto an agar plate, and the supernatant is applied either to sterile paper disks placed on the surface or directly into agar wells.
Antimicrobial activity is visualized as clear inhibition zones, and the antimicrobial potential is quantified by calculating the ratio of inhibition zone diameter to well or disk diameter, providing a standardized and comparable measure of efficacy.



05 Co-Culture Assay

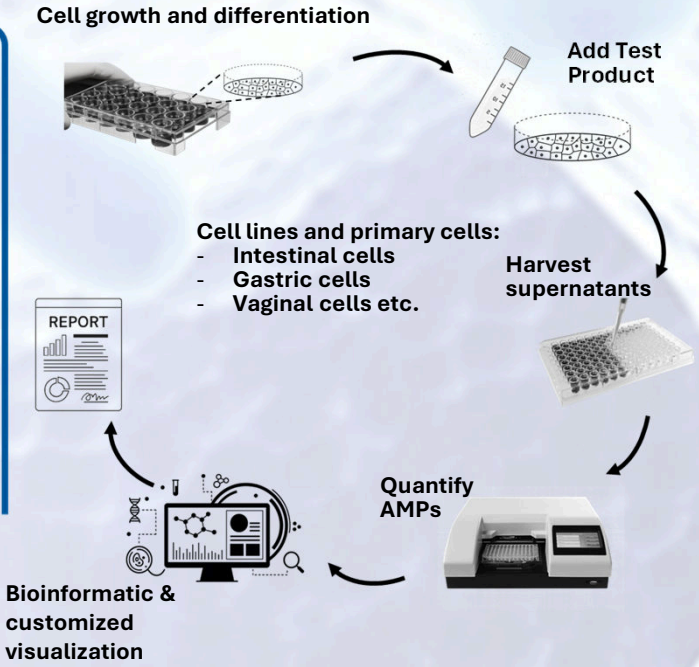
The Co-Culture assay is designed to evaluate the antimicrobial and antagonistic properties of a test product, allowing distinction between inhibitory and lethal effects.
The test product may consist of a probiotic strain, its cell-free supernatant, or any functional ingredient.
In this assay, a standardized pathogen culture is exposed to the test product under controlled conditions. Samples are collected at defined time points, and pathogen growth is quantified by spectrophotometric analysis and colony-forming unit (CFU) determination. This approach provides dynamic insight into the kinetics and magnitude of antimicrobial activity.



NEW OPTION: Now also available for protozoan parasites!

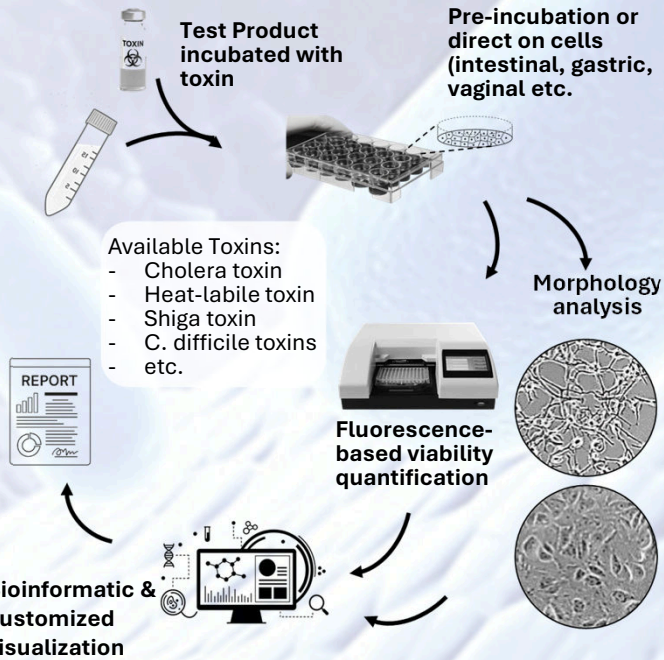
06 AMP Production Assay

This assay evaluates a compound's ability to stimulate the secretion of antimicrobial peptides (AMPs) produced by epithelial cells.
In this assay, intestinal epithelial cells are incubated with the test product under controlled conditions. After incubation, the cell culture supernatant is collected, and the levels of specific AMPs (such as defensins, cathelicidins or REG3γ) are quantified using enzyme-linked immunosorbent assay (ELISA).
Increased AMP production indicates a product's potential to enhance epithelial defense mechanisms and support host protection.



07 Anti-Cytotoxicity Assay

Probiotics, postbiotics, and functional ingredients may exert antimicrobial effects by preventing toxin binding to epithelial cells (intestinal, gastric, vaginal, etc.), either through direct interaction with the toxin or by modulating host cell surface properties.
In this assay, the ability of the test product to prevent toxin-induced cytotoxicity and/or inhibit cytokine binding is evaluated using morphological analysis and/or quantitative assessment of cell viability or toxin binding.
Multiple assay variants are available to accommodate specific research objectives.

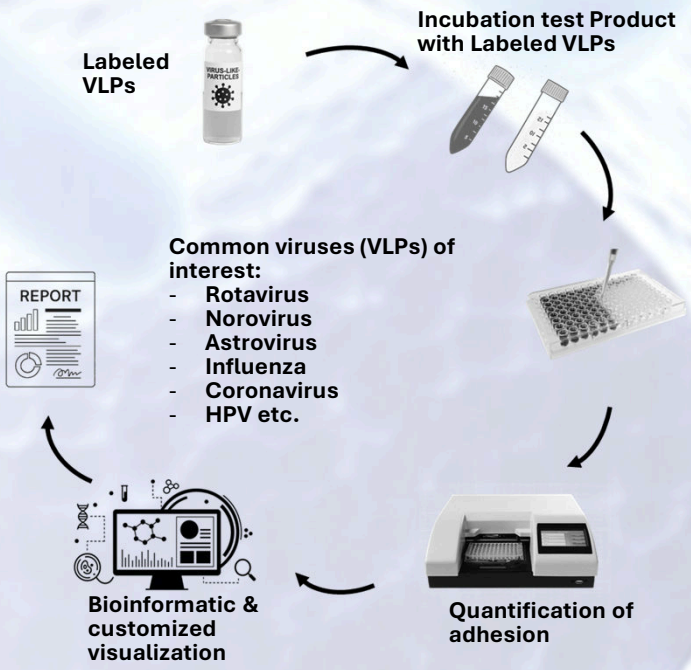


For screening purposes, labeled toxins can be used to enable rapid, cost-effective identification of compounds with toxin-binding potential

08 Virus Binding Assay

Probiotics, postbiotics, and functional ingredients may reduce infection risk by directly binding to viral particles. In this assay, the test product is incubated with labeled Virus-Like Particles (VLPs). After incubation, unbound VLPs are removed by separating the supernatant.
Bound VLPs are then detected using proprietary ELISA assays.

Complementary cell-based assays for virus-specific anti-adhesion are also available. Please contact us for customized solutions tailored to your research needs.

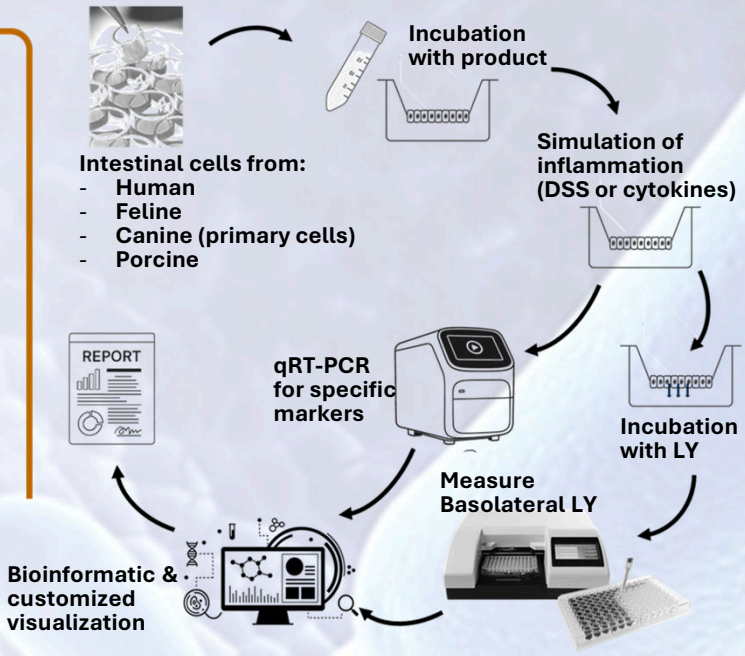


The Intestinal Barrier Integrity

The intestinal epithelial barrier plays a vital role in maintaining health by regulating the selective passage of nutrients while preventing the entry of pathogens and harmful substances. Disruption of this barrier, often referred to as “leaky gut”, can result in low-grade chronic inflammation.
This dysfunction is implicated in a range of gastrointestinal and systemic disorders, including inflammatory bowel disease (IBD), type 1 diabetes, celiac disease, and multiple sclerosis.

09 Permeability Assay

This assay evaluates the ability of a test compound to maintain or restore intestinal barrier integrity.
Differentiated intestinal epithelial monolayers are exposed to dextran sulfate sodium (DSS) or a cytokine cocktail to induce inflammation and disrupt barrier function.
The protective effect of the test product is quantified by measuring Lucifer Yellow (LY) permeability and/or by analyzing the expression of tight junction markers.
The test compound can be applied before, during or after inflammation induction (leaky gut model), depending on the experimental design and intended readout.

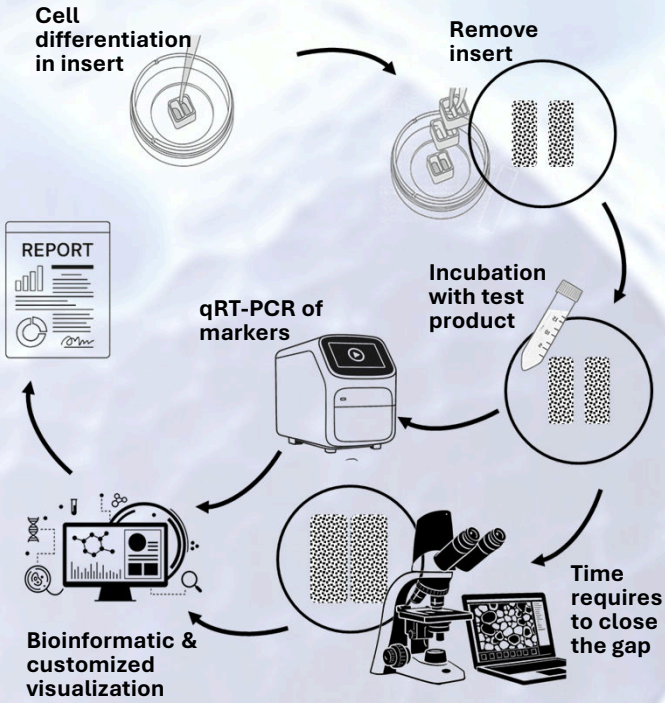


The permeability assay can be run under physiological conditions and simulated inflammatory or infectious conditions, such as bacterial infection (e.g., LPS) or viral infection (e.g., poly I:C).

Assay can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

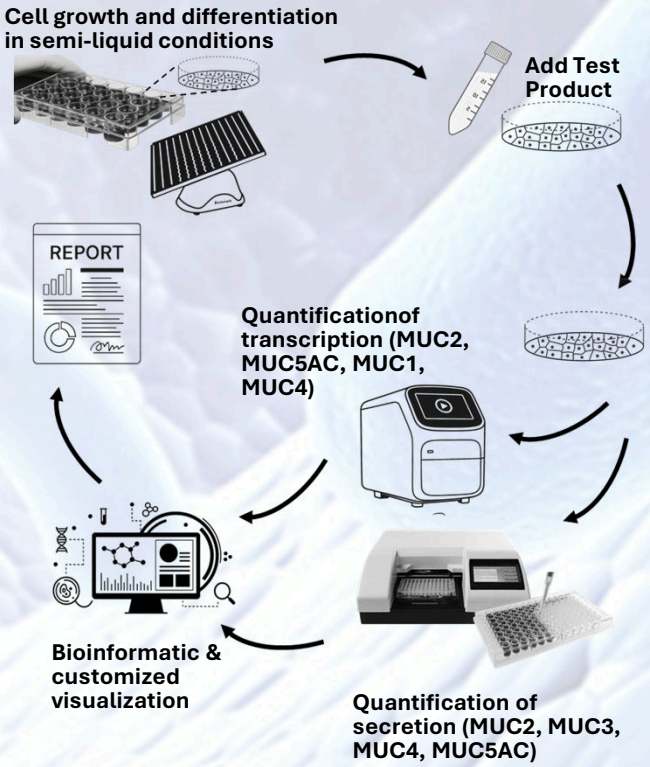
10 Wound Healing Assay

The intestinal epithelium renews itself every 3–5 days, requiring precise regulation of cell proliferation, differentiation, and wound healing to maintain tissue integrity.
This assay evaluates the ability of products to promote epithelial repair.
Intestinal epithelial cells are cultured and differentiated using the ibidi Culture-Insert 2-Well system, which creates a standardized, cell-free "wound" area. Following barrier removal, gap closure is monitored microscopically over time, providing a quantitative measure of cell migration and regeneration. Optionally, the expression of repair and proliferation markers can be analyzed by qRT-PCR.



11 Mucus Production Assay

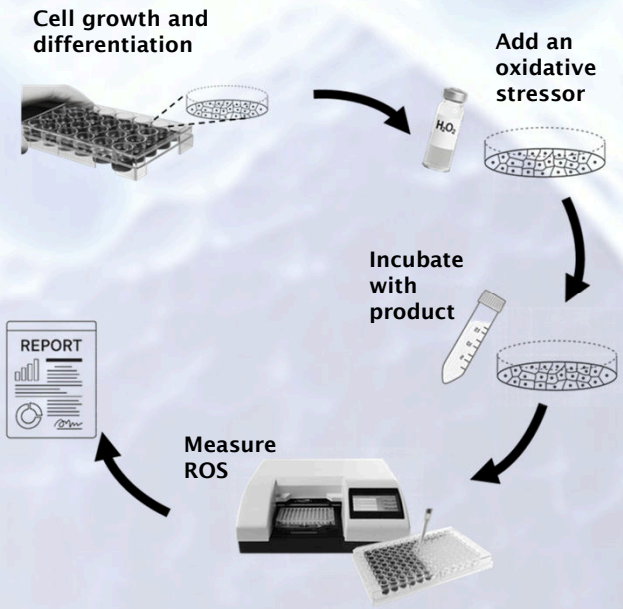
The Mucus Production Assay evaluates a compound's ability to stimulate mucin secretion by epithelial cells. In this assay, HT29-MTX intestinal epithelial cells are cultured under semi-liquid conditions with mechanical stimulation to promote mucus formation. Mucin expression can be modulated by introducing inflammatory conditions (e.g., cytokine mix). The test product can be applied before, during, or after induction, depending on the desired readout. Mucus production is quantified using specific staining methods (Alcian Blue or Periodic Acid–Schiff), ELISA or RT-qPCR for mucin gene expression.



Assays can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

12 Anti Oxidative Stress Assay

Oxidative stress contributes to the development of intestinal pathologies such as inflammatory bowel disease (IBD) and colorectal cancer.
This assay evaluates the ability of a test compound to protect epithelial cells against oxidative stress. Epithelial cells are pre-incubated with the test product, then exposed to an oxidative stressor (e.g., H_2O_2 or AAPH) in the presence of a fluorescent probe (e.g., DCFH-DA).
The probe reacts with reactive oxygen species (ROS) to generate a measurable fluorescent signal, reflecting intracellular oxidative activity.



Immune Hemostasis

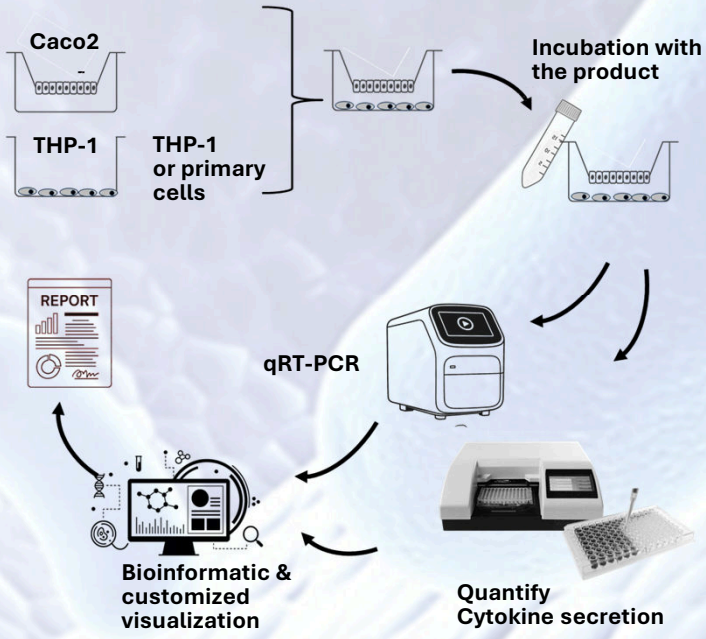
Functional ingredients such as probiotics, postbiotics and plant extracts can significantly influence the immune system, either directly or by shaping the composition and activity of the gut microbiome. Their effects extend across both innate and adaptive immunity, modulating key processes such as cytokine production, macrophage polarization, and phagocytic activity.

At ACARYON,

- we have developed a comprehensive panel of assays to assess a broad spectrum of immune responses.
- Most tests can be performed under physiological conditions or under conditions simulating inflammation, bacterial infection, or viral challenge. Thus, providing flexible and relevant insights into immunomodulatory mechanisms.

13 Cytokine Profiling (innate immune response)

The Caco2/THP-1 co-culture model is a well-established *in vitro* system that mimics the interaction between intestinal epithelial cells and subepithelial macrophages, thereby reproducing key aspects of the innate immune response to intestinal compounds. Test products are applied to the co-culture, and after incubation, cytokine secretion (via ELISA) and gene expression (via qRT-PCR) are quantified to characterize their immunomodulatory effects.
In addition to the human Caco2/THP-1 model, animal-derived cells or primary cell systems can be employed to meet specific research objectives.

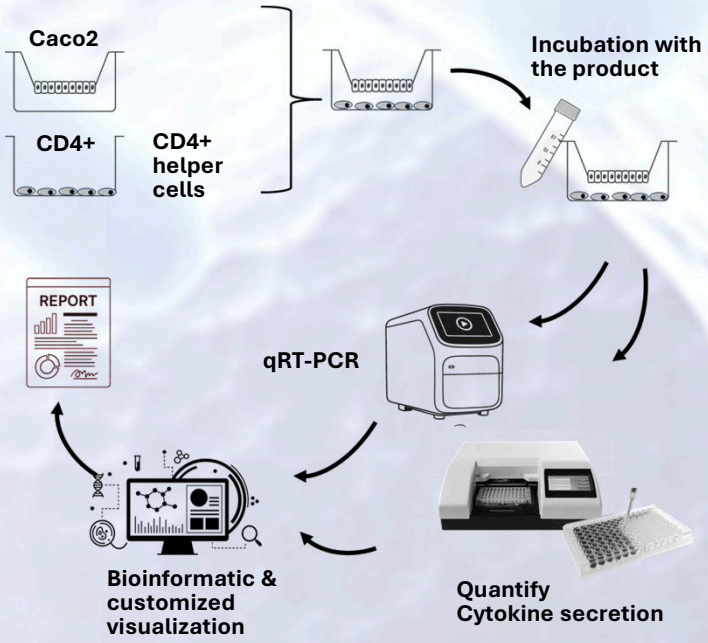


Caco2-THP-1 model may be pre-treated to stimulate pro-inflammatory conditions (recommended way to identify anti-inflammatory properties).

Assay can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

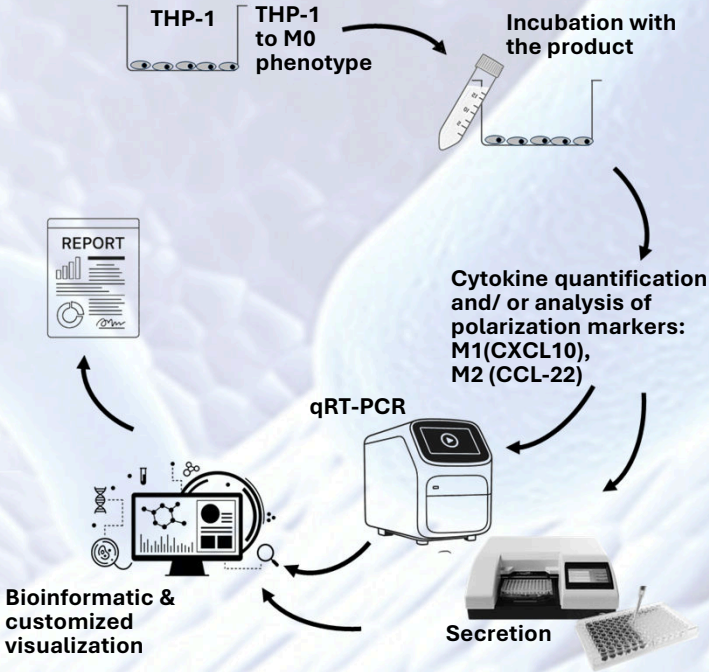
14 Cytokine Profiling (adaptive immune response)

The Caco2/CD4+ T-cells co-culture model is a well-established *in vitro* system that mimics the interaction between intestinal epithelial cells and subepithelial T-helper cells, thereby reproducing key aspects of the adaptive immune response to intestinal compounds.
Test products are applied to the co-culture, and after incubation, cytokine secretion (ELISA) and gene expression (qRT-PCR) are quantified to characterize their immunomodulatory effects.
In addition to the human Caco2/CD4+ model, animal-derived cells or primary cell systems can be employed to meet specific research objectives.



15 Macrophage Polarization

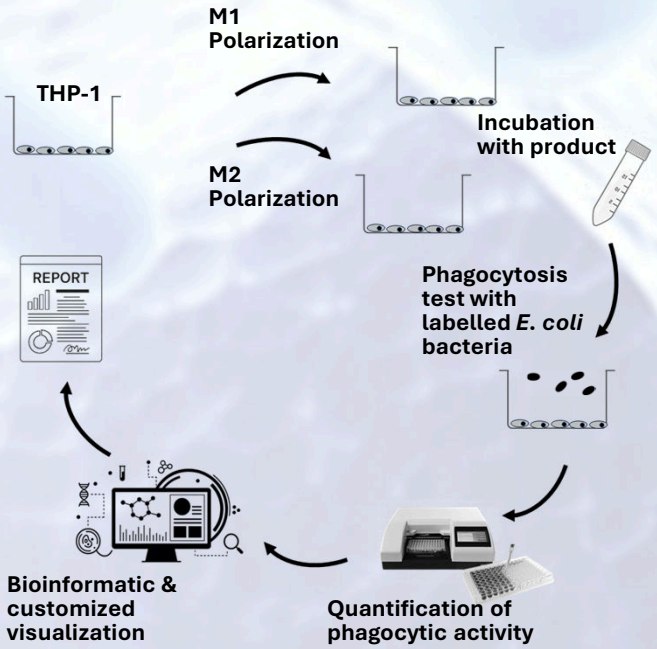
THP-1 cells can be differentiated into M0, M1, or M2 macrophages. M1 macrophages are pro-inflammatory and linked to immune activation, while M2 macrophages are anti-inflammatory and predominantly located in the intestinal lamina propria.
Assessing a product's ability to modulate macrophage polarization provides valuable insight into its immunomodulatory properties. In this assay, THP-1-derived M0 macrophages are incubated with the test compound. Following incubation, phenotype-specific markers are quantified. Optionally, cytokine secretion profiles can be analyzed.



Assays can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

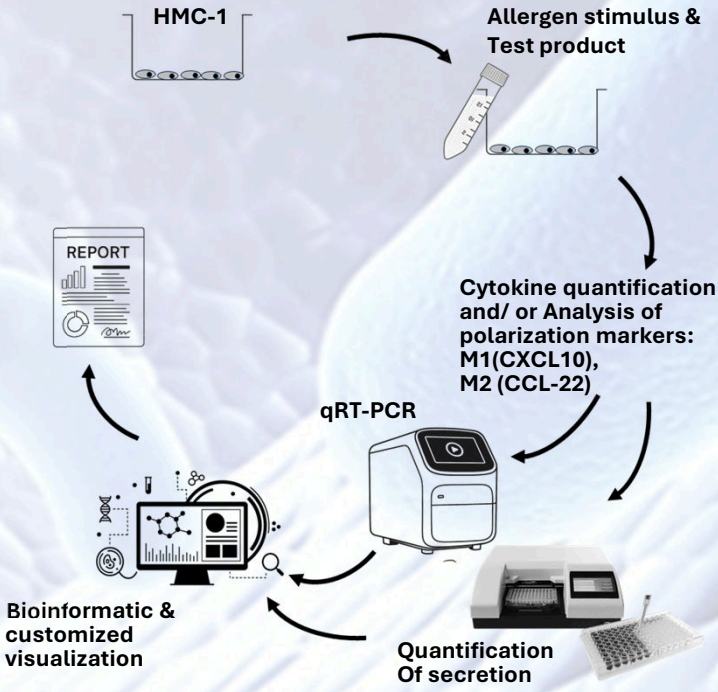
16 Macrophage Phagocytic activity

Macrophage-mediated phagocytosis is a key mechanism of mucosal immune defense. Distinct macrophage subsets exhibit specific functional profiles: M1 macrophages are highly microbicidal and secrete pro-inflammatory cytokines, whereas M2 macrophages are primarily involved in immune regulation and tissue repair.
In this assay, macrophages are incubated with the test product prior to exposure to fluorescently labeled *E. coli*. Phagocytic activity is quantified by measuring the uptake of labeled bacteria, providing insight into the immune-modulating potential of the tested compound.



17 Anti-Allergic Properties

We use HMC-1 cells to model mast cell–mediated allergic responses, providing insight into how test products may reduce allergic inflammation, stabilize mast cells, and attenuate mediator release (key aspects of anti-allergy mechanisms).
In this assay, the effect of the test product on the release of β-hexosaminidase and histamine in response to specific stimuli (e.g., PMA / ionomycin) is evaluated.
Additionally, changes in cytokine production (e.g., IL-4, IL-6, TNF-α) can be quantified to further characterize the product's immune modulatory potential.



Assays can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

Weight Management

Maintaining a healthy weight is a multifactorial challenge influenced by appetite regulation, fat metabolism, and nutrient absorption.

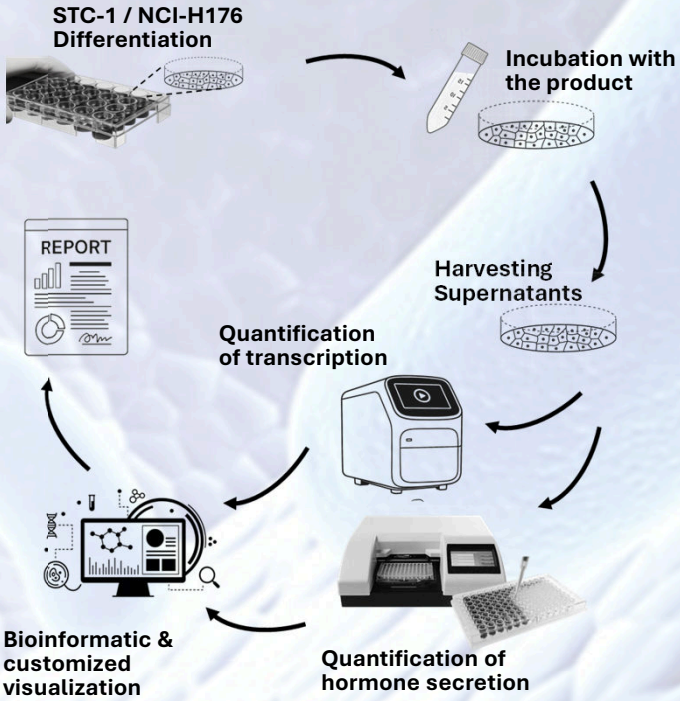
Functional ingredients such as probiotics, postbiotics, plant extracts and other bioactives are increasingly recognized for their potential to support weight management through diverse biological mechanisms.

They can affect the release of key satiety hormones, influence lipid accumulation and leptin signaling in fat cells, and bind dietary cholesterol and fatty acids in the gut.

Consequently, these products may offer promising strategies for addressing overweight and obesity through natural, targeted approaches.

18 Satiety-Related Hormone Release

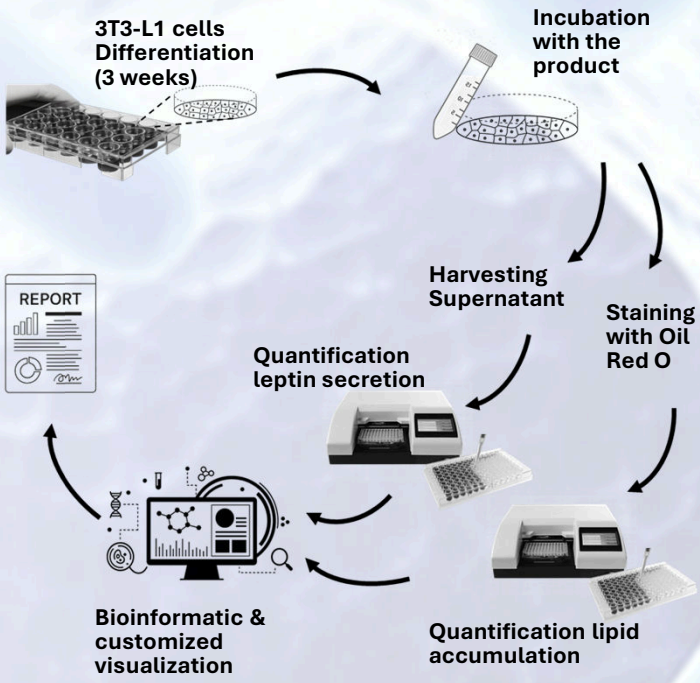
The STC-1 cell line exhibits key characteristics of native intestinal enteroendocrine cells and is a well-established *in vitro* model for studying the expression and secretion of satiety-related hormones such as GIP, CCK, GLP-1, and PYY.
Probiotics, postbiotics, and functional ingredients can modulate the release of these hormones, influencing appetite regulation.
In this assay, differentiated STC-1 cells are incubated with the test product(s).
To characterize the product's appetite-modulating properties, hormone secretion is quantified by ELISA and gene expression can be assessed by qRT-PCR.



Assay can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!
The human cell line NCI-H716 is also available.

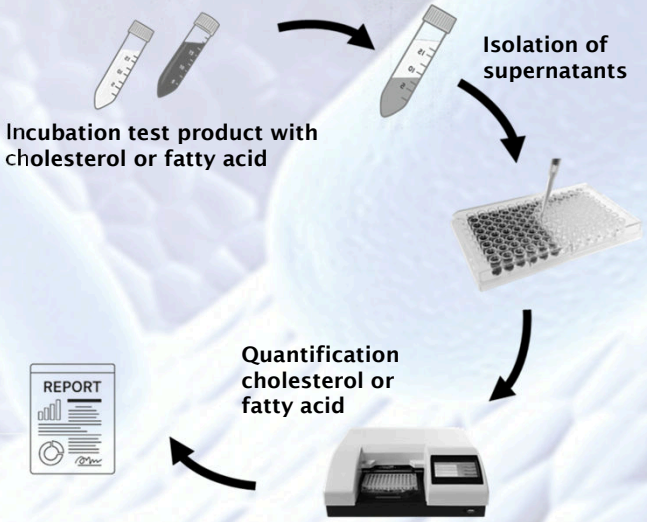
19 Lipid Accumulation & Leptin Release

The 3T3-L1 cell line can be differentiated from preadipocytes into mature adipocytes and is widely used as an in vitro model for adipogenesis.
Postbiotics, probiotics, and functional ingredients may influence both lipid accumulation and the secretion of leptin, a key adipokine involved in appetite regulation.
In this assay, differentiated 3T3-L1 adipocytes are incubated with the test product(s).
Lipid accumulation is assessed by Oil Red O staining. Optionally, the culture supernatant can be collected for leptin quantification.



20 Cholesterol and Fatty Acid binding

High levels of triglyceride and/or cholesterol are among the most significant risk factors for cardiovascular disease.
Postbiotics, probiotics, and functional ingredients may decrease the triglyceride and/or cholesterol level via various mechanisms.
In this assay, the test compound is incubated with cholesterol or fatty acid. After incubation, the remaining unbound cholesterol or fatty acid in the supernatant is quantified to determine the binding properties of the tested product.

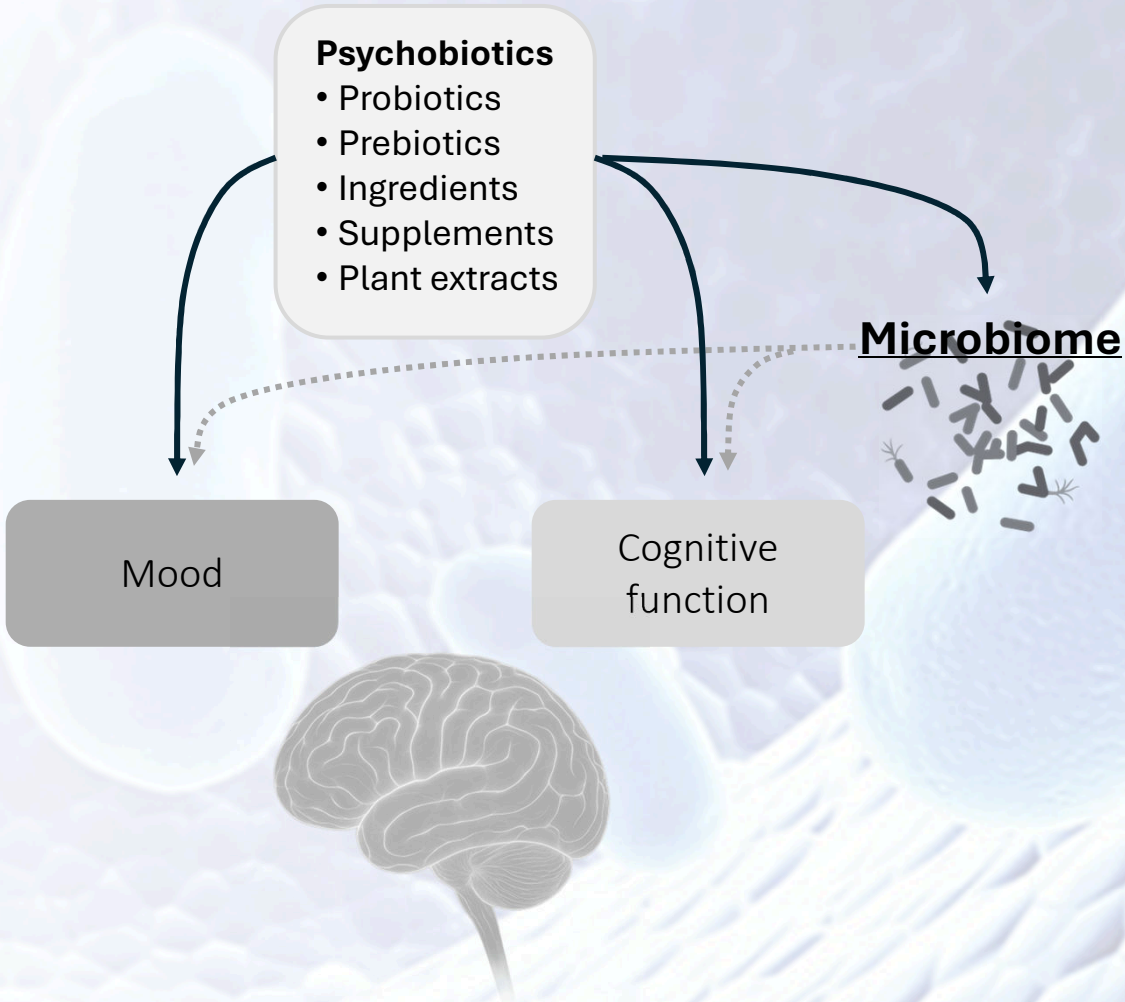


Assays can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

The Gut–Brain Axis integrates neural, immune, endocrine, and metabolic signaling pathways to regulate mood, cognition, and behavior.

Probiotics, prebiotics, nutritional ingredients, plant extracts, and dietary supplements may have psychobiotic properties, thereby modulating this axis.

Acting directly on intestinal and neuronal cells or indirectly through the gut microbiota, products can influence the production and release of key neurotransmitters such as serotonin, dopamine, norepinephrine, glutamate, and GABA.



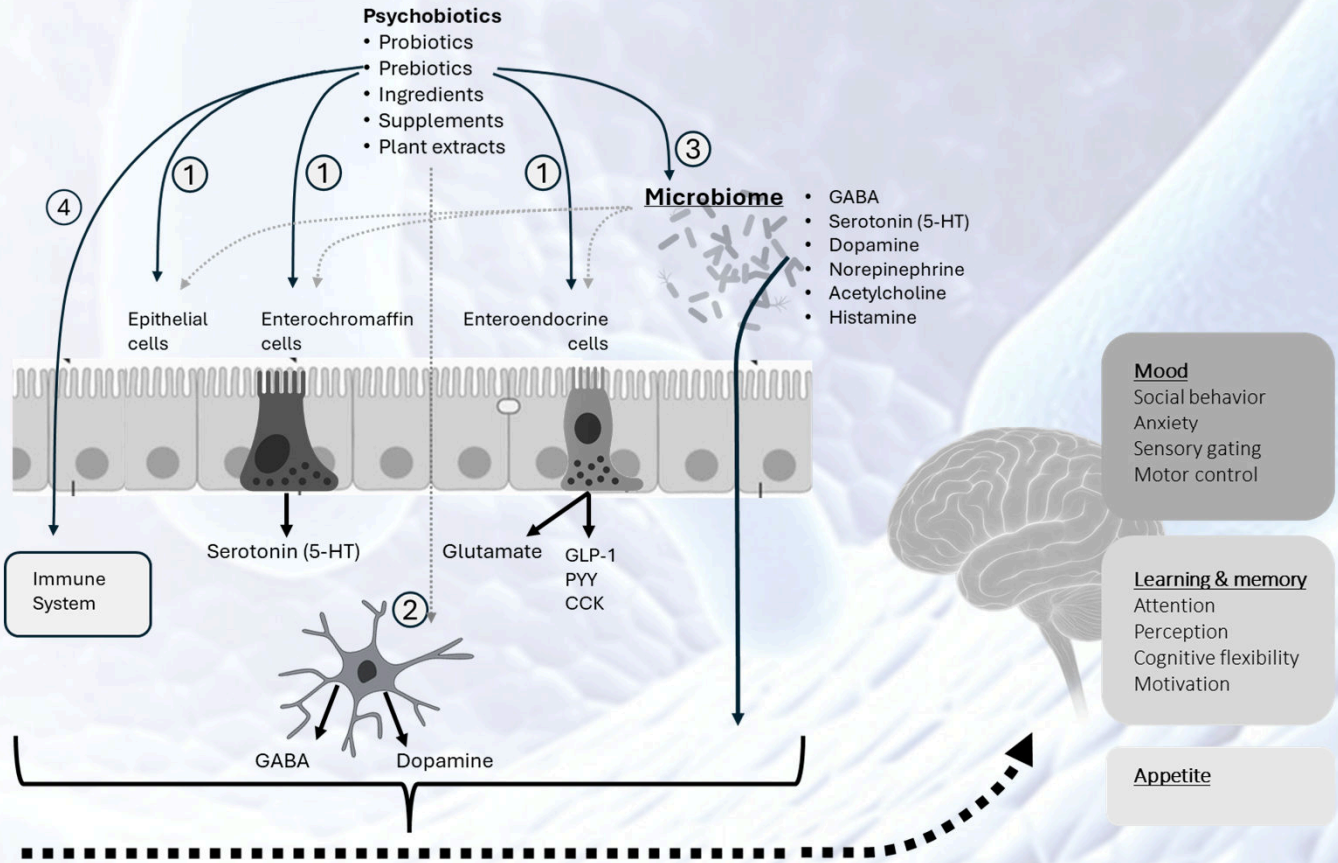
Products may impact fundamental neurophysiological and behavioral processes, through:

① Stimulating enterocytes, enterochromaffin (EC), and enteroendocrine (EEC) cells to secrete neurotransmitters and signaling peptides.

② Activating enteric neurons (ENS), leading to local neurotransmitter release and transmission of signals via the Vagus nerve to the brain.

③ Modulating the gut microbiome, enhancing its ability to produce neuroactive metabolites and/or further stimulate epithelial and neuronal communication.

④ Modulating the immune system by decreasing pro-inflammatory signaling and promoting an anti-inflammatory cytokine profile.

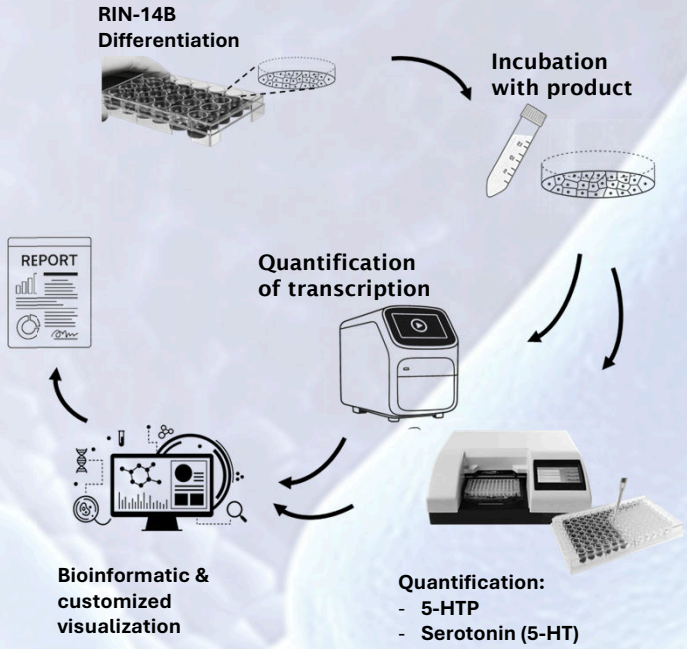


Enterochromaffin cells in the Gut-Brain Axis

The RIN-14B cell line is derived from rat intestinal neuroendocrine (enterochromaffin-like) cells and retains the ability to secrete key neuropeptides and hormones such as serotonin (5-HT).
It serves as a valuable *in vitro* model for studying the Gut–Brain Axis, particularly in assessing how bioactive compounds, probiotics, or postbiotics influence enteroendocrine signaling and serotonin-mediated communication between the gut and the nervous system.

21 Enterochromaffin cells Signaling

The differentiated RIN-14B cell line (enterochromaffin-like) retains the ability to secrete key neuropeptides and hormones such as 5-HTP a precursor of serotonin (5-HT).
This assay evaluates the impact of the test compound(s) on neurochemical signaling, especially the modulation of serotonin production.



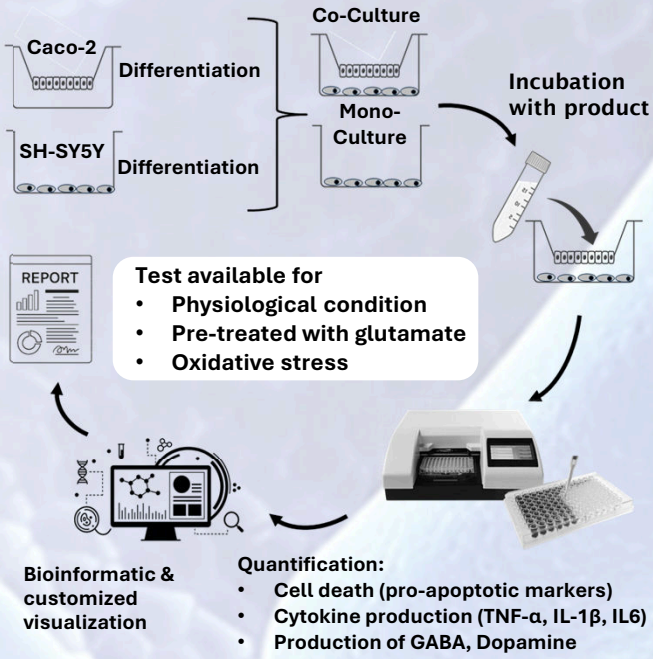
Assay can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

Enteric Neurons in the Gut-Brain Axis

The SH-SY5Y cell line is a human neuroblastoma-derived model that can be differentiated into neuron-like cells exhibiting functional and biochemical properties of enteric and central neurons.
It is widely used to investigate gut–brain axis mechanisms, enabling the study of how bioactive compounds, probiotics, or postbiotics influence neuronal viability, neurotransmitter signaling, and neuroinflammatory responses.

22 Enteric Neurons Signaling

The SH-SY5Y cell line can be differentiated into enteric neuron-like cells and serves as a widely used in vitro model to study the effects of test substances on the Gut–Brain Axis.
This assay evaluates the impact of the test compound(s) on cell viability and neurochemical signaling, including the modulation of pro-apoptotic markers, cytokines, and key neurotransmitters such as GABA and dopamine.
The assay can be performed using SH-SY5Y monocultures or co-culture systems. Optionally, cells can be pre-treated with glutamate to simulate depression- or mood disorder–like conditions.



Related Analyses

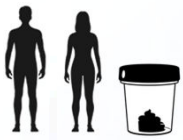
- **The Immune System:** The immune system modulates neuroinflammation, stress responses, and brain function via cytokines, immune cells, and microglial activation.
- **Intestinal Permeability:** Intestinal permeability is a key regulator of the Gut–Brain Axis. A “leaky gut” can trigger immune and neural pathways that can influence mood, cognition, and neuroinflammation.
- **Effect on the Microbiome:** The gut microbiome influences brain function and behavior through the production of neuroactive metabolites, neurotransmitters, and metabolite impacting the immune system and intestinal integrity.

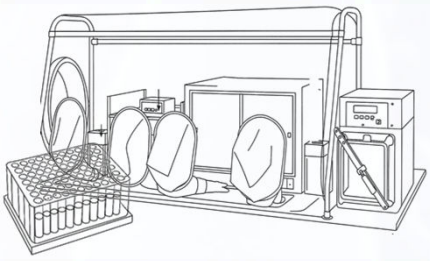
Assay can be run with supernatants of microbiome cultivated with the test substance (see HUMIPLATE)!

The effect of your product on the Gut-Brain Axis

Test Product

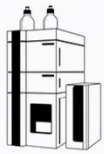
Effect on microbiome





Microbiome composition

- Genera producing SCFA
- Pro-inflammatory genera
- Mucosal protecting genera
- Tryptophan metabolizing genera
- etc.



Microbiome metabolites

- SCFA
- Neurotransmitters etc.

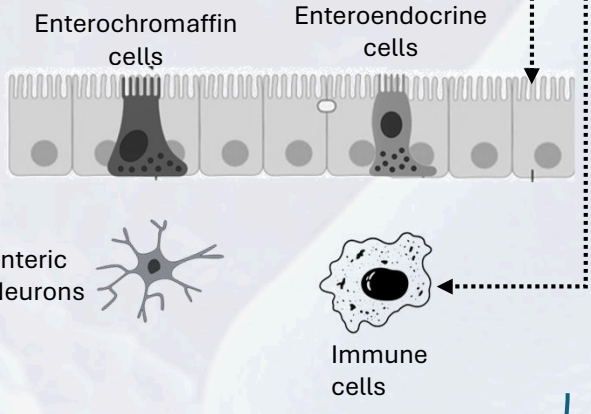
Microbiome functions

Effect on host

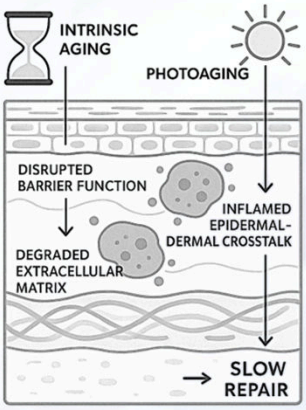
Neurotransmitter

Inflammation

Barrier Integrity



Skin aging arises from two intertwined processes: **Intrinsic aging** (time-driven cellular decline) and **photoaging** (UV/oxidative stress), both of which disrupt barrier function, inflame epidermal–dermal crosstalk, degrade extracellular matrix, and slow repair. The following in-vitro assays translate these hallmarks into measurable endpoints.

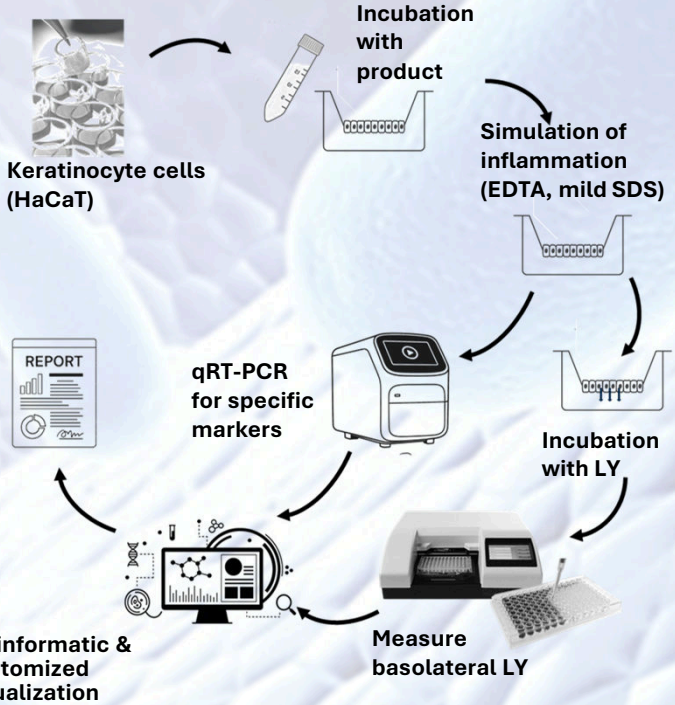


We assess the anti-aging properties of your product(s) by means of

- **Barrier integrity & permeability**
- **Anti-inflammatory properties**
- **Cell proliferation & apoptosis**
- **Resilience to Oxidative stress & UV damage**
- **ECM synthesis & remodeling**
- **Wound healing**

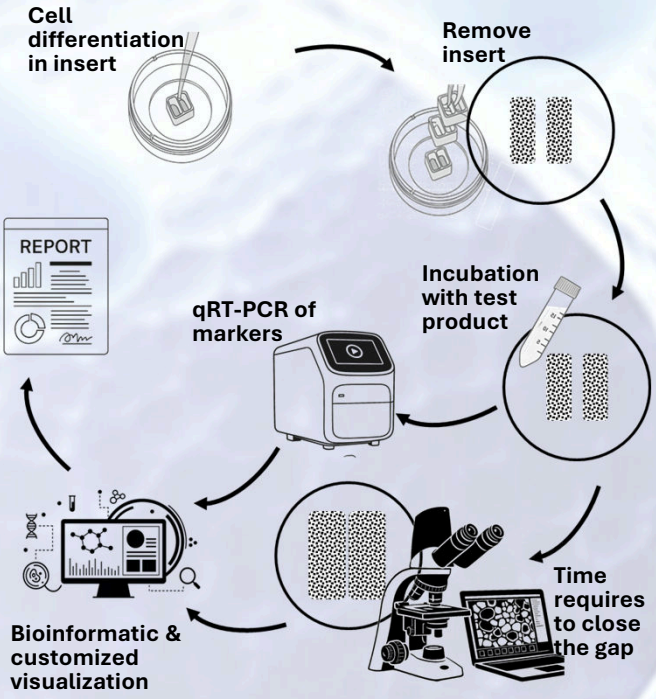
23 Permeability Assay

The skin epithelium serves as a critical barrier protecting the body from environmental stressors. Compromised barrier integrity can lead to inflammation, irritation, and chronic skin disorders.
This assay evaluates the barrier-protective properties of probiotics, postbiotics, or cosmetic ingredients on keratinocyte monolayers.
To simulate barrier disruption and inflammatory stress, monolayers are exposed to EDTA or SDS. The protective effect of the test product is quantified by measuring Lucifer Yellow (LY) permeability and, optionally, by analyzing the expression of barrier integrity markers.



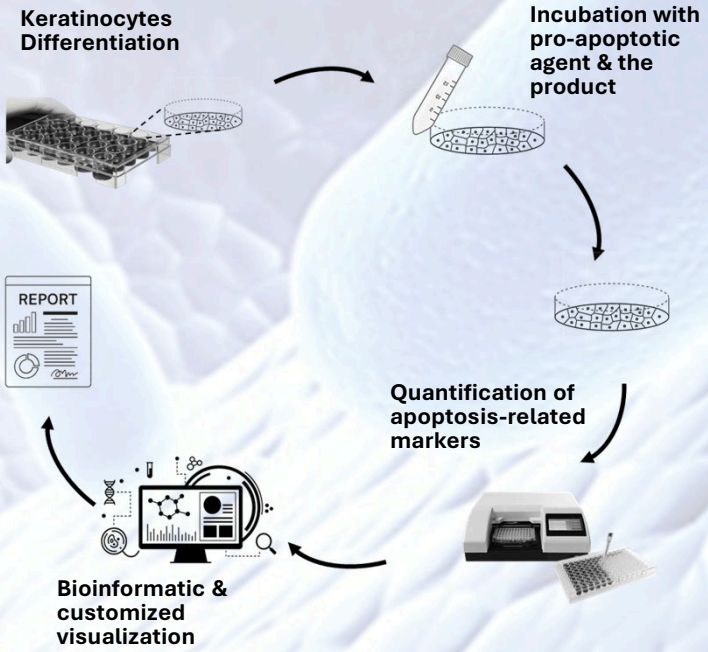
24 Wound Healing Properties

The skin epithelium continuously renews and repairs itself to maintain an effective barrier against environmental stressors.
This assay evaluates the ability of products to promote epithelial repair and regeneration. Keratinocytes are cultured and differentiated using the ibidi Culture-Insert well system, which creates a standardized, cell-free “wound” area.
Following barrier removal, gap closure is monitored microscopically over time, providing a quantitative measure of regenerative capacity. Additionally, the expression or secretion of healing-related and extracellular matrix (ECM) markers can be quantified.



25 Anti-Apoptotic Properties

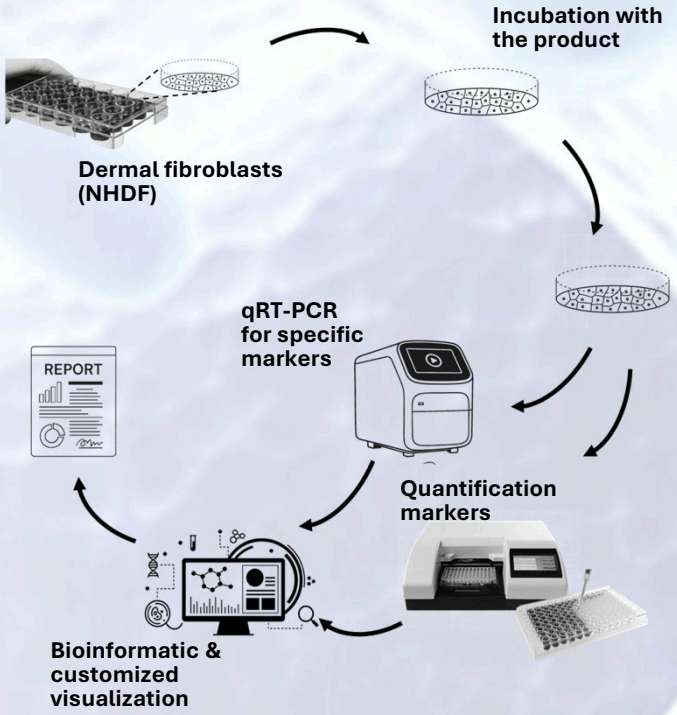
Excessive apoptosis in skin cells can compromise barrier integrity, accelerate skin aging, and impair tissue regeneration.
This assay evaluates the ability of products to protect keratinocytes against apoptosis induced by chemical or oxidative stress.
Keratinocytes are exposed to pro-apoptotic stimuli in the presence or absence of the test product. The anti-apoptotic effect is quantified by measuring cell viability and/or the expression of apoptosis-related markers (i.e. Cytochrome c, Bax).



26 Extracellular Matrix Synthesis

The extracellular matrix (ECM) provides essential structural and biochemical support to the skin, maintaining its firmness, elasticity, and tissue integrity. A decline in ECM synthesis or dysregulated remodeling contributes to skin aging, loss of elasticity, and impaired wound repair. This assay evaluates the ability of products to stimulate ECM synthesis and regulate matrix remodeling in dermal fibroblasts.

Cells are incubated with the test product under controlled conditions, and the expression or secretion of ECM components and remodeling markers (including pro-collagen I/III, fibronectin, hyaluronan, MMP-1/3/9) is quantified.



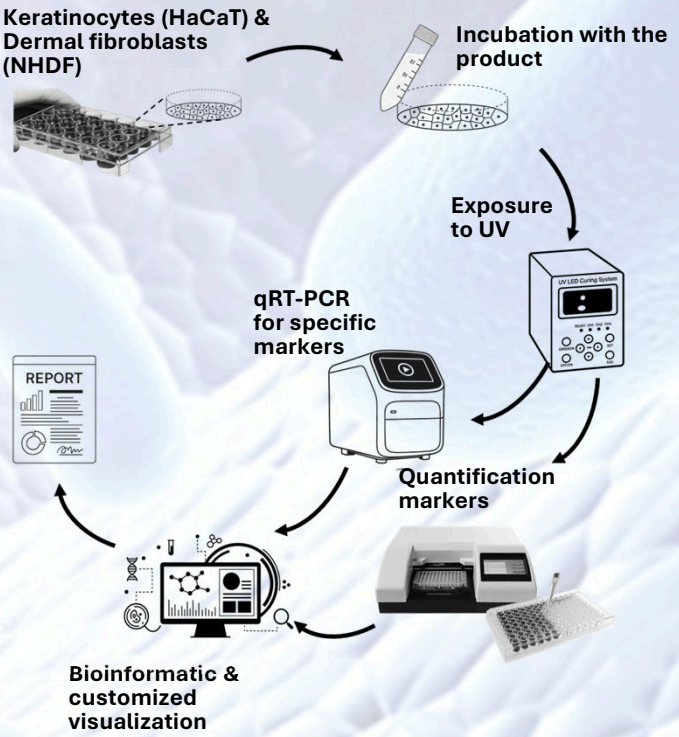
27 Oxidative & UV Protection

Exposure to ultraviolet (UV) radiation induces oxidative stress, DNA damage, and inflammation, accelerating skin aging and impairing barrier function.

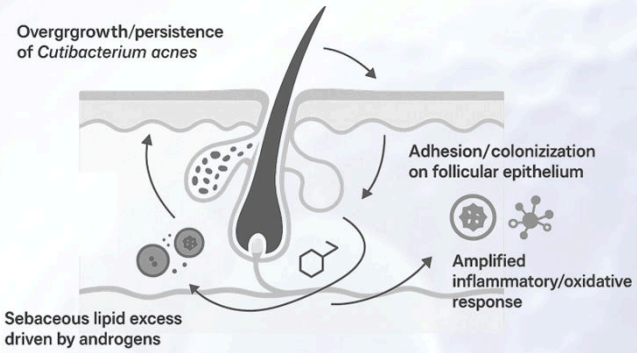
This assay evaluates the ability of products to protect skin cells against UV-induced damage.

Keratinocytes are exposed to UVA to assess barrier and antioxidant protection, while dermal fibroblasts are irradiated with UVB to evaluate anti-photoaging effects.

Cell viability, ROS generation (DCFDA, MitoSOX), and the expression of stress- and repair-related markers are quantified (CPDs, IL-6, IL-8, TNF-α, TSLP, pro-collagen I/III, MMP-1/3/9 etc).



Acne develops when four processes reinforce each other in the pilosebaceous unit: (1) overgrowth and persistence of Cutibacterium acnes, (2) adhesion/colonization of bacteria on follicular epithelium, (3) hyperkeratinization that narrows the follicular duct, (4) sebaceous lipid excess driven by androgens, and (5) an amplified inflammatory/oxidative response. Your assays map directly onto these levers and show whether a product can interrupt the cycle.



We assess the anti-aging properties of your product(s) by means of

- **Antimicrobial activity vs. *C. acnes***
- **Anti-Adhesion activity**
- **Hyperkeratinization**
- **ROS / oxidative stress**
- **Anti-lipogenesis in sebocytes**
- **Cell proliferation & apoptosis**
- **Anti-inflammatory activity**

28 Antimicrobial Properties

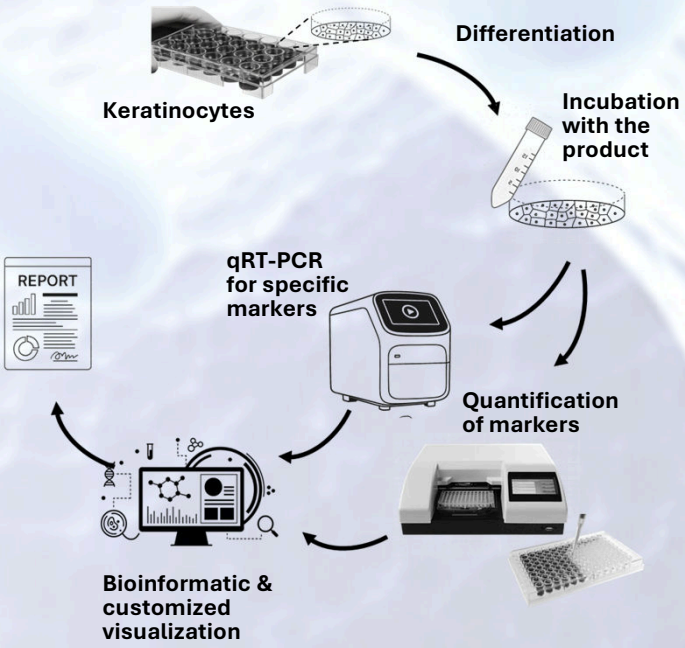
Cutibacterium acnes plays a central role in the development of acne.
This assay evaluates the antimicrobial and anti-adhesion properties of products against C. acnes using:
- Co-culture, well diffusion, or overlay methods to assess growth inhibition and bacteriostatic or bactericidal effects of the test product.
- Anti-adhesion assays to determine the ability of the test compound to prevent bacterial attachment to host cells.

The proposed assays correspond to those depicted in category antimicrobial properties under numbers:

01 03 04 05

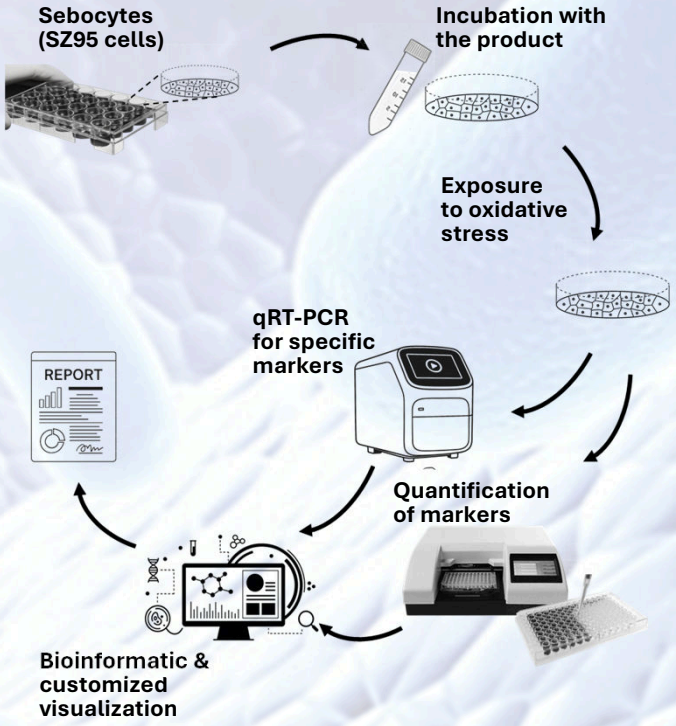
29 Hyperkeratinization & Barrier Properties

Excessive keratinization can lead to follicular occlusion, rough skin texture, and acne formation.
This assay evaluates the ability of products to modulate keratinocyte differentiation and support barrier homeostasis.
Keratinocytes are cultured under differentiation-inducing conditions in the presence or absence of the test product.
The expression of key keratinization and barrier markers (filaggrin, involucrin, loricrin, keratin 1/10) are quantified by qRT-PCR and/or immunostaining.



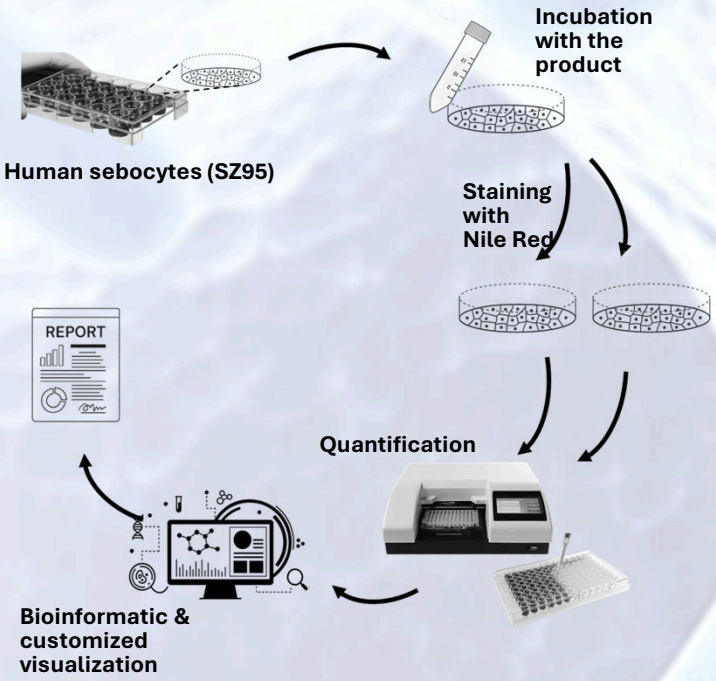
30 Anti-Oxidative Properties

Excessive Oxidative stress in sebocytes contributes to lipid peroxidation, inflammation, and acne.
This assay evaluates the anti-oxidative potential of products in human sebocytes (SZ95 cells). Cells are treated with the test product and exposed to oxidative stressors under controlled conditions. Global ROS levels are quantified using the DCFDA fluorescence assay.
Additionally, MitoSOX can be employed to detect mitochondrial superoxide, while TMRE or JC-1 assays assess mitochondrial membrane potential (ΔΨm) integrity.



31 Anti-Lipogenesis Properties

Excessive sebum production is a key factor contributing to acne formation and microbial imbalance. This assay evaluates the ability of products to inhibit lipogenesis in human sebocytes. Cells are treated with the test product under controlled conditions, and intracellular lipid accumulation is quantified by Nile Red neutral lipid staining, providing a direct measure of sebum synthesis.
In parallel, 5α-reductase activity, a key enzyme involved in androgen-mediated lipogenesis, is quantified to further characterize the product's sebum-regulating potential.



In vivo validation

After essential mechanistic insights have been gained through our laboratory in vitro models, in vivo validation is often necessary to confirm the physiological relevance of observed biological effects.

Benefit from our extensive experience in designing in vivo studies and from our strong partner network, enabling us to provide comprehensive in vivo testing solutions that support the development, differentiation, and regulatory substantiation of innovative functional ingredients.

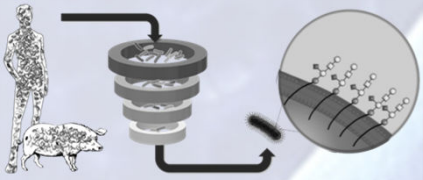
Through the integration of high-quality experimental design, advanced analytics, and rigorous scientific standards, we help transform promising concepts into validated, health-promoting products.

Customized Next Generation Post- and Probiotics

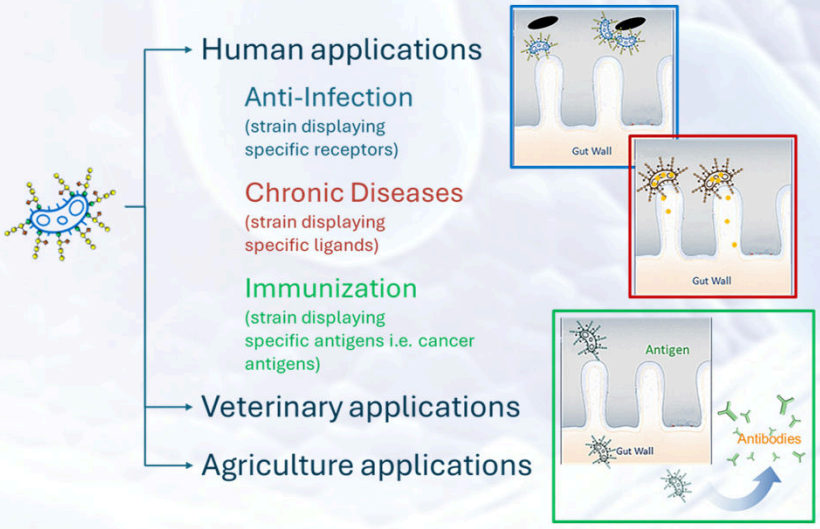
With a proven track record in developing next-generation pre-, post-, and probiotics, ACARYON leverages its proprietary MicroSIS platform, to deliver unmatched product differentiation and positioning.
Our end-to-end expertise across the entire development value chain ensures proactive planning, helping to avoid roadblocks and identify the optimal path forward, at every stage of innovation.

Come with your idea:

- **Based on our MicroSIS (Micro**organisms **S**pecific **I**solation and **S**election) platform we screen the microbiome for microorganisms naturally providing the property you are looking for.
- **Based on your own strain bank**: We screen it for strain expressing the needed structures



Broad application potential



Bacteria naturally expressing pathogen receptors

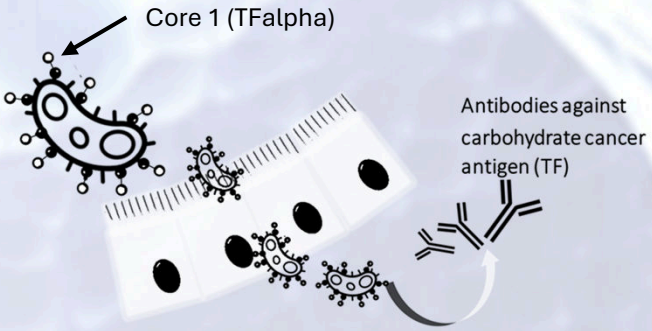
Bacteria naturally binding to specific location (i.e. IBD region)

Bacteria naturally expressing an antigen of interest

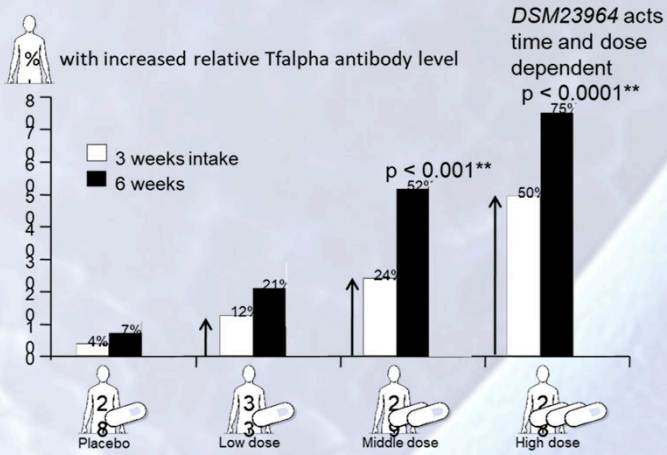
Example 1

First postbiotic with cancer preventive properties

- The commensal strain *B. xylanisolvens DSM23964 is* naturally expressing the cancer specific carbohydrate antigen TFα (core 1) on its surface.



- The intake of the strain was demonstrated to induce TFα specific antibodies in 2 clinical trials.



- The product received FDA-GRAS and EU Novel Food status

USA
GRAS (Generally Recognized as Safe)
APPROVED

EU
Novel Food
APPROVED

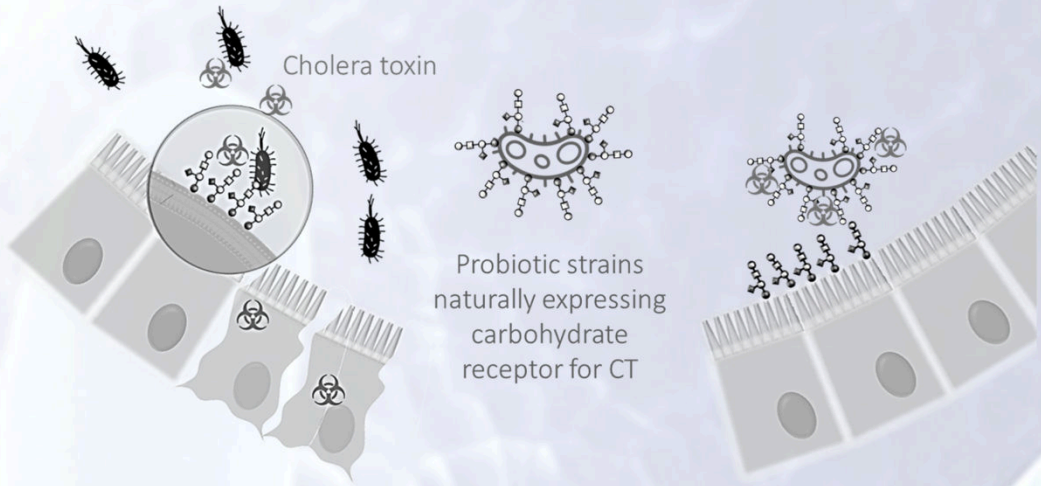
➢ **Publications/Patent**

- doi: 10.3920/BM2015.0143
- doi: 10.1016/j.yrtph.2011.10.014
- Microorganisms carrying a tumor antigen (PCT/EP2012/066360)

Example 2

First postbiotic against Cholera

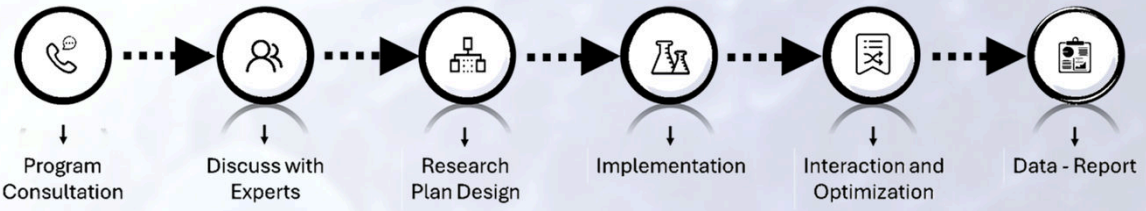
- A commensal strain naturally expresses a structure mimicking the Cholera-toxin-receptor was isolated and further developed.
- The strain limited cytotoxic effect of cells in an in vitro model.



Publication:
Binding and neutralizing the cholera toxin. Toutounian *et. al.* Human Microbiome Journal, Volume 18, December 2020 (https://doi.org/10.1016/j.humic.2020.100075)

Customized Assays

With over 20 years of scientific excellence, ACARYON offers tailored assay development across a wide spectrum of applications, including antimicrobial testing, immune modulation, gut health, and more.
Our expert team and modular analytical platform enable high-precision solutions for screening, product validation, and quality control.
Whether you're in early R&D or seeking regulatory support, ACARYON is your trusted partner in functional ingredient innovation.



Customized Product Development

With a proven track record in developing next-generation pre-, post-, and probiotics, ACARYON leverages its proprietary MicroSIS platform to deliver unmatched product differentiation and positioning.
Simplify to: Our end-to-end expertise ensures proactive planning and clear pathways from R&D to market.

At ACARYON, we leverage over 20 years of experience to deliver a unique broad portfolio of assays, providing integrated, end-to-end solutions for innovation, all under one roof.

With a strong track record of translating concepts into market-ready health solutions, from production to clinical validation and regulatory strategy, we understand the full complexity of innovation in health-related functional products.

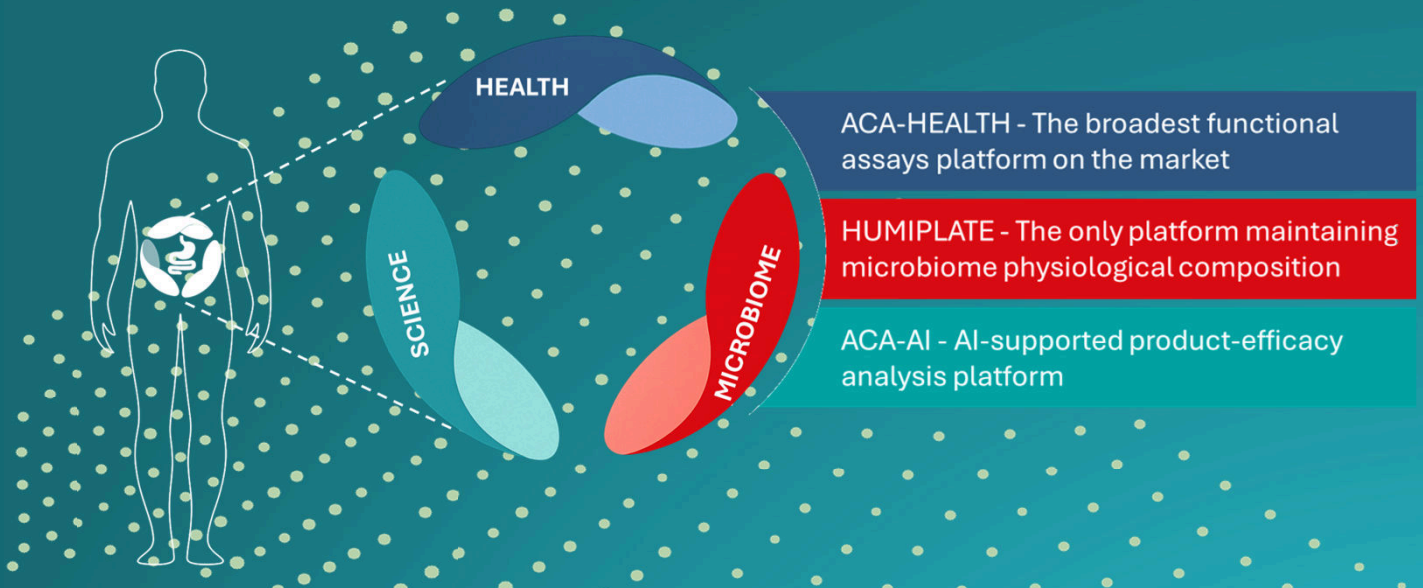
ACARYON accelerates innovation and bridges the gap between cutting-edge science and commercial success.

For further information please contact
Valerie Schaeffer
E-mail: valerie.schaeffer@acaryon.com
Web: www.acaryon.com

Bridging Science and Commercial Success

ACARYON

Bridging Science and Commercial Success



For further information please contact
Valerie Schaeffer
E-mail: valerie.schaeffer@acaryon.com
Web: www.acaryon.com

RESEARCH TAX CREDIT CIR ACCREDITED 2024 - 2026

BSL-2 ACCREDITED Biosafety LEVEL 2

BSL-3** ACCREDITED Biosafety LEVEL 3**