

# BRAIN Biotech AG

Creating a #BiobasedFuture

## Investor Relations Presentation 2023

Zwingenberg, January 2023



Since 2021 we have been committed to the UN Global Compact corporate responsibility initiative and its principles in the areas of human rights, labor, the environment and anti-corruption.



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# Safe Harbor Statement

This document may contain forward-looking statements. These forward-looking statements are subject to risks and uncertainties, as they relate to future events and are based on current assumptions of the Company, which may not occur at all in the future or may not occur as assumed. They do not represent a guarantee for future results or performance of the Company, and the development of economic and legal conditions may materially differ from the information expressed or implied in the forward-looking statements.

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# BRAIN at a Glance

~ **€50m**

'21/'22 Revenues

> **30**

Years of Experience

~ **330**

Employees

> **535**

Specialty B2B Products

> **150**

Industrial Partnerships

**2016**

Listed, Frankfurt Prime Standard

**Creating Breakthrough Bioproducts & Solutions for Nutrition, Health and Environment**

**Industrial Biotech  
(white)**



**Three  
Product Platforms**



**Enzymes**



**Microorganisms**



**Bioactive  
Natural  
Compounds**

**From Lab to Production**

# Mission & Vision

“Mission is what an organization is or does. Vision is what an organization desires to become”

## Mission

Creating Breakthrough Bioproducts and Solutions for Nutrition, Health and the Environment

## Vision

We will be the **Industrial/White Biotech Specialists** in finding and exploring high-value niches in our products business and novel solutions in our science business. We will be much more agile than others and will always look to produce products in-house or with partners

# When Should You **#Think BRAIN?** in the center of mega-trends

## Health & Nutrition

**Vegan & Vegetarian Food:** Alternative Protein Base  
(Precise Fermentation / Microbial Production Hosts)

**Healthy & Better Tasting Beverages:**  
Natural Flavors (like NatBev 1 & 2)

**All Natural Preservatives:**  
Perillic Active from Fermented Orange Oils

**Calorie-Free Natural Sweeteners:**  
Plantbased Sweeteners (Brazzein, Sweet Box)

**Healthy Food:**  
reduction of salt in foods (SALT-1)

**Biological Wound Care:**  
Biological Wound Management (Aurase/SolasCure)

## Creating a BiobasedFuture

**Genome Engineering:**  
Novel Non-Cas9 Nucleases

**Biological Production:**  
Enzymes & Large Scale Fermentation

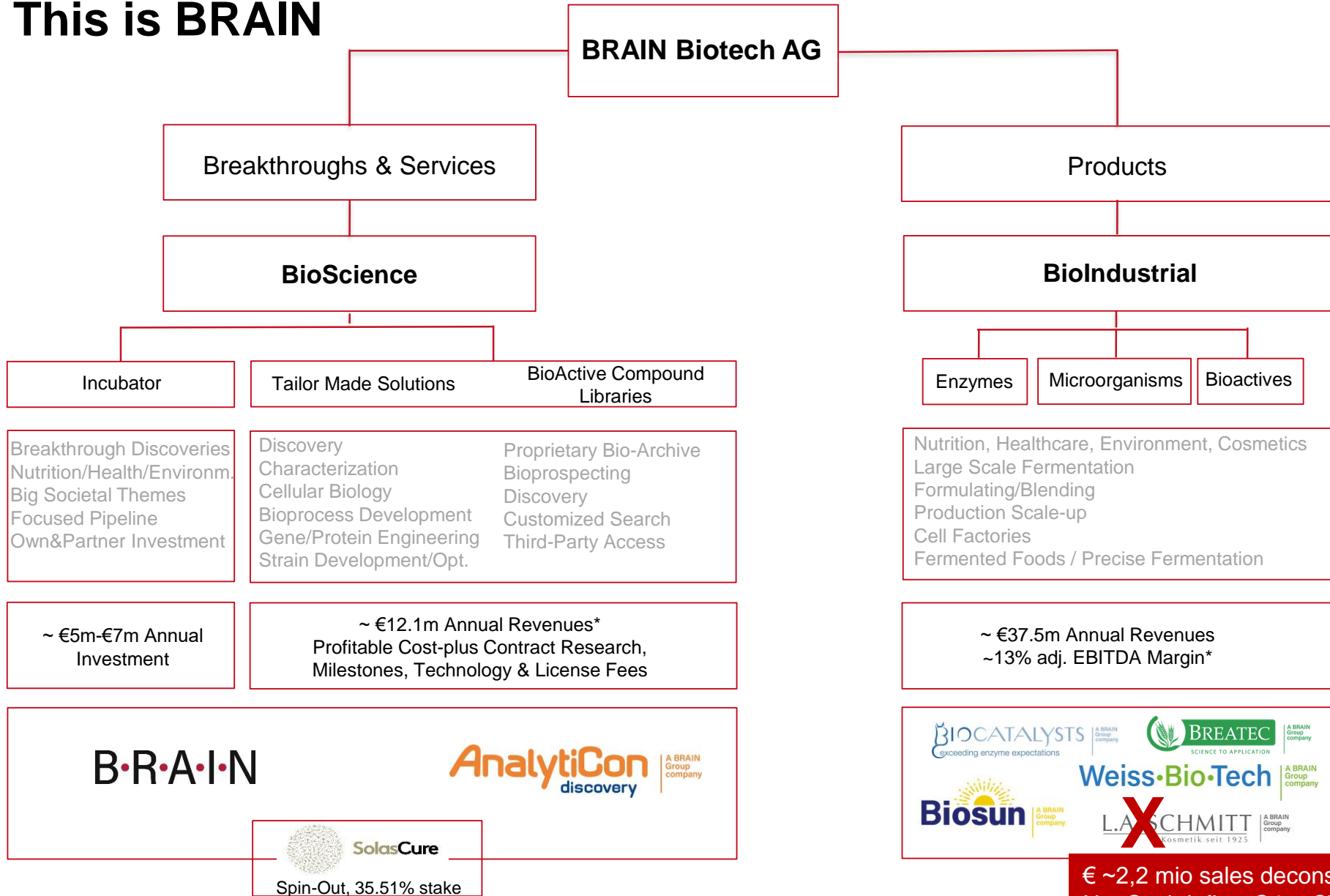
## Environment

**BioMining:**  
Sustainable Metal Extraction (Urban Mining)

**Biological Production:**  
Enzymes & Large Scale Fermentation

**Making Waste Valuable:**  
Fermented Food from Side Streams  
Microbial CO<sub>2</sub> Usage

# This is BRAIN

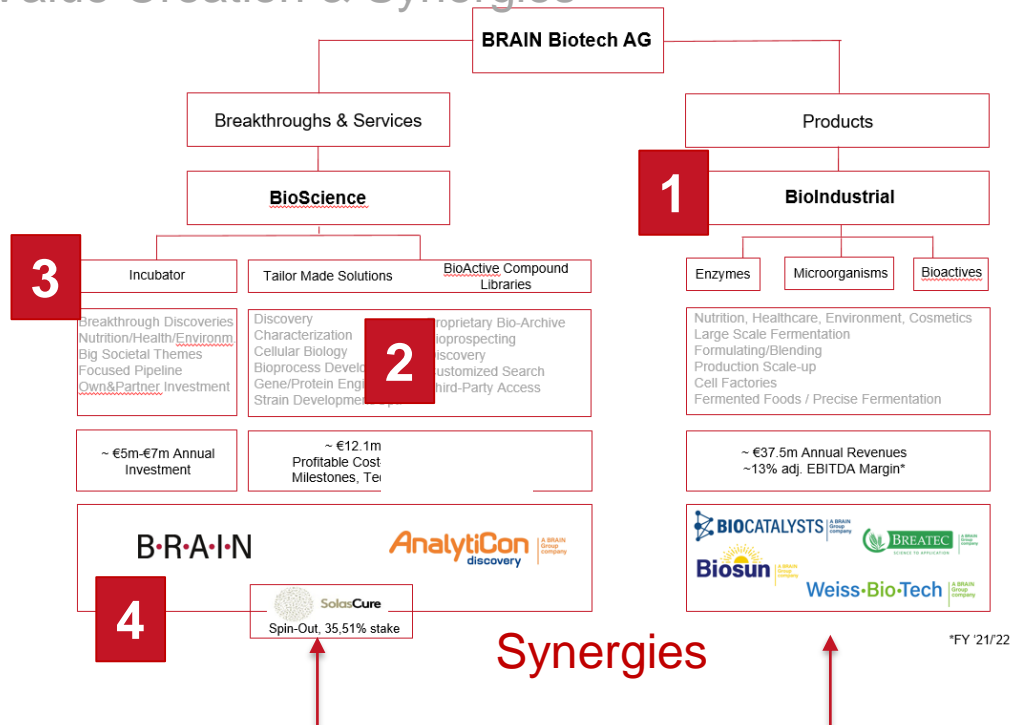


\*FY '21/'22

€ ~2,2 mio sales deconsolidated  
 Net Cash inflow Q1, ~€2 mio

# BRAIN Group – Solutions Provider

## Value Creation & Synergies



- Enzymes: integrated value chain from lab to production
- Industrial Scale-up and application know-how
- In-house strain optimization & development
- Customer strain development & Bio Process
- Variable scientist pool for internal/external projects
- TMS creates strong industrial partner network
- Utilize TMS knowledge for Incubator Projects and alternative use-cases
- Shared corporate services & financing

- 1 Products Business**
  - Focus on high-growth & high-margin niches
  - Re-shape from a purchase for resale to an own production model
  - Strong target markets with healthy sales and margin growth in F&B, healthcare and environment
- 2 TMS /Libraries Business**
  - TMS: longer term contract research programs (average duration 2 years); strong industrial partner network; rich pipeline of possible new projects; “CRISPR for You”
  - Libraries: main customers from food, pharma & cosmetics industries. Access fees and upside from milestone payments / license income
- 3 Incubator**
  - Focus on breakthrough products with a strong societal impact
  - Significant value creation from development to launch
  - De-risk R&D with partners and public funding
  - Dynamic pipeline: mature products marketed, new products will enter
- 4 SolasCure**
  - Innovative enzymatic wound care
  - Spin-out, 35,51% participation
  - IP for enzyme Aurase owned by BRAIN
  - All options open to crystalize value from stakeholding



# Six Strong Reasons to Invest in BRAIN Biotech AG

1. **Mega-trends / UN-SDGs:** our products address the big societal topics – nutrition, health & the environment. We address at least 5 SDGs directly
2. **Incubator products:** big upsides in our breakthrough inventions. BEC/BMC potential to be transformational.
3. **BioIndustrial:** BRAIN is very well positioned to capture high-growth and high-margin niches in its products businesses. We will re-shape our BioIndustrial business and move from a purchase for resale model to an own production model, this creates significant margin and therefore value upside
4. **Strong target markets:** solid target markets for our services & products with CAGRs above GDP and strong EBITDA margin levels also allow BRAIN to harvest healthy sales and margin growth
5. **Value accretive M&A:** space for bolt-on acquisition to accelerate growth with the possibility for transformational growth through larger M&A
6. **R&D:** ability to fund research with partners and from governmental grants to de-risks our own R&D effort and preserve valuable cash

## Six Major Triggers driving Revenue and Margin Growth



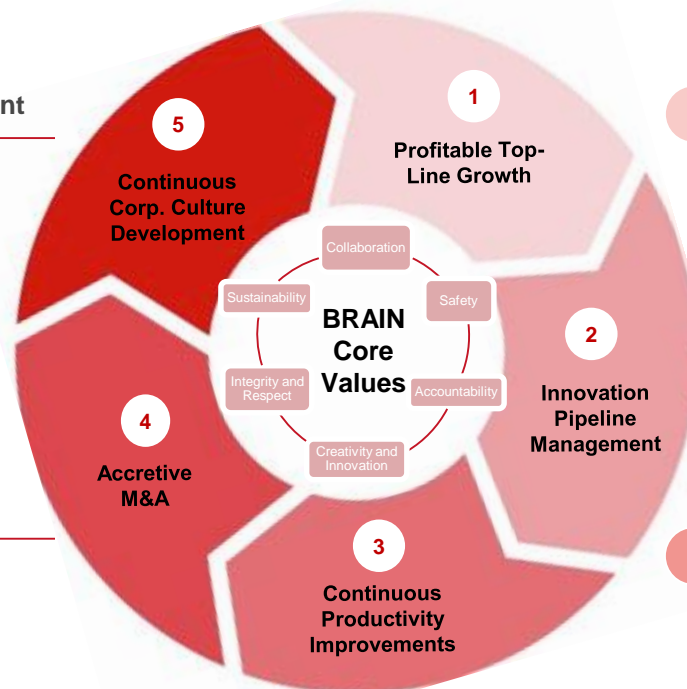
# Five Strategic Initiatives Centered Around our Core Values

## 5 Continuous Corp. Culture Development

- Can do and high ethics culture
- Talent management
- Innovation is our passion
- Teamwork is our basis
- Sustainability as a guiding principal

## 4 Accretive M&A

- Successful track record of integrating acquired entities
- Further build with bolt-on acquisitions
- Transformational M&A in adjacencies



## 1 Profitable Top Line Growth

- Excel in specialty niches with high margins
- Selectively grow outside of Europe
- Always look for ways to produce ourselves

## 2 Innovation Pipeline Management

- Balanced portfolio across markets and technologies
- Breakthrough solutions for big challenges for accelerated growth
- Key customer and application focus

## 3 Continuous Productivity Improvements

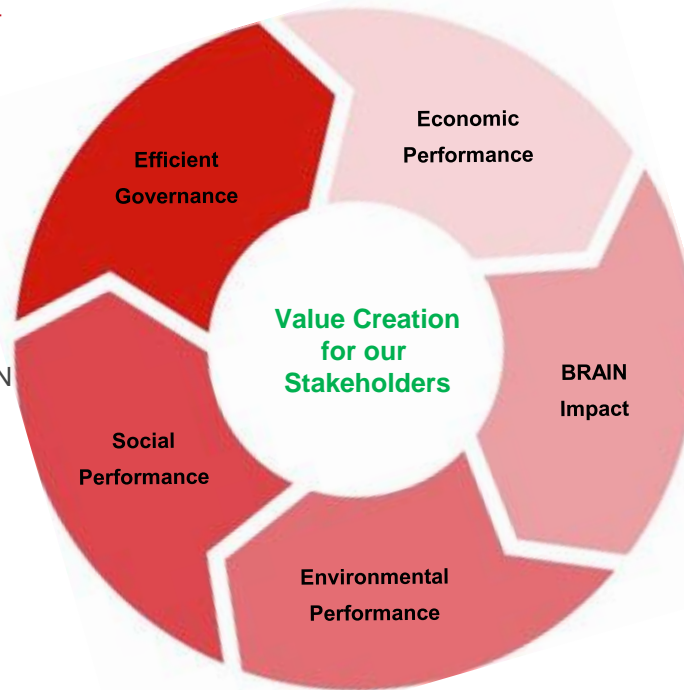
- Strain development
- Focus on working capital efficiencies, cost improvements and free cash flow
- Group revenue synergies
- Bio-Informatics

# ESG+: Responsible Group Management

five key focal points for sustainable value creation

## Efficient Governance

- German Corporate Governance Code (DCGK) compliance
- German Sustainability Code (DNK)
- Member UN Global Compact (UN GC)
- Quality, health and safety policies
- Internal compliance: qualified internal compliance officer, permanent risk assessment, audit committee, internal audit team and risk reporting, external audit, BRAIN Financial Control Framework, BRAIN Red Book
- Monthly reporting and audit meetings with the subsidiaries



## Economic Performance

- Profitable top-line growth
- Organic growth enhanced by value accretive M&A
- Target: reach a self-sustained cash flow profile



## BRAIN Impact

- We make a real difference: our products & services address at least 5 SDG's directly



## Social Performance

- Occupational health & safety
- Employee development & training
- BRAINway corporate culture enforcement
- Safe labour practices
- Community Education & Dialogue
- Promoting women in management



## Environmental Performance

- Energy efficiency
- Reduced travel footprint
- Water management
- Waste management



# Targets ESG+ Roadmap 2032 / 2050

## Minimizing the Environmental Impact from our Operations **E**

### Goals

- By 2032, reduce Scope 1-2 GHG emissions by 30% in relation to current revenue base\*
- By 2050, Scope 1-2 GHG emissions to net zero

### Detailed Actions

- Switch to sustainable sourcing of primary energy
- Building renovation and change of cooling/heating design
- Electrification of processes and transport
- Establish employee best idea contest on cost, energy savings and process optimization

## Livable & Satisfying Employment **S**

### Goals

- By 2032, share of women in management positions above 30%\*
- By 2032, Lost time injury frequency rate (LTIFR) per 1 Million hours worked < 3.0\*

### Detailed Actions

- Attract & retain talent by flexible work options, employee participation programs
- Actively promote female career development to management positions
- Promote safe work environment

## Responsible Business Operations **G**

### Goals

- By 2032, Target zero fines from compliance & operational breaches \*
- Ongoing, significantly increase share of license and royalty income in BioScience in relation to revenues \*

### Detailed Actions

- Evolution of Financial Control Framework (FCF)
- Pro-active IP filing & trade secret strategy to enhance and manifest IP position
- BEC/BMC franchise and producer strains

## BRAIN Impact **+**

### Goals

- By 2032, successful market Introduction of impact products & services from today's incubator \*
- By 2050, launch additional incubator products with an impact

### Detailed Actions

- Continuous incubator pipeline management

\* To be incorporated into the updated executive management compensation scheme as non-financial targets, base year data CY 2020

# Sustainability: Manifold Business Opportunities for BRAIN

enabling technologies & solutions

## Discovery / Biomimicry

Natural and nature-based compounds



## Enabling Biological Manufacturing

Cell-factories  
 Producer strain licensing  
 Bioprocess development  
 Bioactives Development



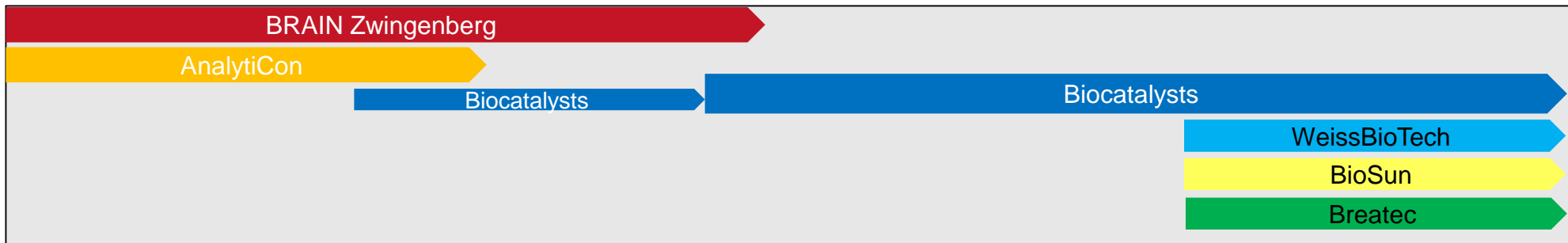
## Biological Production/ Fermentation

Upscaling  
 Process optimization  
 Large-scale fermentation



## BRAIN Group Bio-based Products

Biological catalysts:  
 Enzyme formulation  
 Mixing / Blending  
 Novel enzyme production



BEC/BMC: powering our value chain  
 + large economic upside from licensing

# Our Incubator

review at CMD, February 27th

Pipeline	Partners	Time-to-Market →			rNPV Market Potential *1	Profit Model Options *2	R&D Platform *3	Current Project Status
		R&D	1-3 years out	Market				
Natural fermented beverages 1	SUNTORY	3-5 years out	1-3 years out	In pre-launch	Small	Prod, Fee, MSP	M/O	
Salt taste enhancer 1.0	US-CPGC				Small	Fee, MSP, Lic	B/A	
Natural fermented beverages 2	JP.Bev						M/O	
Perillic Active, Anti-Microbial	ND				Med	Prod, Prof	B/A	
Gold from waste streams	ND				Med	Prod, Fee, Prof	M/O	
Brazzein Natural Sweet Solutions					Large	Fee, MSP, Prof, Lic, Prod	E/P	
Aurase Wound Debride					Large	Fee, Prod, Prof	E/P	
PHA121, HAE Pharma Compound	Pharvaris				Med	Fee, MSP, Lic	B/A	
BRAIN Engineered / Metagenome CAS (BEC/BMC)	Several	Project I-...	Project D-H	Project A-C	Large	Fee, MSP, Lic, Prof	E/P	

Incubator Pipeline Update @ CMD, February 27th

Progress since CMD '20, update '08/21

\*1: BRAIN-Group rNPV FCF+TV: **Small** < €5M, **Medium** €5M - €15M, **Large**: €15M+  
 \*2: **Prod**: Product sales. **Fee**: Research fee income. **MSP**: Milestone payments. **Lic**: License/royalty payments **Tec**: Tech fees **Prof**: Entity formation or profit participation  
 \*3: **B/A**: BioActives, **E/P**: Enzymes and proteins, **M/O**: Microorganisms/starter cultures  
 ND: not disclosed



# Management & Employee Incentives

since the IPO BRAIN Biotech AG's board as well as management compensation has been closely linked and aligned with shareholder interests

## Executive Board

- fixed salary
- variable component based on individual quantitative & qualitative targets
- stock component, see ESOP

## ESOP, Employee Stock Ownership Program

- Since June 2018
- Board, managers and employees
- Incentive and retainer
- Details: see appendix

## CoPerBo, Corporate Performance Bonus

- Since FY 2015/16
- Applied for employees at BRAIN Zwingenberg
- Partially share prices based
- Details: see appendix

## Specific Incentives at Daughter Companies

- See appendix

# Financial Highlights 12M FY 2021/22 at a Glance

strong execution and delivery on guidance

(in € thousand)	12M	12M	Growth	Organic Growth	Q4	Q4	Growth	Organic Growth	Comment
	2021/22	2020/21			2021/22	2020/21			
Revenues	49,509	38,389	29.0%	14.5%	13,534	10,545	28.4%	13.7%	
BioScience	12,079	10,313	17.1%	17.1%	3,536	2,897	22.1%	22.1%	recovery to pre-pandemic Milestones 188K 12M 21/22 Milestones 679fullk 12M 20/21
BioIndustrial	37,548	28,236	33.0%	13.4%	10,018	7,670	30.6%	10.5%	solid organic growth + Breteac
Total operating performance (1)	53,072	40,731	30.3%	15.6%	15,884	10,766	47.5%	29.1%	
Adjusted EBITDA (2)	-98	-2,089	95.3%	88.2%	94	148	-36.6%	-78.8%	(-) EUR 1,384K ESOP 12M (-) EUR 476K M&A Cost 12M (+) EUR 650K LAS Sale
EBITDA	-1,309	-2,533	48.3%	42.4%	134	-472	128.3%	126.4%	
EBIT	-5,648	-6,548	13.7%	14.6%	-1,008	-1,539	34.5%	58.0%	
Net Result	-6,341	-4,680	-35.5%	-33.7%	-136	-1,738	92.1%	105.5%	
Operating Cash Flow	-1,485	-3,906	62.0%	72.5%	-453	-907	50.0%	18.7%	
	30.09.2022	30.09.2021							
Cash	8,443	24,545	-65.6%	-66.1%					

	12M 21/22	12M 20/21	Growth	Organic Growth
Number of Employees	309	288	7.3%	3.8%
Material Expense Ratio	46.4%	43.9%	2.6% PP.	- 1.3% PP.
Adj. Personnel Expense Ratio	41.0%	48.2%	- 7.3% PP.	- 3.9% PP.

## ➤ Akribion Genomics investments @ 12M ~€2.0 million

(1) Revenues + change in inventories + other income + R&D grants

(2) The full reconciliation from adjusted to unadjusted EBITDA can be found in the appendix

## Major Events 12M '21/'22:

- **BioIndustrial overall** solid organic growth, margin up +by 140 BSP
- **Breteac** consolidated for eight months, happy with revenue development; EBITDA still suppressed by first year integration costs
- **BioScience** strong sequential growth Y on Y mainly due to Zwingerberg recovery to pre-crisis levels, keeps also be driven by "We CRISPR for You" and TMS+ business
- **M&A cost** of Breteac purchase/ integration and other M&A cost EUR 476K



# Cash & Cash Flow

improving OCF, high investments, adequate cash position

(in € thousand)	12M 2021/22	12M 2020/21	Growth	Q4 2021/22	Q4 2020/21	Growth	Comment
Gross Cash Flow	-5,120	-5,250	2.5%	-1,425	-1,189	-19.8%	
Operating Cash Flow	-1,485	-3,906	62.0%	-453	-907	50.0%	significant improvement
Investing Cash Flow	-12,686	-2,180	-481.8%	-4,033	-181	-2124.4%	(-) ~3.1 Mio Breatec purchase (-) ~1.2 Mio SolasCure Series B (-) ~6.1 Mio Capex Biocatalysts
Financing Cash Flow	-1,966	11,572	-117.0%	-382	18,398	-102.1%	debt repayment
Net change in Cash & Cash Equiva	-16,137	5,485	-394.2%	-4,868	17,310	-128.1%	
	30.09.2022	30.09.2021					
Cash	8,443	24,545	-65.6%				
Equity	34,248	41,828	-18.1%				

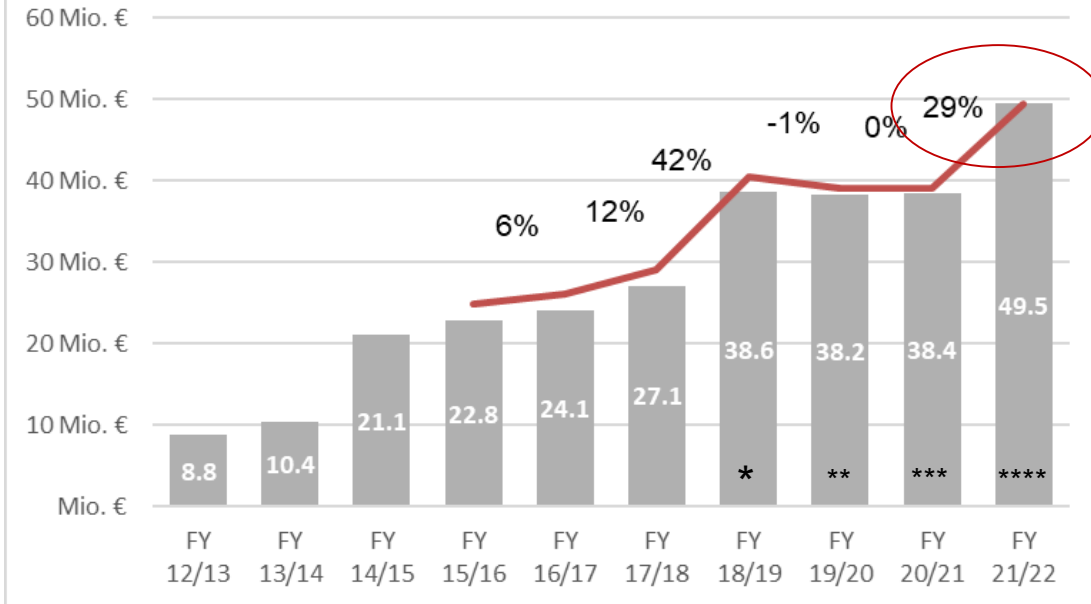
- Significantly improved operating cash-flow
- Reduction in cash on hand mainly due to investment spending and M&A
- L.A. Schmitt GmbH cash-in from disposal will be recognized in Q1
- EUR 7 million undrawn credit facility remains available on top
- Additional debt capacity at subsidiaries available



# Long-Term Revenue Growth Trajectory

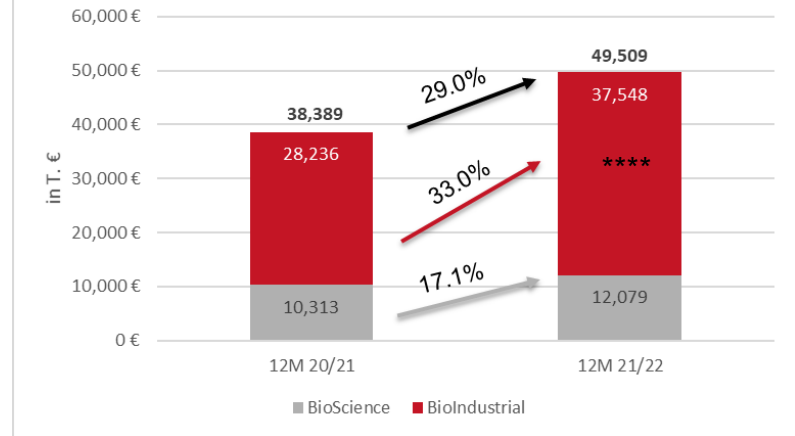
strong growth driven by Biocatalysts, Breatec inclusion and BioScience recovery

BRAIN Revenue History

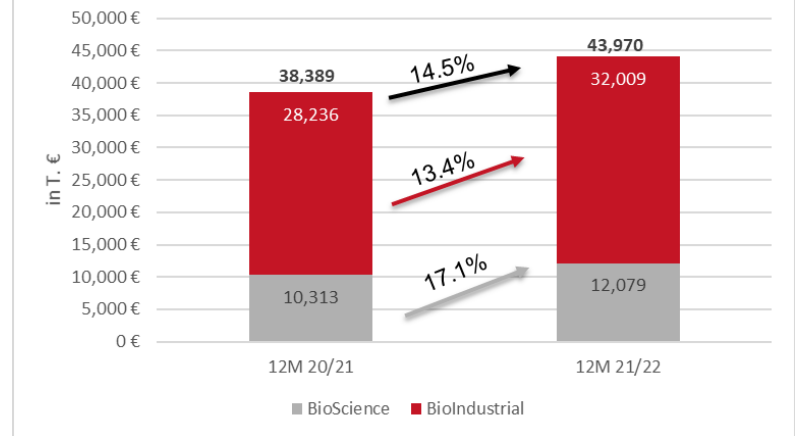


- As guided: back on the growth trajectory in FY 21/22
- Growth: strong organic plus Breatec inclusion
- Both segments are contributing

Revenues segments 12M 21/22



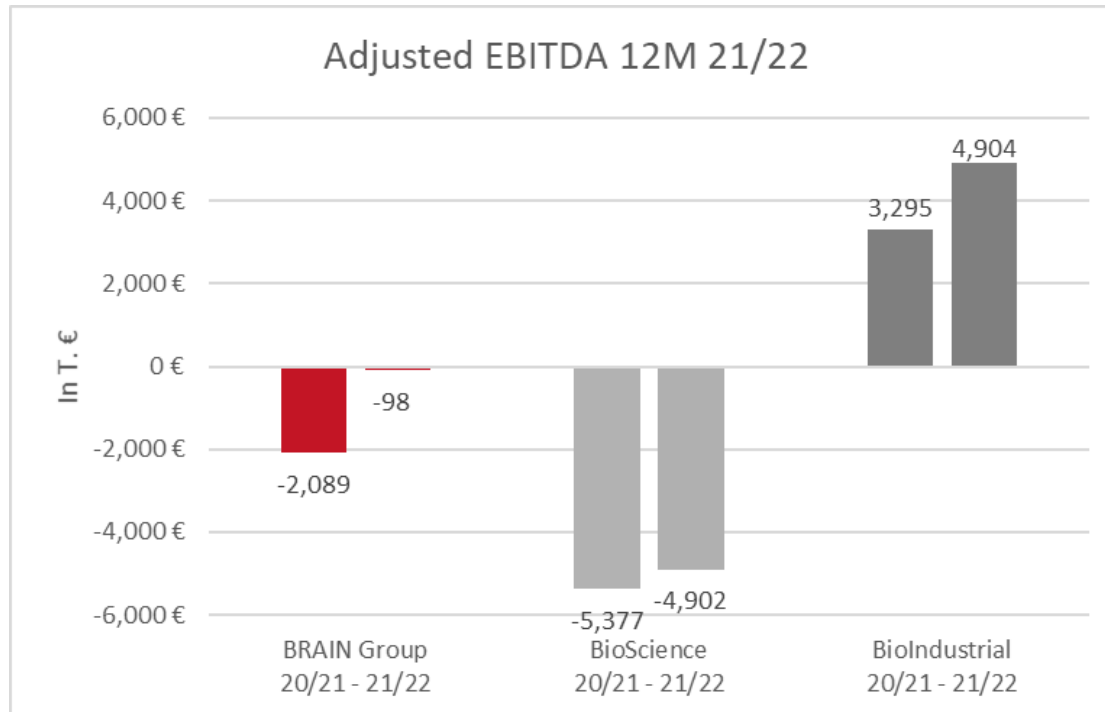
Revenues segments 12M 21/22 organic growth



\*purchase BioCatalysts Ltd. \*\*divestment Monteil Cosmetics \*\*\*purchase BioSun \*\*\*\*Breattec integration for 8 months

# Adjusted EBITDA

ongoing improvement of profitability despite high CRISPR expensed investments



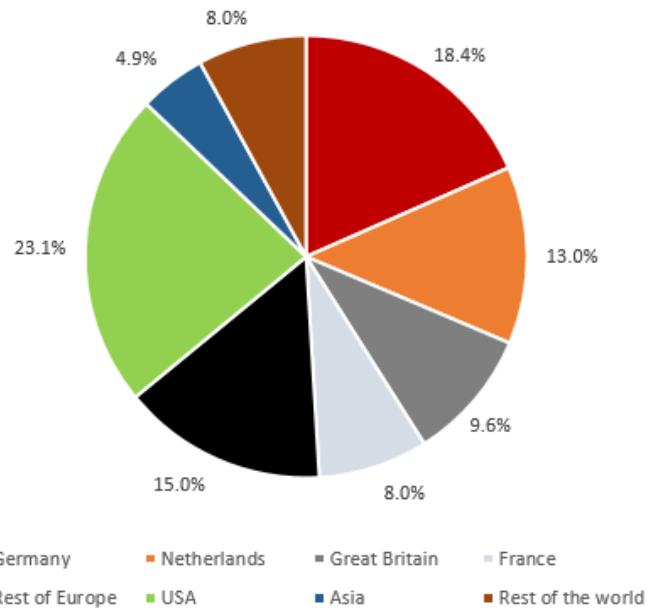
- **Group** adj. EBITDA strongly improved driven by both divisions
- **BioScience:** improved result despite higher investments into Akribion Genomics; good cost control
- **BioIndustrial** overall very strong improvement, even more dynamic development hindered by supply chain restraints

➤ Akribion Genomics investments @ 12M ~€2.0 million

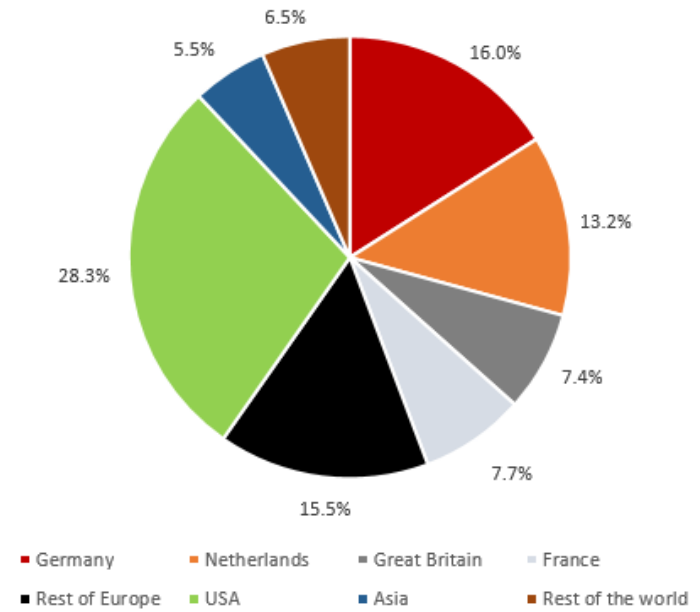
# BRAIN Revenue by Geographic Region

well diversified sales split with high international share

Revenues per Region 12M 20/21



Revenues per Region 12M 21/22



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# General Risk Factor Update

ongoing business risk monitoring

## Summary:

**BRAIN Group: overall business remains solid. Supply chain still stretched but partially easing. Inflationary pressures remain high**

**Current Situation:** Certain supply chain restraints still persist, mostly caused by consequential effects of the pandemic. High inflationary pressures on material, energy and labor costs. SolasCure now on track with Phase 2a clinical trials after ~9 months delays incurred due to the pandemic situation

**Future Challenges:** tight labor market conditions making it challenging to fill vacancies as well as to attract and retain talent. General business cycle risk with stagflation or recession as a likely scenario. Negative spill-over effects from Chinese departure of Zero-Covid policy especially on the supply chains possible

# Our Targets

## Guidance and Mid-Term Targets

### This FY Guidance

#### Qualitative Guidance

- Solid organic revenue growth continues
- Rising profitability in adjusted EBITDA

As far as this guidance is concerned, investments in the novel genome editing tool (Akribion Genomics) are considered separately and do not form part of this forecast

### Mid-Term Targets, Unchanged

(issued 09/'20, 4-5 year targets)

(excluding CRISPR)

#### Double group revenue from base '18/19

- Double digit topline product CAGR
- Accretive M&A
- Contract research "TMS" proportionally reduced (excl. milestones)

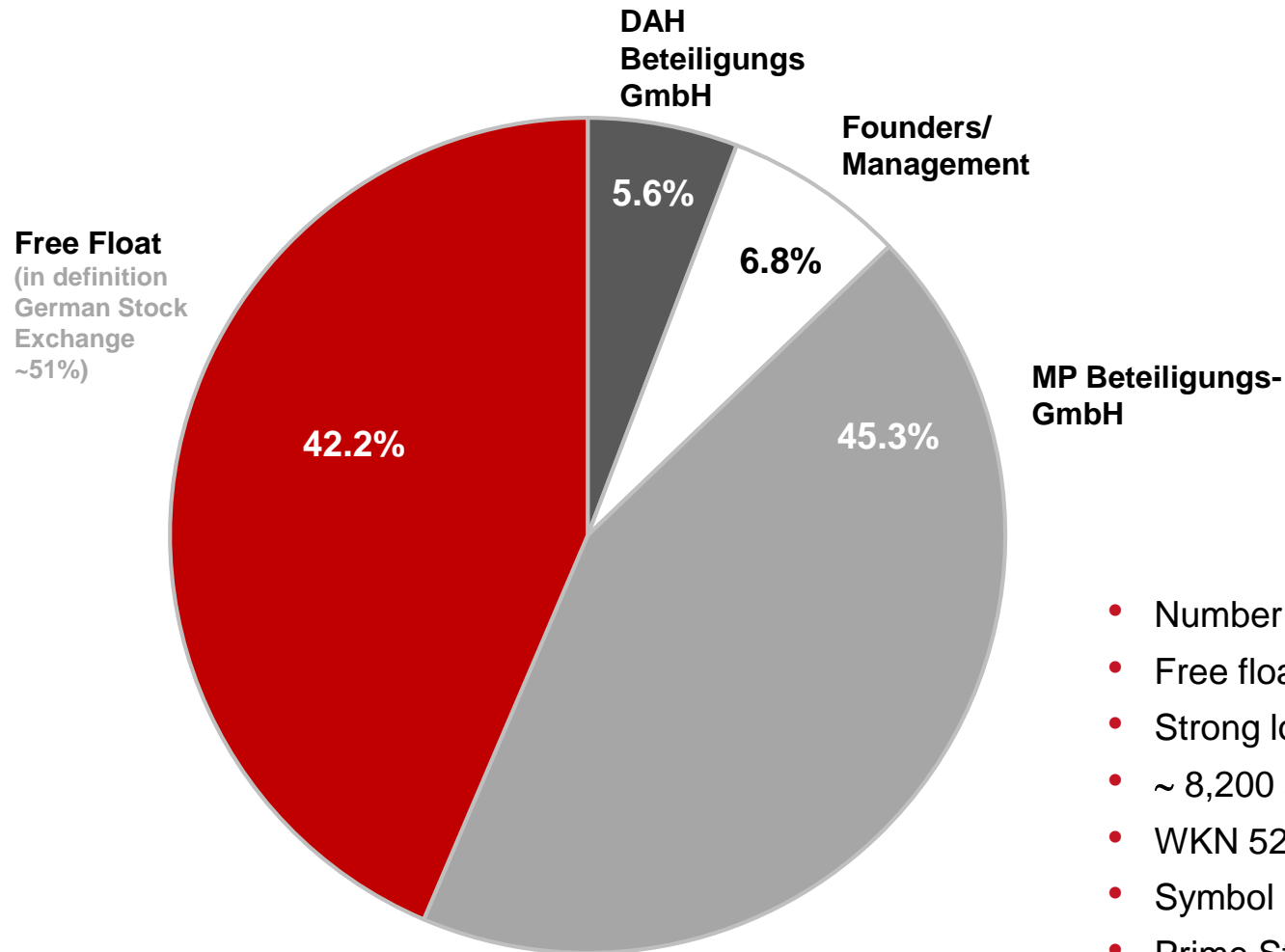
#### Group adj. EBITDA margin 15% (+/- 5PP)

- Double digit fermentation production volume of customized novel enzymes
- Mid-single digit annual productivity improvements

#### Proportion of new product sales: ~30% of total revenues

- Continuous innovation pipeline management

# BRAIN Biotech AG Share Ownership\*



- Number of shares: 21,847,495
- Free float of ~ 42%
- Strong long-term investor base
- ~ 8,200 shareholders
- WKN 520394 / ISIN DE0005203947
- Symbol BNN
- Prime Standard; Frankfurt/M

\*December 31<sup>st</sup>, 2022

# Financial Calendar



## QUARTERLY STATEMENT

Publication of the quarterly statement as of December 31<sup>st</sup>, 2022 (3M)

**February 27<sup>th</sup>, 2023**



## ANNUAL GENERAL MEETING

Annual General Meeting (FY 2021/22)

**March 8<sup>th</sup>, 2023**



## HALFYEAR STATEMENT

Publication of the half year report as of March 31<sup>st</sup>, 2023 (6M)

**May 25<sup>th</sup>, 2023**



## QUARTERLY STATEMENT

Publication of the quarterly statement as of June 30<sup>th</sup>, 2023 (9M)

**August 30<sup>th</sup>, 2023**

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# Thank you for your attention.

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BRAIN Biotech AG





# Appendix

	Page
High barriers to entry	25
NBD deep dive	26
Service business deep dive	38
Partnerships "BRAIN Inside"	39
Enzyme production, expression hosts	41
Enzyme value chain	43
BioArchive	44
HR: People -- our core capital	45
Detailed management & employee incentives	46
Peers by business activity	47
Detailed financials	
Detailed adjusted vs. reported	48
Expenses Development	49
Adj. vs reported	50
Financial debt vs. financial liabilities	51
Balance sheet	52
M&A criteria & history	54
Management CV	55
Analyst coverage	56
Glossary	57

# High Barriers to entry

## Our novel products & solutions are based on:

- Proprietary BioArchive with >450 person years to reproduce
- Extensive patent portfolio, around 175 patents granted and around 40 patent families
- Trade secrets
- Broad and deep technology know-how in enzymes, microorganisms and bioactive natural compounds
- Ability to express target compounds in bacteria, yeast or fungi
- Full process capabilities from the lab to production
- Strong industry partner network with over 100 partner collaborations successfully completed
- Strategic alliances for new business development
- Strong scientific and university network
- State-of-the-art technology portfolio
- Our people: first class scientists and process specialists

# NBD Deep Dive, The Pipeline

## Large Market Potential

### Natural Beverage 2

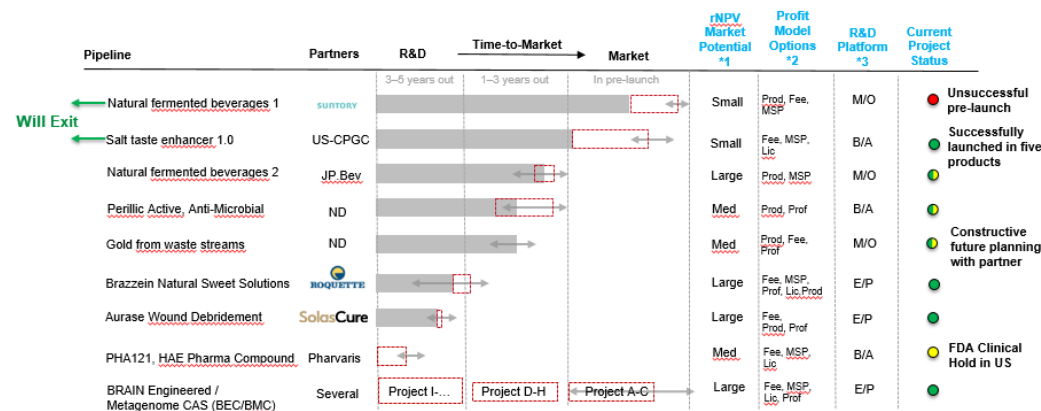
- Partners: Japanese Beverage Company
- Scope: undisclosed, confidentially agreement
- Exclusive to partner
- Technology Platform: microorganism
- Research Business Model: milestone payments
- Commercial Model: starter cultures, production, license fee, JV an option/profit share

### Brazzein Natural Sweet Solution

- Partners: BRAIN, AnalytiCon Discovery, Roquette
- Scope: development, approval and commercialization of new natural sweet solution
- Based on access to our SweetBox and Human Tongue Cell technology derived sweetener candidates
- Technology Platform: BioActive and process development
- Research Business Model: tech access fee, success fees
- Commercial Model: initial production, licensing, royalties

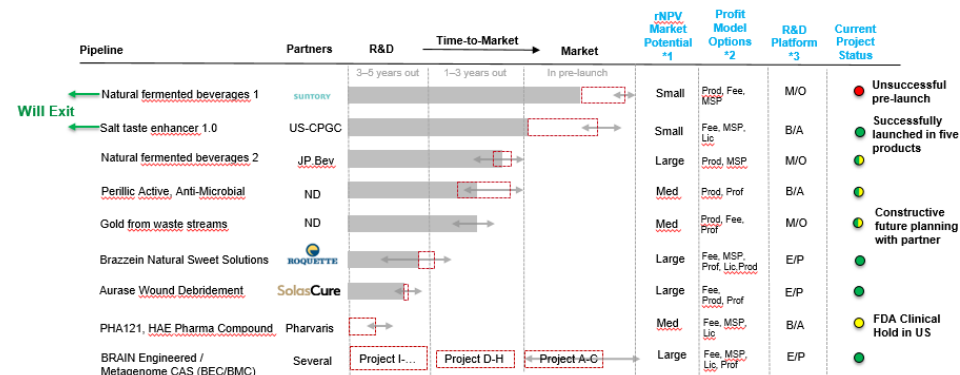
### Aurase

- Partners: Spin-off SolasCure
- Scope: innovative wound debridement agent for the cleaning of chronic wounds
- Exclusive development through SolasCure, active enzyme IP at BRAIN
- Technology Platform: enzyme/proteins
- Research Business Model: fees, technology transfer
- Commercial Model: spin-off, exit optionality, production through BRAIN (independent from owner)



# NBD Deep Dive, The Pipeline

Large Market Potential



## BRAIN CRISPR Non-Cas9 Associated Nucleases (BEC/BMC)

- **Genome Editing:** directed and precise change or use of a chromosomal target in a given organism; “the power to program cells”
- **CRISPR** = clustered regularly interspaced short palindromic repeats
- **CAS** = CRISPR associated sequence
- **CRISPR-Cas** systems have enabled genome editing in multiple species and provided genetic tools with speed as well as simplicity that were previously unavailable
- **Editing** requires only two components (1. Cas nuclease 2. programmable guide RNA), and can be multiplexed for simultaneous modification of multiple sites in a single transformation event
- Novel BRAIN CRISPR Cas system developed using metagenomics sequencing and protein engineering
- Non-Cas9 type genome editing nuclease
- Scarless gene modification at the single nucleotide level
- In-house designed application tools and strategies
- Development of customized screening cells for target identification / validation or bioactive product development / identification
- State of the art technology for the development of high performance producer strains
- Business Model: all option are still being evaluated, NewCo formation in 2022

# BEC/BMC: What is Genome Editing and How Does it Work?

## the power to program cells



The power to program cells → disable, correct or change genes



DNA: biological *four letter* code of living organisms

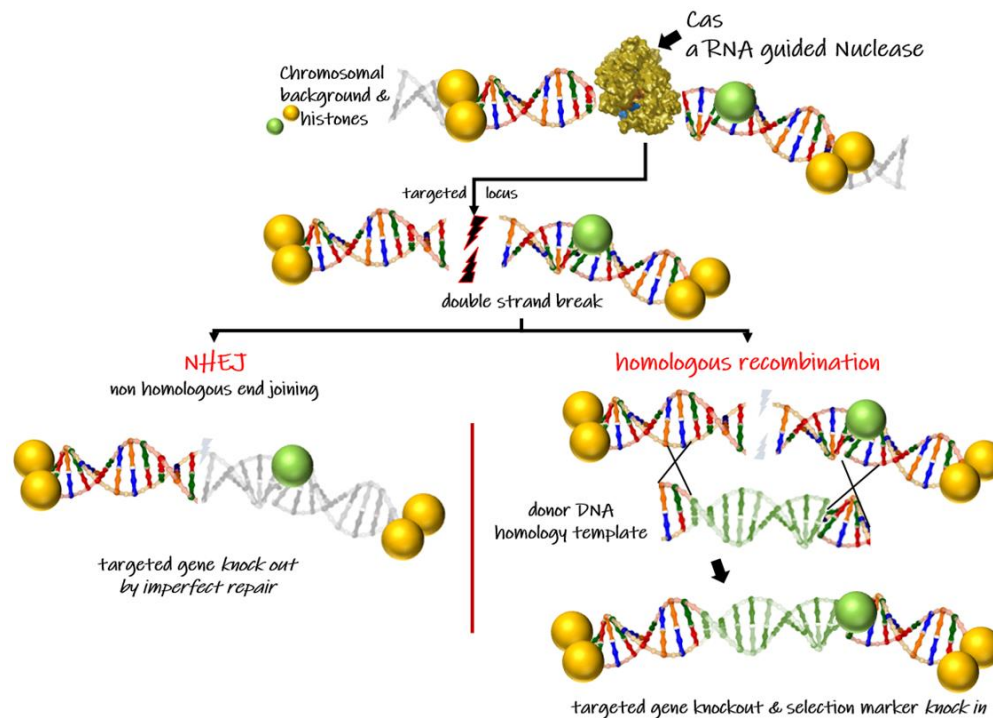
➤ Genes: biological templates making the proteins & enzymes to build & maintain tissue

### Editing only requires two components

1. Cas nuclease
2. programmable guide RNA

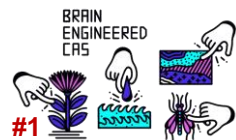
### Edit a genome through

1. gene **knock out**
2. homology-mediated **knock in**



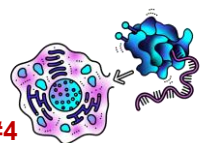
# BEC: Discovery Steps

## Creating a proprietary tool



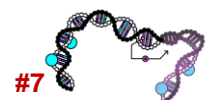
**#1**  
**Let's start with nature**

Metagenomics samples were selected using rational bioprospecting and the DNA of all microorganism living in those habitats was isolated.



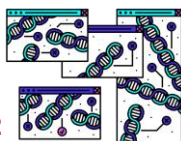
**#4**  
**BEC comes into action**

To perform genome editing, the BEC protein loaded with a specific gRNA is introduced into the target cell.



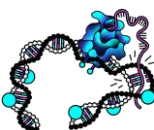
**#7**  
**Gene knock-out**

The native repair mechanism of the target cell repairs the DNA that was targeted by the BEC protein in a non-perfect way leading to small insertions or deletions inside the genome. This mechanism can be used to knock-out genes.



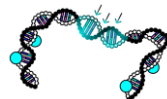
**#2**  
**Metagenomics meets Bioinformatics**

The isolated DNA was sequenced using state of the art next generation sequencing techniques and analyzed to identify novel genome editing tools



**#5**  
**Select the target**

With the help of a specific spacer sequences incorporated inside the gRNA the BEC protein can be programmed to find and bind a specific region on the genome of the target cell.



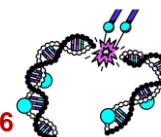
**#8**  
**Gene knock-in**

The targeted DNA can be repaired by the integration of a repair fragment that researchers can design to precisely integrate genes of interest into the genome.



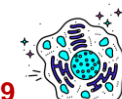
**#3**  
**Shaping the heroes**

The selected metagenomics sequences were optimized by protein engineering to enhance the genome editing activity and specificity and one best performing prime candidate was selected (BEC).



**#6**  
**Processing the DNA**

If the programmed spacer sequence perfectly matches the DNA sequence present in the genome the BEC protein precisely cuts the DNA at the pre-defined position.






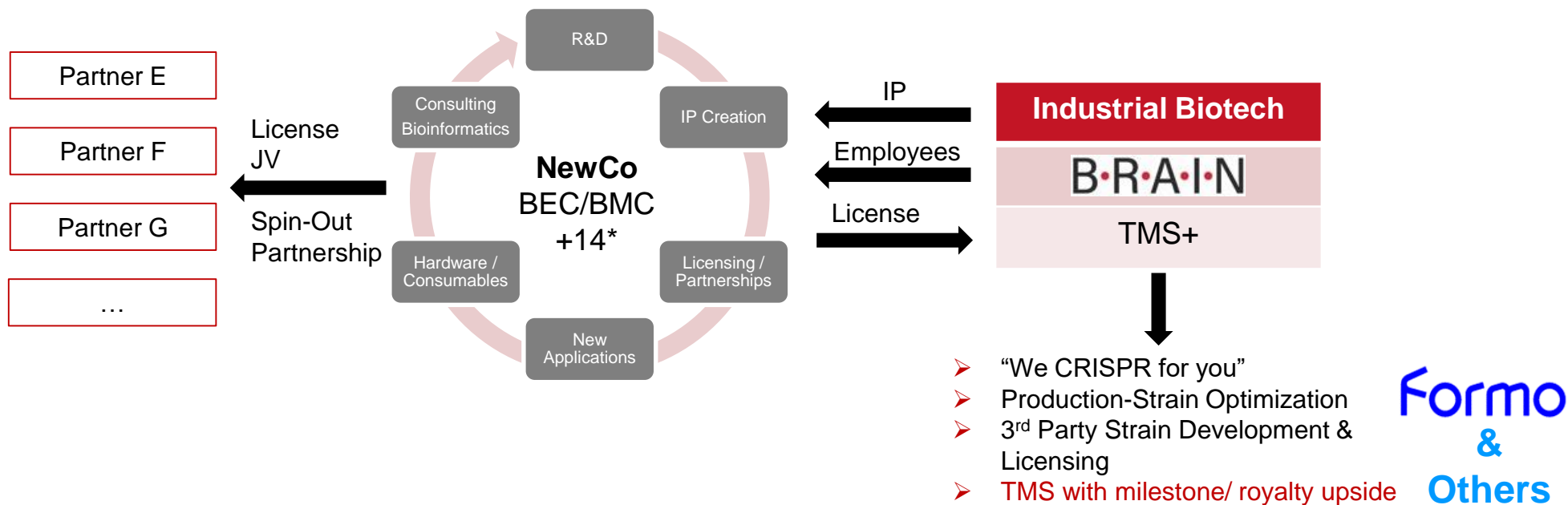
**#9**  
**Optimized Organism**

The BEC protein can be used to specifically knock-out or knock-in genes to optimize the genome of a variety of organisms.

# BRAIN Genome Editing: Platform Business

adding value across the group

Agriculture	Life Science Application	Marine Application	Producer Strains
Non-Disclosed Int.			
Exclusive License	Non-Exclusive License	Research License	Cooperation

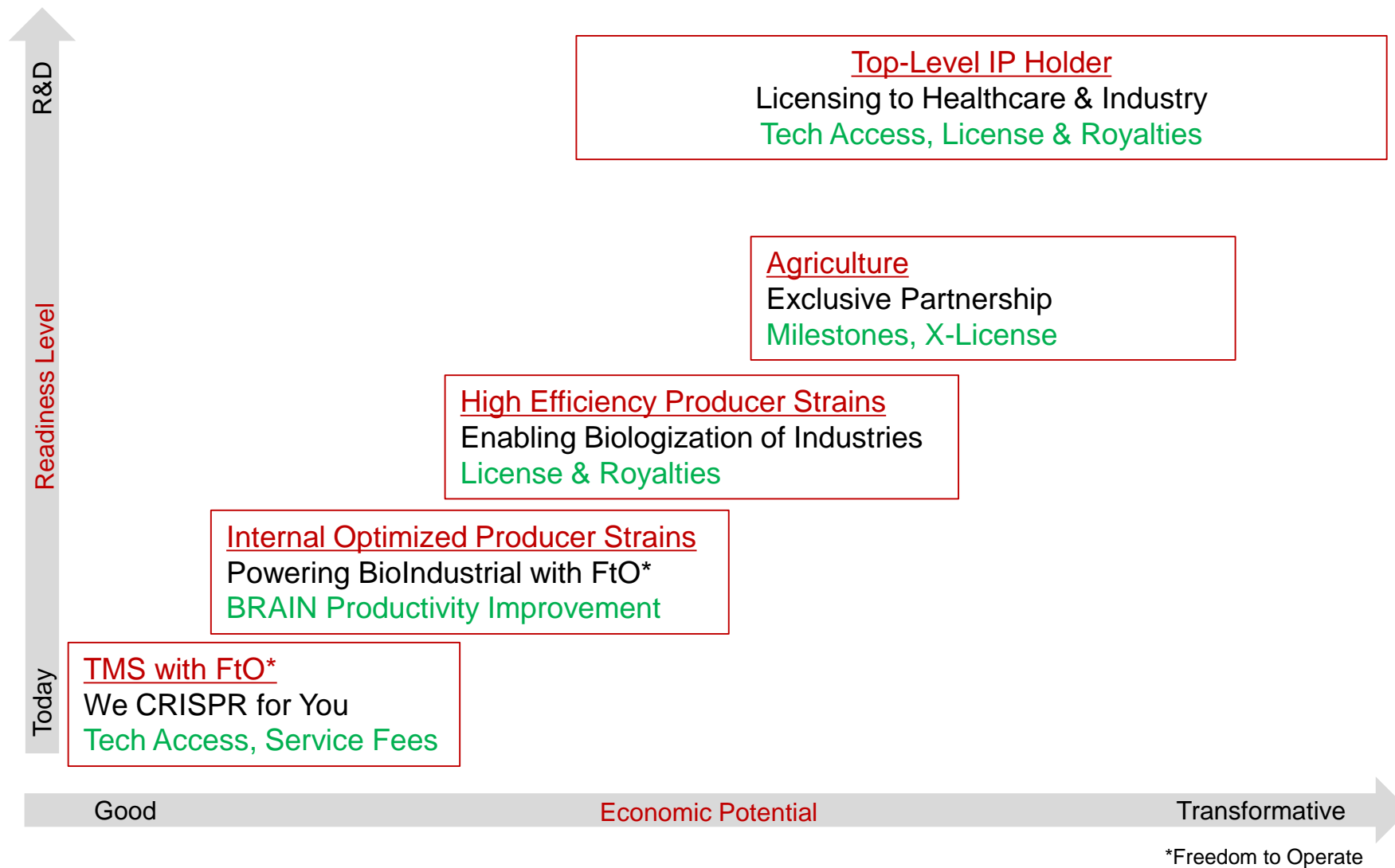


\*additional nucleases filed for IP protection



# BEC/BMC Has Transformational Characteristics for BRAIN

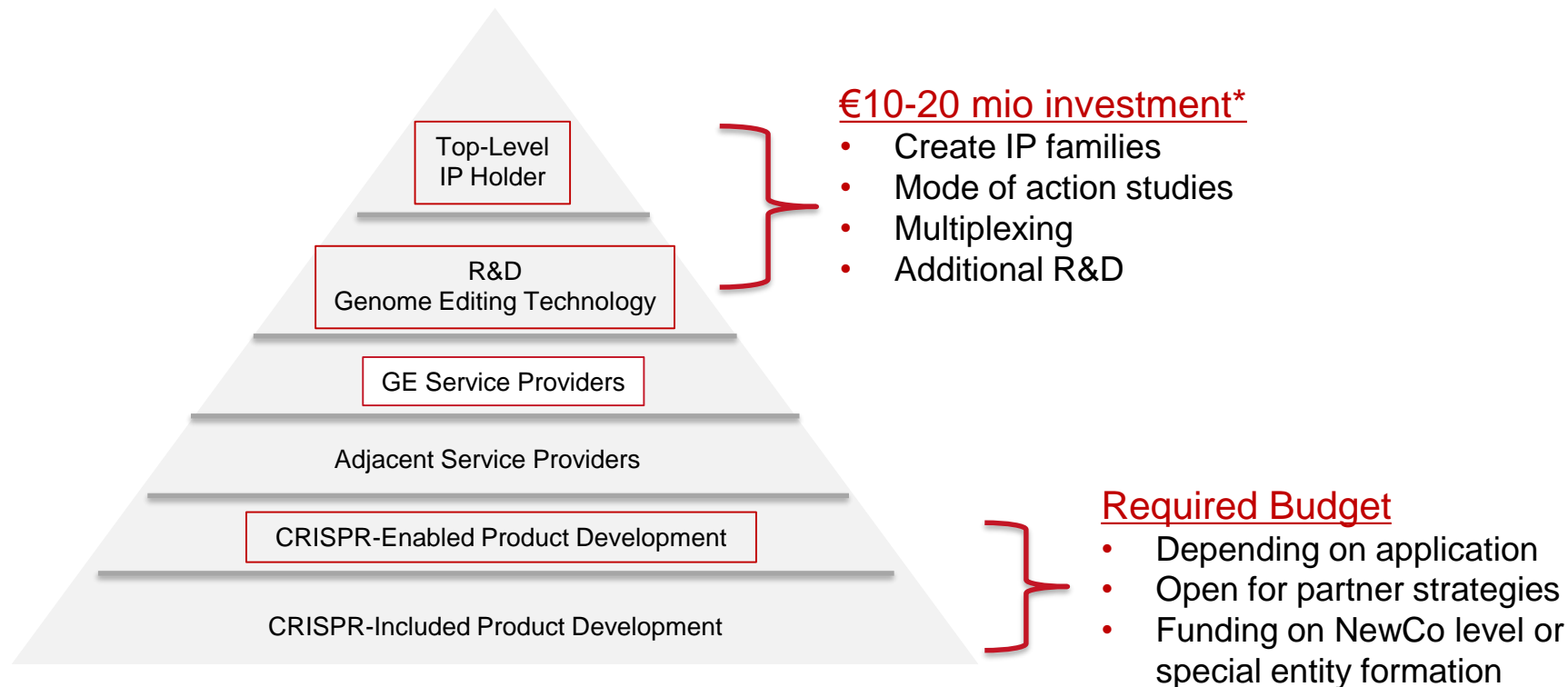
freedom to operate, fees, creating licence & royalty opportunities





# BEC/BMC Budget

a first indication



\*as previously guided

# SolasCure Ltd.

Revolutionizing Chronic Wound Care through Biomimicry



SolasCure

## For BRAIN:

- Discovering a unique technology and spinning it out in 2017 as a separate company
- 35,51% shareholding of BRAIN Biotech AG, at equity consolidated
- Created a targeted team at SolasCure Ltd.
- Share the commercialization financing burden with new investors
- Allows monetization at exit (e.g. IPO, Strategic Investor, PE)
- Aurase® IP stays with BRAIN Biotech AG, (patent estate, WO 2010/099955)

## The Market:

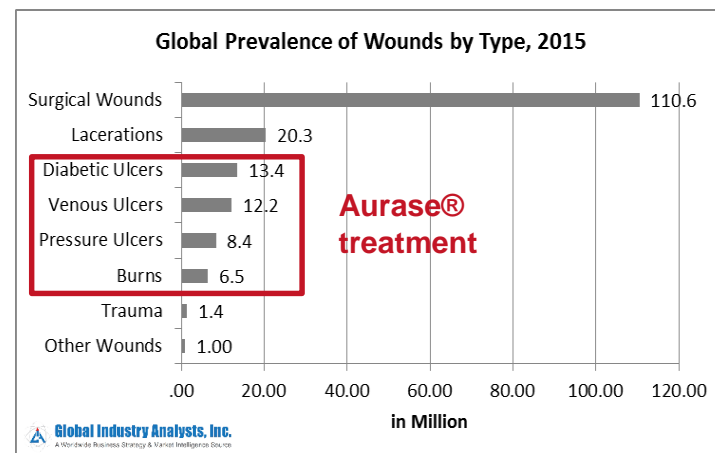
- Chronic wounds effect about 40mln people and consume about 10% of health care expenditures
- Advanced wound care market CAGR expected at 6,5% '18-26\* (aging, diabetes and obesity are the main growth drivers)
- Alternative to ineffective and painful surgical or autolytic debridement
- Current target market size ~€600mln

## The Product:

- Aurase® is a hydrogel containing a safe, active, highly specific enzyme
- The enzyme has been isolated and cloned from medical maggots (green bottle fly)
- Currently phase 2 of clinical trials
- Aurase® to be produced in a GMP biotechnological process
- Santyl® of S&N is currently the market leading drug for non-surgical wound debridement

## Latest Funding, Q1 '22

- GBP 3.7 Mio Series B1 in total
- BRAIN participated around pro-rata stake
- Pre-Money valuation +50% versus last capital injection
- BRAIN invested GBP 1.0 Mio cash
- New partner attracted

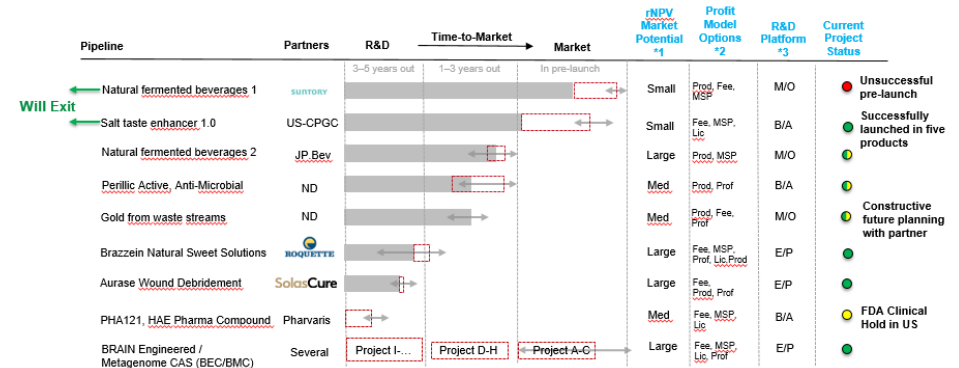


\*allied market research '19



# NBD Deep Dive, The Pipeline

Medium Market Potential



## Perillic Active

- Partners: US distribution partner contracted (non-disclosed); toll manufacturing
- Scope: nature based anti-microbial for food, feed, drinks and cosmetic applications, generated from industrial side streams; fermented orange oil
- US patent granted
- Technology Platform: BioActive
- Research Business Model: fee
- Commercial Model: JV/profit share

## Gold from Waste Streams / Urban Mining

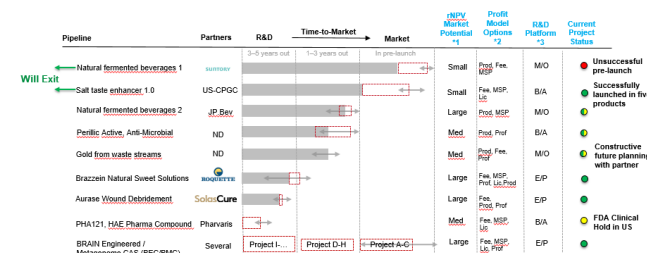
- Contract signed with undisclosed partner
- Scope: CO<sub>2</sub> efficient biological process for gold extraction from waste streams such as e-waste, today these valuable waste streams are deposited
- Technology Platform: microorganisms
- Research Business Model: own development, partially public funding, partner funding
- Commercial Model: flexible, dependent on partner and options for BRAIN (options: royalty, license, JV or franchise system)

# PHA121 / Pharvaris

## Value Creation

### The Market\*

- Large global HAE (hereditary angioedema) market of ~**USD 2 Billion size** with robust growth ~9% CAGR
- Rare but potentially life-threatening genetic condition: painfully, hospitalization
- At least 6,600 patients in the US, at least 8,900 patients in Europe
- Cash-Runway Pharvaris for > 2 years, USD 353 million gross financing proceeds since inception
- Supporting on-demand as well as prophylactic treatments of HAE
- Superior preclinical potency and longer duration compared to icatibant (Shire/Firazyr, SC injection)
- IP: issued US patent expires in 2038



### Value Creation\*\*

- PHA121 discovered by AnalytiCon
- Licensing agreement combined with a research agreement for Lead Optimization and CMC as a TMS service
- **Milestone payments** based on clinical development, regulatory events and sales development (**up to EUR 11.4 million**), paid to date EUR 1.15 million (€250K '16, €100K'18, €300K '19, €500K '21)
- **Tiered Royalty Agreement:** low to medium-single digit on direct and/or indirect net sales

- Successful example how we can create long-term value for BRAIN shareholders initiated by the TMS business
- Has entered our incubator as a project initially with “Medium” rNPV potential, could become “Large” when entering Phase III

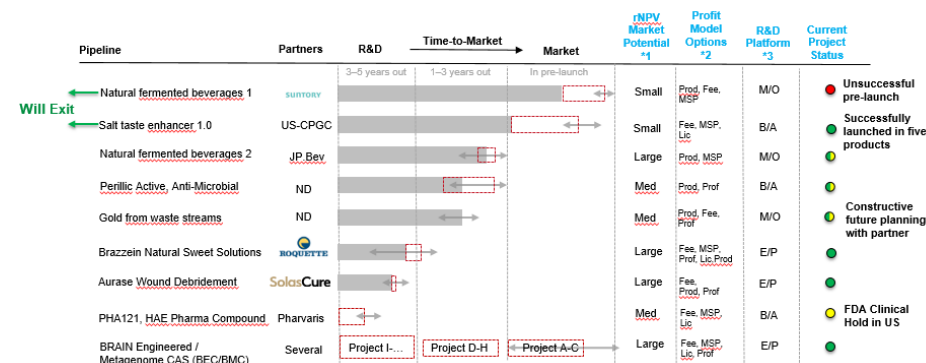
\*Source: Pharvaris corporate presentation

\*\*Source: Pharvaris Form F-1 Registration Statement



# NBD Deep Dive, The Pipeline

## Small Market Potential



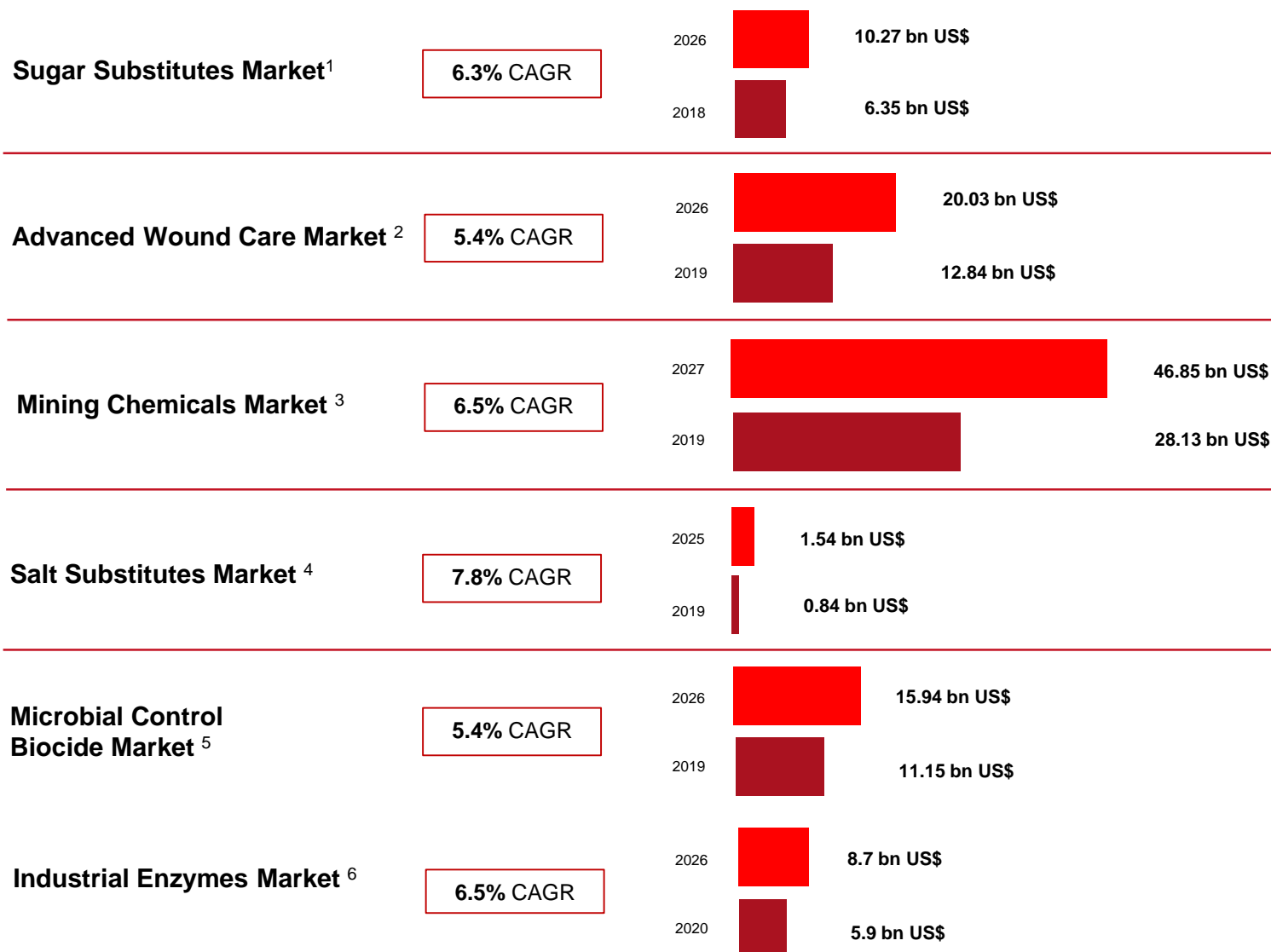
## Natural Beverage 1

- Partners: Suntory
- Scope: nature based low calorie drink innovation through fermentation
- Exclusive to Suntory, in a certain field
- Technology Platform: microorganism/starter cultures
- Research Business Model: milestone payments
- Commercial Model: starter cultures, license fee, royalties
- In market pre-launch

## Salt Taste Enhancer 1.0

- Partners: US-Consumer Packed Goods Company
- Scope: salt reducing taste enhancement via taste modulation
- Exclusive development with partner for one identified molecule
- Technology Platform: BioActive
- Research Business Model: fee, milestone payment (research phase finalized)
- Commercial Model: royalties
- Launch expected 2022

# NBD Deep Dive, The End-Markets



<sup>1</sup> Fortune Business Insights; 05/2020, <sup>2</sup> Industry Research; 08/2020 <sup>3</sup> Coherent Market Insights; 08/2020 <sup>4</sup> Industry statsreport BMRC; 01/2020 <sup>5</sup> Global Market Insights, 07/2020 <sup>6</sup> Markets and Markets, PR Newswire, 04/2020



# Service Business Deep Dive

## Programs with industry partners

- BRAIN Biotech AG has a long track record with dedicated contract R&D programs
- Monetization: tech-access, fees and milestone payments, royalties or entity formation/profit participation
- **Non-cyclical service contract business with secular growth**

## Tailor Made Solutions (TMS)

Novel natural products & solutions for the industry

- Partnered projects with the industry
- Active NBD sales approach
- Cost-plus contracts, milestones & license fees
- Cross selling of IP to non-exclusive areas
- Strong industry network with over 100 collaborations completed
- Deep and broad knowledge in enzymes, microorganisms and bioactive natural compounds
- Focus areas: nutrition, health and the environment
- From lab to production
- Multi-year contracts

## Libraries Business

BioArchive – industry leading collection of natural resources and metagenome libraries

- MetXtra™: unique in silico enzyme selection (Biocatalysts)
- ABEL®: Activity-Based Expression Libraries (BRAIN Zwingenberg)
- LIL®: Large Insert Libraries (BRAIN Zwingenberg)
- METAGENOME®: substantial metagenome libraries (BRAIN Zwingenberg)
- CompActives®: easily scalable compounds for bioactivity screenings (BRAIN Zwingenberg)
- MEGx: world's most sustainable collection of purified natural products, isolated from plants (MEGxp) and microorganisms (MEGxm) (AnalytiCon Discovery)

↑ \_\_\_\_\_ Strong link & interaction \_\_\_\_\_ ↑

# Partnerships „BRAIN Inside“

More than 100 exclusive partner collaborations successfully completed












	 <p><b>Speciality Enzymes</b></p>	 <p><b>High-performance Microorganisms</b></p>	 <p><b>Bioactive Natural Compounds</b></p>
<p><b>Industrial Partner*</b></p>			

\*confidential partnerships not disclosed



# Partnerships „BRAIN Inside“

Novel Solutions with high value added for our partners

	 <b>Speciality Enzymes</b>	 <b>High-performance Microorganisms</b>	 <b>Bioactive Compounds</b>
<b>Product range</b>	 		
<b>BRAIN inside</b>	<p>Low temperature detergent enzymes</p> <p>Flavorpro™ 786P Flavor creation in cheese processing</p>	<p>Optimisation of microbial strain for Isomalt production</p>	<p>Beiersdorf <b>Eucerin</b></p> <p>Skin anti-irritant Symstitute 1609</p>
<b>Industrial partner</b>	  <p>#3 detergent business globally</p> <p>BRAIN subsidiary</p>	 <p>#1 European sugar company</p>	 <p>#4 ingredients supplier globally</p>

# Enzyme Production, Expression Hosts

For expression hosts, a wide variety of protein expression systems are available

Enzymes can be expressed in cell cultures of bacteria or yeasts.

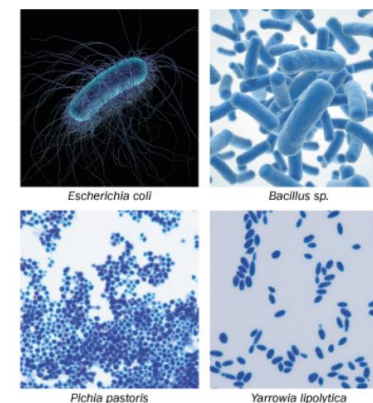
## Factors for choosing an expression system

- Protein quality
- Functionality
- Regulatory
- Production speed and yield

## Biocatalysts and WeissBioTech

- Use either bacteria or yeasts for the recombinant production of the enzyme being manufactured
- Have the ability to perform the fermentation process over a range from 250mL to 10m<sup>3</sup> scale
- This makes it possible to efficiently optimize the production yield

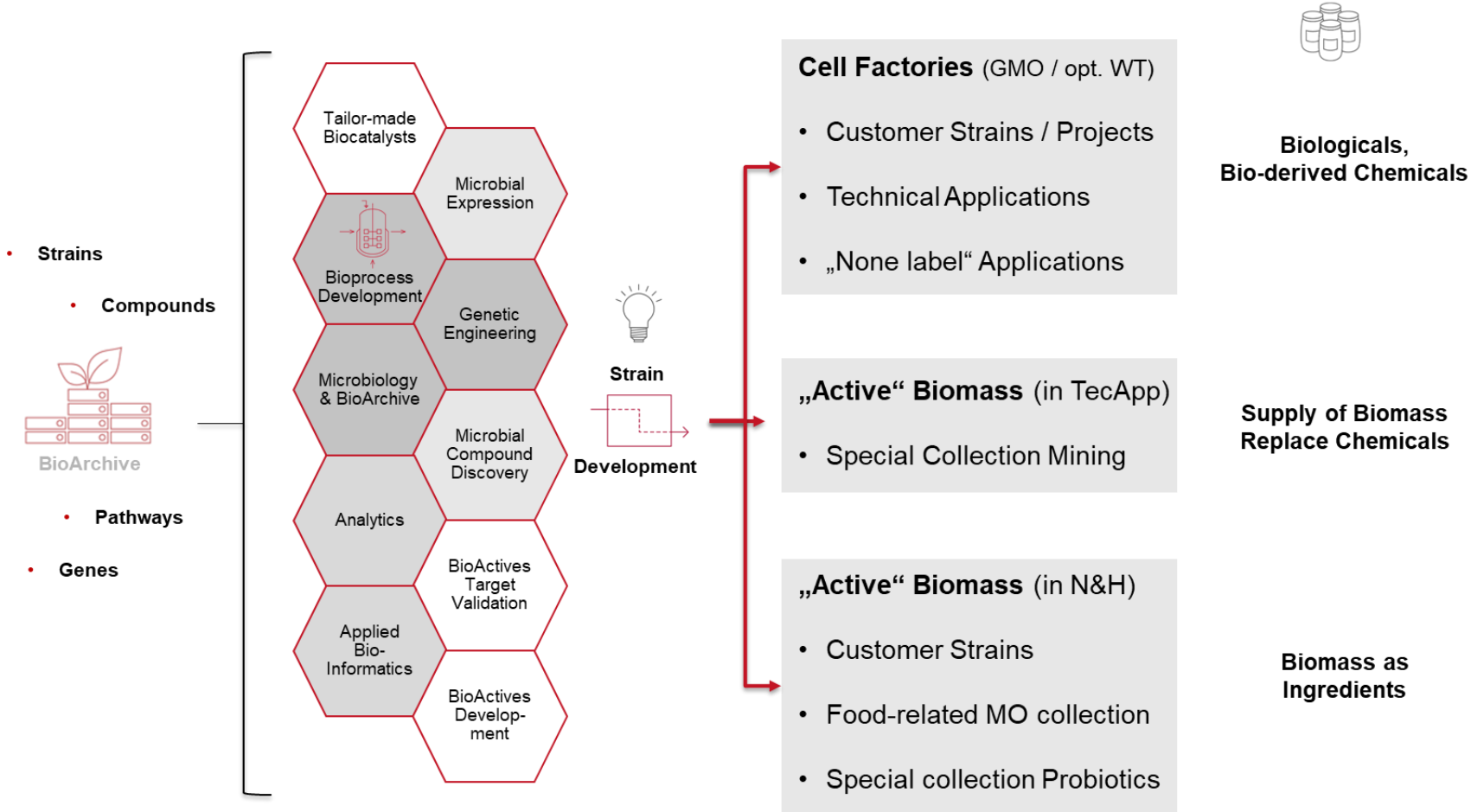
**Ongoing development & optimization of our expression hosts is key for the cost competitiveness of our products. In-licensing is also under consideration.**



\*source: Biocatalysts

# Enzyme Production, Expression Hosts

## Strain Development: Setting the Scene



# We Cover the Entire Enzymes Value Chain

All steps are underpinned by strong customer application knowledge



Discovery



Protein and Enzyme Engineering



Expression/Secretion: Bioprocesses & scale-up



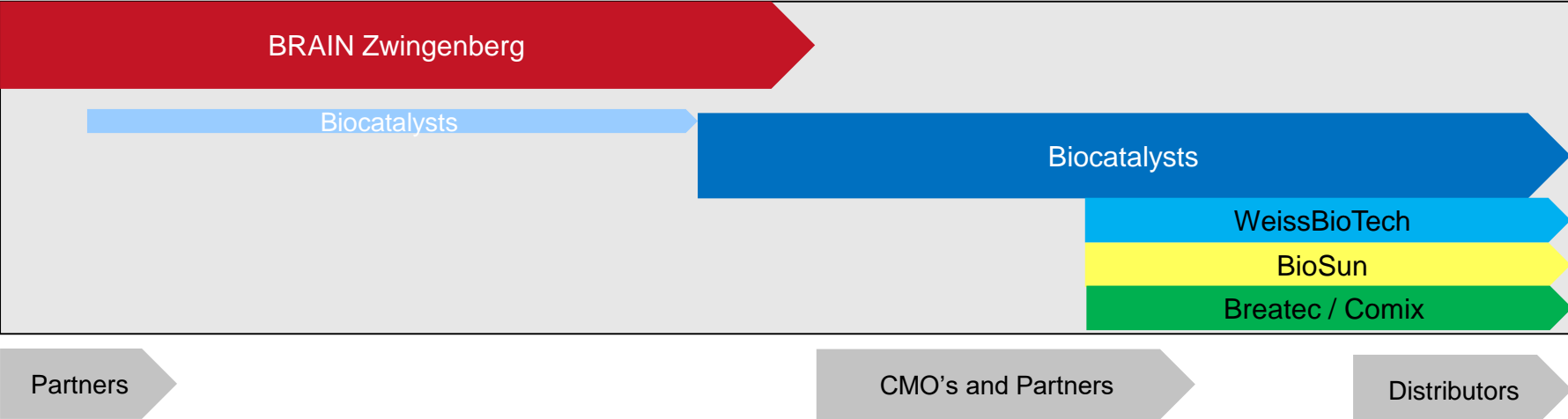
Large Scale Fermentation



Formulation And Blending



Marketing and Sales



**Bolt-on M&A further strengthens our offering**



# BRAIN BioArchive – Nature's Toolbox

~ **53,000**

Characterized  
Microorganisms

**450**

Habitat collections  
and environmental  
samples

**464**

Gene libraries  
available for  
screening

~ **13,000**

Plant fractions  
available for isolation  
campaigns

~ **13,000**

Plant fractions available  
for isolation campaigns

~ **50,000**

Natural and naturally  
inspired compounds

**54**

Metagenome  
libraries

**231**

Giga-bp DNA ready  
to screen

~ **300 Mio.**

Reusable ready-to-  
screen Metagenome  
clones



## High Value:

- ✓ >450 person years to reproduce
- ✓ ~175 patents
- ✓ ~40 patent families
- ✓ Powering TMS, NBD & product sales

# HR: People – Our Core Capital\*

BRAIN is a Knowledge Driven Enterprise

Innovation is our Passion & Teamwork our Basis

- Strong corporate culture
- Technology campus
- Global scientific and university network
- BRAIN alumni platform

**~41**

years average age

**10**

years average tenure

**57%**

female employees

**4**

trainees

**57%**

Academics

**~ 8%**

Average fluctuation since '12



strong support for PhD and  
master theses

**21%**

PhDs



equal pay policy

\* numbers refer to BRAIN Biotech AG

# Detailed Management & Employee Incentives

- ✓ **Since the IPO BRAIN Biotech AG's board as well as management compensation has been linked and aligned with shareholder interests**

## Executive Board

(Fix + performance based bonus)

variable component based on individual quantitative & qualitative targets  
stock component, see ESOP

## CoPerBo

Corporate Performance Bonus

- ❖ Since FY 2015/16
- ❖ For all employees without personal targets
- ❖ Annual bonus based on basic salary
- ❖ Three factors, 1/3 each
  - Total operation performance BioScience
  - Adj. EBITDA BioScience
  - Absolute share price performance in FY
- ❖ Payout range between 0-30% of basic salary

## ESOP

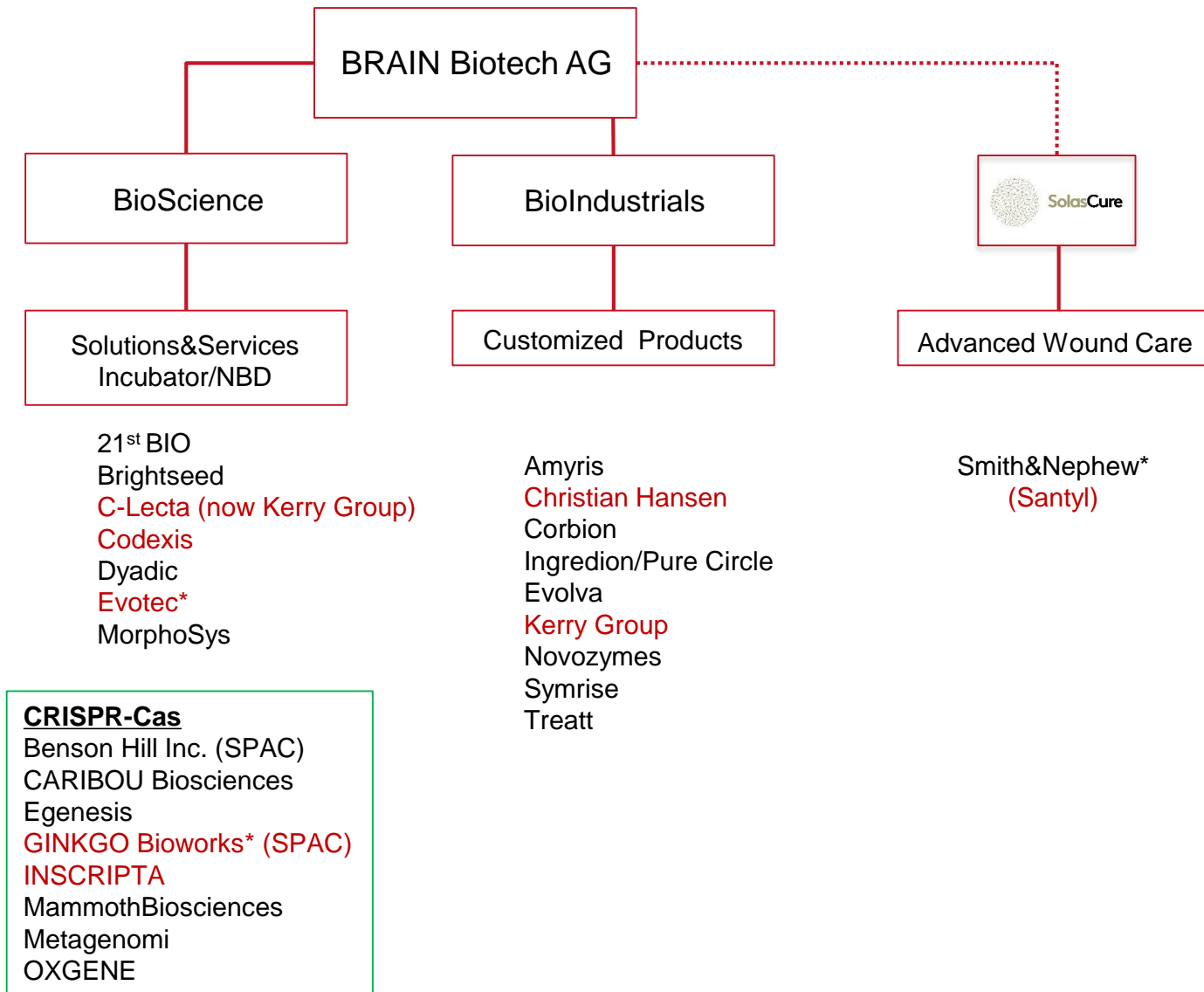
Employee Stock Ownership Program

- ❖ Since June 2018
- ❖ Board, managers and employees
- ❖ Incentive and retainer
- ❖ 1 Option = 1 Share at exercise price
- ❖ Strike price €20,67 and €10.64 from ESOP 2017 and 2018
- ❖ Beneficiary needs to still be employed
- ❖ Earliest exercise day, 4 years after grant
- ❖ Caps partially in place
- ❖ Monte Carlo model applied for fair value calculation
- ❖ 437,600 options outstanding as of Sept.30<sup>th</sup> 2019

## Specific Incentives at Daughter Companies

- ❖ Growth equity program Biocatalysts Ltd.
  - Incentivize and retain managers
  - Share program without voting or dividend rights
  - Put option based on reporting Sept. 30<sup>th</sup>, 2022
  - Growth incentive with pre-defined EBITDA multiples
  - Cash settled, €17.07 value/share as of September 30<sup>th</sup>, 2019
- ❖ Employee share scheme, AnalytiCon Discovery
  - Put options for employees and management until February 2020
  - Remuneration in 3 tranches
  - Ownership now at 100%

# Peers by Business Activity

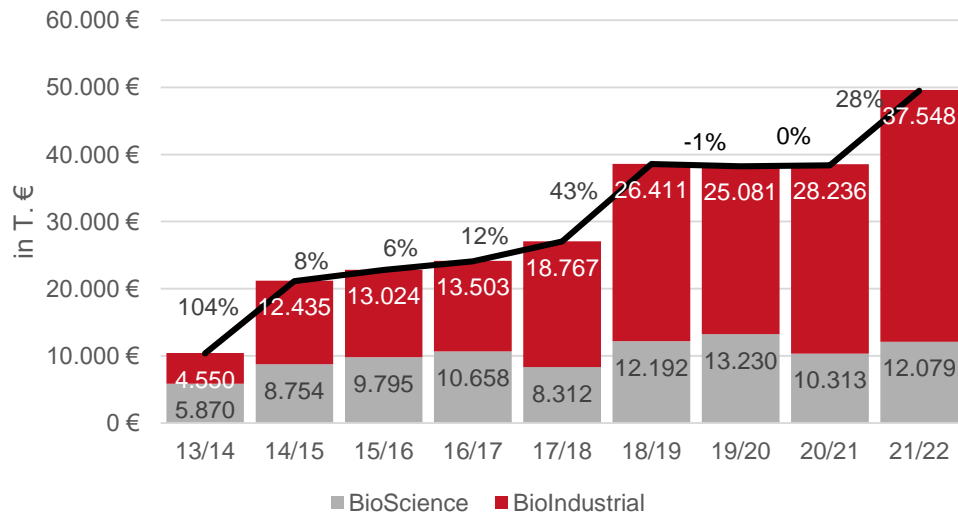


\*peers by business model

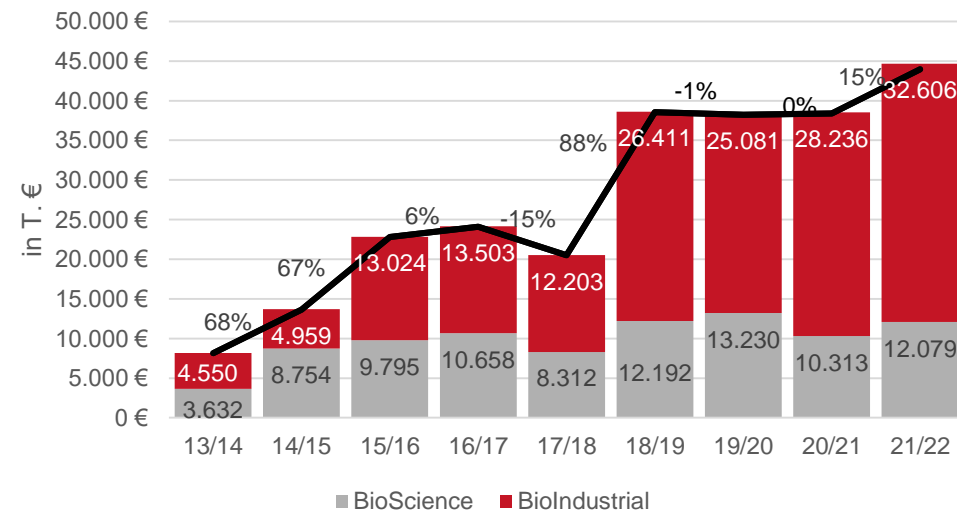


# Detailed Financials – Organic vs. Reported

Long-term reported revenues per segment

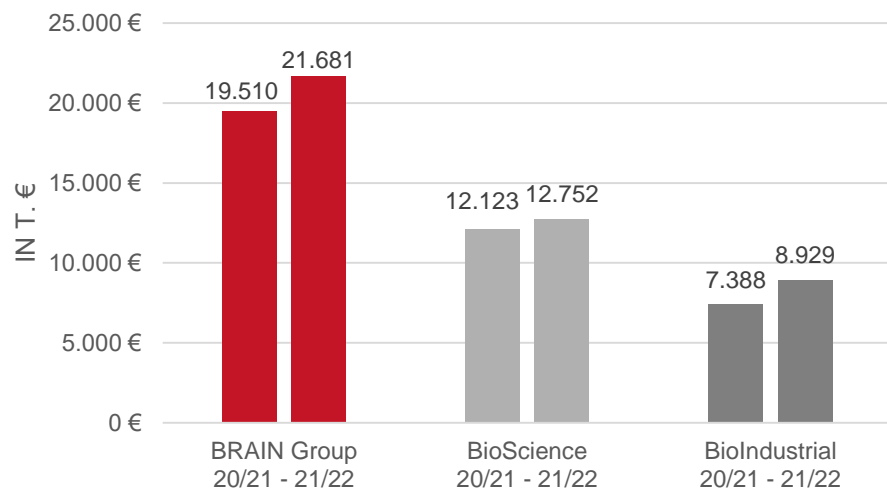


Long-term organic revenues per segment

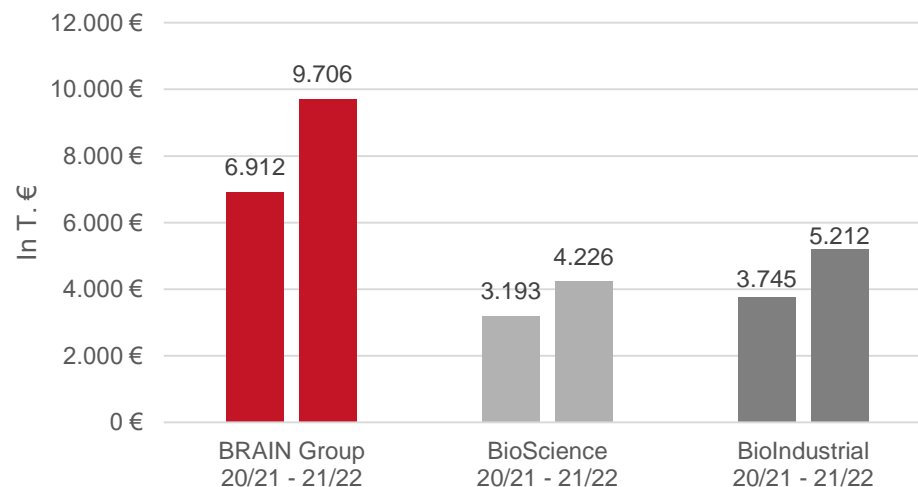


# Detailed Financials – Expenses Development

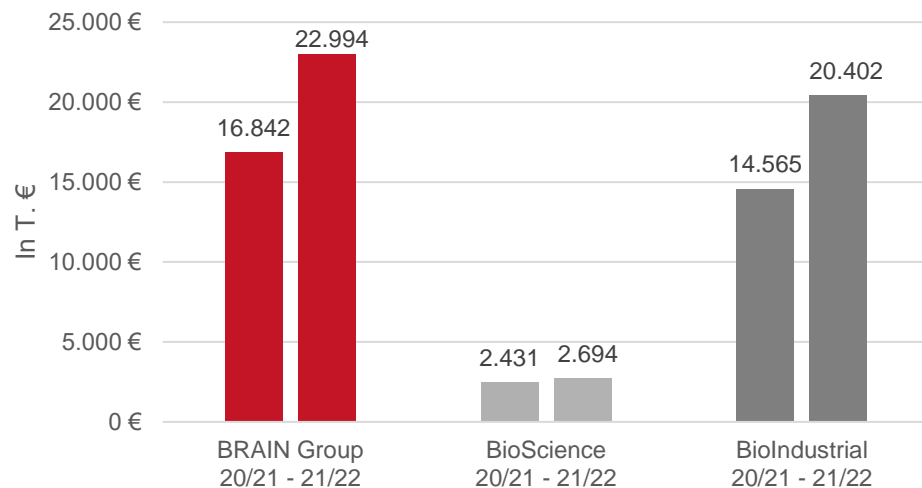
## Personnel expenses 12M 21/22



## Other expenses 12M 21/22



## Material expenses 12M 21/22



# Detailed Financials – Adjusted vs. Reported

For a like-for-like comparison BRAIN Biotech AG adjusts its EBITDA for its employee stock ownership program, performance based numeration in daughter companies, acquisition & integration costs

(in € thousand)	12M 21/22	12M 20/21
<b>EBITDA</b>	-1,309	-2,533
Gain on bargain purchase	0	858
Share-based employee compensation	-1,384	-989
Acquisition and integration costs incurred in the expansion of the BRAIN Group	-476	-313
Sales of L.A. Schmitt	650	0
<b>Adjusted EBITDA</b>	-98	-2,089

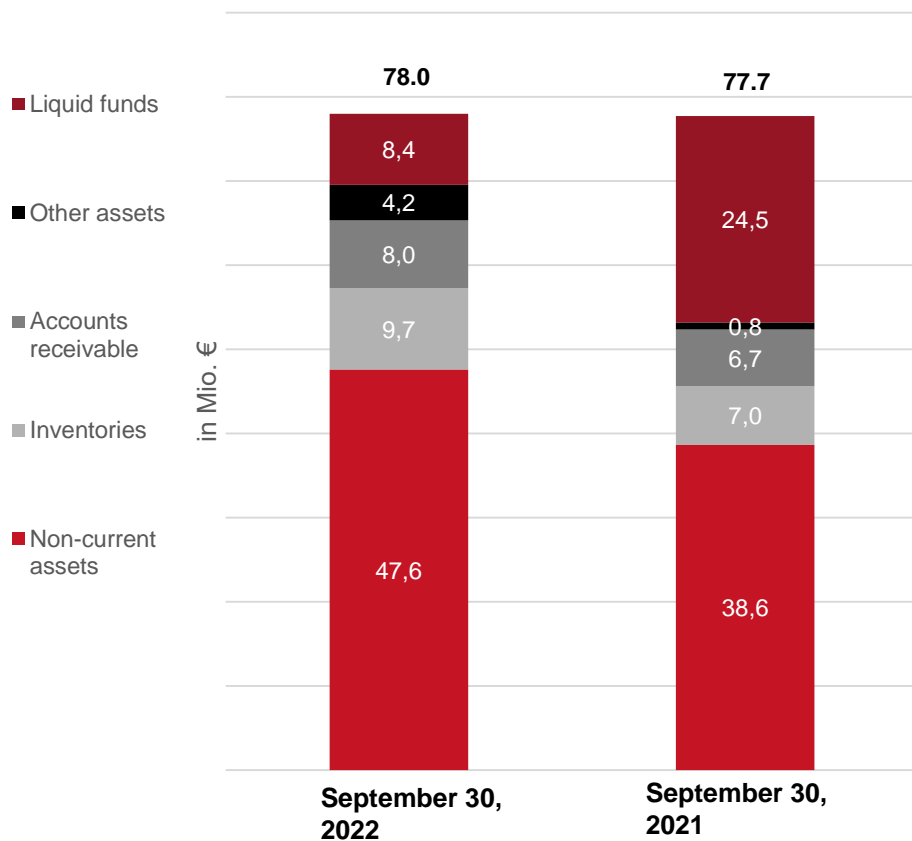
# Detailed Financials – Financial Debt vs. Financial Liabilities

For a detailed analysis of our EV calculation, our financial liabilities include:

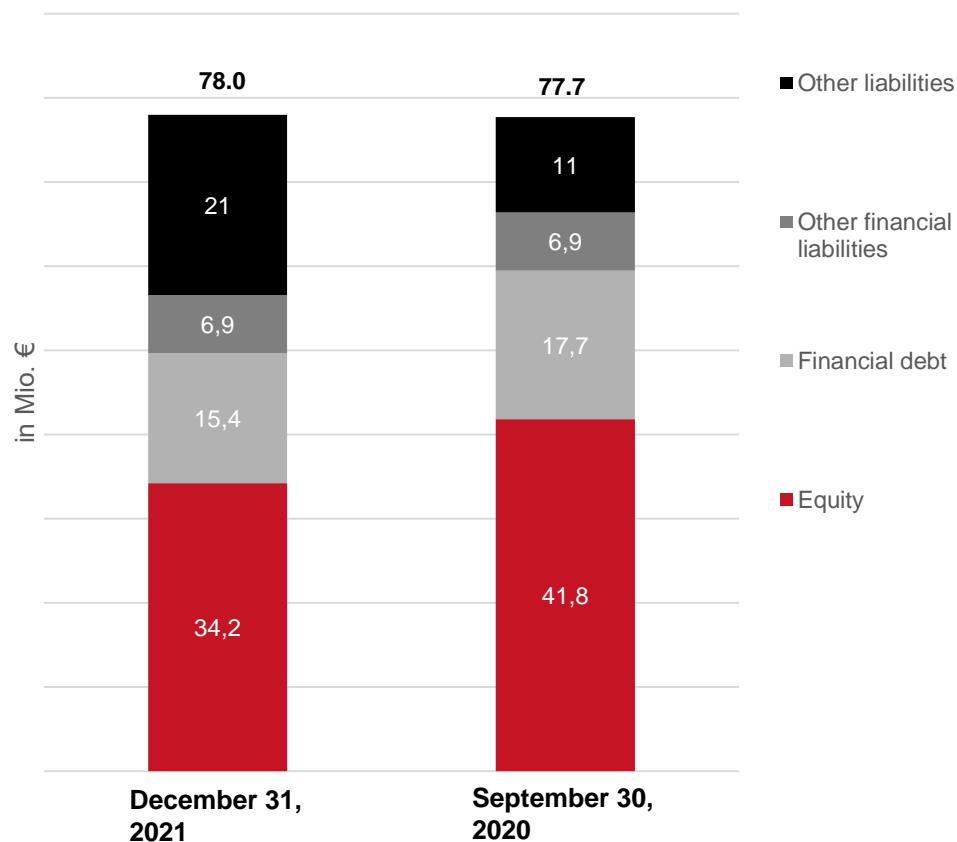
€thousands	Sept 30th, 2022	Comment
Liabilities from put option rights Biocataylsts	5,103	Biocatalysts Ltd. Call/Put option '22/'23, currently 80.65% ownership
Liabilities from put option rights Breatec	3,328	Breatec Call/Put options earliest '24/'25, currently 62.00% ownership
Contribution by silent partners	4,200	€1.2mln Hessen Kapital I GmbH, €3.0mln Hessen Kapital II GmbH, Hybrid Instruments (silent participation)
Sum I	12,631	
Loans	4,053	€2.5mln secured by Brain AG, Biocatalysts & L.A. Schmitt land charges
Finance Lease Liabilities	6,685	mostly plant & equipment
Derivatives	297	mostly FX hedging
Defered Payment Breatec	200	
Other	6	
Sum II	11,241	
Total	23,872	
Cash, 12M	8,443	

# Detailed Financials – Balance Sheet

Balance sheet September 30, 2022 vs September 30, 2021



Balance sheet September 30, 2022 vs September 30, 2021



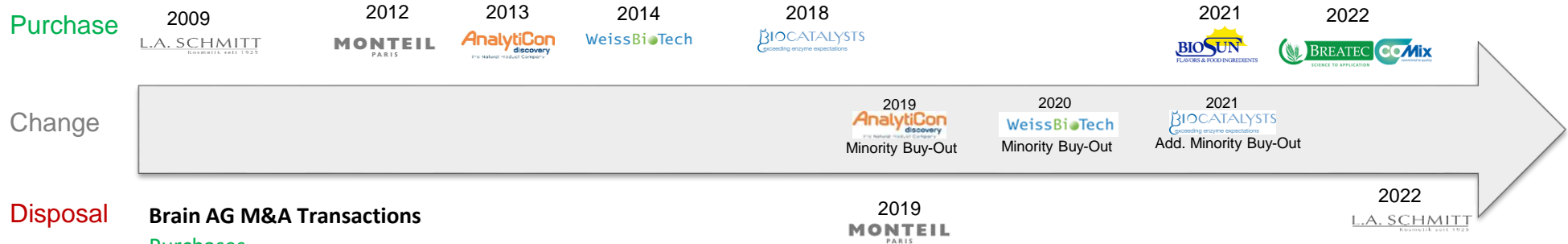
# M&A Criteria & History

## Qualitative mid-term M&A criteria

- B2B only
- Clearly focused on the product business
- Niche applications and producers
- Europe focused, US an option

## Quantitative mid-term M&A criteria

- Bolt-on character
- Profitable or at least break-even
- Value accretive within 1-2 years post synergies
- Realize economies of scale



## Brain AG M&A Transactions

### Purchases

Target	Time	Description	Comment
L.A.Schmitt	2009	B2B cosmetics	
Monteil Cosmetics	2012	B2C cosmetics	
AnalytiCon Discovery	2013	Library, TMS, R&D, nature-based	
WeissBioTech	2014	distributor, formulator and blender	
Biocatalysts	2018	enzyme design & production	65.55% owned, put/call options in place
BioSun	2021	distributor, formulator and blender	
Biocatalysts	2021	enzyme design & production	stake increased to 82.2%, put/call options in place
Breatec/Comix	2022	extension into baking enzymes	62% owned, put/call options in place

### Disposals

Asset	Time	Description	Comment
Monteil Cosmetics	2019	B2C cosmetics	refocus of Brain on the B2B segment
L.A. Schmitt	2022	B2B cosmetics	Withdrawal of BRAIN from cosmetics business

# Management CV – Executive Board



**Adriaan Moelker (CEO)**

- Master of Business Administration
- Year of birth 1964
- Joined BRAIN in 2020
- 20+ y of professional experience in industrial biotechnology innovation
- Successful in terms of innovation & revenue
- Extensive global experience in all key industrial enzyme segments



**Michael Schneiders (CFO)**

- Business Finance and Economics
- Year of birth: 1970
- Joined BRAIN in 2020 as Head of IR and later, in addition, as Head of Sustainability
- 20+ y of professional capital market experience with a strong focus on German equities and international institutional investors
- held a variety of management positions in investment banking, including Head of Equities & Research
- Part of the banking team in the IPO of BRAIN AG

# Analyst Coverage

Bank	Analyst	Target Price	Recommendation
	Markus Mayer	15.00 €	Buy
	Falko Friedrichs/Jan Koch	12.00 €	Buy
	Dr. Mohamad Vaseghi	14.00 €	Buy
	Fabien Le Disert	14.00 €	Buy
	Dr. Christian Ehmann	15.00 €	Buy



# Glossary I

Akribion Genomics	Registered trademark of BRAIN Biotech AG. The genome editing platforms based on the CRISPR-associated nucleases BEC and BMC are further developed and marketed under the brand. The founding of a separate economic entity is planned under this name.
Alternative proteins	Protein alternatives to animal proteins traditionally derived from meat or milk of higher farm animals; can be derived from plant sources (e.g. pea protein) and from microbial biomass (e.g. yeast) or obtained by targeted microbial fermentation (precision fermentation); are also obtained from protein-rich edible insects or from meat-like tissues cultivated in the laboratory (“clean meat”). The goal of producing alternative proteins is to avoid factory farming and associated environmental devastation and reduce carbon emissions. Proteins of animal origin that are produced by microorganisms while retaining their biochemical structure and functionality are also referred to as “animal-identical proteins.” Examples include milk proteins, egg proteins, and proteins used in the production of meat substitutes. For other proteins (e.g. enzymes, structural proteins), the protein structure is often purposefully altered in the bioprocess to improve (e.g. enzyme activity) or eliminate (e.g. instability) properties for later use
Aurase®	Enzymatic active ingredient as part of an innovative drug gel for the biotherapeutic treatment of chronic wounds. SolasCure Ltd., founded in 2018 with the participation of BRAIN Biotech AG, is responsible for the development, CE certification and marketing of the drug product for the biological conditioning of chronic wounds based on Aurase®.
BEC (BRAIN-Engineered-Cas)	BRAIN-Engineered-Cas (BEC) is an enzyme identified and developed at BRAIN Biotech. It is a CRISPR-associated nuclease that can be used to selectively insert, remove or modify individual DNA segments in living organisms (genome editing). With CRISPR-Cas technology, not only can the selection process be accelerated enormously; above all, it can be targeted and precise. BRAIN Biotech aims to build a patent family around the genome editing tools BEC and BMC. The genome editing platforms will be further developed under the Akribion Genomics brand
Bioactive natural compounds	Used to develop products for the food, beverage, skin care, cosmetics and chemical industries; BRAIN Biotech’s subsidiary AnalytiCon Discovery is an expert in the natural product chemistry area and performs active substance screening. Over the years, the company has built up an extensive library of bioactive substances (including “small molecules”)
Bio-based products	Bio-based products are goods manufactured from renewable raw materials
Biocatalysts	A BRAIN Group company based in the UK (headquartered in Cardiff, Wales) with a subsidiary in the USA (Illinois); developer and manufacturer of industrial-scale specialty enzymes; has a global distribution network, including Korea, Australia, New Zealand

# Glossary II

BioIndustrial	One of the two operating segments of BRAIN Biotech AG: responsible for development and marketing of the company's own products along the value chain
Biologization of industry	Application of biological processes in an industrial setting with the aim of creating a more sustainable economy
Bioeconomy	concept for a bio-based, sustainable economy; promotes increased use of organic waste and recycling of biological resource
Biorefinery	Technology for the sustainable processing of biomass into marketable products (e.g. food, feed, materials and chemicals) and energy (fuels, electricity and heating); integrated biorefineries combine various such technologies with the aim of greater flexibility and cost reduction. Integrated biorefineries facilitate the use of byproducts and waste, and enable the production of high-quality products (e.g. fine chemicals) combined with products from side streams (e.g. bioenergy)
BioScience	One of the two operating segments of BRAIN Biotech AG, focusing on the development-intensive contract business and in-house developments
Biotechnology	Application-oriented sub-sector of biology; includes insights and methods from microbiology, genetics, biochemistry, bioinformatics, technical chemistry and process engineering; utilizes biological processes, e.g. for industrial applications
BioXtractor	BRAIN Biotech demonstration plant at the Zwingenberg site for next-generation metal extraction in the areas of green and urban mining based on microorganisms
BRAIN libraries	BRAIN Group collections, consisting of enzymes, DNA sequences or natural substances; part of the BRAIN BioArchive: <i>Enzyme library</i> : up to 500 isolated and precharacterized enzymes and DNA coding for enzymes introduced into expression vectors; <i>Metagenome library</i> : screenable DNA library with metagenomes (see "metagenome") from different habitats; collection serves to identify previously uncharacterized enzymes and metabolic pathways; <i>Substance library</i> : collection of natural substances with sub-libraries of specific, well-characterized groups of substances
BRAIN BioArchive	In-house collection consisting of around 53,000 comprehensively characterized microorganisms (including "chassis microorganism" strains for the development of production organisms) and the BRAIN libraries: an enzyme library, a metagenome library and a substance library with numerous isolated natural compounds (see also "BRAIN libraries")
Brazzein	Sweet protein with an exceptional sweetening potential. It combines a good flavor profile with the benefits of being sugar-free. In nature the African plant <i>Pentadiplandra brazzeana</i> produces the protein in its berries. The ingredient can be obtained by extraction or by fermentation of the plant material; BRAIN follows the latter approach

# Glossary III

Cellular agriculture	Controlled and sustainable production of agricultural products using cells and cell assemblies without involving animal or plant organisms
Circular Bioeconomy	Concept for the complete utilization of utilized raw materials beyond the life cycle of a raw material to new production processes; part of the bioeconomy concept
Clones	Genetically identical organisms, created by natural division or reproduction, or artificially created
Compliance	Alignment of companies with statutory legislation and directives, as well as voluntary codes
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CRISPR-Cas (CRISPR/Cas)	<p>Name of a method used by molecular biologists to cut DNA in a targeted and precise manner. So-called “gene scissors” (for genome editing) enable the selective insertion, removal or modification of individual DNA segments in the living organism. The method enable biotechnologists to carry out targeted mutations and thereby, for example, rapidly optimize the metabolic performance of microbial production organisms.</p> <p>Biochemically, the CRISPR-Cas complex consists of the CRISPR-associated protein “Cas” with the function of a DNA-cutting protein (a member of the enzyme class of nucleases), as well as a piece of RNA, the so-called guide RNA, which directs the Cas protein to the site on the DNA where it is to be cut. The acronym “CRISPR” stands for a repetitive sequence region on the genome of the bacterium where this DNA region was initially discovered and by which CRISPR systems can be recognized. CRISPR-Cas systems are derived from a natural mechanism that bacteria use to protect themselves from harmful viruses</p>
Disruptive innovations	Innovations that can lead to business models or technologies being replaced
DNA	Deoxyribonucleic acid: biomolecule that carries genetic information (genes)
DNK	Abbreviation for the German Sustainability Code (Deutscher Nachhaltigkeitskodex); BRAIN Biotech has published a declaration in relation to the German Sustainability Code. The entry in the DNK database supports BRAIN Biotech’s sustainability reporting activities and provides transparency in relation to the company’s development
DOLCE	Strategic partnership initiated by BRAIN Biotech AG for the development of natural sweeteners and sweet taste enhancers (dolce = Italian for sweet)

# Glossary IV

Editing	requires only two components (1. Cas nuclease 2. programmable guide RNA), and can be multiplexed for simultaneous modification of multiple sites in a single transformation event
Enzymes	Proteins that accelerate biochemical reactions in their function as biocatalysts; they play an important role in the development of biobased products; BRAIN Biotech identifies and develops optimized enzymes for complex process and application requirements; so-called protein engineering is used in the development of enzymes for specific applications
Fermented Food	Foods and beverages that have undergone controlled contact with microorganisms and a fermentation
FRESCO	BRAIN Biotech AG development program for freshness and product stability utilizing natural bioactive substances; suitable for the food and feed industry, for medical products, paints, cleaning agents and other household products; ("fresco" = Italian for "fresh")
Genome Editing	Targeted modification of DNA using molecular biology techniques
Giga-bp	Length of a DNA sequence, indicated by the number of base pairs (1 Giga bp = 1,000,000,000 base pairs); common metagenomics measure
GMO	Genetically modified organisms
GRAS status	"Generally Regarded as Safe" status: declaration of safety for the use of substances (e.g. microorganisms) to manufacture foodstuffs; GRAS organisms can be utilized without restriction in biotechnological production
Green mining	Sustainable mining, e.g. ore processing with microorganisms instead of chemicals to extract metals such as gold, silver, copper, rare earths, etc.
Habitat	An organism's natural environment
High-performance microorganisms	Biotechnologically optimized microorganisms that serve as microbial "cell factories"
Industrial biotechnology	Includes the application of modern biotechnology in industrial production processes; chemical feedstocks are converted by enzymes (isolated or in cells, such as in bacteria or fungi) into suitable products for further processing; drives innovation for a paradigm shift in the economy – towards biological processes and bio-based products, and away from fossil raw materials and carbon emissions

# Glossary V

Incubator pipeline	BRAIN Biotech's own disruptive development projects or partnered projects for "new business" offering high commercial potential; value creation options include spin-offs, licensing, milestone payments, production, sales. (see "disruptive Innovations,,)
Markets for bulk enzymes	Volume-driven bulk markets for enzymes sold in large quantities. In contrast, a high-margin specialty enzymes business exists. BRAIN Group focuses on this latter niche business.
Metagenome	Genomic information present in the totality of all microorganisms of a given community; BRAIN Biotech AG owns more than 50 metagenome libraries containing genomic information relating to a large number of novel enzymes and metabolic pathways from previously unculturable organisms
Metagenomics	Analysis of the genome (whole genetic material) of a community of organisms by gene sequencing; genetic material is extracted, sequenced and analyzed directly from environmental samples, which saves the previous cultivation of microorganisms
Microorganism	Microscopically small unicellular or multicellular organisms, e.g. bacteria, algae, fungi or viruses
New Business Development (NBD)	Systematic further development of existing and development of new business opportunities including e.g. R&D and marketing activities
New Product Development (NPD)	R&D activities that aim to develop product candidates for the BRAIN Group's own market offerings
NGS	NGS stands for "Next Generation Sequencing". It describes the process of high-throughput sequencing of DNA
Peptides	Linear, sometimes ring-shaped chain of molecules consisting of two or more amino acids; long polypeptide chains are called proteins.
Precision fermentation	Further development of classical fermentation using molecular biology and bioinformatics; fermentable organisms such as bacteria, yeasts, or fungi are engineered into production microorganisms ("cell factories") so that they produce a specific protein (or other molecule) in high quantity and purity and with specific properties. Prerequisites typically include targeted, precise changes in the microorganism's genome - e.g. using genome editing or the insertion of genetic blueprints – and the development of sophisticated fermentation processes. Proteins produced by precision fermentation and subsequently purified include enzymes, alternative proteins (see "alternative proteins") a structural proteins for different industries
Precision probiotics	Probiotics that have been optimized for performance and/or safety using nonGMO techniques (e.g. natural evolution and targeted genome editing without the use of foreign DNA)

# Glossary VI

Product sales at BRAIN Group	Sales of products in the form of merchandise, technologies or biotechnological system solutions; can be achieved via the BRAIN Group's direct B2B business or through joint product developments with industrial partners and corresponding licensing agreements; scalable-product business option offered by the BRAIN Group
Postbiotics	Non-viable bacterial products or metabolic by-products of probiotic microorganisms that develop biological activity in the host. Application areas include cosmetics
Prebiotics	Food or dietary supplement containing an (indigestible) ingredient that selectively stimulates the growth and/or activity of indigenous bacteria
Probiotics	Live microorganisms which, when used adequately, exert a health-promoting effect on humans and animals. Have been used for intestinal health in the food sector for over 50 years; new application areas include cosmetics, agricultural and household products. Precision probiotics: Probiotics optimized for performance and/or safety using non-GMO processes (e.g. natural evolution and targeted genome editing without the use of foreign DNA)
Protein engineering	In the process of protein engineering, proteins (e.g. enzymes) are constructed and optimized for specific purposes. The approach is either via so-called "rational design" (targeted mutagenesis, possible with existing knowledge of protein structure) or "directed evolution" (mimics natural evolution and requires no prior knowledge of protein structure)
R&D	Research and development
SALT-E	One of several BRAIN development programs for healthier foods through salt reduction
SDGs-UN	United Nations Sustainable Development Goals
Single-cell proteins	Also known as microbial proteins; are commonly derived from microalgae, fungi or bacteria
Specialty chemicals	Specific chemical products with a broad range of activities on which a large number of other industrial sectors depend
Specialty enzymes market	Markets for high-margin specialty enzymes business
Synbiotics	Combination of probiotics and prebiotics
Synthetic Biology	Area of biology in which organisms are modified to develop new, useful abilities

# Glossary VII

Tailor-Made-Solutions (TMS)	Dedicated contract R&D programs for the development of tailor-made solutions for industry
Urban mining	Sustainable extraction of valuable substances from secondary raw materials and waste flows in order to retain them in value chains in the long term
White Biotechnology	Includes the application of modern biotechnology in industrial production processes. Chemical starting materials are converted by enzymes and cells into products suitable for further processing. Also known as industrial biotechnology