

The future  
of sweetness  
Transforming health  
with sweet proteins

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# Sugars in daily diets

## Added sugars in foods

Sugar is added to many of the foods we consume, including processed foods, baked goods, and sauces.

## Sugars in beverages

Sugary drinks such as soda, energy drinks, and sports drinks are a major source of added sugar in our diets.



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# Presentation outline

The impact of sugar

The growing public health crisis

Introduction to sweet proteins

Leading innovators in sweet proteins

Market potential and applications

Consumer education and adoption



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# Dr. Adam M. Adamek

iCIO and Director of Innovation at EIT Food

**Expertise:** AgriFoodTech, personalized nutrition, innovation leadership

**Professional experience:** Led nutrition innovation and R&D at foodspring (Mars Co.)

Held senior R&D & Innovation positions at Mondelēz and Danone.  
Worked with Merck, Pharma Nord and in Academia in earlier roles

**Education:** PhD in Life Sciences, Biomedicine  
Postgraduate studies in Strategic Leadership and Management,  
MPH, International Public Health & Nutrition



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# The World's heaviest problem

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The number of people with diabetes rose from **108 million in 1980 to 537 million in 2023**. By **2045** we might reach **783 million**.

Prevalence has been rising **more rapidly in low- and middle-income countries** than in high-income countries.

Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.

In 2019, diabetes and kidney disease due to **diabetes caused an estimated 2 million deaths**.

HUMAN DEVELOPMENT

PERSPECTIVES

OVERVIEW

# Obesity

Health and Economic Consequences  
of an Impending Global Challenge



Meera Shekar and Barry Popkin, Editors



WORLD  
OBESITY

# World Obesity Atlas 2024

## Obesity and its consequences

- Global, regional and national estimates of the contribution of obesity to leading non-communicable diseases in adults
- Global, regional and national predictions of the effects of obesity on children's higher risk of non-communicable diseases
- 186 national scorecards for child and adult obesity and its consequences

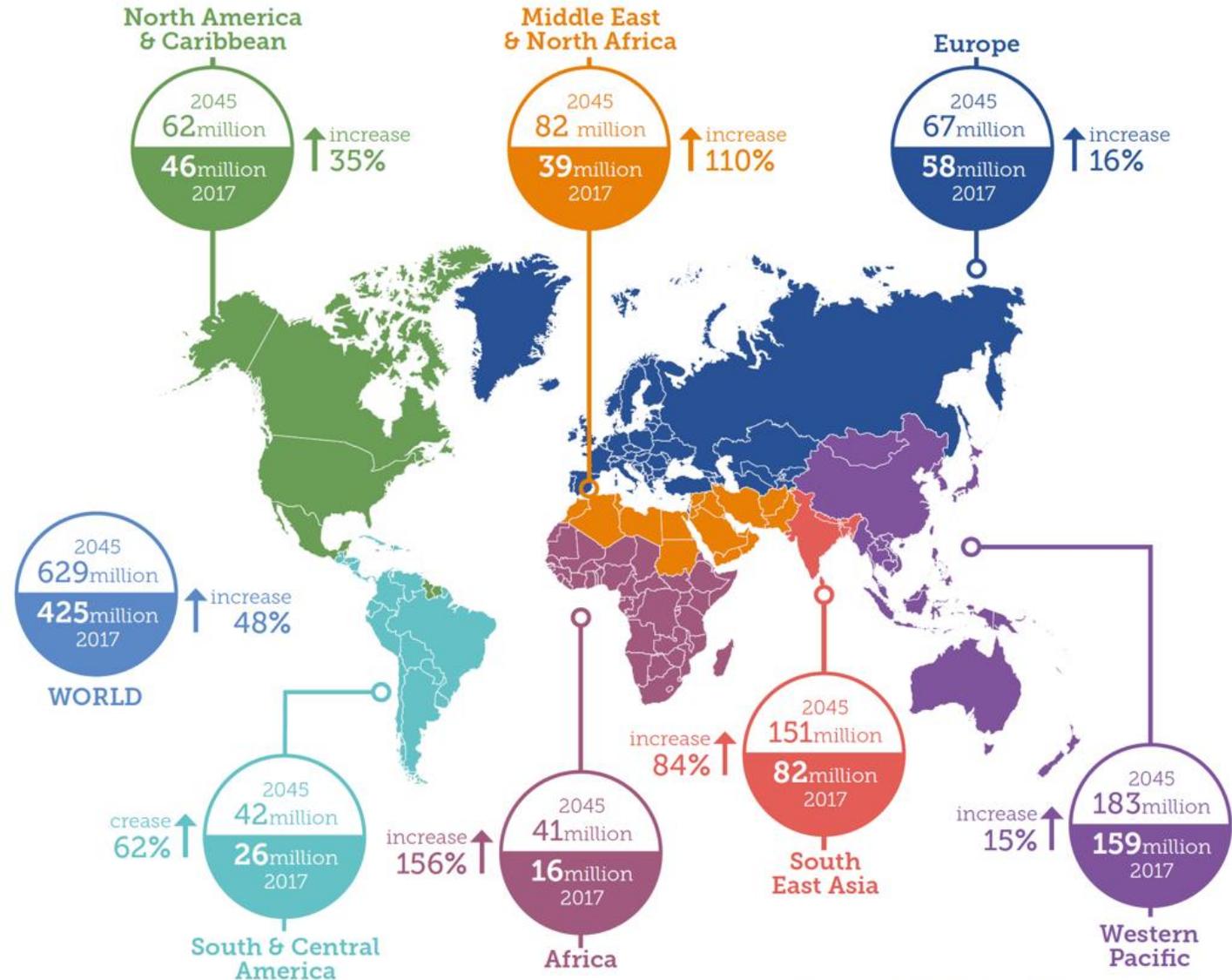
March 2024



# Growing Numbers of People Worldwide with Diabetes

More than 530 million people worldwide are affected by diabetes, making it a significant health concern.

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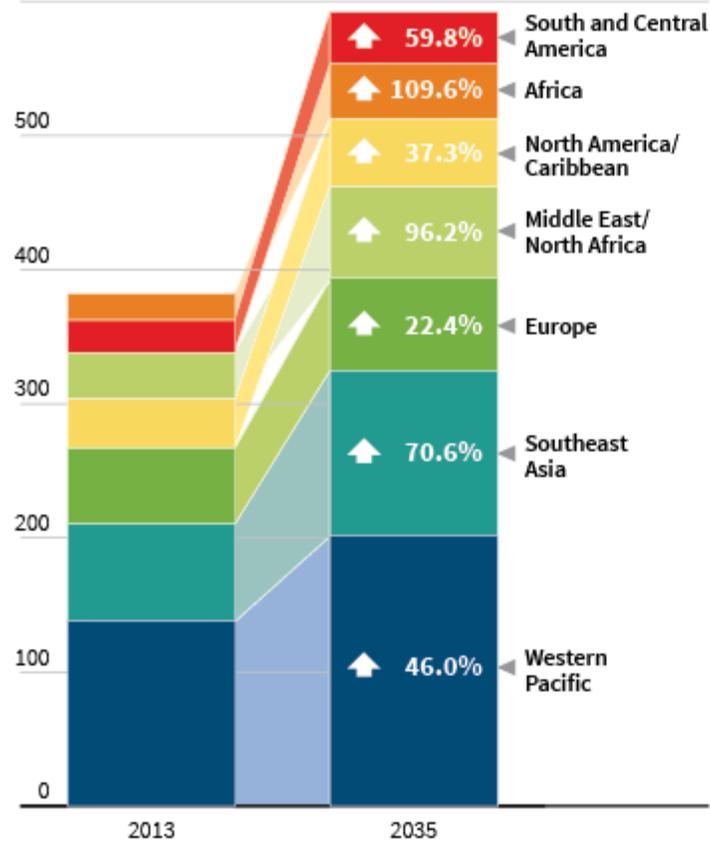


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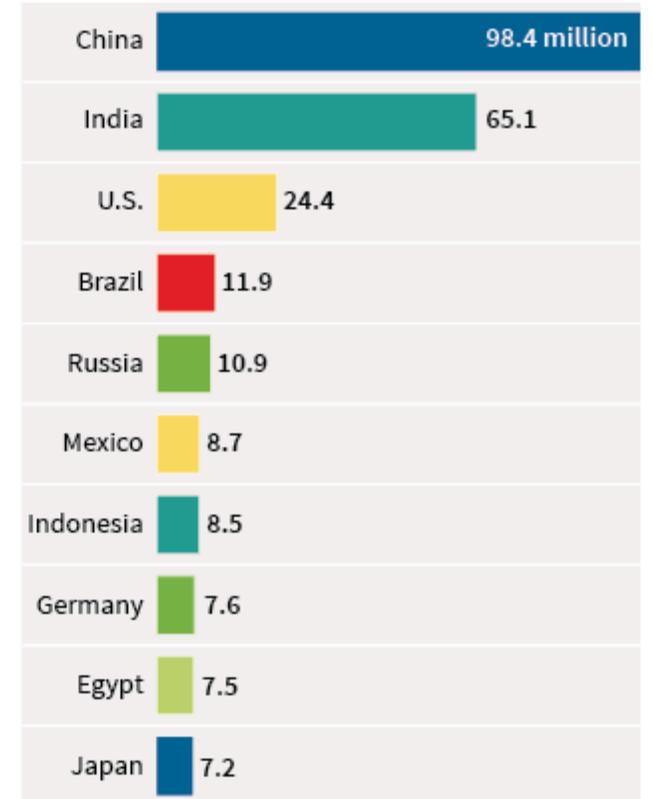
## World diabetes cases expected to jump 55 percent by 2035

Current and projected cases of diabetes by region

600 million



Top 10 countries by number of people with diabetes in 2013, ages 20 to 79



Source: International Diabetes Federation

S. Culp, 12/11/2013

# Introduction to *sweet* proteins

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# What are sweet proteins?

Sweet proteins are naturally occurring proteins that have a sweet taste but are not metabolized by the body like traditional sugar. They are a healthier alternative to sugar and can be used in various food products.

up to **3,000 x sweeter than sugar**

✓ No insulin response.

✓ No calories.

✓ No effect on microbiome, liver, kidneys.





	<b>Thaumatococcus danielli</b>	<b>Dioscoreophyllum cumminsii</b>	<b>Capparis masakai</b>	<b>Pentadiplandra brazzeana</b>	<b>Pentadiplandra brazzeana</b>	<b>Curculigo latifolia</b>	<b>Richadella dulcifica</b>
Source	Thaumatococcus danielli Benth	Dioscoreophyllum cumminsii Diels	Capparis masakai Levl	Pentadiplandra brazzeana Baillon	Pentadiplandra brazzeana Baillon	Curculigo latifolia	Richadella dulcifica
Geographic distribution	West Africa	West Africa	China	West Africa	West Africa	Malaysia	West Africa
Variants	I, II, a, b, c <sup>a</sup>	-	I, II- a, III, IV <sup>a</sup>	-	-	-	-
Sweetness factor (weight basis)	3000	3000	100	500	2000	550	-
Molecular mass (active form, kDa)	22.2	10.7	12.4	12.0 <sup>b</sup>	6.5	24.9	98.4
Amino acids	207	45 (A chain) 50 (B chain)	33 (A chain) 72 (B chain)	?	54	114	191
Active form	Monomer	Dimer (A + B)	Dimer (A + B)	?	Monomer	Dimer (A + A)	Tetramer (A+A+A+A)



# Health benefits over traditional sugars

## **Lower or no calorie content**

Sweet proteins have lower calorie content than traditional sugar, making them a healthier option for people looking to reduce their calorie intake.

## **No effect on blood sugar levels**

Sweet proteins do not affect blood sugar levels, making them a safer option for people with diabetes or those looking to manage their blood sugar levels.

## **No dental decay**

Sweet proteins do not cause dental decay, making them a healthier option for maintaining good oral health.

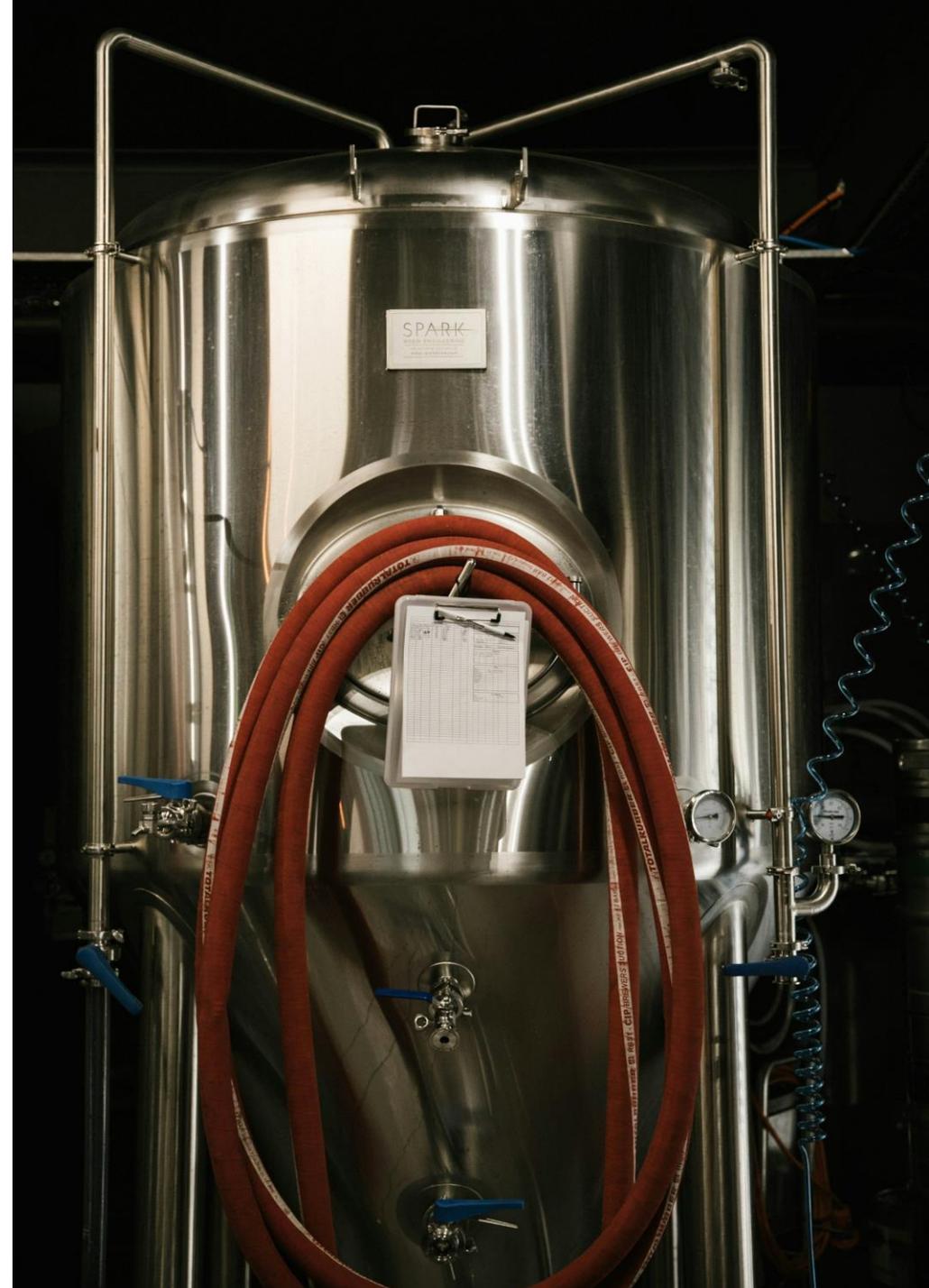
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But... they cannot  
be easily used in the food industry

High cost

Sweetness profile

Low stability



# Leading innovators in sweet proteins

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# Amai Proteins and their contributions

## Synthetic biology

Amai Proteins uses synthetic biology to create novel proteins with sweet taste, providing a sustainable and scalable solution for sweet protein production.

### SCIENCE

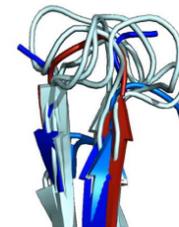
“The  
breakthrough  
in protein folding  
is one of the  
greatest ever...”

“Solving the Protein Folding Problem”  
2021 Science magazine breakthrough  
of the year

17 DECEMBER 2021 • VOL 374 ISSUE 6574 1415

### AI-CPD is defined as “The Inverse Folding Problem”

Amai’s PRO<sup>3</sup> Platform  
cracks the code of inverse  
protein structure prediction  
which is exponentially  
harder than protein  
structure prediction.



### LEGEND

Blue - Floppy edges of wild (plant) protein

Gray - Single-chain protein

Red - Amai’s Designer protein: **100% sweeter and > 40°C more stable than wild protein**

Sources: Samish, 2017, *Computational Protein Design* (Springer); Samish et al, 2015, *Bioinformatics*, 146-150.  
Samish et al, 2012, *Annu Rev Phys Chem* 62:129-149



# Oobli

Oobli's  
innovative  
solutions

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## Proprietary technology

Oobli (form. Joywell Foods) uses proprietary technology to produce high-purity sweet proteins from plant sources. This technology allows for the production of sweet proteins with various functional and nutritional benefits.





## Sweegen's sweet protein solutions

Sweegen offers various solutions for sugar reduction in the food and beverage industry, including sweet protein-based products that have been approved by various regulatory bodies for various applications in the food and beverage industry, including bakery, confectionery, beverages, and dairy products.

# Sweegen's advancements in the Market

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### What makes Brazzein so special?



High-Sweet Potency



Heat Stable



pH Stable



Water Soluble



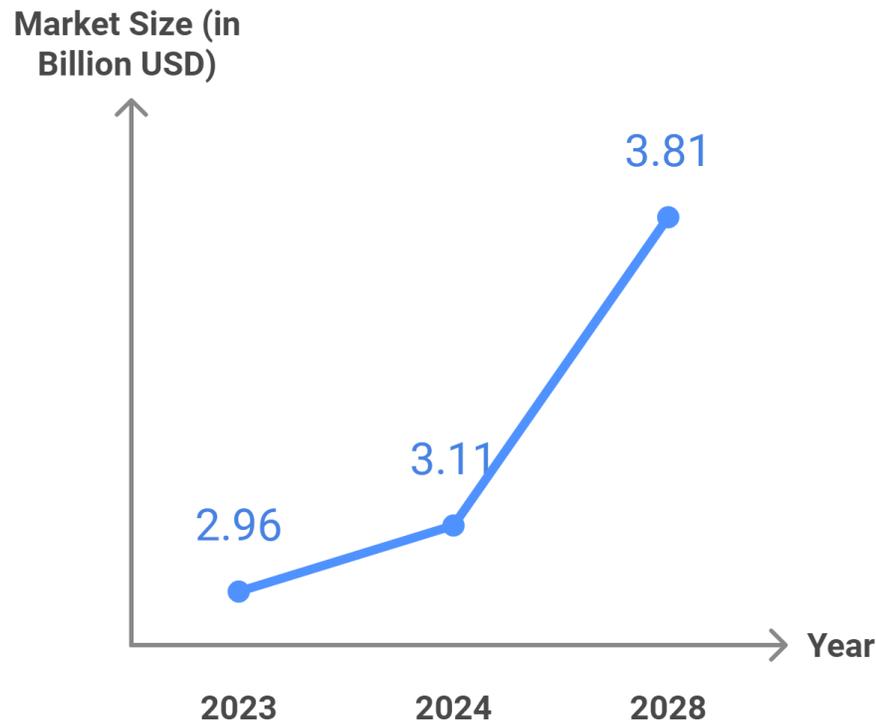
Sweet Synergy

# Market potential



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# High-intensity artificial sweeteners market



While not directly comparable, it's worth noting the high-intensity artificial sweeteners market for context:

**2023 market size: \$2.96 billion**

**2024 projected size: \$3.11 billion**

**Expected to reach \$3.81 billion by 2028, growing at a CAGR of 5.21%**

This data suggests that while the sweet protein market is smaller, it is projected to grow at a faster rate than the artificial sweeteners market.

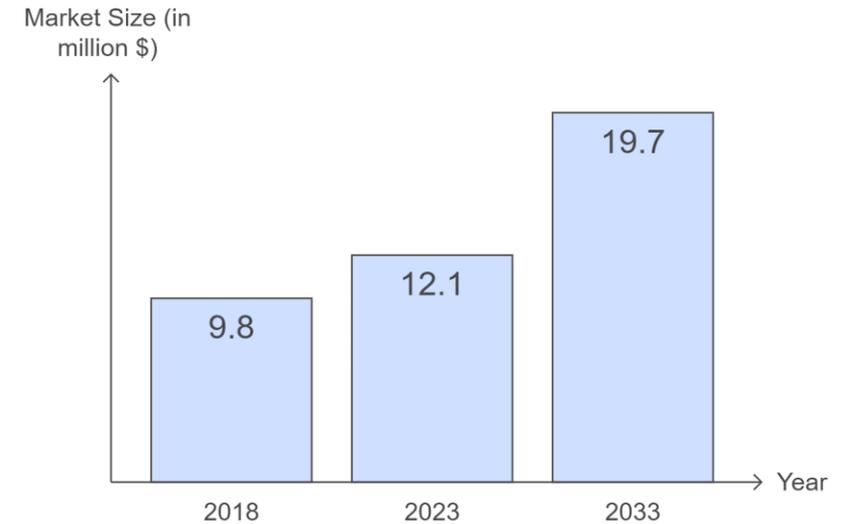
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# Growth projections for the global sweet protein market

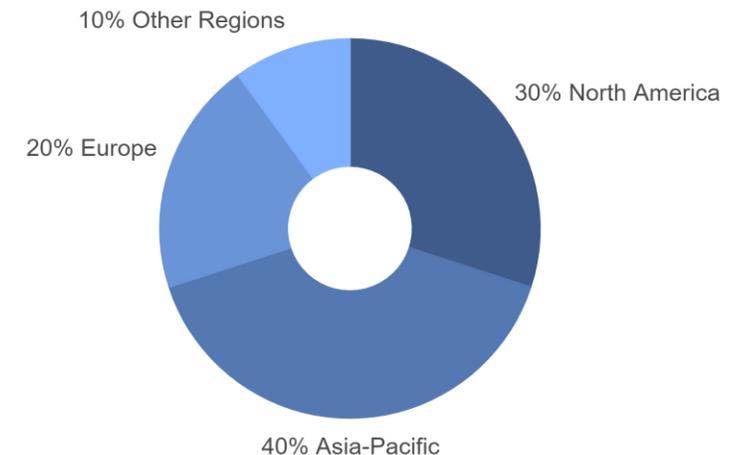
The global sweet protein market is expected to grow rapidly in the coming years due to increasing demand for natural and healthy sweeteners.

**North America and Europe:** These regions are seeing steady growth due to government initiatives and rising consumer awareness about health benefits.

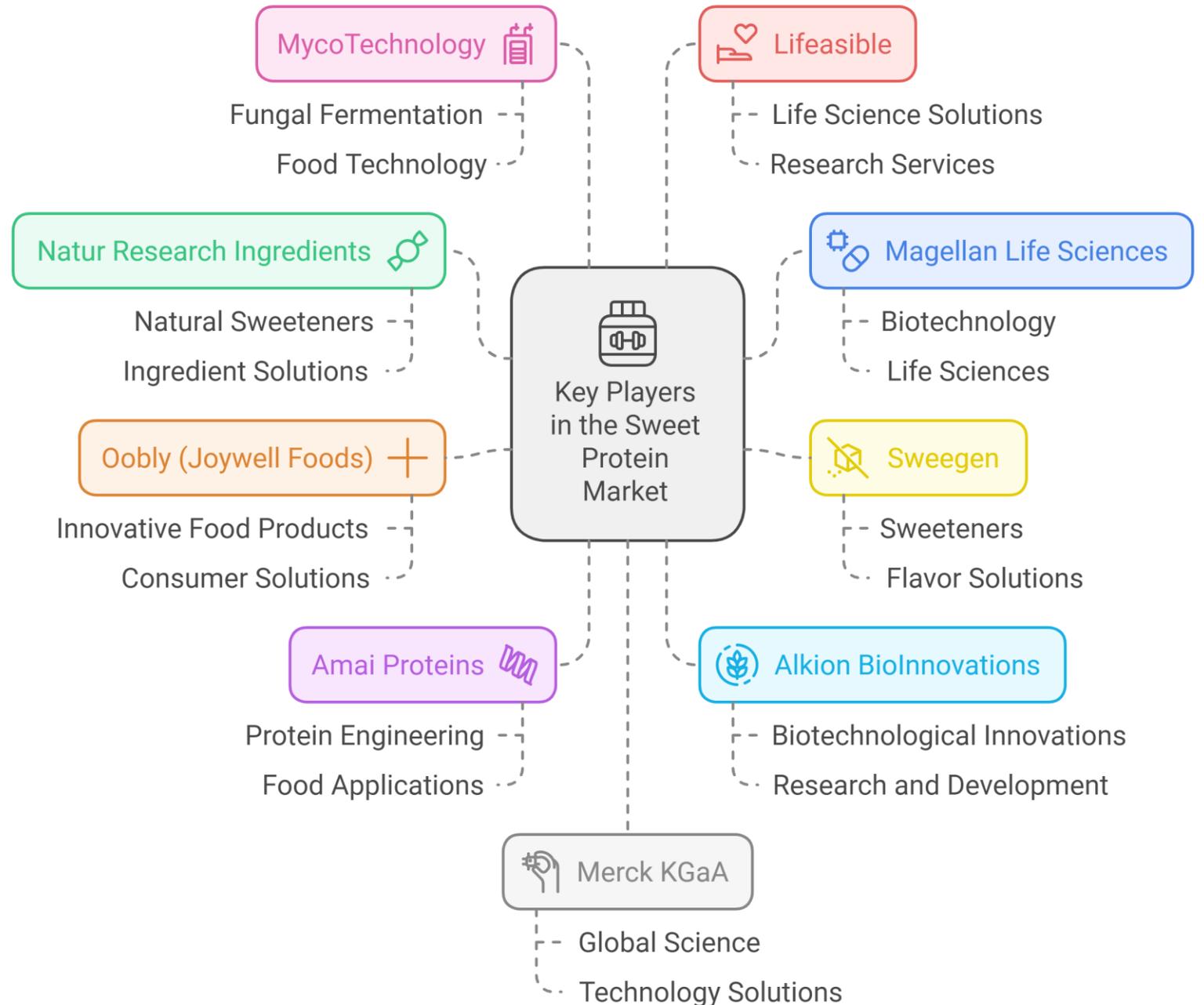
**Asia-Pacific:** Particularly China, leads the market with robust domestic demand, supportive policies, and a strong manufacturing base.



**Projected Market Share of Sweet Proteins by Region**



# Opportunities Main players



# Consumer education and adoption

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# Importance of educating consumers on sweet proteins

## **Sweet proteins as sustainable alternative to traditional sugar**

Sweet proteins offer a natural and sustainable alternative to traditional sugar. Educating consumers on this alternative can contribute to reducing the negative effects of sugar consumption on health and the environment.

## **Benefits of Sweet Proteins**

Educating consumers on the benefits of sweet proteins can help increase adoption and demand. Sweet proteins offer a low glycemic index and are suitable for people with diabetes and other health conditions.

## **How to Use Sweet Proteins in Everyday Life**

Educating consumers on how to use sweet proteins in everyday life can help increase adoption and demand. Sweet proteins can be used in a variety of applications, including beverages, baked goods, and snacks.



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## Consumer taste test results and acceptance

Consumer taste tests have revealed that sweet proteins can provide a similar taste experience to traditional sugar, with some even preferred over traditional sugar.

Sweet proteins have significant potential for consumer adoption as a substitute for traditional sugar.

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## Aligning with consumer values

Sweet proteins are a sustainable alternative to traditional sugar that aligns with eco-conscious consumer values, promoting public health and sustainability.

They have the potential to radically reduce the environmental footprint of the food industry.



# Credits and references

## References

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