Atopic dermatitis management

with whey protein hydrolysates

Arla Foods Ingredients

Discovering the wonders of whey

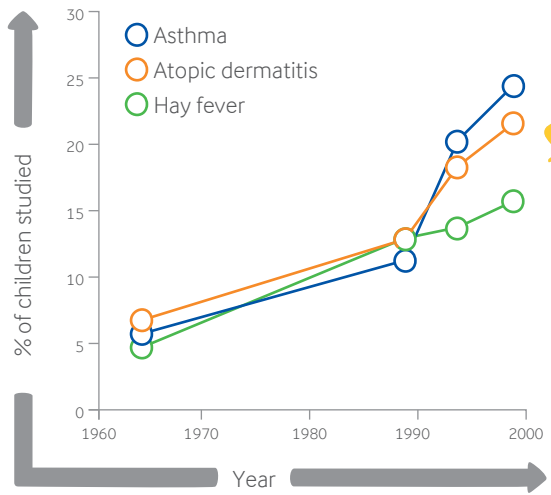
Prevalence, symptoms and causes of atopic dermatitis

Atopic dermatitis (AD) is a common, multifactorial, chronic skin disorder, most often seen in infants and children. It results from the interaction of genetic, immune and environmental factors[1-6], such as allergen exposure, irritants, microbes, stress, air quality and diet.

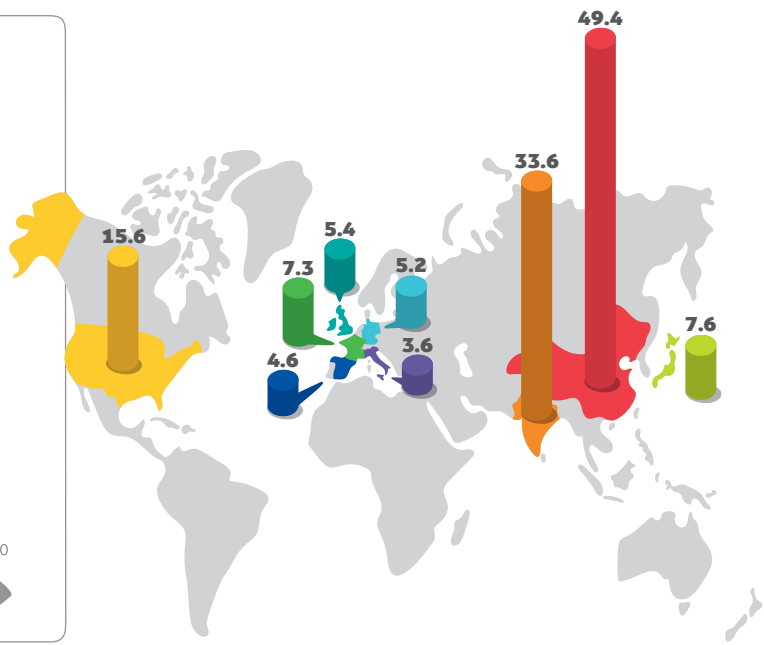
In most cases, AD appears in the first months of life[6], and its prevalence decreases around 2-4 years of age[7]. Even though AD is primarily a children's disease, up to 3% of adults are affected[2, 8].

AD affects up to 20% or more of the population in developed countries[3]. However, lifetime prevalence has shown a doubling to a tripling in the past 30 years[2, 8]. There is some evidence of a higher risk for AD in urban compared to rural areas, which could be due to environmental factors[3, 16].

Children with allergic disease[22]



Prevalence of lifetime atopic dermatitis around the world (millions)[29]



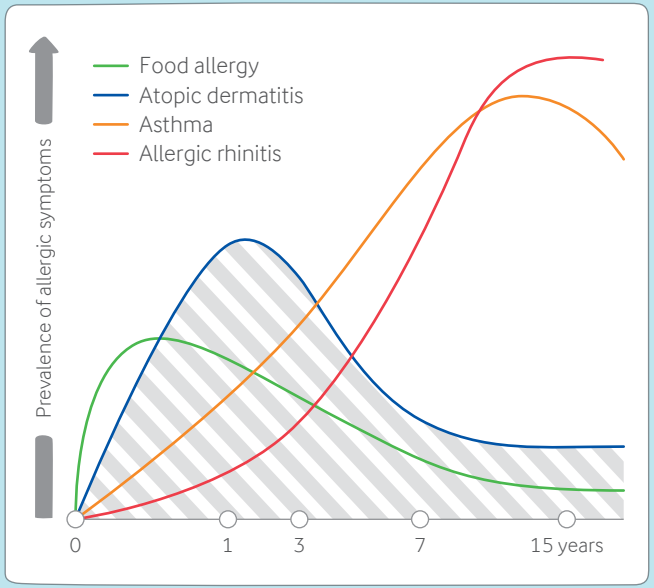
The hallmark of AD is skin inflammation, culminating in dry, scaly and itchy skin[2, 5], especially at night. One of the major stress-causing factors is sleep disturbances as a result of itching and scratching. This affects the parents, siblings and infant, potentially resulting in daytime tiredness and decreased coping skills at work and at home[6, 9, 10].

Furthermore, AD patients and their families must also cope with the financial burden of the disease[9].

The cause of AD is not known, but there is evidence that genetic factors and probably growing up in a clean environment may predispose to the development[2, 4, 11, 12].

The evidence to date favors that AD is the initial atopic manifestation of allergies later in life[13, 14]. It has been shown that children with AD are more likely to develop asthma and rhinitis compared to children without AD (three-fold increased odds)[15].

Hence, early intervention is key to improving long-term outcomes for AD, reduction of associated allergic diseases and prevention of the atopic march[1].

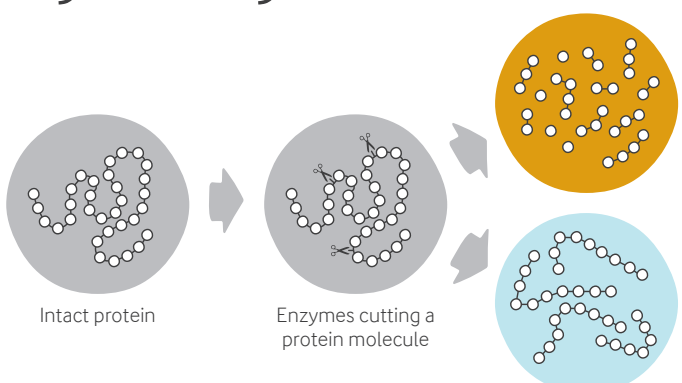


Management of atopic dermatitis with whey protein hydrolysates

Prevention of AD should start as early as possible, and breastfeeding is considered the best strategy. However, when breastfeeding is not possible, one nutritional option in the prevention of AD is to use infant formula with hydrolised protein, which reduces allergenicity. Extensively as well as partially hydrolised formulas have the potential for primary prevention in high-risk infants[17-22].

A protein hydrolysate is the outcome of an enzymatically-driven process, where the intact protein is cut into smaller peptide fragments or free amino acids. Protein hydrolysates offer three main benefits:

- Reduced allergenic potential compared to intact proteins
- Easier digestion and absorption compared to intact protein and free amino acids
- Faster absorption compared to intact proteins



Extensively hydrolysed whey protein with smaller peptides

Partially hydrolysed whey protein with larger peptides

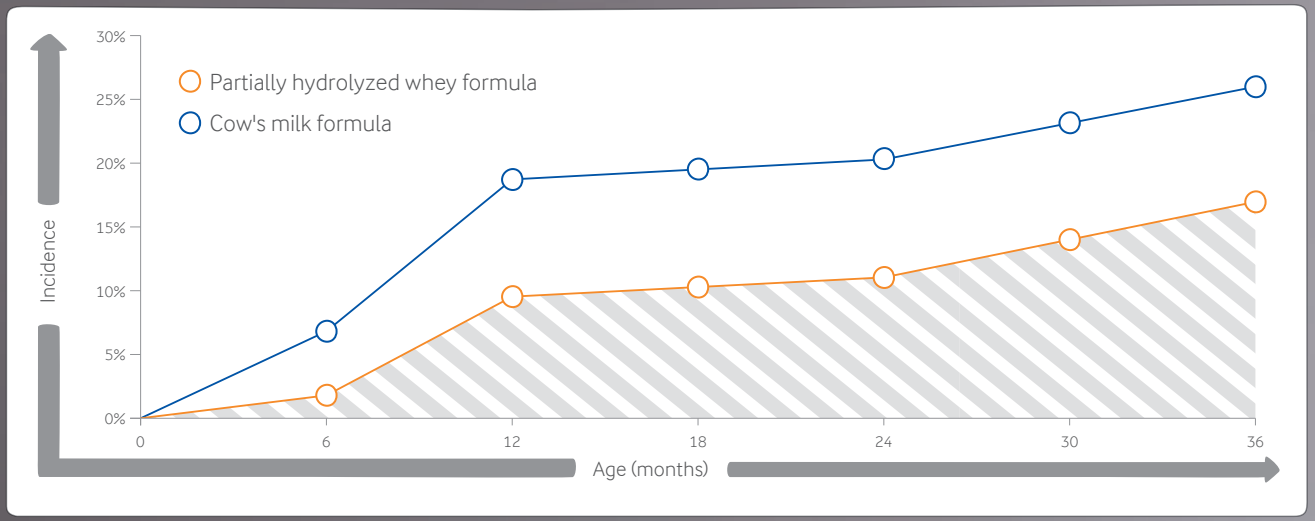
Both partial and extensive hydrolysates consist of a wide range of peptide sizes. Protein molecular weight (MW) profile enables differentiation of the protein characteristics of formulas, but does not determine the allergenic formula properties.

The differentiation between partial and extensive formulas is generally performed by molecular weight profile and clinical demonstration of reduced allergenicity.

Studies have shown an allergen must contain two epitopes in order for antibody binding to occur. Therefore, the minimal molecular mass to elicit allergenicity of hydrolysates appears to be approximately 3 kDa[24, 25, 26].

Protein type	Molecular weight (kDa)	Comments
Whole (standard infant formulas)	Up to 160	
Partially hydrolysed formulas (pHF)	Generally <5	Ranges between 3-10 kDa. Peptides up to 40 kDa
Extensively hydrolysed formulas (eHF)	Most peptides <3 (>90%)	1-5% > 3.5 kDa

A meta-analysis has shown that prolonged feeding with partially hydrolyzed whey formula reduced the incidence of AD in healthy infants with a family history of allergy by 55% compared to infants fed with intact protein infant formula[22].



In the German GINI study, four formulas were tested in a randomised, double-blind infant clinical study with 998 children completing the study per protocol – partial whey, extensive whey and extensive casein formulas. The infant formulas were given as the only substitute to breast milk for the first 4 months of life. The study reported a significant risk reduction of AD up to 15 years of age for infants who received the partially hydrolysed whey-based formula and the extensively hydrolysed casein formula[21]. A very important finding of the GINI study was that it was impossible to predict the effect, based on protein source and degree of hydrolysate only.

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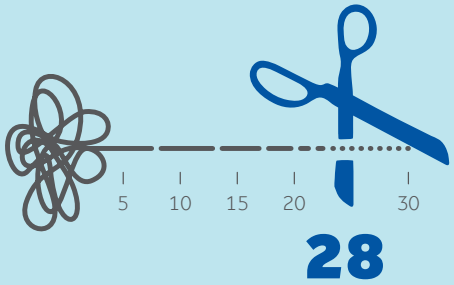
In an infant clinical study published in 2009, 106 high-risk infants were recruited and divided into two groups. A breastfed group and a group receiving hypoallergenic formula based on Peptigen® IF-3080. There were no significant differences with regard to the development of atopic dermatitis between the groups in the first two years of life. The infants fed with hypoallergenic formula had higher weight increase and body weight at 6 months compared to breastfed infants. Furthermore, there were no differences in measured immunological outcomes between the groups[23].

Peptigen® IF-3080 for atopic dermatitis management

Peptigen® IF-3080 is a **100% whey-based**, extensive hydrolysate. The degree of hydrolysis is **26-30** and **>99%** of the peptides are **3.5 kDa**. Peptigen® IF-3080 has passed the ASA-test, and its reduced allergenicity has been demonstrated in a clinical study.

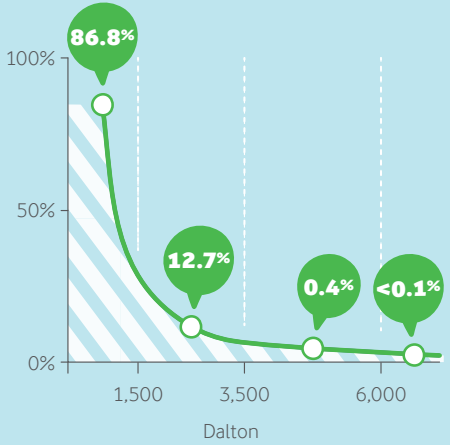
DEGREE OF HYDROLYSIS

Extensive
whey hydrolysate

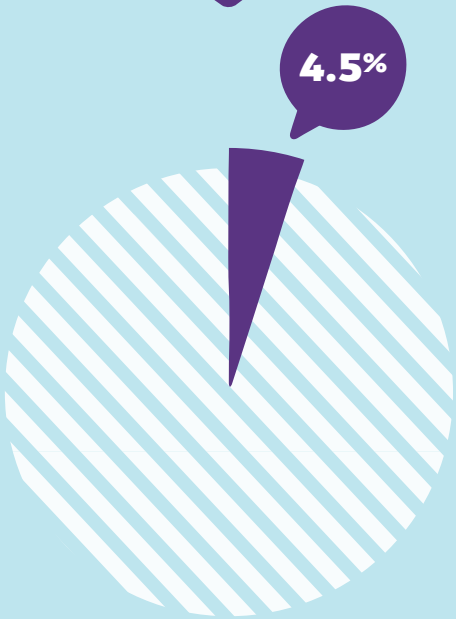


PEPTIDE DISTRIBUTION

Reduced
allergenicity

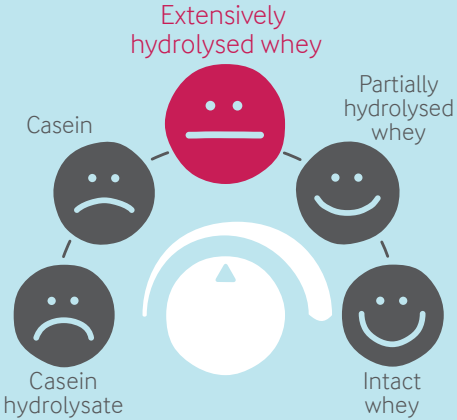


LACTOSE CONTENT



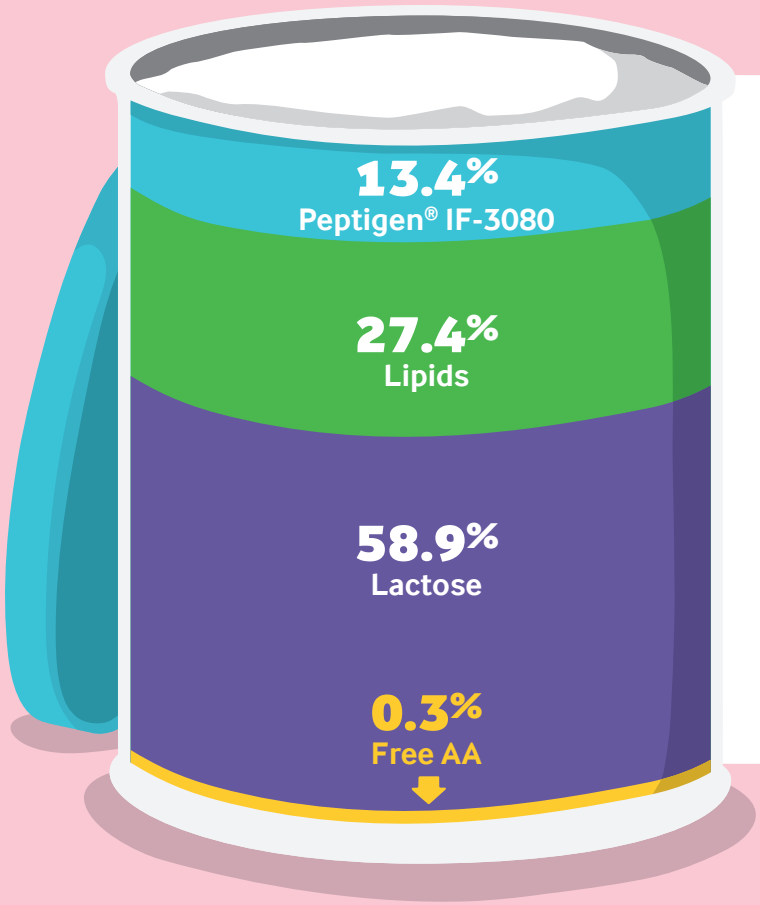
TASTE

Neutral
taste



Hypoallergenic infant formula with Peptigen® IF-3080

Peptigen® IF-3080 in infant formulas provides **low protein content** (2.0 g/100 kcal), **reduced allergenicity**, and **minimises the addition of free amino acids**.



Theoretical formulation with Peptigen® IF-3080 for allergy management

Protein:
2.05 g/100 kcal

Energy:
515 kcal/100 g

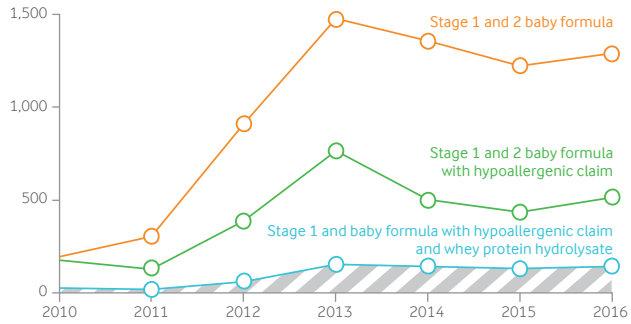
100%
whey

Infant formula industry market development and future projections

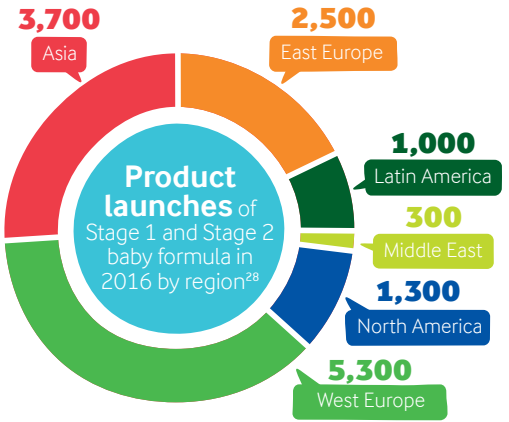
The global infant formula industry has experienced a steady growth in the past 6 years. The retail value of Stage 1 and 2 Milk Formulas increased in 2010-2016 by a 6.6% compound annual growth rate (CAGR)[27], with a very high product launch activity accounting for a 36% CAGR[28]. Special Baby Milk Formula, which is given to babies to prevent or treat allergies, has followed a similar trajectory, with growth in retail value of 5.5% CAGR 2010-2016[27], and 31% CAGR[28] for new product launches during the same period.

Looking forward to 2020, the future looks bright for the global infant formula industry. Stage 1 and 2 Milk Formulas are projected to continue a healthy growth with 6.8% CAGR in retail value[27], while Special Baby Milk Formula is expected to surpass this growth with a 7% CAGR[27]. With these enviable future projections, the infant formula industry looks ahead to a period where the market will certainly see the launch of many new products, especially in the Special Baby Milk Formula segment, given its relatively high growth expectations.

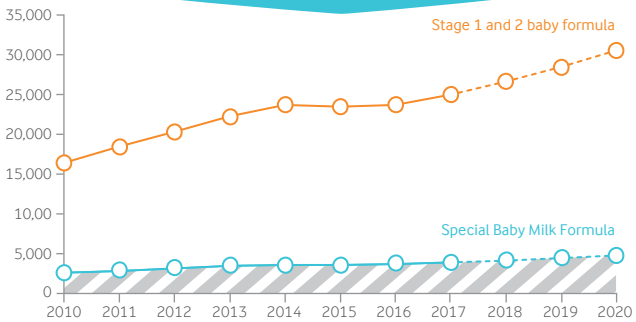
Global product launches for Stage 1 and Stage 2 baby formula from 2010 to 2016[28]



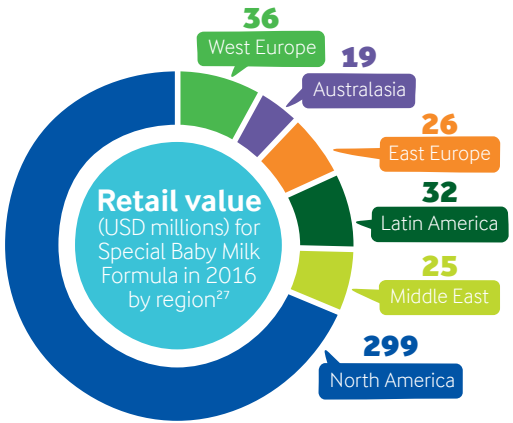
Innova



Global retail value (USD millions) for Stage 1, Stage 2 and Special Baby Milk Formula 2010 to 2016, and predictions until 2020[27]



Euromonitor



Hydrolysate capabilities at Arla Foods Ingredients

A WORLD LEADER IN HYDROLYSATE PRODUCTION

- More than 25 years of experience in milk-derived protein hydrolysate production
- Broad milk and whey-derived protein hydrolysate portfolio
- Opportunities for customised protein hydrolysate
- State-of-the-art manufacturing facilities, pilot plants, analytical laboratories and R&D facilities

NEW HYDROLYSATE FACILITY AT OUR DANMARK PROTEIN PLANT

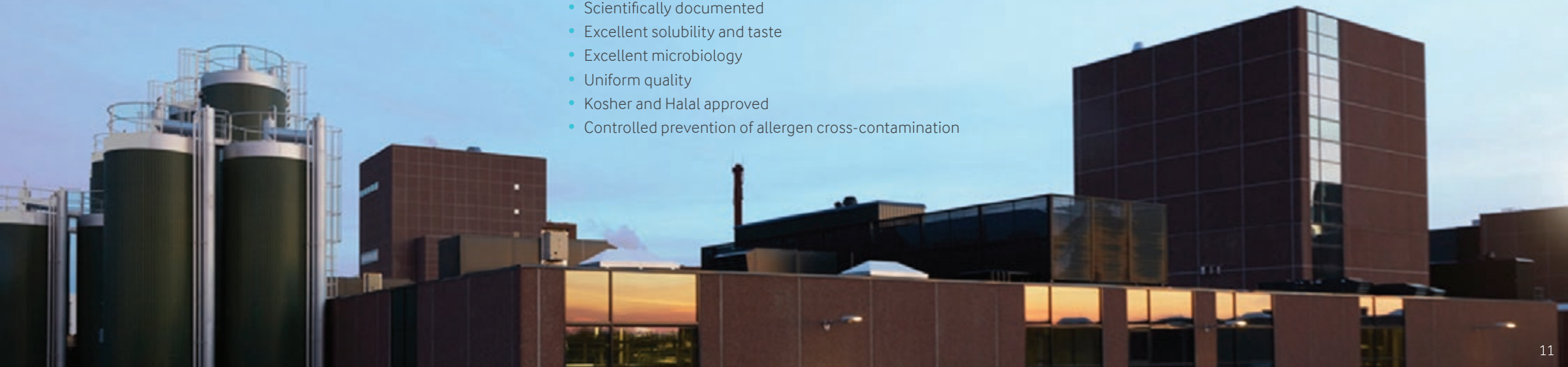
- Complies with the strictest quality and safety standards,
- Annual capacity of 4,000 tonnes
- Dedicated packaging line for filtered products

PREMIUM QUALITY HYDROLYSATE INGREDIENTS

- Scientifically documented
- Excellent solubility and taste
- Excellent microbiology
- Uniform quality
- Kosher and Halal approved
- Controlled prevention of allergen cross-contamination

FRONTRUNNERS IN RESEARCH AND DEVELOPMENT OF HYDROLYSATES

- Extensive clinical study experience
- Broad scientific network
- Support for following the new global legislation regarding IF for allergic prevention. Including new EU regulations and the new GB 25596-2010 standard on FSMP in China.



Why choose Arla Foods Ingredients?

A world leader in natural whey solutions

- Among the world's top 5 producers of whey protein concentrate, whey protein isolate, whey protein hydrolysate, whey protein fractions and lactose
- Production of whey proteins since 1980

R&D in our DNA

- +15% of our employees in Denmark work in R&D
- Collaboration with top universities worldwide
- Clinical and scientific documentation
- Application centres on two continents

Superior quality by design

- Premium quality ingredients
- Kosher and Halal certification
- Our factories adhere to the strictest quality and safety standards
- Free of annatto

Your trusted business partner

- Application support
- Business development support
- In-depth nutrition research and formulation support

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