Replacing animal gelatin fully or partly in food applications in general, and dairy products in particular, is a challenging issue in the entire food world. Agar-Agar, natural seaweed hydrocolloid, offers a serious alternative to industrial manufacturers involved in the production of gelatin-free or gelatin-reduced, halal, kosher, vegetarian and vegan foodstuffs, among which the highly versatile sector of dairy products – ranging from milk and cheese to desserts, creams, yogurts, curd, custard, puddings, mousses, spreads, ice-creams, confectionery, infant formula, smoothies and beverages. “Popularity of dairy products, westernisation of diets and the increasing range of dairy products continue to be the key drivers underpinning dairy markets worldwide. The dairy sector remains among the fastest growing sectors... In the next 10 years, world milk production is projected to increase by 153 Mt. The majority of the growth is anticipating to come from developing countries. The average growth rate for the projection period is estimated at 1.9%, slightly below the 2.1% level witnessed in the last decade.” And further “The increased concerns of consumers about health and nutrition and the trends of tightening food law legislations are expected to continue. This is another important issue for the future, bringing opportunities but also challenges to the dairy sector... concerning labelling and debate related to health...” (cf. OECD-FAO Agricultural Outlook 2011-2020, Chapter 9, Dairy – www.oecd.org/dataoecd/2/34/48184340.pdf)

**Natural gelling power** > Agar-Agar is a natural hydrocolloid obtained from the red seaweeds Gelidium and Gracilaria (bot. fam. Rhodophyceae). Gelidium algae are harvested on the atlantic coastline of Morocco, Spain, Portugal and France while Gracilaria algae come from the coastlines of Chile,
South Korea, Japan and Argentina. Agar-Agar is composed of Agarose, a neutral polysaccharide, and Agaropectin, a charged polymer. Agarose is essential for the gelling power of Agar-Agar. Soluble in hot water at min. 85°C Agar-Agar gives aqueous, non-viscous solutions that build thermoreversible gels at temperature levels of 35±5°C, which can be dissolved again at 85±5°C. This hysteresis of Agar-Agar is unique and brings many concrete advantages to the food manufacturers because the high thermic stability of the gels is not affected by production processes. Agar-Agar can jellify, thicken and stabilize food products at low concentration levels starting at 0.04% without any technical aid. Agar gels are more compact and resistant than gels based on carrageenan or gelatin. The gel-strength of Agar solutions is practically 5 to 10 times higher than the one obtained with gelatin. Agar gels are generally transparent and show a short, brittle structure. To form an Agar gel, no foreign substance such as sugar, acids, proteins, cations is required, which means a simple handling in the industrial practice.

The key functionality of Agar-Agar lies in its gel-building ability along with remarkable binding, thickening, texture enhancing and stabilising properties. These intrinsic characteristics of Agar-Agar provide a long-lasting form stability to the finished products from the moment of the production through the whole transport and storage chain to the moment of their consumption. Norevo GmbH – in cooperation with their supply partner Setexam, Morocco – offers Agar-Agar and organic certified Bio-Agar with different gel-strength levels, corresponding to the manifold industrial applications of this vegetable gelling agent.

**Agar-Agar in dairy applications** > A high number of foodstuffs require a jellied structure for which Agar-Agar is a welcome alternative to fully or partly replace animal gel-
Traditional applications are found in the confectionery, bakery, fine food, meat industries, e.g. in jellified sweets, meringue, fruity gels, jellied fruits, toffees, marshmallows, cake fillings, piping gels and glazings, jams, dressings, hamburgers, meat or fish in aspic, sausages. Conventional Agar-Agar and Bio-Agar are ideal for vegetarian and vegan food as well as foodstuffs with the Halal and Kosher label.

A strongly expanding sector is the dairy industry, where Agar-Agar is a natural gelling agent for dairies (with fat or low-fat formulations) with a stirred or a set texture, for puddings and flans, aerated and whipped mousse, spreads, creams and sherbets as well as for beverages based on chocolate or fruit flavoured milk and all further milk-based desserts. That is to say for all dairy products that require a more or less firm gel structure to stabilize their shape and consistency and thus preserve their optical freshness during shelf life prior to the consumption. Norevo offers Quick Soluble Agar (QSA) and further types of Quick Gelagar – Setexam brands dedicated to various types of dairy applications – to the dairy manufacturers because of their lower temperatures of dissolution compared to conventional Agar.

QSA/Quick Gelagar is first dispersed in cold milk or water, then the respective dispersion is pasteurised. The pasteurisation temperature is sufficient to fully dissolve the seaweed hydrocolloid without negative side-effects on the cations and milk proteins, i.e. without precipitation due to the influence of the lactic acid. These properties of QSA and Quick Gelagar are technologically functional.

### Dairy recipe examples with Agar-Agar/QSA Quick Gelagar

#### Low-fat set yogurt (*)

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Quantity/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick Gelagar QT30</td>
<td>0.3</td>
</tr>
<tr>
<td>Skimmed milk</td>
<td>98</td>
</tr>
<tr>
<td>Cream 40% fat</td>
<td>2</td>
</tr>
<tr>
<td>Starter</td>
<td>0.06</td>
</tr>
</tbody>
</table>

**Production process**

1. Pre-mix cream with skimmed milk
2. Disperse QT30 under agitation in the cream + skimmed milk mixture
3. Pre-heat the mixture at 55–65°C while stirring
4. Homogenize and pasteurize, then cool down to 43–45°C
5. Inoculate with starter
6. Fill the portion pots and incubate at 43–45°C during 2–4 hours till obtaining a pH of 4.5–4.6
7. Keep in the refrigerator at 4°C

**Advantages of Agar-Agar/QSA Quick Gelagar QT30**

- Easy dissolution during the pasteurization stage
- It controls texture and consistency
- It prevents syneresis
- No necessity of new technical investments
- 100% from vegetable origin
- No content of animal gelatin
- Halal and Kosher ingredient

(*) This recipe is a basic formulation of yogurt. The definition, prescribed composition and ingredient declaration of yogurt may vary from one (in)national food legislation to another. This application example illustrates the gelling and fat-reducing functionality of Agar-Agar/QSA/Quick Gelagar. This information cannot be considered in any way as a recommendation to use any product in violation of patent rights. (Source Norevo/Setexam)
in recipes of yogurt products, i.e. fermented dairies, providing those with a creamy, unctuous and yet firm texture and avoiding the hysteresis tendency of such yogurt products. Homogeneous texture and stable consistency are also key quality criteria for milk-based desserts with a set or stirred texture and further product types such as whipped/aerated mousses – with chocolate or other flavours, custard, whipped cream, ice-cream on milk basis and cheese spreads. In beverages such as chocolate flavoured milk, Agar-Agar, QSA and Quick Gelagar impede the sedimentation of cocoa particles at the bottom of the bottle and hence provides the beverage with a perfect homogeneity.

### Mousse au chocolat/Chocolate dessert mousse (*)

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Quantity/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART A</strong></td>
<td></td>
</tr>
<tr>
<td>Quick Gelagar QC70</td>
<td>0.5–06</td>
</tr>
<tr>
<td>Whole milk</td>
<td>60</td>
</tr>
<tr>
<td>Cocoa powder</td>
<td>2.5</td>
</tr>
<tr>
<td>Dark chocolate</td>
<td>3.9</td>
</tr>
<tr>
<td>Sugar</td>
<td>18</td>
</tr>
<tr>
<td><strong>PART B</strong></td>
<td></td>
</tr>
<tr>
<td>Egg white powder</td>
<td>1.5</td>
</tr>
<tr>
<td>Water</td>
<td>10</td>
</tr>
<tr>
<td>Sugar</td>
<td>8</td>
</tr>
</tbody>
</table>

**Production process**
1. Pre-mix QC70 with abt. twice its weight of sugar
2. Disperse the blend in the cold milk while stirring
3. Add cocoa powder
4. Heat the mixture until boiling stage, then add the melted dark chocolate (water bath or microwave)
5. Cool down to 50ºC
6. Beat the mixture of part B: water, egg white powder and the remaining sugar in planetary beater until obtaining a firm white mousse, then add the mixture of part A by lifting the chocolate milk gently
7. Pour the mousse into glass ramekins and keep cool

**Advantages of Agar-Agar/QSA Quick Gelagar QC70**
- Easy dissolution during the pasteurization stage/It controls texture and consistency/It prevents syneresis/
- No necessity of new technical investments/100 % from vegetable origin/No content of animal gelatin/Halal and Kosher certified

(*) Using this ingredient in food applications may be submitted to different rules from one country to the other. It is therefore advisable to check the ruling regulations of the country of consumption of the final product. This information cannot be considered in any way as a recommendation to use any product in violation of patent rights. (Source: Norevo/Setexam)
Dairy manufacturers may wish to use a mix of Agar-Agar and animal gelatin to combine the respective properties of these two gelling agents. The compatibility of use of these ingredients may prove appropriate to influence the dairy texture according to the recipe requirements. And, also, since gelatin prices rose considerably throughout the past months, a partial or full replacement of gelatin by Agar-Agar in some recipes may be another advantage offered by the seaweed hydrocolloid.

**Nutrition, safety, sustainability** > The seaweed hydrocolloid and food ingredient Agar-Agar corresponds to the Commission Directive 2008/84/EC. In the European list of permitted additives, it is listed under the number E 406 – gelling and thickening agent for foodstuffs. The caloric value of Agar-Agar states 191 kcal (775 kJ) per 100 g. Due to its naturally high jellifying power, Agar-Agar is used in very small percentages in food recipes, therefore its caloric contribution to a normal daily diet is almost insignificant. Harvested from 100% natural, botanical and sustainable seaweed origin, Agar-Agar and, hence, organic Bio-Agar offer a valuable vegetable alternative for animal gelatin whenever a gelling function is required, quite especially in Halal and Kosher food, vegetarian and vegan foodstuffs as well as in the new segment of foodstuffs from sustainable origin.