

# *Egg Protein*

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# Processed Egg Products

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*Processed to fit foodservice and food industry ingredient specifications.*

- Refrigerated (as liquid)
- Frozen (as liquid)
- Dried
- Specialty Products



# Advantages of Processed Egg Products

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## ❑ Reduced Risk of Contamination

- All Liquid, Frozen and Dried egg products are pasteurized
- No *Salmonella*
- There has never been a food-borne illness associated with pasteurized egg products

## ❑ Extended shelf-life

- Refrigerated liquid egg products – 12 weeks at 4 C
- Frozen egg products- 1 year or more
- Dried egg products - 1 year or more with no refrigeration required

# Advantages of Processed Egg Products

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## ❑ Convenience

- Easy Storage
- No extra labor for breaking shell eggs
- Always ready to use

## ❑ Consistent Baking Performance

- Uniform egg solid consistency
- Ease of formulation
- Product stability over time

# Frozen Egg Product Equivalency to Shell Eggs

	FROZEN PRODUCT (Kg)	SHELL EGG* (No.)
Whole	0.45	9
Yolks	0.45	22
White	0.45	14

# Frozen Egg Products- up to 1-year shelf-life

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- Whole eggs, whites or yolks
- Scrambled egg mix
- Salted whole egg or yolks
- Sugared egg yolks
- Whole eggs and yolks with corn syrup
- Whole eggs with citric acid
- Whole eggs with corn syrup

# Frozen Egg Products

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**Usage:** As an ingredient for the food industry

**Availability:** 4, 5, 8 and 10 lb. pouches or waxed plastic cartons, and 30 lb. containers

**Advantages:** Long shelf life (1 year), functionality, variety blends

**Storage & Handling:** Keep frozen at temperatures below 10°F (-12°C). Use as soon as possible

**Mayonnaise**



Made with liquid frozen whole egg

Made with liquid frozen salted egg yolk

**Cheese Cake**



Made with liquid frozen sugared egg yolk



**Cinnamon rolls**



# Refrigerated Liquid Egg Products - 12-week shelf-life

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- Whole eggs, whites or yolks
- Sugared egg yolks
- Salted whole eggs or yolks
- Scrambled egg mix
- Cooked scrambled eggs
- Extended shelf life whole eggs, whites or scrambled egg mix

# Foodservice and Commercial Food Industry



# Refrigerated Liquid Eggs

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**Usage:** Foodservice and the commercial food industry

**Availability:** Bulk tank trucks, totes, metal or plastic containers, polyethylene coated fiber or laminated foil and paper cartons, and hermetically sealed polyethylene bags. Container size from small bags to cartons (8 oz. to 5 lb.) and lacquer coated tins and plastic pails up to 40 lb.

**Advantages:** Pasteurized, quick and easy to use, 12 week shelf-life at 4 C (only when not opened)

## **Storage**

**& Handling:** Store according to processor's recommendations.

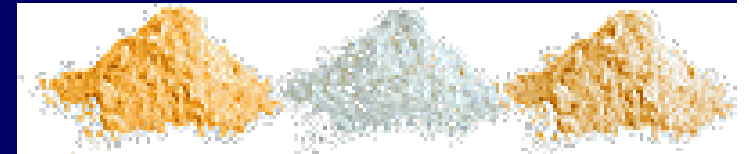
**Use within four to five days once opened**

except for extended shelf life products for which the supplier's recommendations should be

followed

# Dried Egg Products

- Whole egg or yolk solids
- Dried egg or scrambled egg mix
- Various types of whole egg solids
- Free flowing whole egg or yolk solids
- Stabilized (glucose free) whole egg or yolk solids
- Blends of whole egg and/or yolk with carbohydrates



# Egg Nutrients – Dried

*Source: Agricultural Research Service, USDA, 1994.*

<b>Dried (per 100g)</b>	<b>Whole Egg</b>	<b>Yolk</b>	<b>White</b>
Protein – g	<b>47.35</b>	<b>34.25</b>	<b>81.1</b>
Moisture – g	<b>3.1</b>	<b>2.95</b>	<b>5.8</b>
Fat (Total Lipid) – g	<b>40.95</b>	<b>55.8</b>	<b>0</b>
Ash – g	3.65	3.4	5.3
Carbohydrate – g	4.95	3.6	7.8
Calories – cal	594	666	382
Cholesterol – mg	1715	2335	0

# Dried Egg Products

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**Usage:** As an ingredient especially for the food industry

**Availability:** *Foodservice* – 6 oz. pouches, 3 and 25 lb. poly packs  
*Commercial* – 25 and 50 lb. boxes, 150, 175, and 200 lb. drums

**Advantages:** Long shelf life (>1 yr), stable and mixable

**Storage & Handling:** Keep in dry storage away from extreme temperatures and strong odors. Use pallets

Nidi di semola  
*Noodles of semolina*

Nidi all'uovo  
*Egg noodles*



5 FETTUCCINE

6 FETTUCCIE

4 TAGLIATELLE

5 LINGUINE

1 CAPELLINI

# Angel food cake



*soufflé*



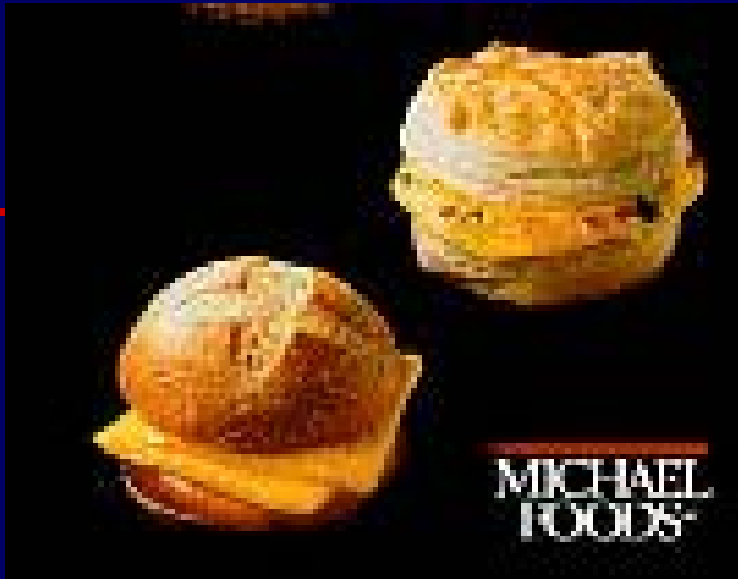
# Specialty Egg Products

*Marketed to institutional and consumer users.*

- Diced hard-cooked, peeled eggs\*
- Refrigerated whole hard-cooked, peeled eggs, plain or pickled\*
- Frozen hard-cooked eggs\*
- Frozen quiche mixes
- Frozen scrambled egg mix
- Dried scrambled egg mix
- Other frozen pre-cooked products\*
- Ultra-pasteurized liquid egg products



*\*Cooked egg products are not processed under USDA supervision.*



Diced Eggs



# FUNCTIONS

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- COAGULATION
- EMULSIFICATION
- FOAMING
- RETARD CRYSTALLIZATION

# Coagulation/ Gelation

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changes in structure of egg proteins (yolk and albumen) resulting in thickening or change from a fluid to solid or semi-solid state



# Thickening & Coagulation

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*Whipping or heating allows products that contain eggs to thicken and/or coagulate, converting the mixture from a liquid state to a solid or semi-solid state.*

- Can use both yolks and whites
- Binds products naturally
- Suspends other ingredients
- Gelling agents in custards
- Thickening agents in soft pie fillings when the egg custard is heated
- Creates texture and height
- When the egg foam is heated, creates structural stability

# Coagulation/ Gelation induced by:

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**Heat - protein denaturation**

**Mechanical means - beating, chopping**

**Sugar - raises temp. of coagulation**

**Acids- decrease temperature of coagulation**

**Alkali- high alkali can induce gelling of egg white**

# Eggs For Coating And Binding

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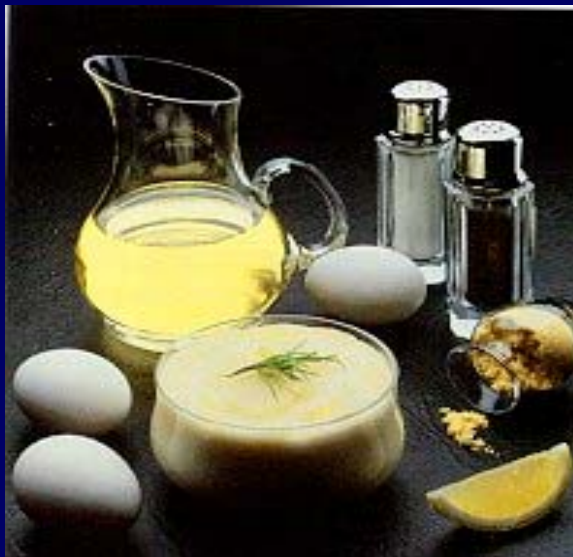
*With heat, egg coagulation imparts rigidity causing mixtures to gel and ingredients to adhere.*

- Egg white is an excellent binding ingredient
- No essential differences are found in binding properties of dried whole egg and yolk and those of fresh liquid eggs

# Emulsions/Surface activity-

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a stable mixture of two immiscible liquid phases, one which is dispersed in the other



*Mayonnaise*



# Emulsification

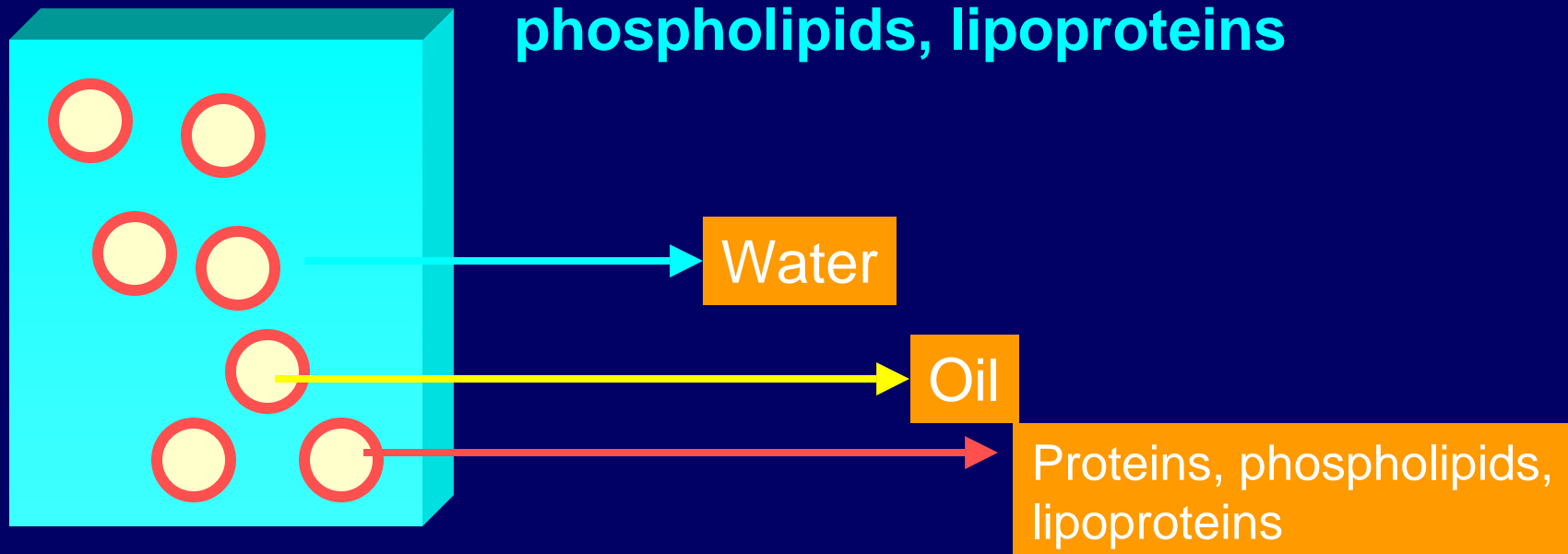
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*The phospholipids, lipoproteins and proteins found in egg yolks are surface active agents that enable the formation of emulsions from immiscible liquids such as oil and water.*

# Emulsions/Surface activity

## 3 Components necessary for an oil-in-water emulsion

- a) oil
- b) water
- c) interface, proteins, phospholipids, lipoproteins



# Factors Affecting Emulsification

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- Freezing
- Temperature
- Acid
- Salt
- Drying

# Eggs For Aeration

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*When eggs are beaten, air is incorporated, creating a lighter, more air-filled product.*

- Distinct cellular structure from eggs' leavening action
- Structural framework helps to hold product together
- Increased volume for lighter foods
- Airy texture and smooth mouth-feel
- More integrated, sponge-like texture

## **Foaming/Surface activity-**

**colloidal dispersion in which a gaseous phase is dispersed in a liquid phase**

**air trapped during beating**

**air bubbles decrease in size and increase in number**

**as more air is incorporated the foam becomes stiff**



# Factors Affecting Egg Foams

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- Degree of beating
- Blending
- Homogenizing
- Temperature
- pH
- Fat
- Salt
- Water
- Manipulation
- Heat
- Copper
- Sugar
- Acid

# Foaming/Surface activity- egg white

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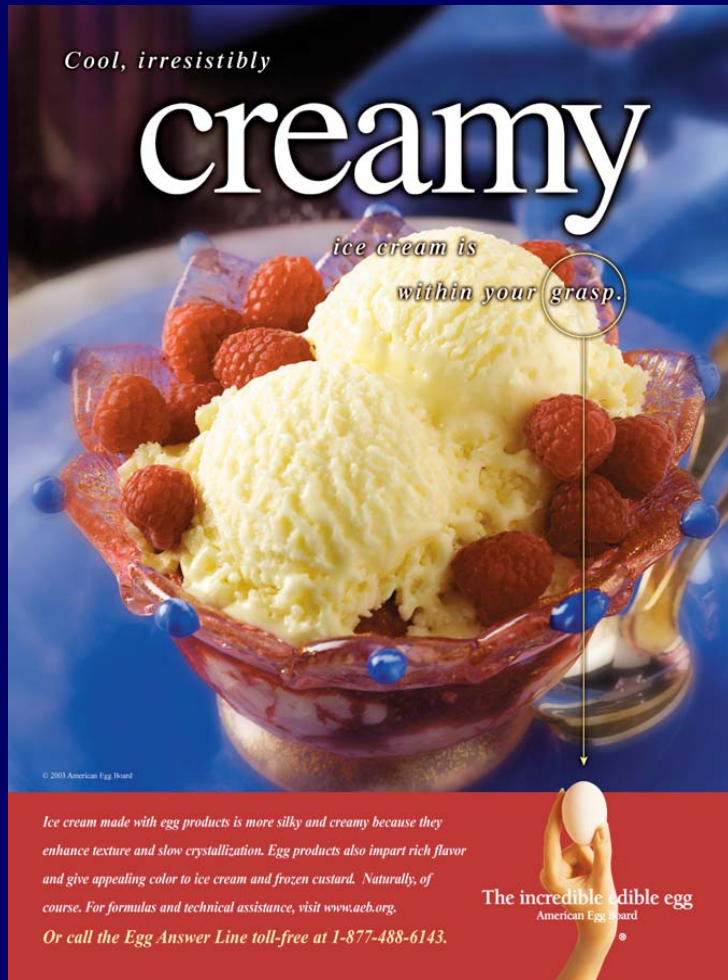
foam ability (volume) due to ovalbumin

foam stability due to ovomucin

yolk contamination - "fat bullets" destroy foam



# Control Of Crystallization



Cool, irresistibly

# creamy

ice cream is  
within your grasp.

© 2011 American Egg Board

Ice cream made with egg products is more silky and creamy because they enhance texture and slow crystallization. Egg products also impart rich flavor and give appealing color to ice cream and frozen custard. Naturally, of course. For formulas and technical assistance, visit [www.aeb.org](http://www.aeb.org). Or call the Egg Answer Line toll-free at 1-877-488-6143.

The incredible edible egg  
American Egg Board

Eggs are used in confectionery products and ice creams to control crystallization of water molecules and create smooth texture and mouth-feel



# APPLICATIONS

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- BAKING CATEGORIES
- EGG USAGE
- FLAVOR & COLOR
- HUMECTANCY & SHELF LIFE BENEFITS
- BREAD EFFECTS
- SWEET BAKED GOODS
- HEALTH BARS

# Egg Baking Categories

Industry	Product Usage	Functional Rationale
Breads	Used in standard breads and buns	<ul style="list-style-type: none"> <li>Used as an egg wash to brown the crust and for flavor and structure in specialty breads and rolls</li> </ul>
Sweet Goods	Used in egg custard fillings and tarts	<ul style="list-style-type: none"> <li>Gels filling and adds color and richness to mass</li> <li>Excellent emulsifier</li> </ul>
Cakes	Eggs add volume and height to cakes of all sorts	<ul style="list-style-type: none"> <li>Works to aerate and build ingredients into product matrix</li> <li>Eggs provide structure</li> </ul>
Cookies & Specialty Items	Used in meringues and other items where lighter texture is required	<ul style="list-style-type: none"> <li>Eggs allow for aeration of baked goods</li> <li>Eggs provide structural benefits</li> </ul>
Muffins & Popovers	Creates unique pastry effect obtainable only through use of eggs	<ul style="list-style-type: none"> <li>Binds and produces desirable texture and mouth-feel</li> <li>Aeration of eggs build volume</li> </ul>
Frostings	Used to thicken frosting and fillings	<ul style="list-style-type: none"> <li>Coagulates and creates firm, smooth base</li> </ul>
Frozen Products	Used in frozen dough and other items to control crystallization	<ul style="list-style-type: none"> <li>Creates desirable characteristics in reheating and bake-off</li> </ul>
Healthy Snack Bars	Adds protein and makes them a meal replacement	<ul style="list-style-type: none"> <li>Eggs are one of the highest quality protein sources available</li> </ul>

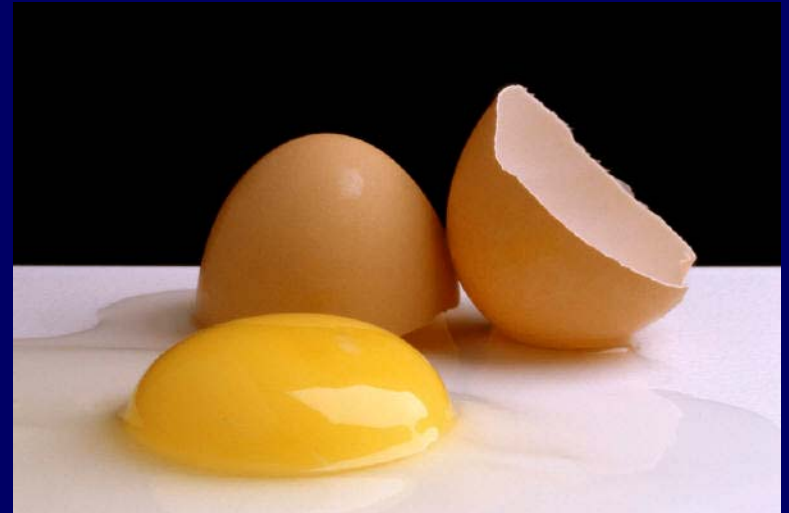
# Egg Usage

Industry	Product Usage	Functional Rationale
Baking	Breads, pastries, custards, cakes, cookies	<ul style="list-style-type: none"> <li>Adds richness, increases volume and improves machine flexibility</li> </ul>
Dairy	Ice cream, frozen desserts	<ul style="list-style-type: none"> <li>Improves texture, decreases melting point, eliminates crystallization</li> </ul>
Confectionery	Bars, fondants, fillings	<ul style="list-style-type: none"> <li>Improves interior texture, stabilizes, adds richness and flavor</li> </ul>
Sauces	Mayonnaise, salad dressings, dips and prepared foods	<ul style="list-style-type: none"> <li>Binds sauces and emulsifies mixtures of oil and water</li> </ul>
Meal Replacements	Energy bars for active and elderly	<ul style="list-style-type: none"> <li>Provides excellent protein source as well as other functional benefits</li> </ul>
Beverages	Pourable yogurts, dietary drinks and alcoholic beverages	<ul style="list-style-type: none"> <li>Adds creamy texture and clarifies certain wines and juices</li> </ul>
Prepared Foods	As an ingredient in frozen and prepared entrées and side dishes	<ul style="list-style-type: none"> <li>Improves texture and freeze/thaw microwave capabilities</li> </ul>
Nutraceuticals	Used as a protein supplement and as a source for extraction of beneficial substances	<ul style="list-style-type: none"> <li>Used for the extraction of lysozyme and other substances such as yolk lecithin and sialic acid</li> </ul>

# Flavor And Color

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- Eggs contain fats which carry and meld flavors in food products
- Eggs add flavor and enhance other flavors
- Egg yolks impart rich color and are used to fortify whole egg blends for a deeper color in baked products



# Humectancy And Shelf Life Benefits

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- Eggs improve cell structure and enable products to maintain structure during baking, thus reducing moisture loss from baked products
- Egg proteins also bind water, making it less available for microorganisms to grow and cause spoilage

# Breads

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## Functional Rationale:

- Browning qualities (e.g., golden brown crust)
- Structural desirability
- Egg white imparts crisper crust to hard rolls and hearth rolls
- Adds flavor benefits
- Adheres seeds and grains to the outside of bread
- Adds color to egg breads and varieties
- Adds nutritional benefits

# Frostings And Glazes

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## Functional Rationale:

- Structural desirability and binding benefits; create texture and height (volume)
- Adds rich flavor to mass
- Allows other ingredients to adhere
- Emulsifies
- Helps prevent crystallization in boiled frostings



# Glaze Variations

Glaze	Result
Egg + Salt	Shiny surface
Egg + Milk	Medium shiny surface
Egg + Water	Less intense shine, golden surface
Egg yolk + Water	Shiny golden surface
Egg yolk + Cream	Shiny brown surface
Egg white	Light colored, crisp surface
Egg white + Water and nuts and/or seeds	Sticky surface for adhering nuts and/or seeds
Egg white + Milk	Transparent shiny surface



# Sweet Baked Goods

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## Functional Rationale:

- Browning qualities (e.g., golden brown crust)
- Structural desirability and binding benefits
- Aeration of baked goods
- Adds rich flavor to mass
- Adds color to yellow cakes, cookies and Danish pastry
- Gels fillings such as custards

# Health Bars

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## Functional Rationale:

- Structural desirability and binding benefits
- Binds other ingredients
- Improves nutritional value
- One of the highest protein sources available
- Flavor carrier
- Adds richness to mass

# Egg Replacers

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- Consumer research has shown that Americans know it is okay to eat eggs
- American Egg Board research indicates manufacturers' aversion to egg replacers
- No replacer can adequately perform all the functions of real eggs

# Liquid or Frozen Egg Products

Specification	Whole	Yolk	White
<b>Total Microbial Count/g</b>	<b>&lt;5,000</b>	<b>&lt;5,000</b>	<b>&lt;5,000</b>
<b>Yeast</b>	<b>10 max</b>	<b>10 max</b>	<b>10 max</b>
<b>Mold</b>	<b>10 max</b>	<b>10 max</b>	<b>10 max</b>
<b>Coliforms</b>	<b>10 max</b>	<b>10 max</b>	<b>10 max</b>

**ALL MUST BE SALMONELLA NEGATIVE**

# Dried Solids

	WHOLE		YOLKS			WHITES	
	PLAIN	FREE (2) FLOW- ING	PLAIN	FREE (2) FLOW- ING	SCRAM. EGG	SPRAY DRIED	PAN DRIED
<b>Total</b>	<10,000	<10,000	<10,000	<10,000	<10,000	<10,000	<10,000
<b>Yeast</b>	10 max.	10 max.	10 max.	10 max.	-	10 max.	10 max.
<b>Mold</b>	10 max.	10 max.	10 max.	10 max.	-	10 max.	10 max.
<b>Coliforms</b>	10 max.	10 max.	10 max.	10 max.	-	10 max.	10 max.
<b>Salmonella</b>	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.