# **Individual Whey Proteins**

Individual proteins are produced by ion exchange/chromatographic methods. The desired protein typically is captured on special "beads" or membranes while the remainder of the whey proteins proceeds unhindered through the vessel. Special solutions are then used to release the captured proteins. The desired proteins typically have a very high purity especially as compared to enriched products that have increased concentrations of a particular protein or group of proteins.

 $\alpha$ -Lactalbumin – makes up approximately 20 – 25% of the whey proteins. Denatures at 144°F (62°C). Binds calcium which stabilizes it against denaturation.

**Lactoferrin** - is an iron binding protein. Present at 30 - 100 mg/L in whey. Lactoferrin is not denatured by standard pasteurization (72°C for 15 seconds).

**Lactoperoxidase** – is an enzyme with antimicrobial ability. It is present in whey at approximately 1 - 30 mg/L and is considered to be relatively heat resistant.

**Glycomacropeptide (GMP)** – is a peptide that is also known as casein macropeptide (CMP). The peptide is formed when rennet clips off a piece of  $\kappa$ -casein during cheese manufacture. GMP therefore is present only in whey that is produced using rennet.

#### <u>Types</u>

- α-Lactalbumin
- Lactoferrin
- Lactoperoxidase
- Glycomacropeptide (GMP)

#### **Regulations**

Lactoferrin

FDA GRAS Notice No. 42 (2001)

 Other proteins None, products not defined

ADPI Industry Standard for lactoferrin derived from colostrum or milk

Colostral lactoferrin - lactoferrin derived from fresh colostrum Lactoferrin - lactoferrin from fresh milk or fresh whey



#### Individual whey protein composition

## General composition of individual whey proteins

|           | α-Lactalbumin | Lactoferrin | Lactoperoxidase | GMP |  |
|-----------|---------------|-------------|-----------------|-----|--|
| Component | %             |             |                 |     |  |
| Protein   | 90            | 94          | 92              | 86  |  |
| Lactose   | 1             | 0           | 0               | 1   |  |
| Ash       | 3             | 1           | 3               | 6   |  |
| Fat       | 1             | 0           | 0               | 1   |  |
| Moisture  | 5             | 5           | 5               | 6   |  |

## ADPI industry standard for lactoferrin

|               | Minimum/<br>maximum | Bovine<br>lactoferrin | Colostal<br>lactoferrin |
|---------------|---------------------|-----------------------|-------------------------|
| Component     |                     | %                     |                         |
| Protein*      | minimum             | 96                    | 96                      |
| Lactoferrin** |                     | 90                    | 90                      |
| Ash           | maximum             | 2.0                   | 2.0                     |
| Moisture      | maximum             | 5.0                   | 5.0                     |

\* Protein content is remported on a dry basis, all other parameters are reported "as is"

\*\* Reported as a % of total protein

#### General Process for the Manufacture of Individual Whey Proteins



#### Manufacture of Individual Whey Proteins



## Typical composition and characteristics

5%

1%

1%

3%

99%

96%

5%

na

na

1%

6%

1%

1%

6%

#### $\alpha$ -Lactalbumin

 Typical composition 98% Protein (db) 91% Lactalbumin\* Moisture Lactose Fat Ash

## Lactoferrin

Typical composition • Protein (db) Lactoferrin\* Moisture Lactose Fat Ash

## Lactoperoxidase

٠

Typical composition 97% Protein (db) Lactoperoxidase\* na% Moisture 5% Lactose na Fat na 3% Ash

# Glycomacropeptide (GMP)

 Typical composition 92% Protein (db) 96% GMP\* Moisture Lactose Fat Ash

- ٠ Characteristics Color: light cream Flavor: bland, clean pH 7 Solubility: fully soluble Storage
- <27 C, <65% rh 12 months
- ٠ Characteristics Color: light red Flavor: na pH 6-7 Solubility: 99% Storage <25 C, <65% rh
  - time period na
- ٠ Characteristics Color: green/brown Flavor: na pH 7 Solubility: fully soluble
- Storage 2 - 8 C, na rh 6 months

٠

- Characteristics Color: light cream Flavor: bland, clean pH na Solubility: na
- Storage <27 C, <65% rh 12 months

\* Given as a percentage of total protein