

乳清粉的不同干燥工艺和产品特点以及市场展望

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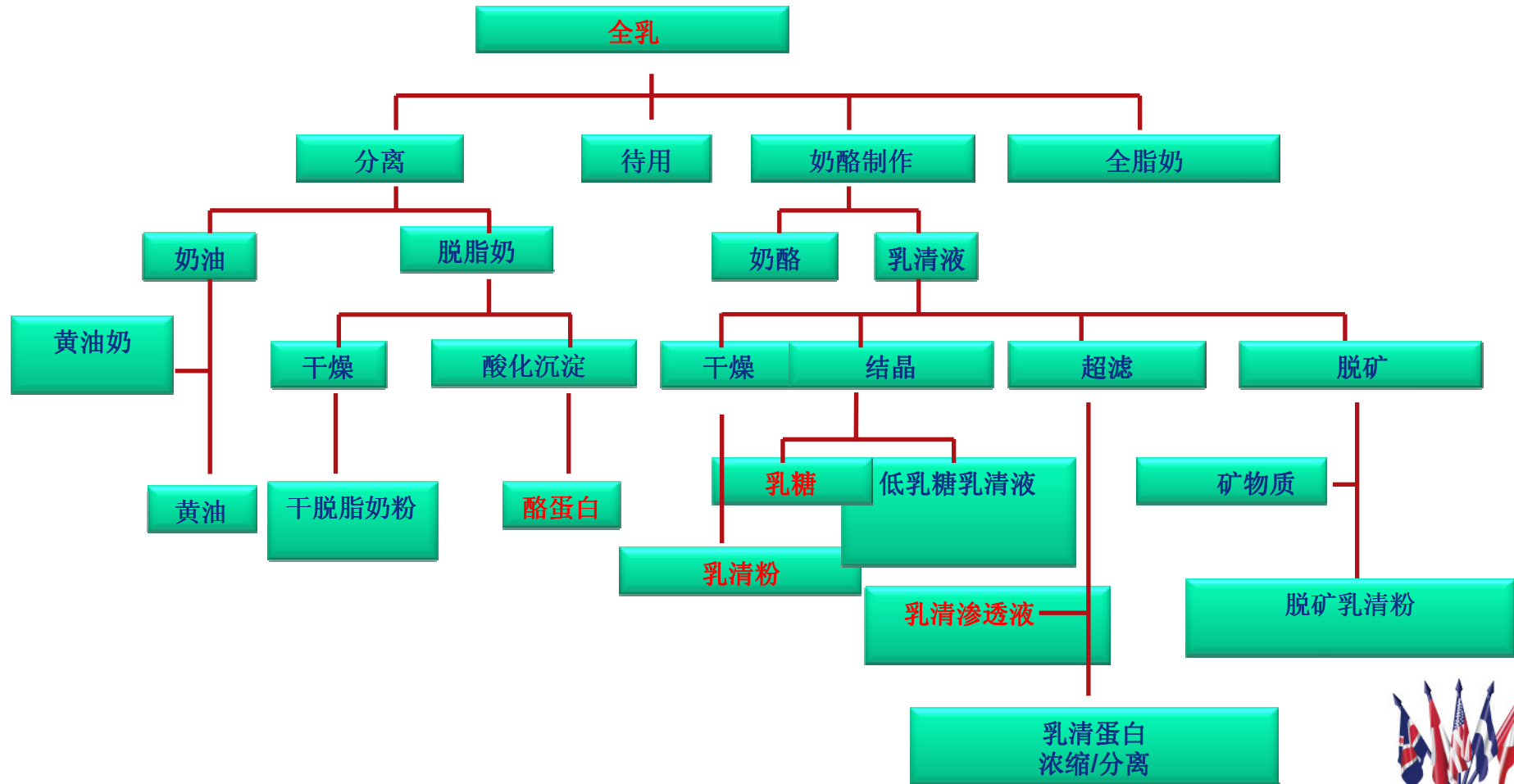
INTERNATIONAL
INGREDIENT
CORPORATION

液态奶的营养成分

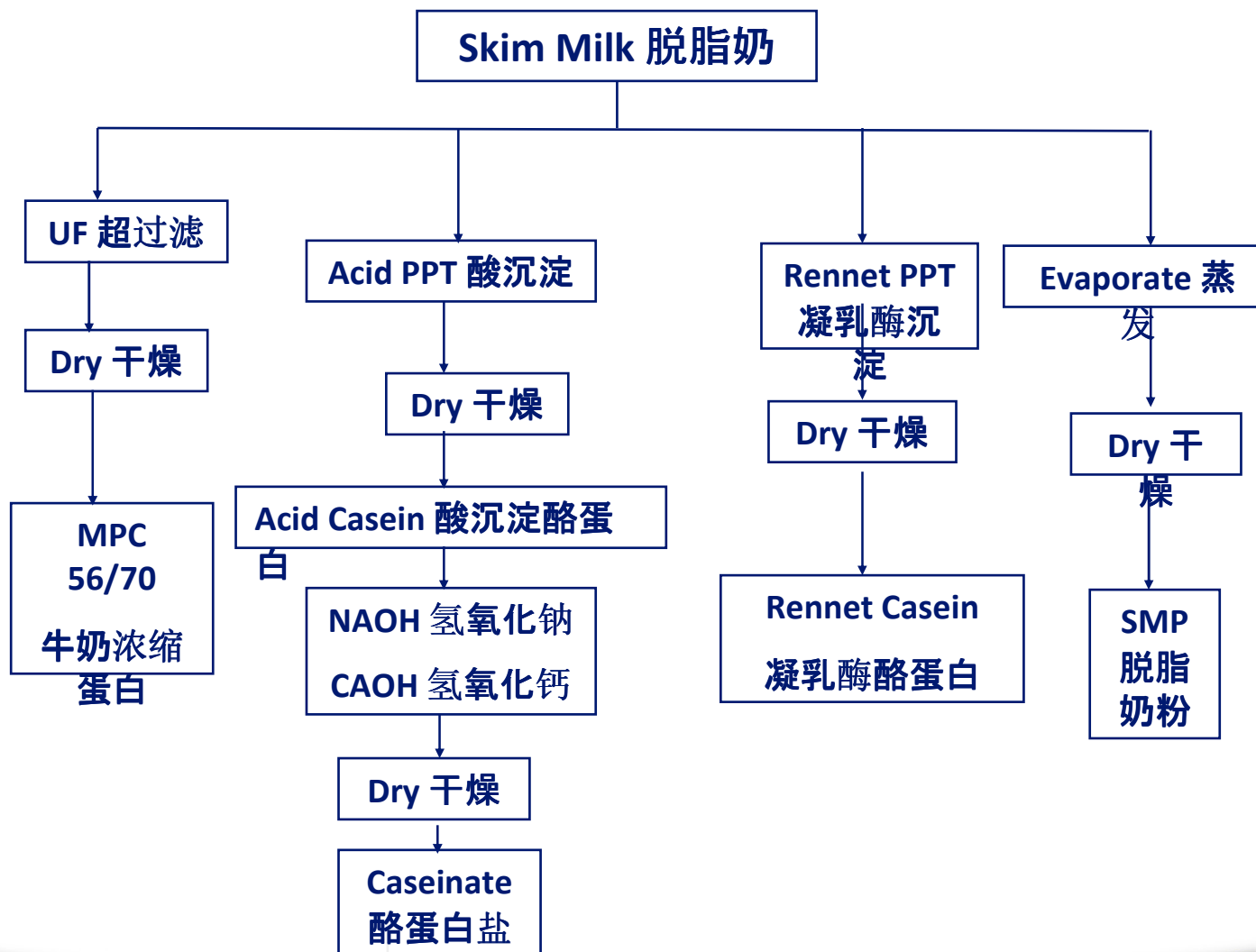
- 水 87.6%
- 脂肪 3.7%
- 蛋白 3.4%
- 乳糖 4.8% (milk sugar)
- 矿物质 0.5%



不同的牛乳加工技术制备的牛乳衍生品



脱脂奶加工产品



不同乳制品典型性营养分析

乳制品	蛋白	脂肪	乳糖	灰分	钙	磷	钾	钠	氯
	%	%	%	%	%	%	%	%	%
全脂奶粉	26.0	27.0	38.0	6.0	0.9	0.8	1.3	0.4	0.8
脱脂奶粉	35.0	0.9	50.0	8.0	1.3	1.0	1.6	0.5	1.0
部分脂奶粉	25.0	17.0	35.0	6.0	0.8	0.8		0.4	
酪蛋白	88.0	0.8	0.0	6.0	0.6	0.9	0.01	0.01	0.04
奶酪产品	34.0	20.0	10.0	6.0	0.8	0.8		1.18	1.82
纯奶酪粉	30.0	40.0	0.0	11.0	1.0	1.2	0.00	2.87	3.06
乳清粉	12.0	1.0	70.0	8.5	0.8	0.7	2.0	0.9	1.4
乳酪乳清复合物	11.5	5.5	65.0	8.5	1.1	1.0			
乳糖	0.3	0.0	95.0	0.1	0.03	0.002	0.02	0.01	
低乳糖乳清粉	23.0	1.1	55.0	16.0	2.0	1.4	4.7	1.9	3.4
脱盐乳清粉	13.0	1.3	75.0	3.5	0.1	0.2		0.02	



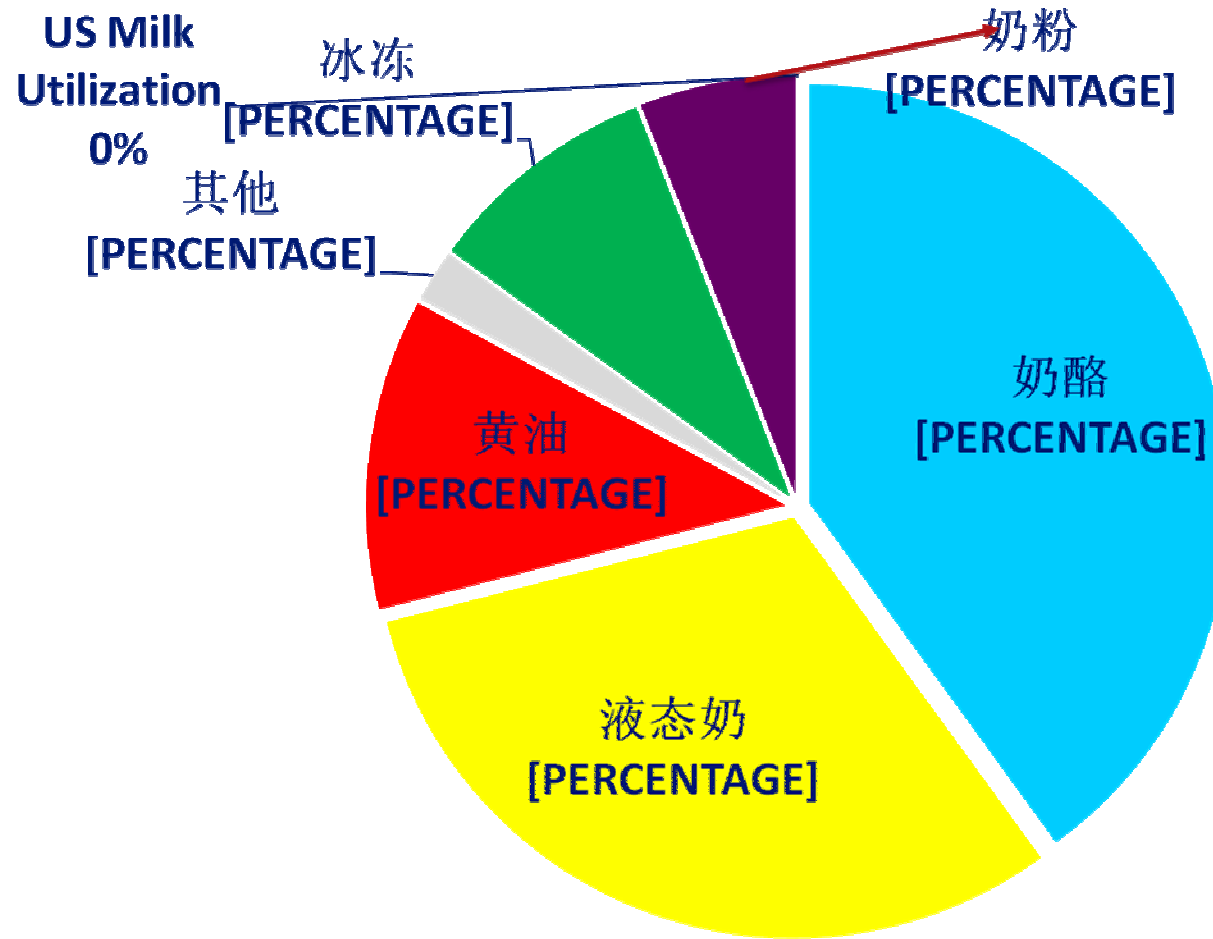
不同乳制品典型性营养分析

乳清渗透物	3.5	0.2	82.0	8.5-11	0.9	0.7	2.1	1.0	2.2
乳清浓缩蛋白	34.0	4.0	50.0	5.0	0.5	0.6	1.7	0.6	1.5
乳清隔离蛋白	91.0	0.8	0.8	2.5					
乳铁蛋白	90.0			1.0					
乳过氧化物酶	92.0			3.0					
糖巨肽		0.6	1.0	6.2					

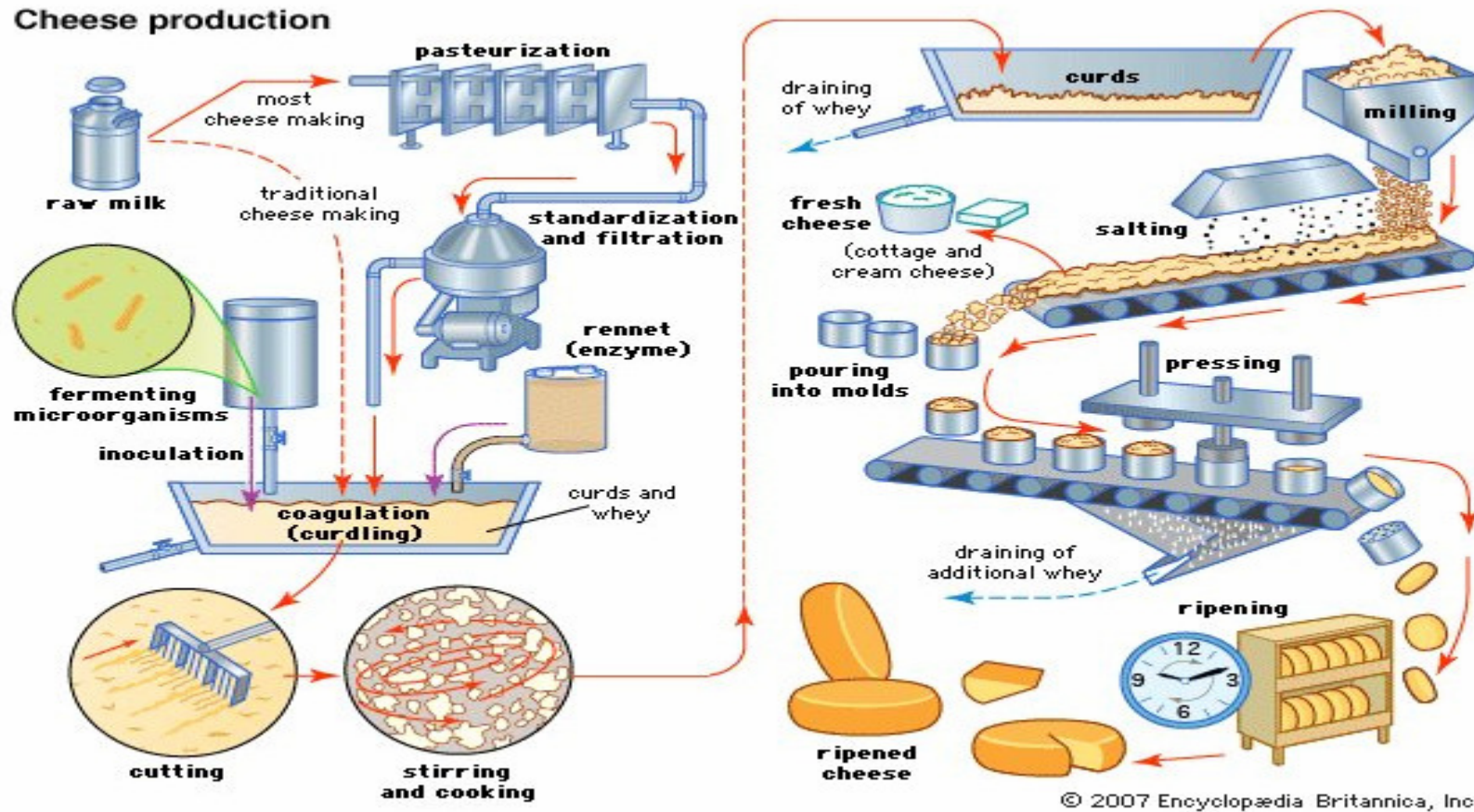


美国牛奶的使用分布

Source IDFA Milk Facts



Cheese Manufacturing 奶酪生产过程



Cheese Manufacturing 奶酪生产

- 酪蛋白在pH 4.6的时候会凝结并变得不溶解
- 乳脂，酪蛋白和部分乳矿物质进入到奶酪中
- 乳清蛋白在pH 4.6的时候仍然溶解在乳清液中
- 乳清蛋白，乳糖和部分乳矿物质仍然停留在乳清液中



奶酪生产产物

Manufacture of milk into cheese & whey



Classification of Liquid Whey

乳清的分类

- Whey from the manufacture of hard, semi-hard cheese and rennet cheese is known as sweet whey with pH ranging from 5.7 to 6.6.

来源于生产硬奶酪, 半硬奶酪和凝乳酶凝结的奶酪的乳清液, pH值为5.7-6.6. 因此, 我们称他们为甜乳清。

- Sweet whey powders: Cheddar, Mozzarella, Swiss and brick whey
- 甜乳清粉: 切达奶酪, 莫扎里拉, 瑞士和砖型奶酪乳清粉

- Whey from the manufacture of mineral acid precipitated casein or soft cheeses is called acid whey with pH ranging from 4.3 to 4.6.

来源于生产酪蛋白和软奶酪的乳清液, pH在4.3到4.6, 统称为酸乳清

- Acid whey powders: cottage, ricotta, quark, cream cheese, and casein whey
- 酸乳清粉: 乡村奶酪, 里科塔奶酪, 夸克奶酪, 醍醐奶酪, 和酪蛋白乳清粉

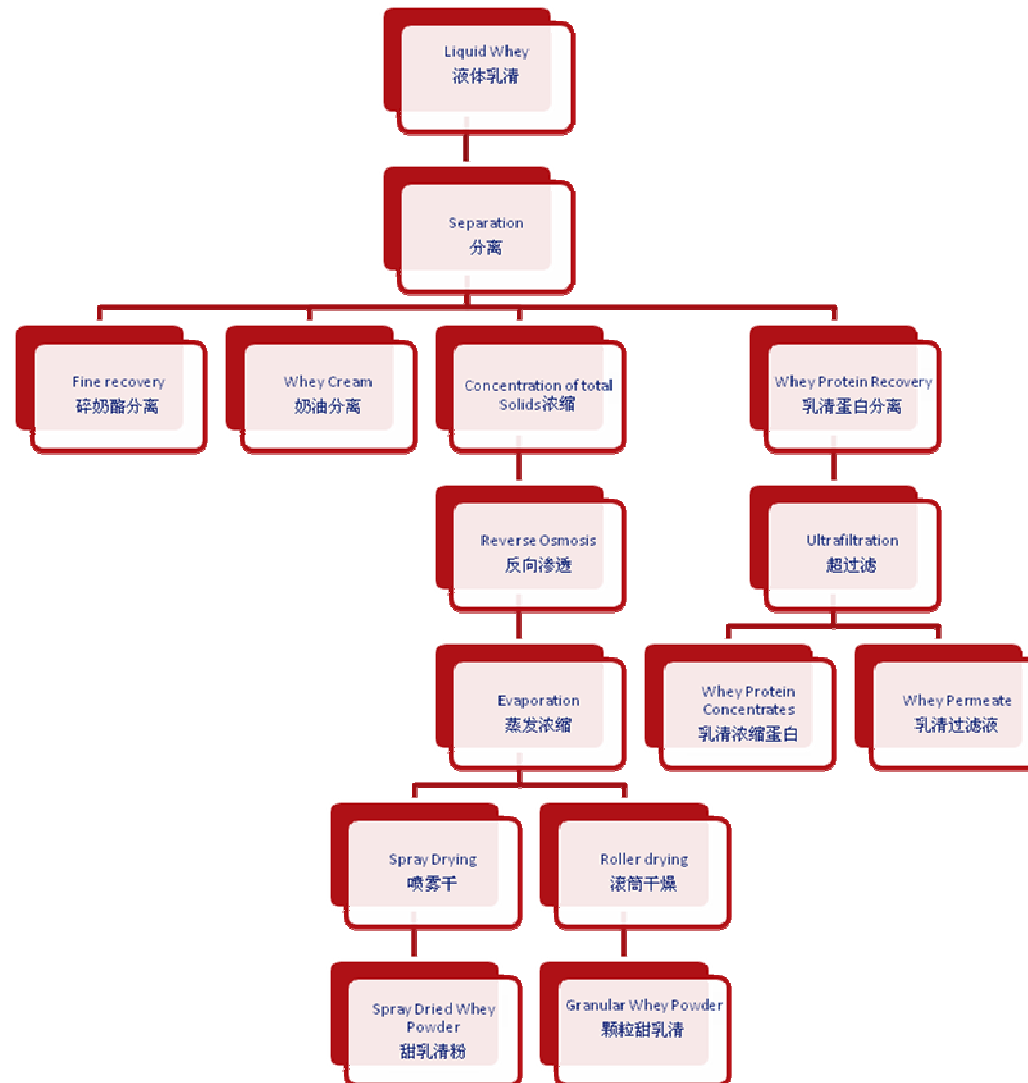


Compositions of Liquid Whey 乳清液的成分

组成	牛奶	甜乳清液	酸乳清液
总固形物, %	12.5	6.5	6.5
蛋白, %	3.5	0.8	0.7
乳糖, %	4.8	4.8	4.4
灰分 (乳矿物质), %	0.7	0.5	0.6
乳脂, %	3.5	0.3	0.3
乳酸, %	—	0.1	0.5
Ca, mg/100 g	120	45	103
P, mg/100 g	95	45	78
Na, mg/100 g	58	45	50
Cl, mg/100 g	119	90	110
K, mg/100 g	141	140	160
pH	6.5- 6.7	5.7 – 6.1	4.5

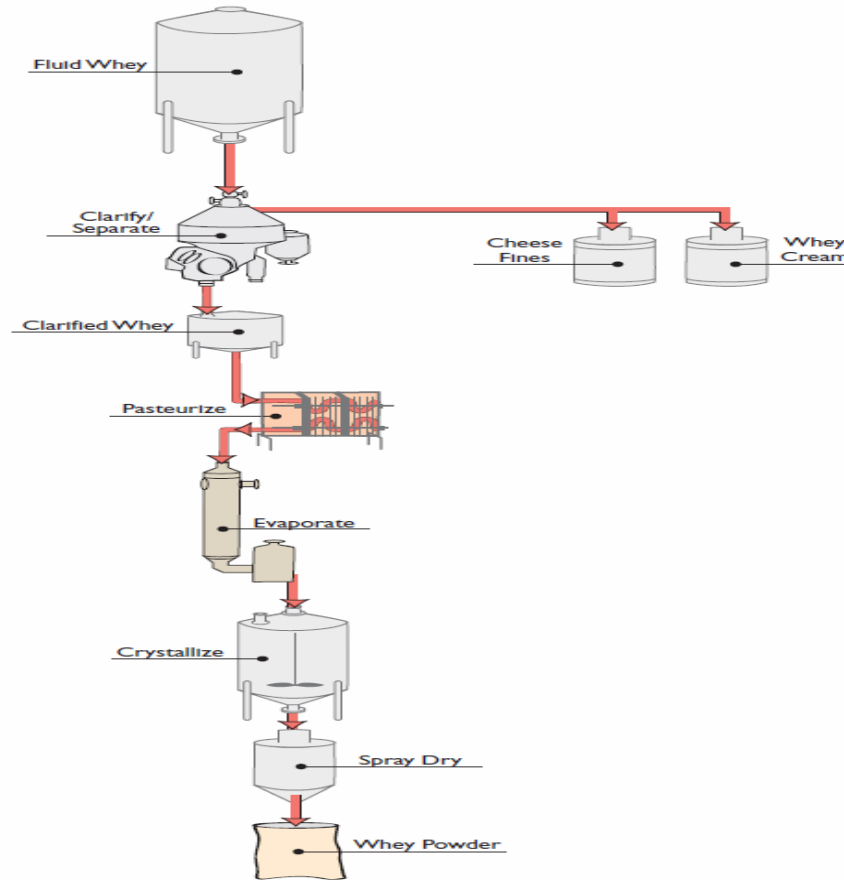


液体乳清的加工流程



Sweet Whey Production

甜乳清的喷雾干燥



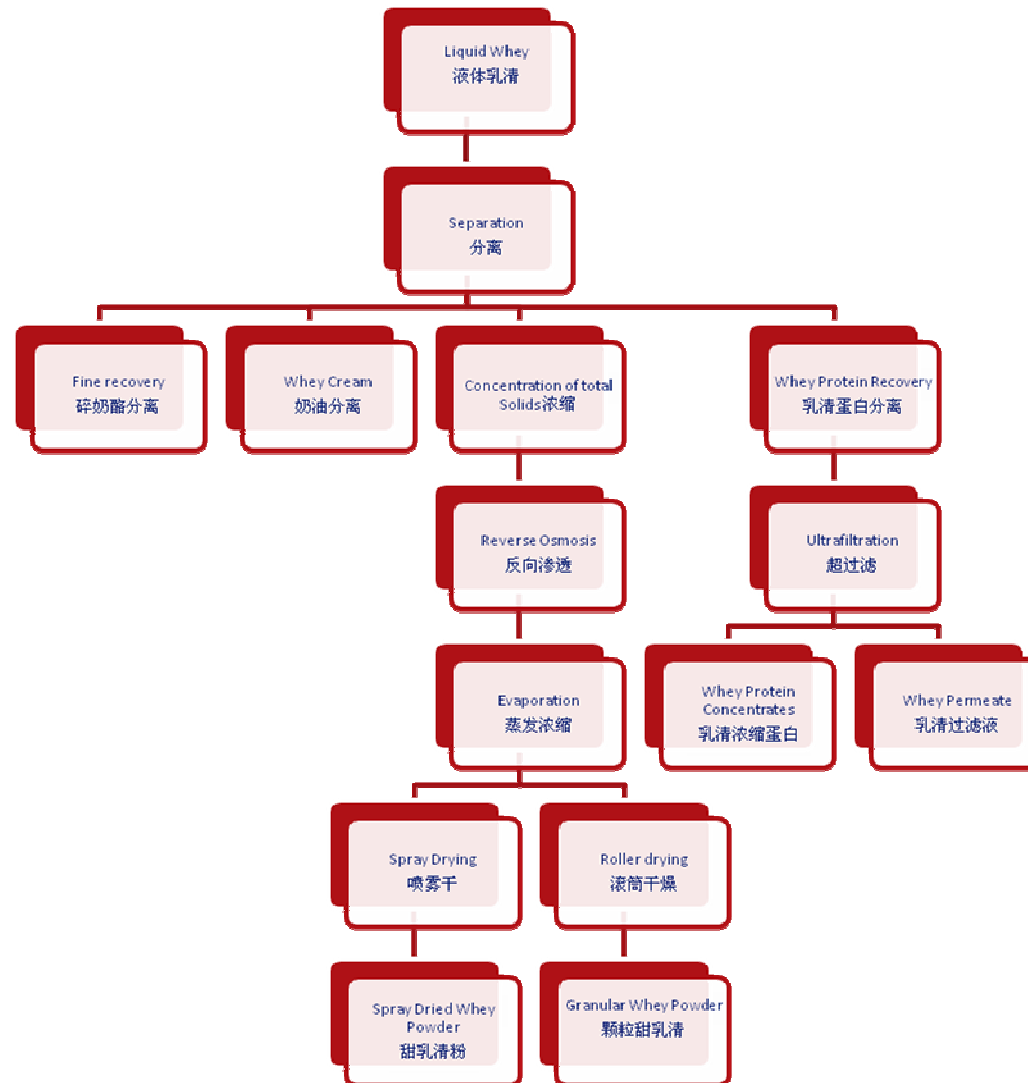
Typical Compositions of Dried Whey Powders

高蛋白乳清粉的营养成分

成分	甜乳清粉	酸乳清粉
蛋白, %	12	12
乳糖, %	70	55 – 65
灰分, %	8	12 – 15
脂肪, %	<1%	<1%
水分, %	<5%	<5%
pH	5.7 – 6.0	<5.1
可滴定酸, %	<0.16	0.35 – 0.44



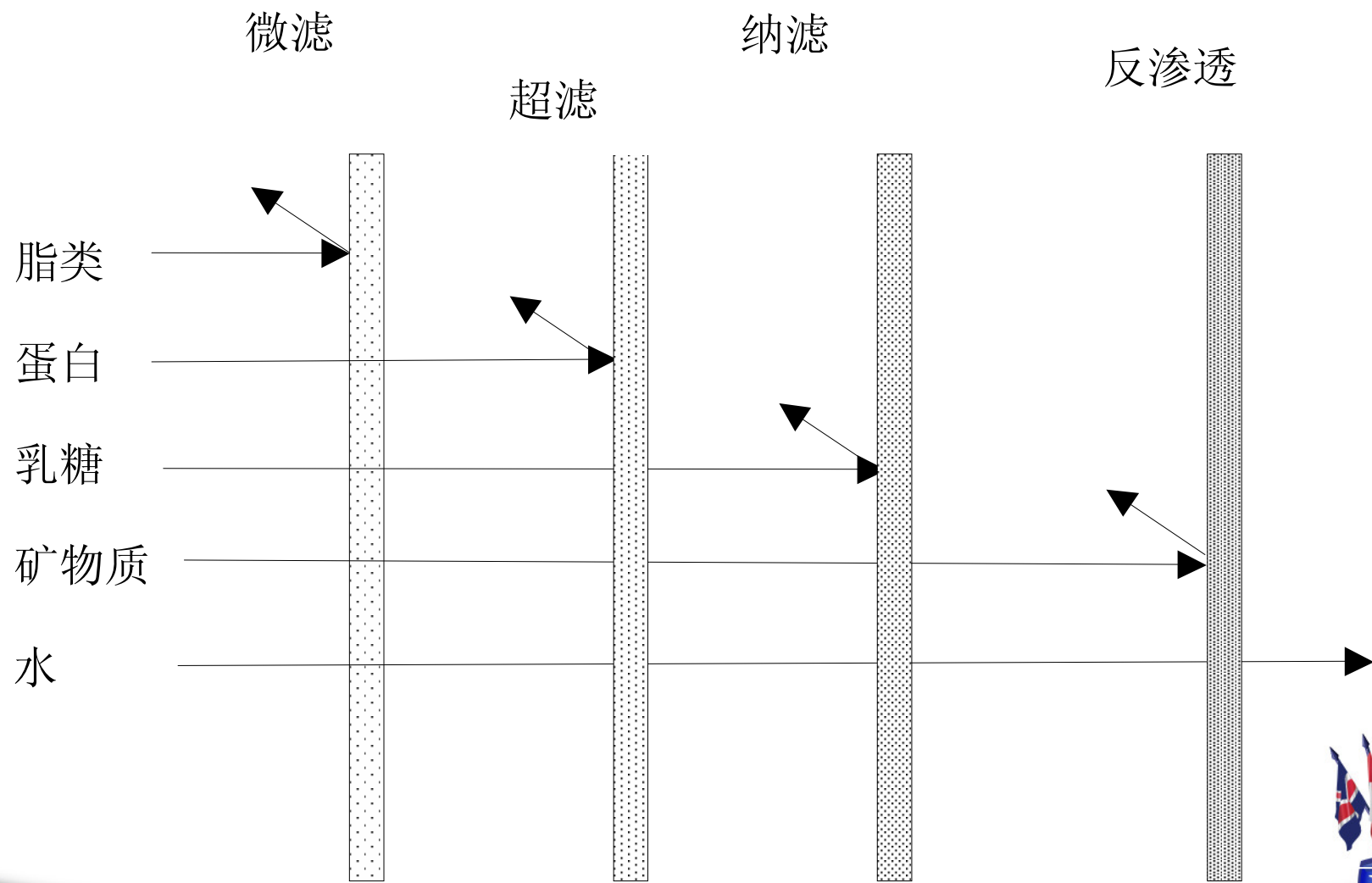
液体乳清的加工流程



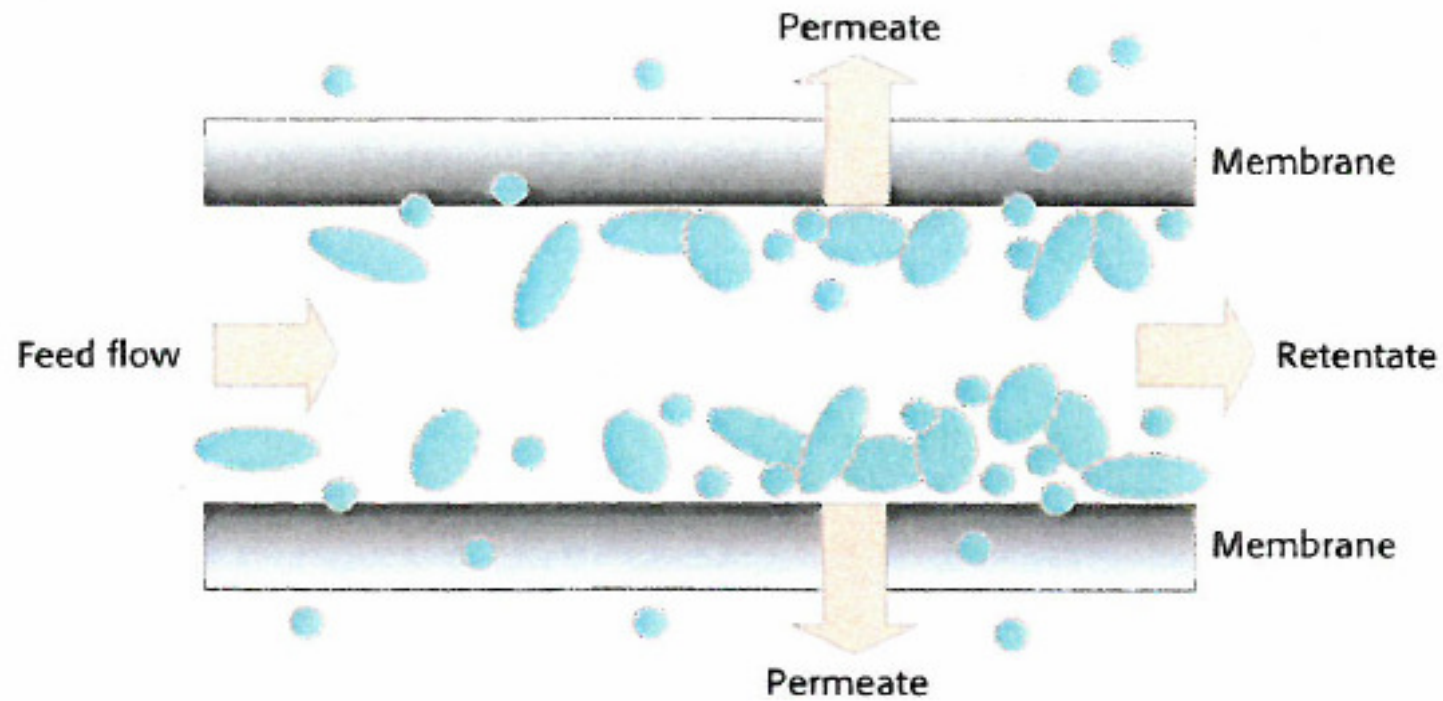
乳成分的颗粒大小比较

指标	微米
水	0.0003
Cl ⁻ , Ca ²⁺	0.0004
乳糖	0.0008
乳清蛋白	0.003-0.005
酪蛋白胶粒	0.025-0.3
脂肪球	0.1-10
细菌	0.2-8





渗透膜示意图



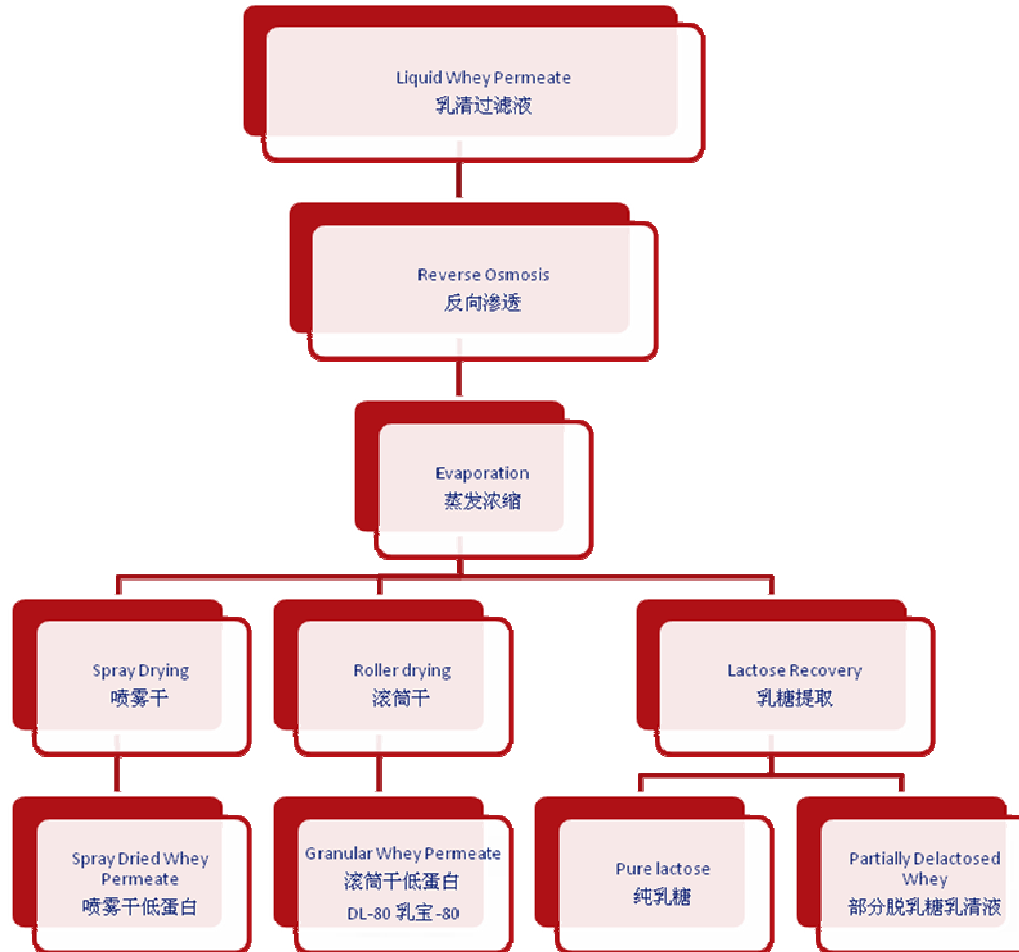
Compositions of Liquid whey & Whey Permeate

成分	液体乳清	乳清过滤液
真蛋白, %	0.55	0.01
乳糖, %	4.80	4.69
灰分, %	0.55	0.51
NPN非蛋白氮, %	0.18	0.17
乳脂, %	0.03	traces
Total DM, 总干物质, %	6.11	5.38
乳糖占总干物质的比例 %	78.6	87.2



Liquid Whey Permeate Processing

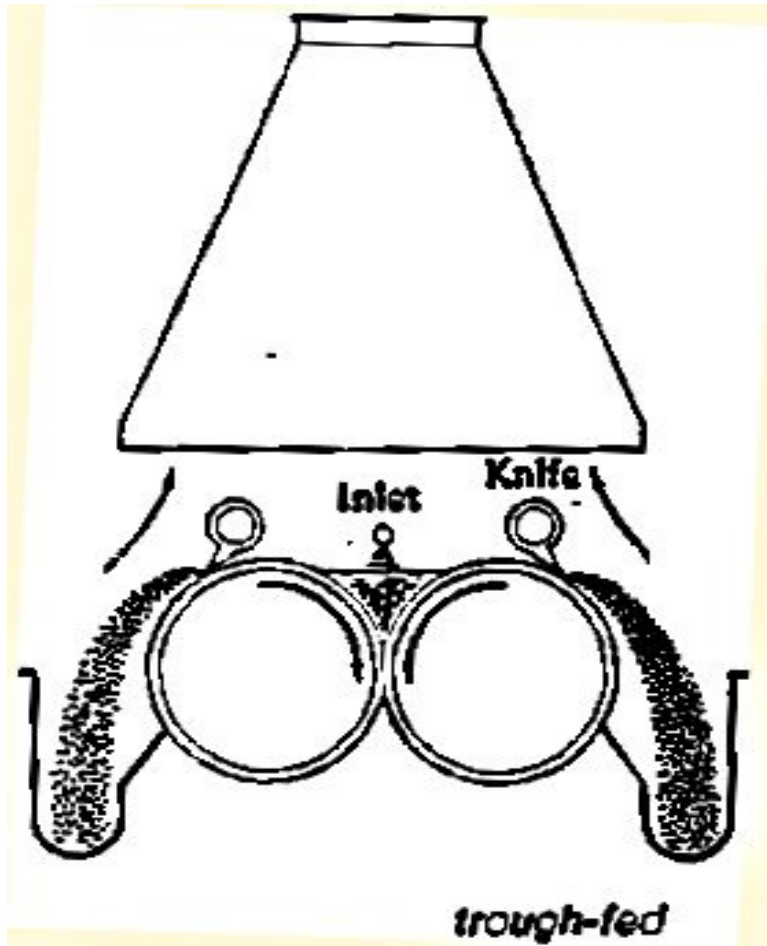
乳清过滤液的加工流程



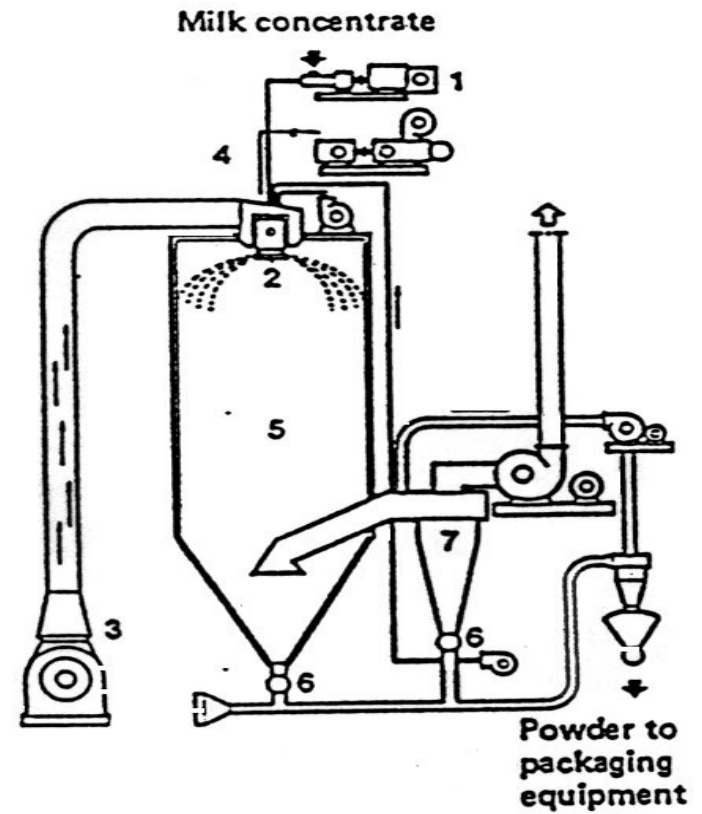
低蛋白乳清粉的典型营养组成

组成	低蛋白乳清粉
粗蛋白, %	3
乳糖, %	78 – 82
灰分（乳矿物质）, %	8 -11
脂肪, %	<0.1%
水分, %	<4%
pH	5.7 – 6.0
可滴定酸, %	<0.16





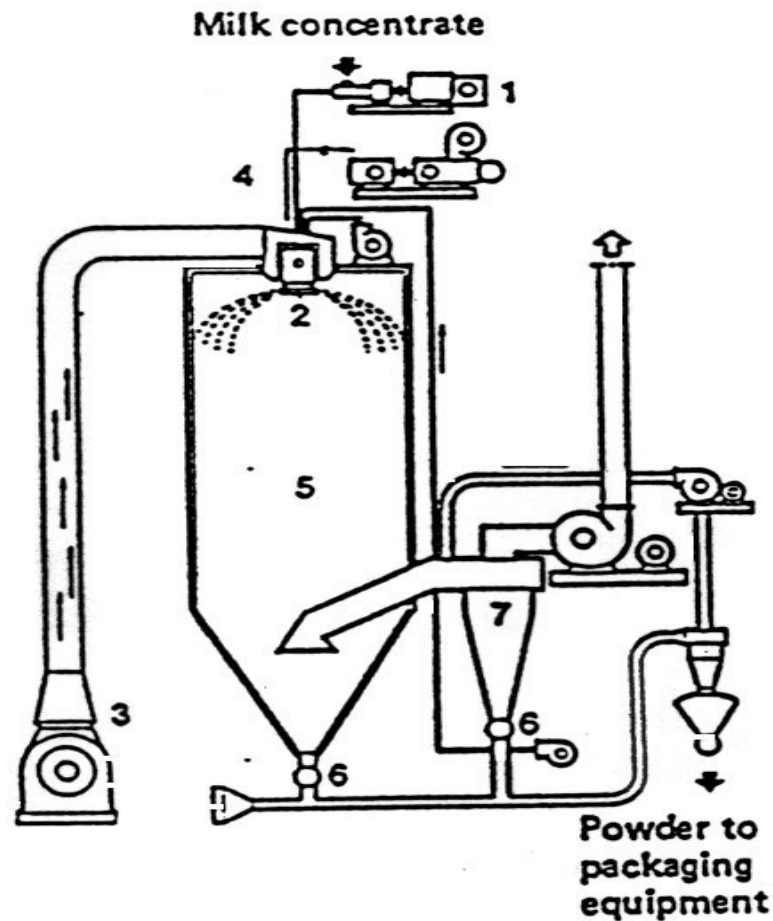
滚筒干燥



喷雾干燥



喷雾干燥

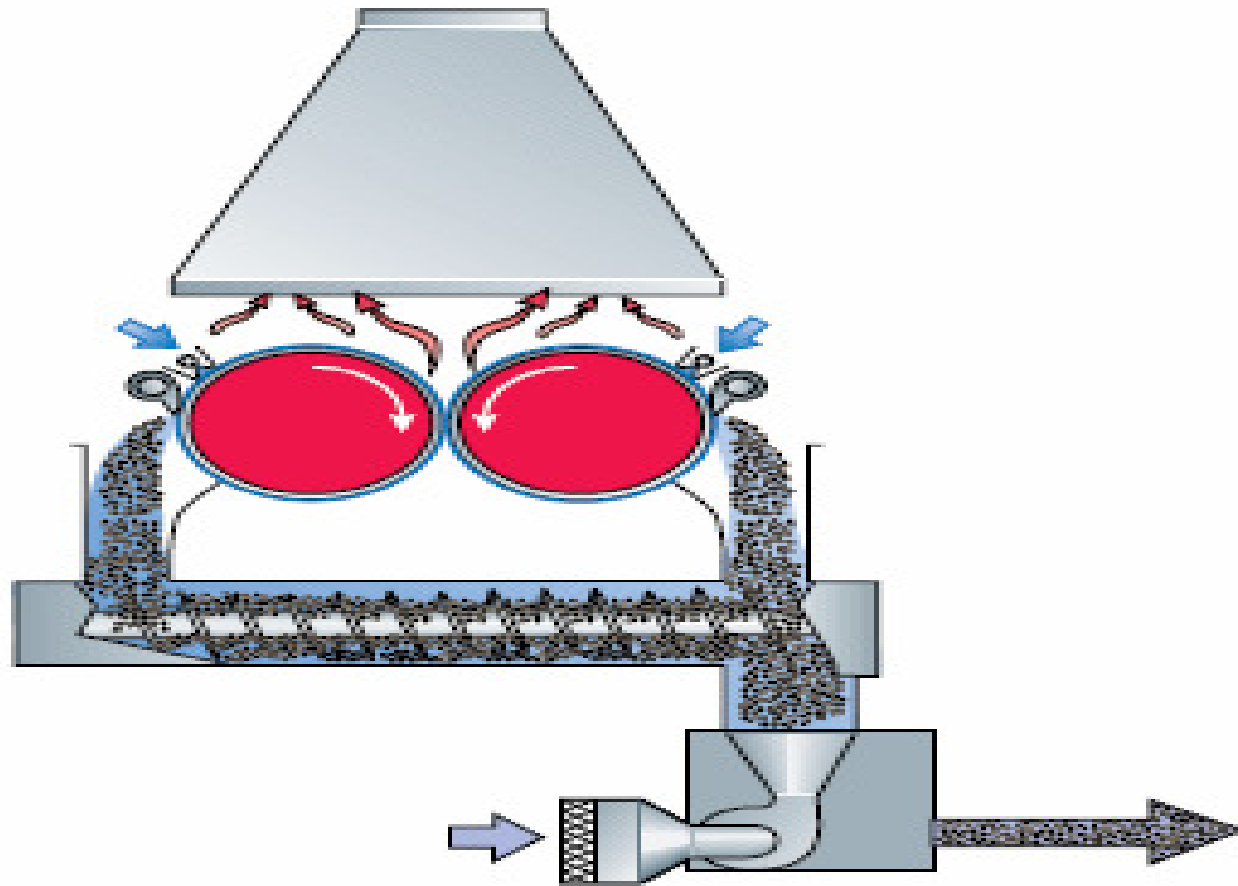


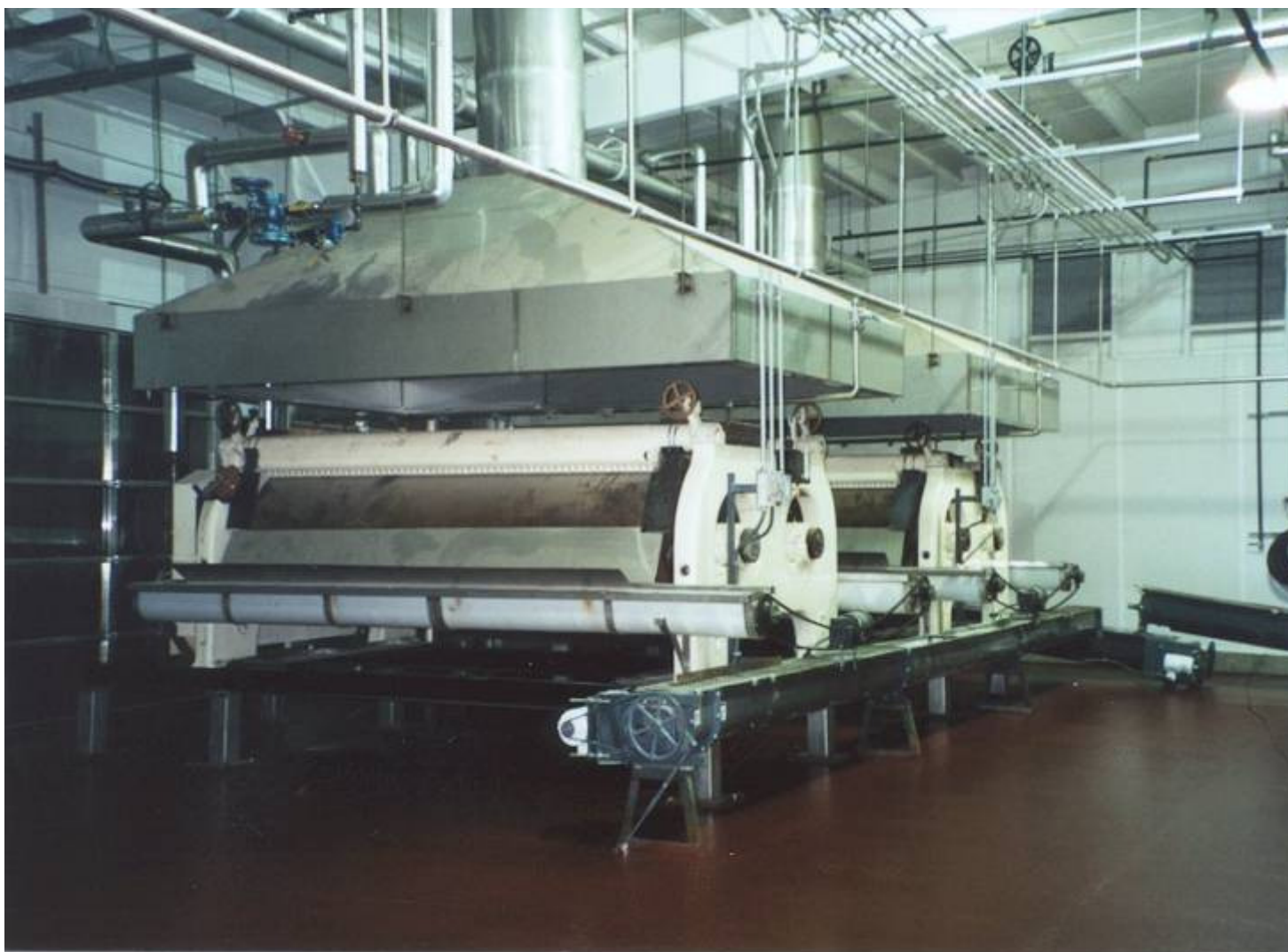
1. 高压泵
2. 雾化设备
3. 热空气供给
4. 混合舱
5. 干燥室
6. 分流设备
7. 清洗设备

内温. 200-250° C
产品. 80-95° C



滾筒干燥机





IIC 滚筒干燥机





DAIRYLAC 80 "POPCORN"





DAIRYLAC 80[®]



滚筒干燥的要求和特点

- 要求新鲜优质乳清液
- 温和迅速的干燥方法
- 无需中和pH，也不需要添加漂白粉
- 促进 β 乳糖的形成(比 α -型乳糖更甜).
- 最终产品具有颗粒，流动性好和吸水性低的特点。



滚筒干燥

- 滚筒温度 **125 - 150 °C**
- 干后乳清温度* **45 - 50 °C**
- 滚筒转速 **29 rpm**
- 干燥时间 **1.5 seconds**

*蒸发具有降温的作用，因此产品温度达不到滚筒的温度



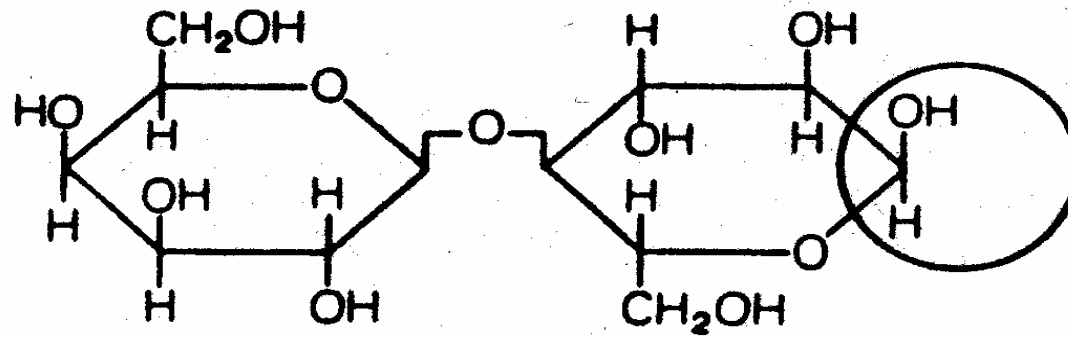
滚筒乳清粉与喷雾乳清粉的差异

- 如果工艺控制的好，两方法都能生产出较好的产品。
- 滚筒干燥
 - 颗粒, 自由流动
 - β -乳糖 (甜度超过 α -乳糖)

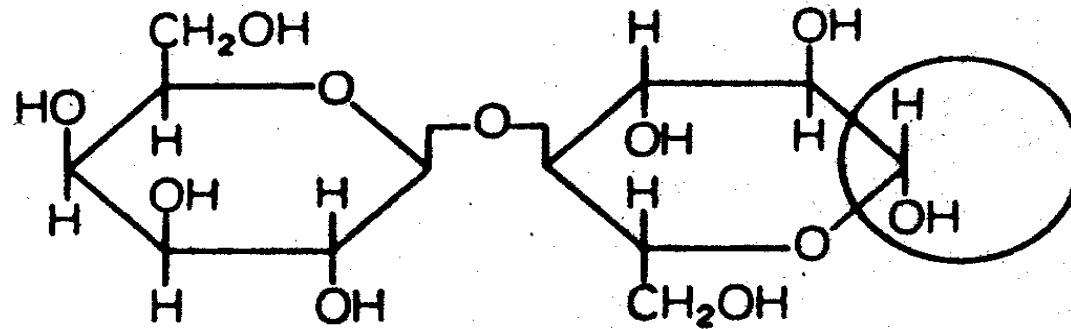


乳糖： α -、 β -同分异构体

α -lactose:



β -lactose:



α -乳糖 和 β -乳糖

溶液温度

Alpha \longleftrightarrow Beta

在干燥以后，乳清产品中的 α -乳糖和 β -乳糖的比例是固定的。



α -乳糖和 β -乳糖的形成

喷雾干燥 (有利于 α -乳糖的形成)

- 干燥仓温度 最高
- 出口温度 最低

滚筒干燥 (有利于 β -乳糖形成)

- 初始温度 最低
- 最后温度 最高



滚筒干燥的高蛋白乳清粉

- 研究证明对动物生产性能没有负面影响
 - 滚筒干燥的甜乳清和喷雾干的甜乳清营养和饲用价值相同 (**Dr. Gary Cromwell, U. of KY**)
 - 两种干燥方法生产的甜乳清蛋白质(赖氨酸) 的利用率相同 (**Dr. Tom Crenshaw, U of WI**)
 - 早期断奶仔猪的生产性能相同 (**Dr. Gary Allee, U. of MO**)



四个研究的结果比较 (相对日增重)

研究者	断奶日令 (d)	喷雾干 (日增重作为 100)	滚筒干 (相对日增重)
Cromwell	28	100	102
Crenshaw	10	100	110
Radke	21	100	106
Allee	17	100	109
平均		100	107



乳宝-80 (Dairylac[®] 80) 的研究总结

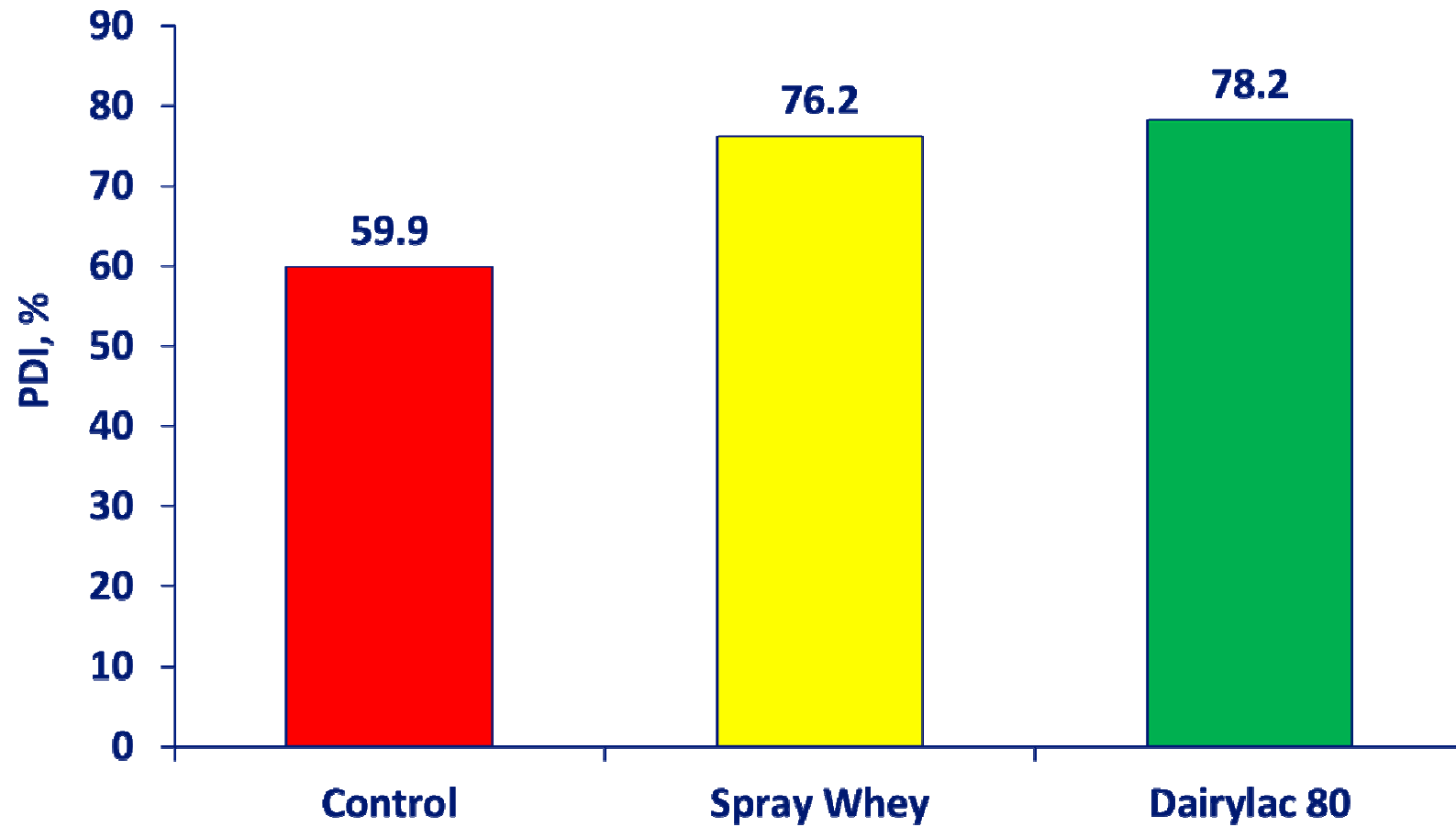
(8 个研究结果, 相对日增重)

研究者	喷雾干甜乳清或者乳糖 (日增重 100)	DL-80 (相对 ADG)
1. Cromwell	SDW 100 (n=27)	110 (n=27)
2. Allee	SDW 100 (n=30)	95 (n=120)
3. Mahan	SDW 100 (n=36)	98 (n=36)
4. Easter	SDW 100 (n=36)	100 (n=72)
5. Tokach	SDW 100 (n=60)	106 (n=60)
6. Tokach	SDW 100 (n=102)	101 (n=51)
7. Cromwell	Lactose 100 (n=59)	105 (n=59)
8. Allee	SDW +L 100 (n=138)	GW + DL 106 (n=138)
平均	100 (n=488)	103 (n=563)



Dairylac[®] 80

颗粒耐久指数 *Pellet Durability Index*



结论

- ▶ 饲喂滚筒干乳清粉日粮的宗旨生产性能至少和喷雾干乳清粉相同。
- ▶ 滚筒干干甜乳清粉和低蛋白乳清粉流动性更好，不容易结块。
- ▶ 尽管滚筒干乳清粉含有粒度大的颗粒，研究证明他们不会影响到颗粒饲料的颗粒耐久性。



Dairylac[®] 80

- 80% 乳糖
- β -乳糖 (比 α -型甜).
- 颗粒状, 吸水性低, 流动性好
- 自然乳清色泽 (无漂白剂)
- 研究证明和动物生产企业的普遍好评



美国乳制品协会低蛋白乳清粉标准

Nutrient(营养物质)	Whey Permeate (低蛋白乳清粉)	Remark (备注)
Crude Protein (粗蛋白)	典型 3 -7%， 最大 7.0%	AOAC 991.20 (N x 6.38)
Lactose (乳糖)	典型 76 – 85%， 最小76%	HPLC ISO 22662/IDF 198
Crude Fat (粗脂肪)	典型 0 – 1.0%， 最大 1.5%	AOAC 989.05
Ash (灰分)	典型 8 -11%， 最大 14%	Oven at 550 C AOAC 942.05
Moisture (水分)	典型 3 – 4.5%， 最大5.0%	Vacuum oven AOAC 925.45
pH	5.5 到 6.6	



乳制品的质量控制

➤ 营养成分

- 乳糖(乳碳水化合物), 乳蛋白, 乳脂, 乳灰分(乳矿物质), 水分

➤ 物理特性

- 色泽, 味道(嗅觉, 味觉), 结晶和颗粒大小

➤ 流动性



色泽

- 乳白色 - 正常
- 浅黄色 - 可以
- 深黄到褐色-高蛋白乳清粉可能有问题
- 如果没有脱色, 奶酪颜色会影响到乳清粉色泽
- 过度加热影响乳清粉色泽
- 美拉德反应影响乳清粉色泽





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Savings on the spot

2.29
Savings on the spot



20¢
Compare to: 2.49

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Savings on the spot

2.29
Savings on the spot

2.29
Savings on the spot



20¢
Compare to: 2.19

20¢
Compare to: 2.49

20¢
Compare to: 2.49

2.29
Savings on the spot

1.99
Savings on the spot

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Savings on the spot

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DAIRYLAC[®] 80

流动性

- 颗粒过小影响乳清粉流动性, 大颗粒增加流动性
- 不同乳糖结晶影响乳清粉吸水性
 - 不规则乳糖结晶 (amorphous) 吸水性高
 - 一水乳糖结晶吸水性稳定 (α -monohydrate)
 - β -乳糖的吸水性最低
 - 大颗粒减少表面积, 降低吸水性
- 吸水以后容易结块, 减少流动性, 容易变色



低蛋白乳清粉中粗蛋白的理解

- 尽管可能有少量的氨基酸和小分子肽存在，低蛋白乳清粉中的粗蛋白主要是非蛋白氮(NPN)。
- 这些NPN包括尿素，肌酸，肌酐，尿酸，乳清酸，和氨。这些含氮化学物质的分子量小可以通过超过滤膜。
- 这些非蛋白氮物质对单胃动物无营养价值。因此，低蛋白乳清粉中的蛋白质价值被人们高估了。
- 使用低蛋白乳清粉的目的是为了它的高乳糖含量。而不是为了它的粗蛋白。



灰分含量的理解

- 正常情况下，低蛋白乳清粉的灰分含量为 8.5 到 11%
 - 几乎所有的灰分都来自于天然的乳源灰分
 - 乳源性的灰分具有营养价值而不是负面的东西
 - 0.5% Ca, 0.84% P, 生物学利用率极高
 - 铁, 锌, 镁, 钾和其他



乳清粉中的Na和Cl

- 正常的蛋白乳清粉的盐分含量不超过3%
 - 部分来自于牛奶本身
 - 部分来自于奶酪脱水过程中添加的
 - 经过脱盐以后，含量和牛奶相近 2.62%
 - 我们的低蛋白乳清粉为2.62%
- NRC 2012, 5到7 公斤体重保育和生长猪Na和Cl最低需要量分别为0.4 %到0.5%
- 美国常见的保育料Na和Cl含量是0.9 到1.15%



纯乳糖和低蛋白乳清粉的比较

- 一般情况下，商业食品级乳糖是以100%的乳糖为 α -一水乳糖结晶的形式存在。
- 1分子乳糖 + 1 分子水 = 1分子 α -一水结晶乳糖
- 乳糖的分子量为342，水的分子量为18. 一次含有一个结晶水的 α 乳糖的分子量为380. 其中95%是乳糖，而另外5%是结晶水。
- 因此在购买纯乳糖时，应该使用95%乳糖和含有80%乳糖的低蛋白乳清粉作比较。



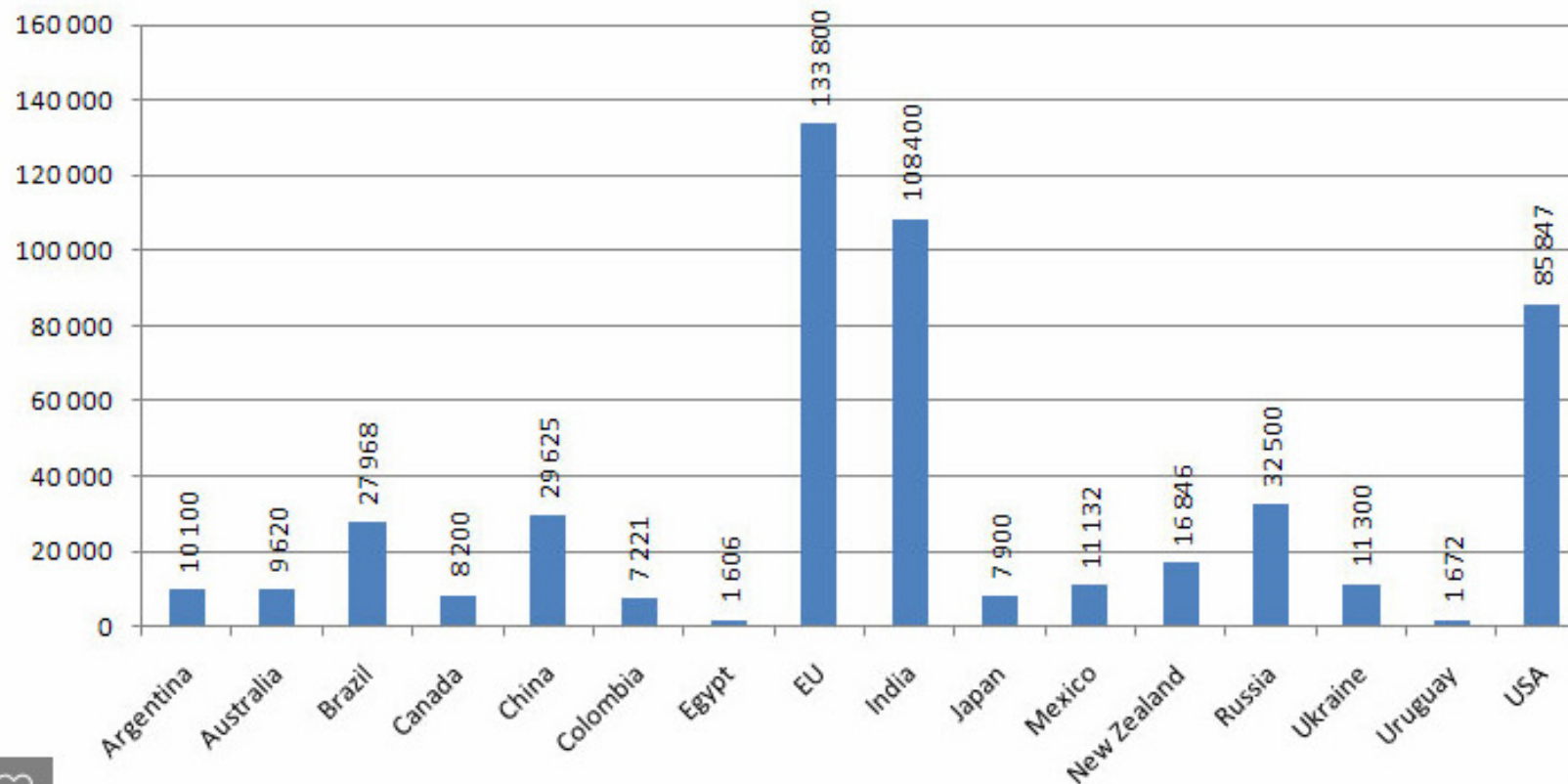
Trend and Market Outlook of Whey Products

乳清产品的市场趋势



World Milk Production 全球牛奶产量

Cow Milk Production (thousand metric tons)

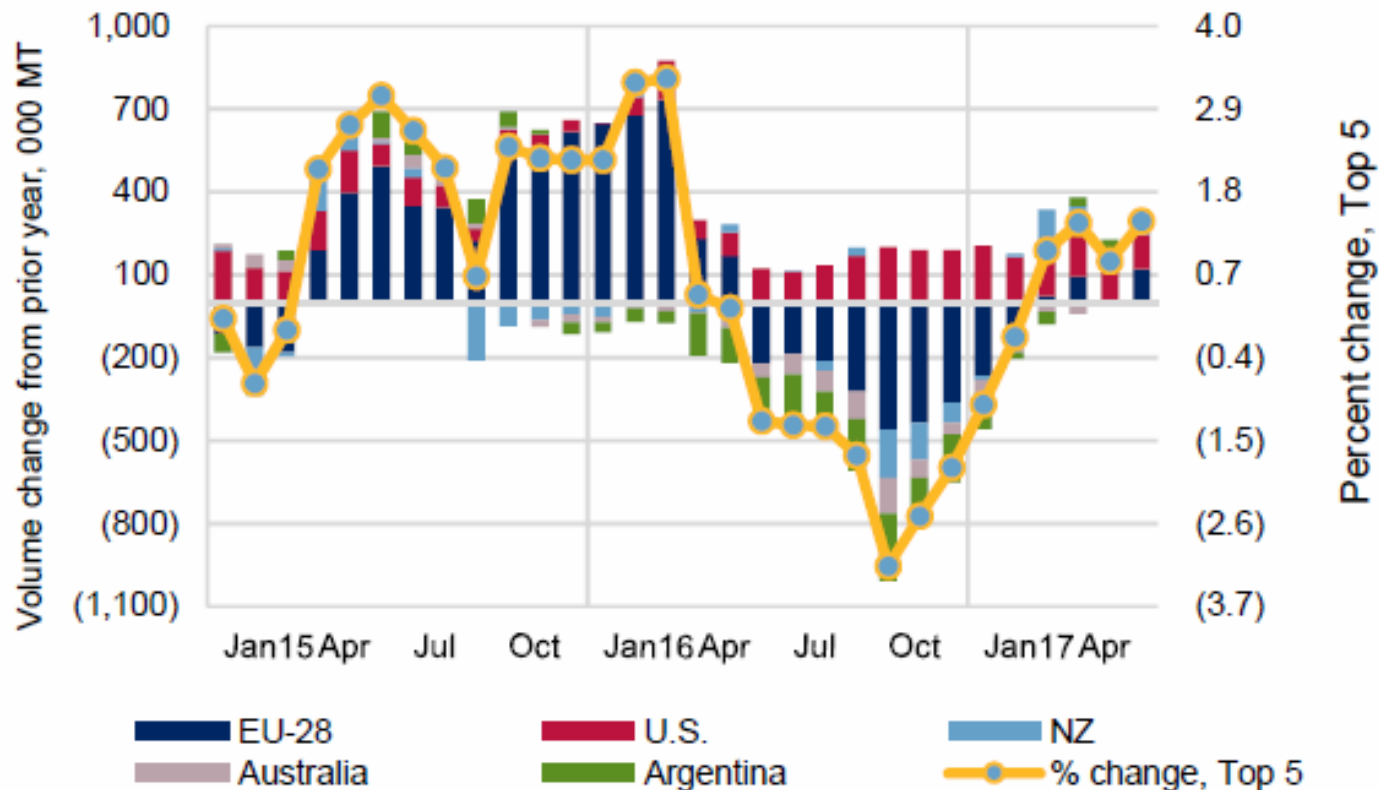


World total milk production as around 816 million MT in 2016



World Milk Production 全球牛奶产量

Milk Production Change from Prior Year, Top 5 Global Suppliers



Feb. 16 adjusted for leap day. Latest month may include USDEC estimate.



World Milk Supply Situation

- World milk production in 4 key regions grew just 1.2%, 1.3%, and 0.5% in May respectively.
- Production in the EU 28 and NZ slipped below year ago levels
- Australia milk production remained to be lower for 15 consecutive month in May and slightly recovered in June.
- In all regions, weather conditions continue to be favorable to higher milk production.

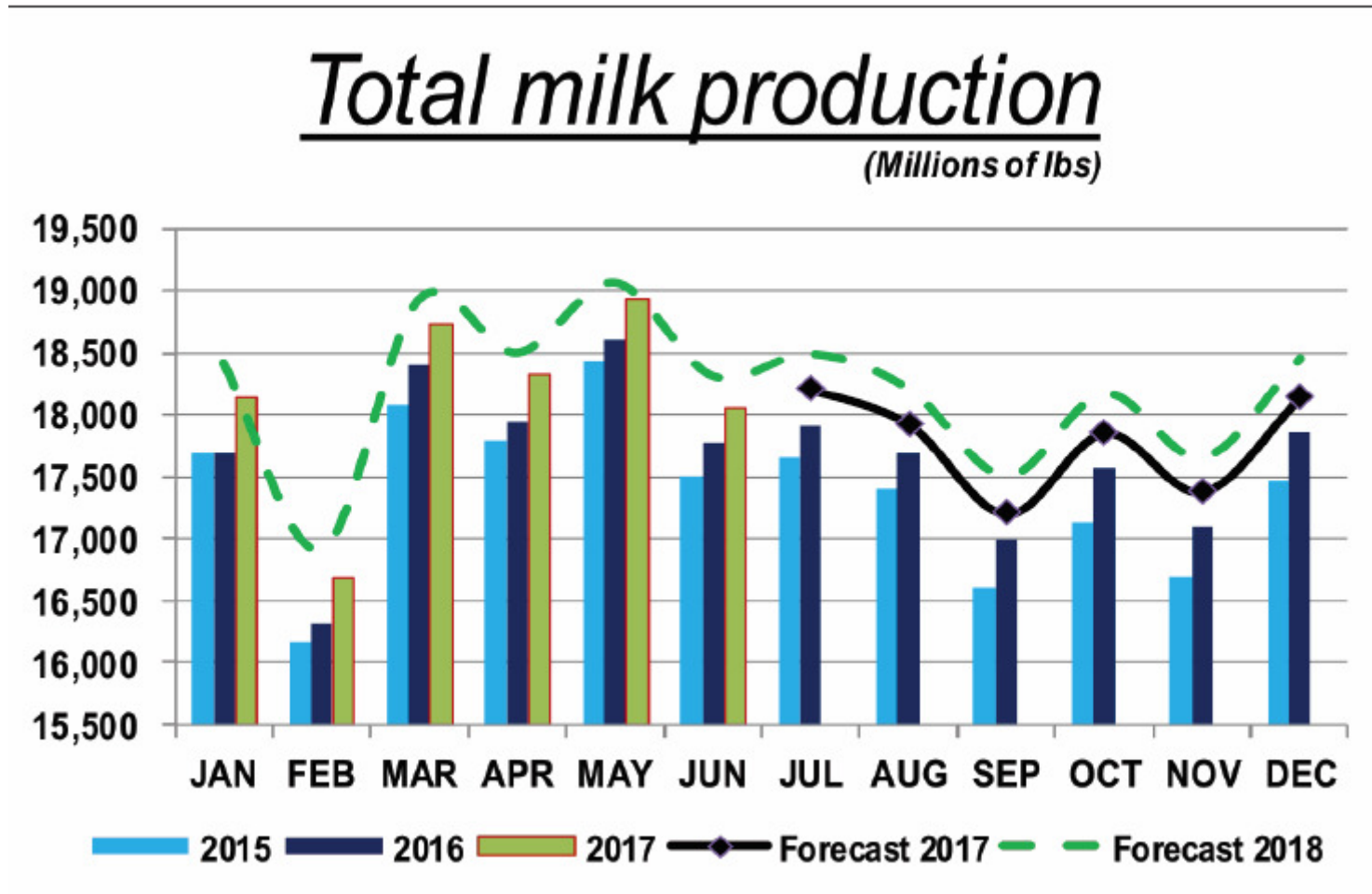


US Milk Production 美国牛奶生产

- In 2016, US milk production was 96.4 million MT and increased by 1.86% over 2015.
2016年美国产奶量为9千6百40万吨。比2015年提高1.86%
- Total US milk production during 1st half 2017 was up 2.0% compared to 2016, but only up 0.7% in June.
2017年上半年美国牛奶产量环比增长2.0%，但是六月只增加了0.7%。
- Milk cow numbers have continued to grow and up 69,000 heads over 9 month periods, reached to be 9.4 million heads total.
奶牛的头数在过去9个月中增加了69,000头，总头数达到了9百40万头。
- Hot weather in the summer has affected Northwest regions in USA and caused cow milk yield drop.
炎热的天气影响到美国西北地区，造成奶牛的产量下降。
- The US ROFC for 1st half 2017 was \$11.00/cwt. which indicates continued milk growth. But June ROFC came nearly \$13/cwt.
美国2016年12月的ROFC为\$11.00/cwt，这表明牛奶产量会继续增长。
- US milk production is forecast to grow 1.9% in 2017
预计美国牛奶产量在2017年增长1.9%。



US Milk Production 美国牛奶产量

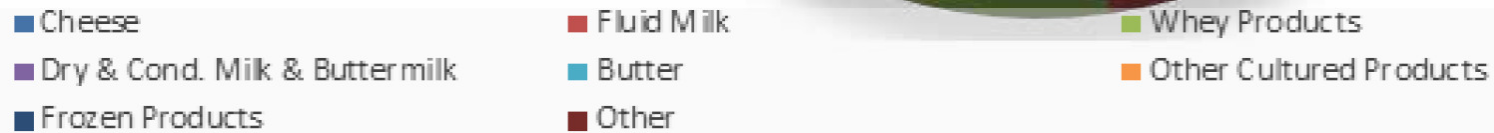
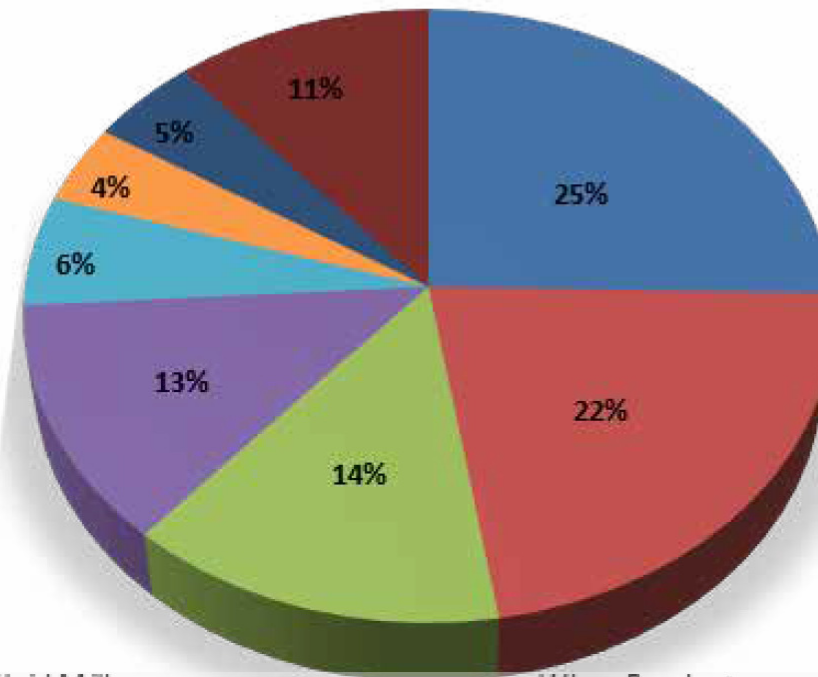


Estimated Final Disposition of Milk Solids in the U.S. in 2016 Total of 26.78 billion pounds of milk solids

Total milk solids produced in 2016 equaled 26.78 billion pounds.

While nearly 50% of these solids went into Fluid Milk and Cheese Products, Dry and Condensed Milk Products accounted for **3.2 billion pounds** of these solids, with whey products accounting for another **3.7 billion pounds** of solids.

The following utilization map tracks the estimated final disposition of the 26.78 billion pounds of milk solids produced in the U.S. in 2016:



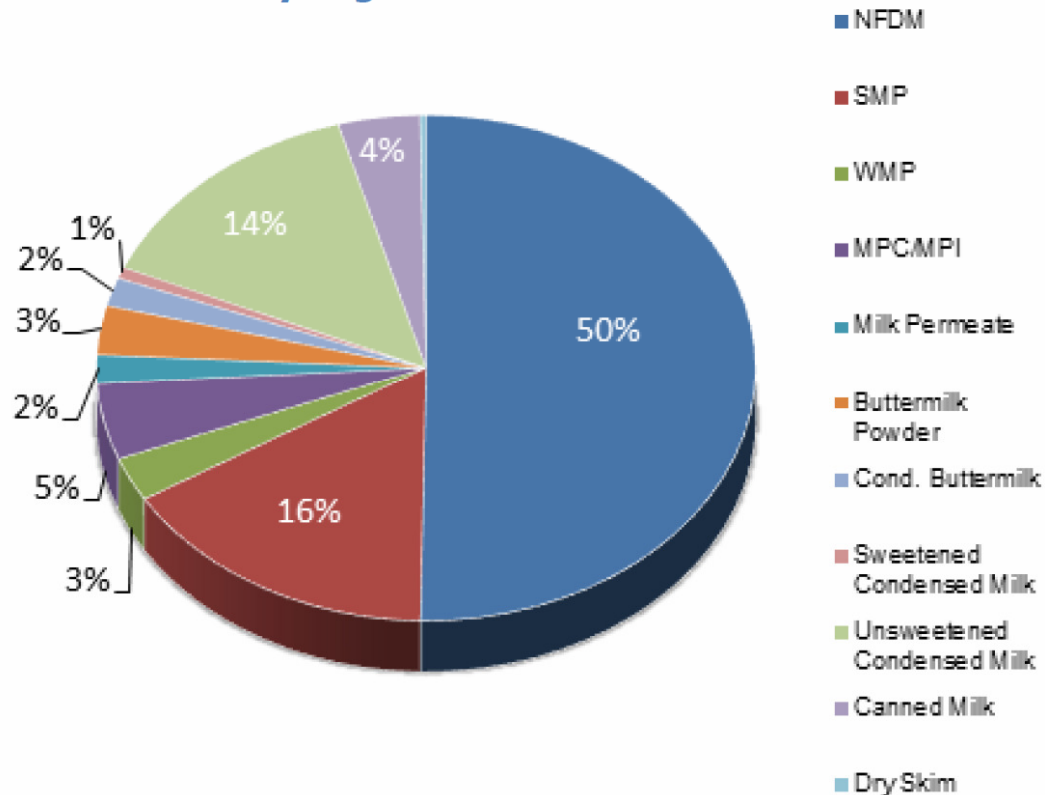
Milk Based Dairy Ingredients

2016 Milk-based Dairy Ingredient Production

2016 Milk-based Dairy Ingredients Production

Total 3.457 Billion Lbs

	Million Lbs
• NFDM:	1,754
• SMP:	559
• Dry Skim:	10
• WMP:	98
• MPC/MPI:	171
• Perm:	64
• Buttermilk:	110
• Cond BM (solids):	31
• Cond Milk (solids):	660

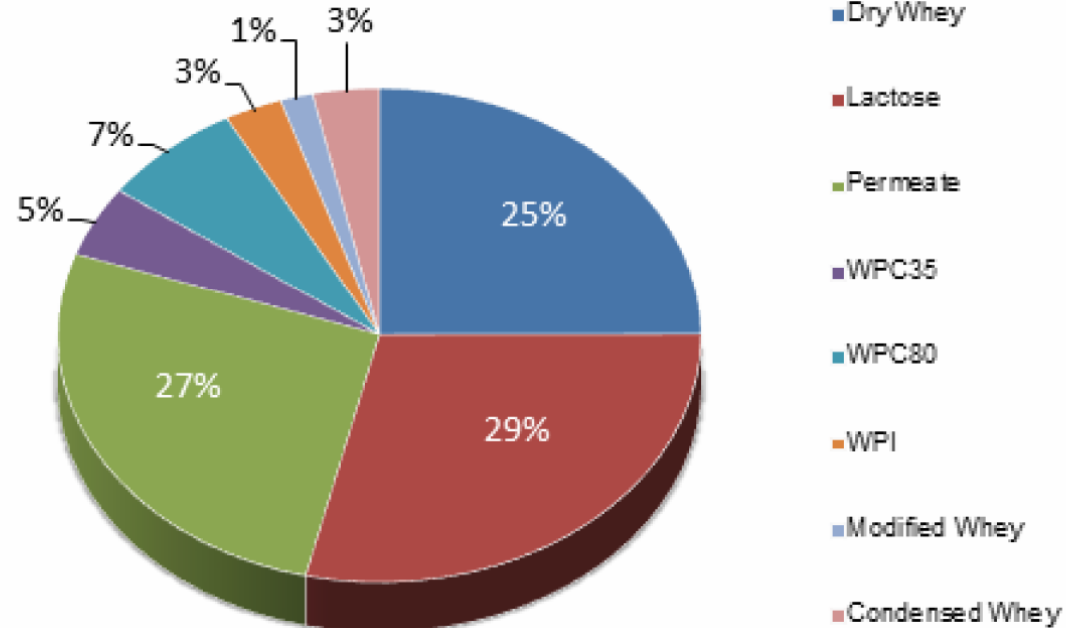


Whey Based Dairy Ingredients

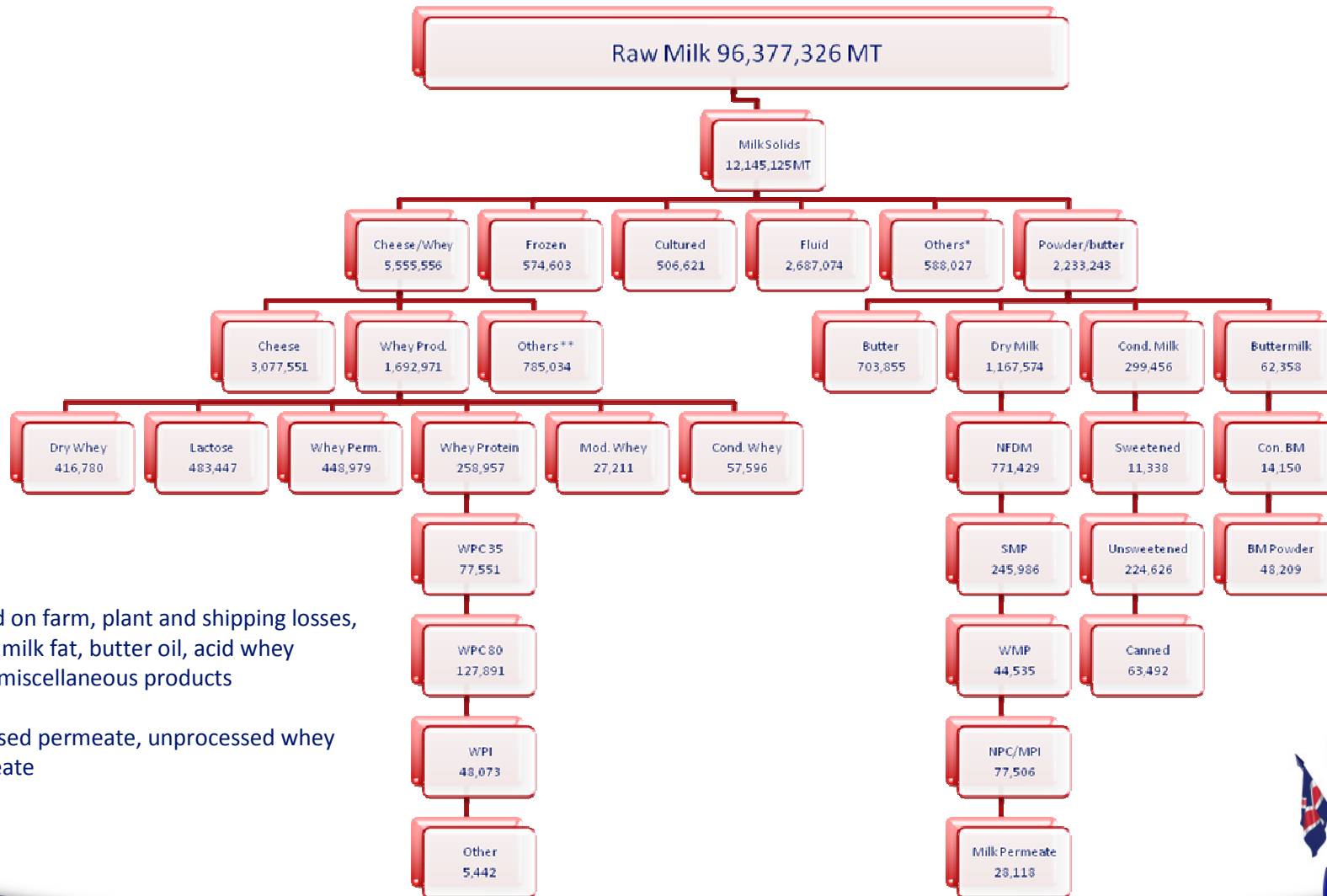
2016 Whey-based Dairy Ingredient Production

2016 Whey-based Dairy Ingredients Production	
Total 3.843 Billion Lbs	
	Million Lbs
• Dry Whey:	955
• Lactose:	1,099
• Permeate ¹ :	1,020
• WPC35:	177
• WPC80:	291
• WPI:	111
• Mod Whey:	63
• Cond whey (solids):	127

¹Estimate



2016 Milk Solids Utilization Map (MT of Milk Solids)



* Milk used on farm, plant and shipping losses, anhydrous milk fat, butter oil, acid whey And other miscellaneous products

** Delactosed permeate, unprocessed whey And permeate



World Permeate Production

世界乳清过滤液产量, MT/年

Country	2012	2013	2015	2016
USA	408,163	463,946	469,388	448,979
EU-28	150,959	157,971	166,970	203,962
Latin America	29,994	34,994	39,992	39,992
All others	39,993	44,992	49,991	49,991
Total World	629,109	701,903	726,341	742,924

Total world liquid whey production in 2015 is 186 million MT, 2% increase/year

US total whey production is 430,839 MT in 2016

US total lactose production is 480,000 MT in 2016



US Dairy Exports

美国乳制品出口



Exports 出口

- **Us dairy exports in 1st half 2017 were the highest in past 3 years, led by record sales of skim milk powder and whey products, a 24% year to year gain in cheese exports.**

2017年前半年美国总出口是3年以来最高的，脱脂奶粉和乳清产品出口量创历史记录。奶酪的出口量环比增加24%

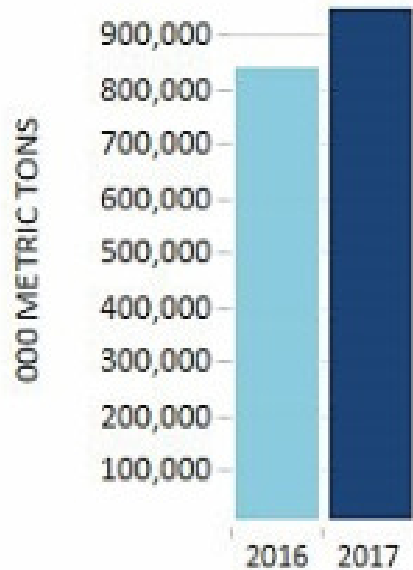
- **On a total milk solid basis, US exports were equivalent to 14.3% of US milk production in the 1st half of 2017.**

2017年前半年美国出口了相当于美国牛奶固形物的14.3%



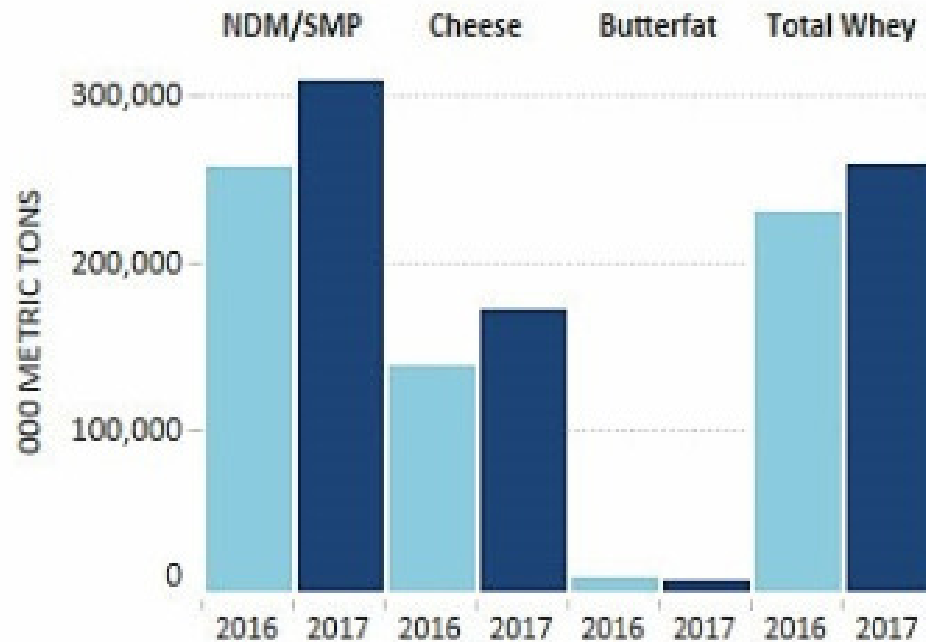
US Dairy Export in 1st Half 2017

U.S. Exports Aggregate Volume* - YTD



950,291 MT of milk product
Exported in 1st half , 2017

U.S. Exports Volume - YTD



259,757 MT of whey products were
Exported in 1st half, 12% higher than last year



US Dairy Export As % of Production

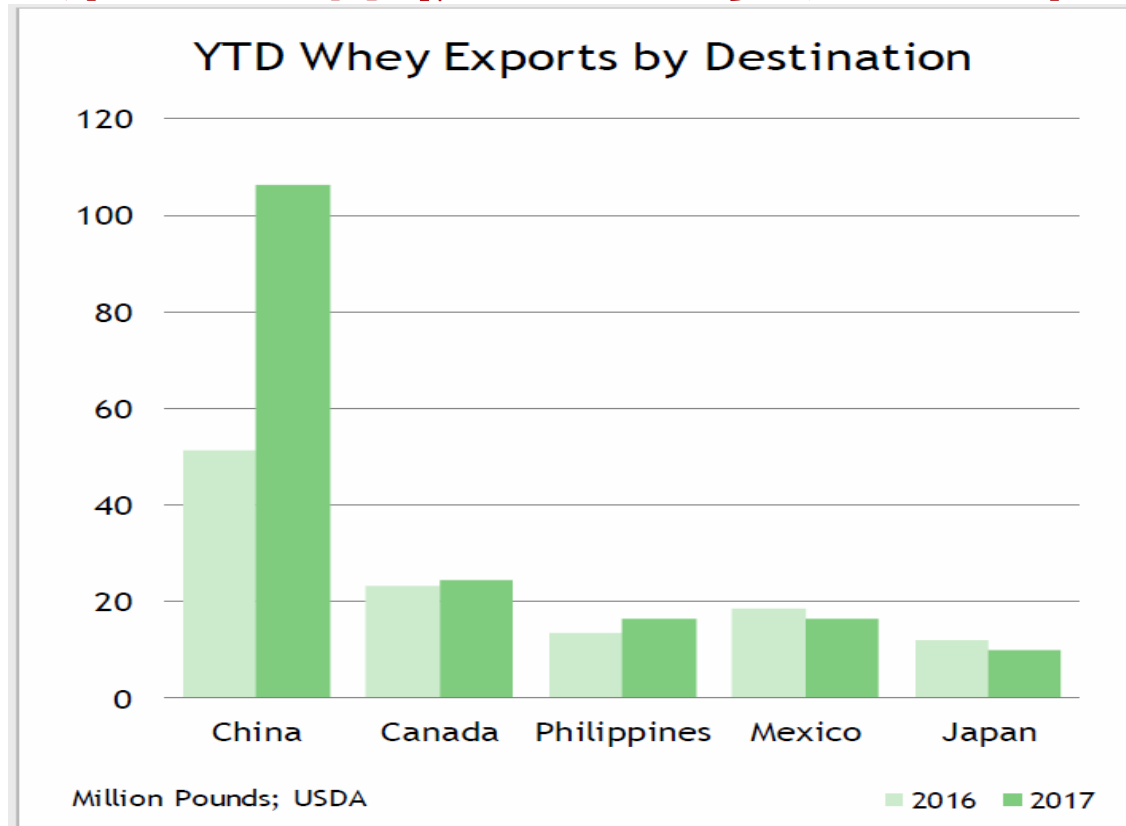
U.S. EXPORTS AS % OF PRODUCTION

	June	yr ago	Jan-Jun 17	yr ago
NDM/SMP	50%	46%	55%	47%
Total cheese	6.5%	5.1%	6.2%	5.1%
Butterfat	5.5%	1.5%	2.7%	2.8%
Dry sweet whey	45%	47%	44%	38%
Lactose	69%	73%	68%	71%
Total milk solids	14.4%	14.2%	14.3%	13.1%



Main Destinations of US whey Export

美国乳清粉的主要出口国家



对中国的出口达122,596吨, 增加43%。乳清粉的出口量增加了25,071 MT; 改性乳清粉的出口量提供了 36% 总量增加了 10,435 MT,



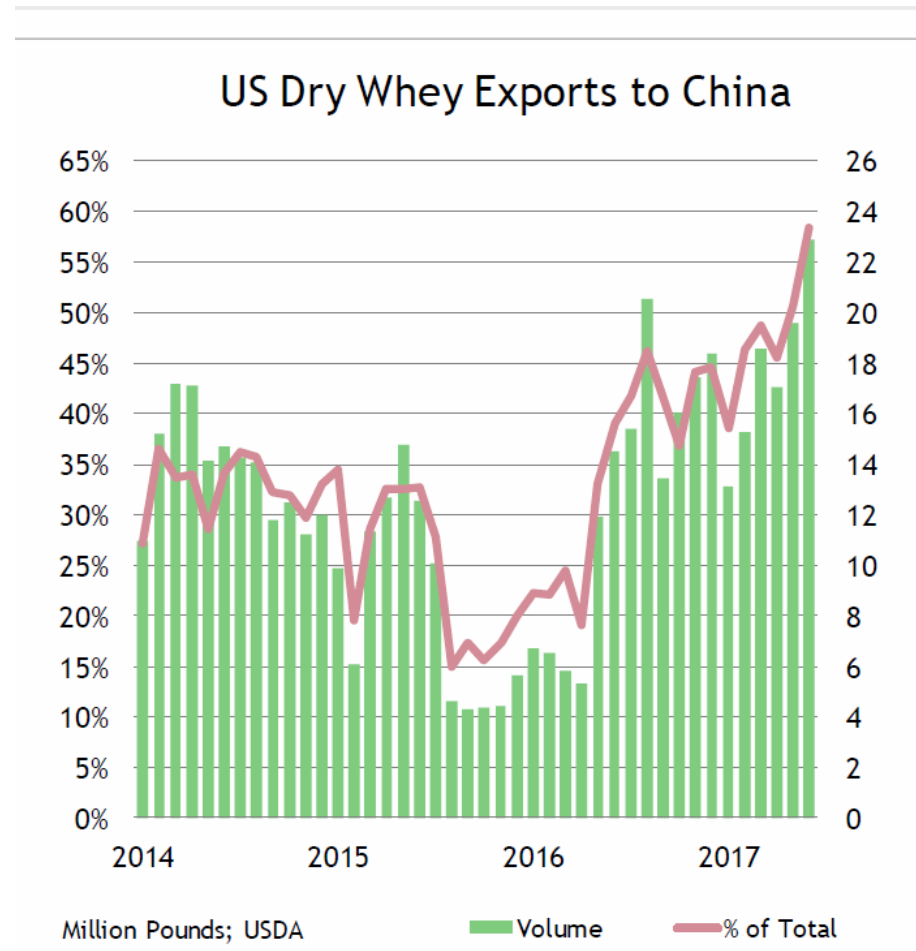
美国乳清粉总出口量和中国出口量三年比较

Whey Exports (million pounds)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	YTD	Change
2017	34.0	32.9	38.2	37.4	38.8	39.1							220.4	220.4	19%
2016	30.3	29.6	23.8	28.0	36.2	37.2	36.8	44.4	32.4	43.6	39.6	41.2	423.0	185.0	-17%
2015	28.7	31.1	39.7	38.9	45.3	38.3	36.4	30.8	24.7	27.8	25.4	28.2	395.2	222.0	
Whey Exports to China (million pounds)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	YTD	Change
2017	13.1	15.3	18.6	17.0	19.6	22.9							106.5	106.5	109%
2016	6.7	6.5	5.8	5.3	11.9	14.5	15.4	20.5	13.4	16.1	17.4	18.4	152.1	50.9	-24%
2015	9.9	6.1	11.3	12.7	14.8	12.6	10.1	4.6	4.3	4.4	4.4	5.6	100.6	67.3	

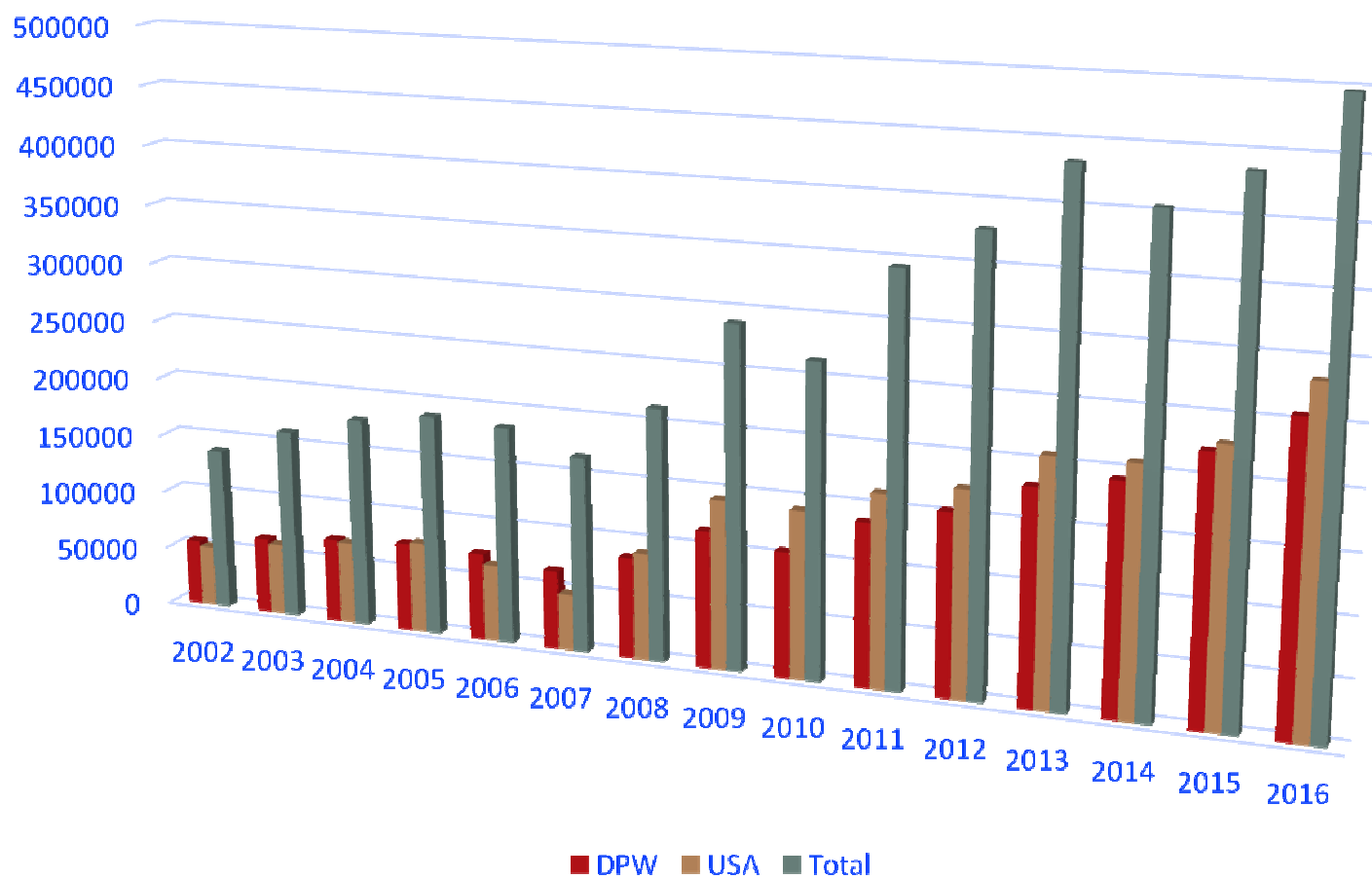


US Dried Whey Export to China

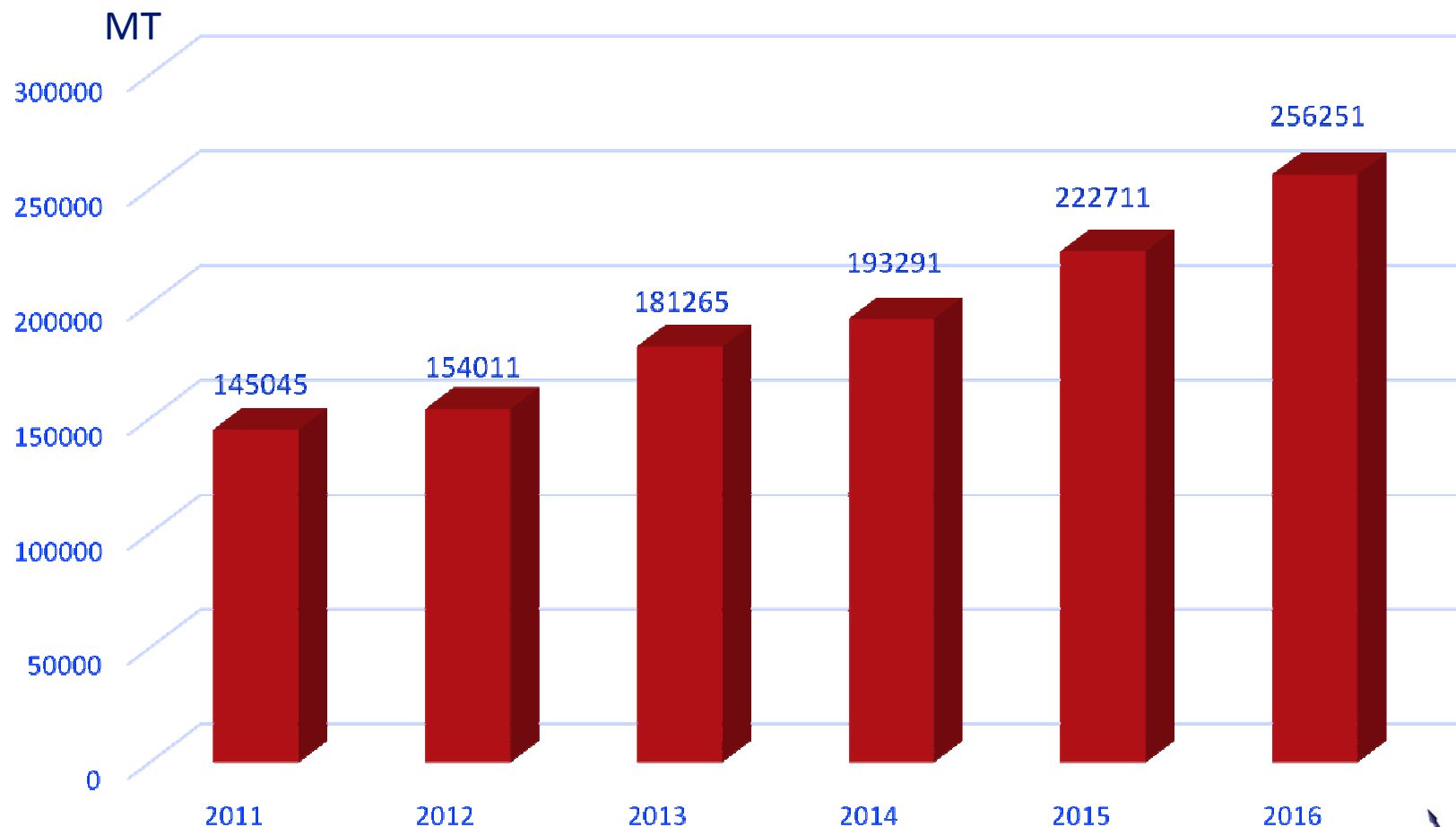
美国乳清粉出口量占美国乳清粉总出口量的比例



中国进口乳清粉数量及从美国进口情况 (2002-2016年)



中国低蛋白乳清粉进口量逐年增长

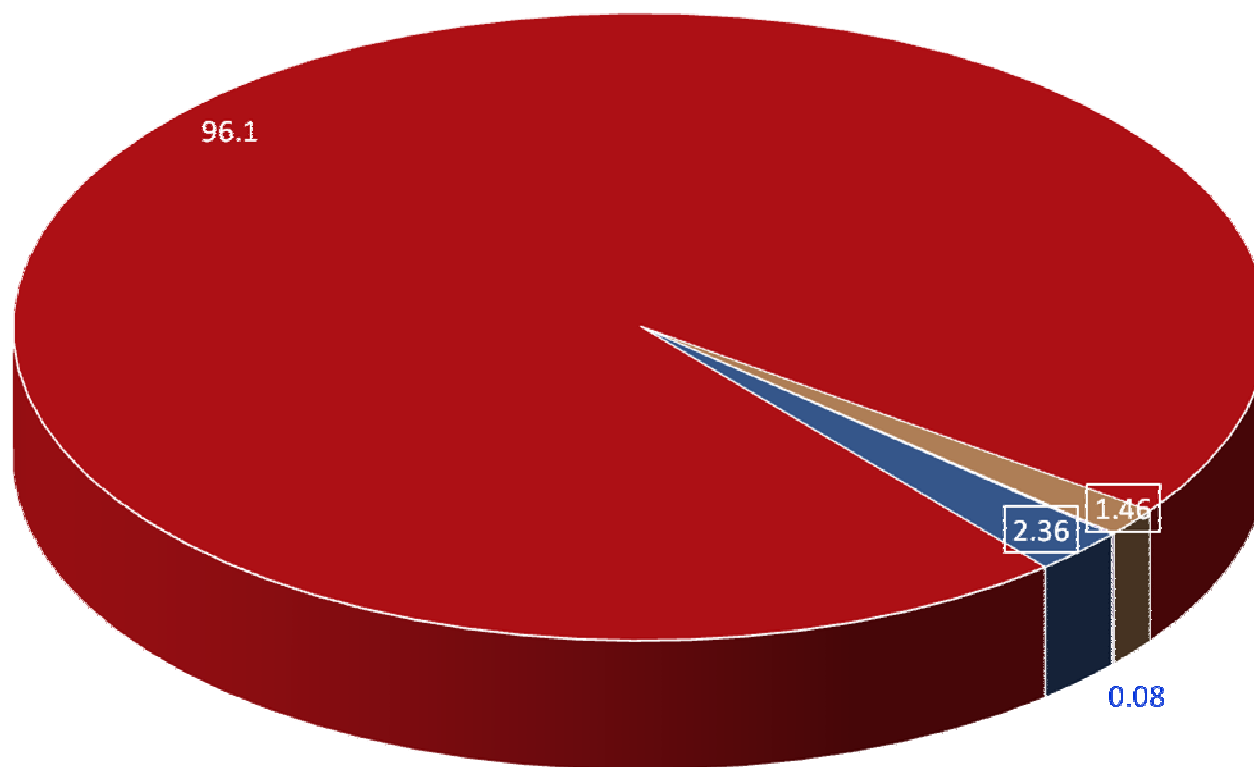


低蛋白乳清粉进口量2011 到2016 以每年13.43%的速度增加。从美国进口的增长率为13.65%。

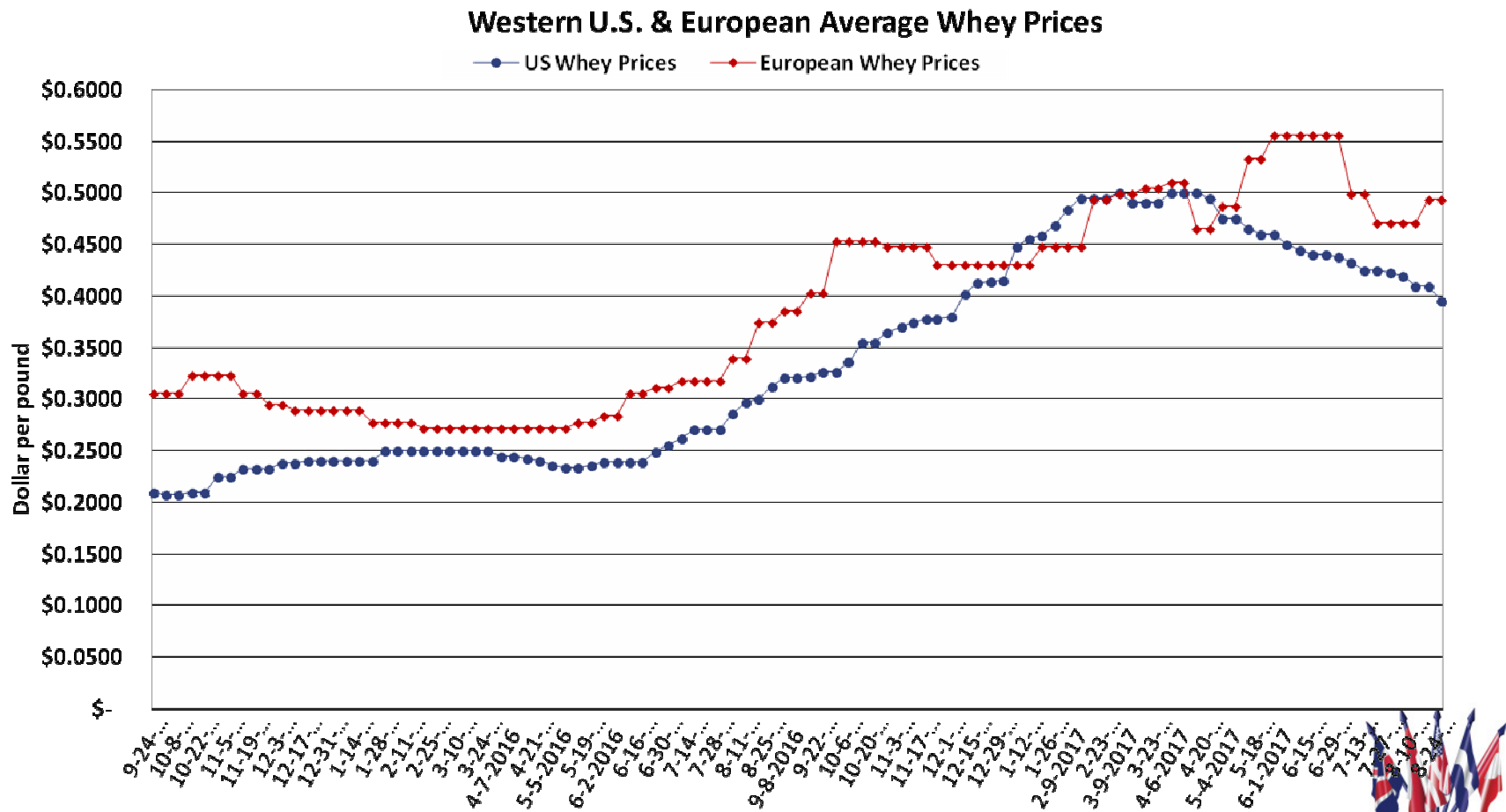


中国低蛋白乳清粉的主要进口国

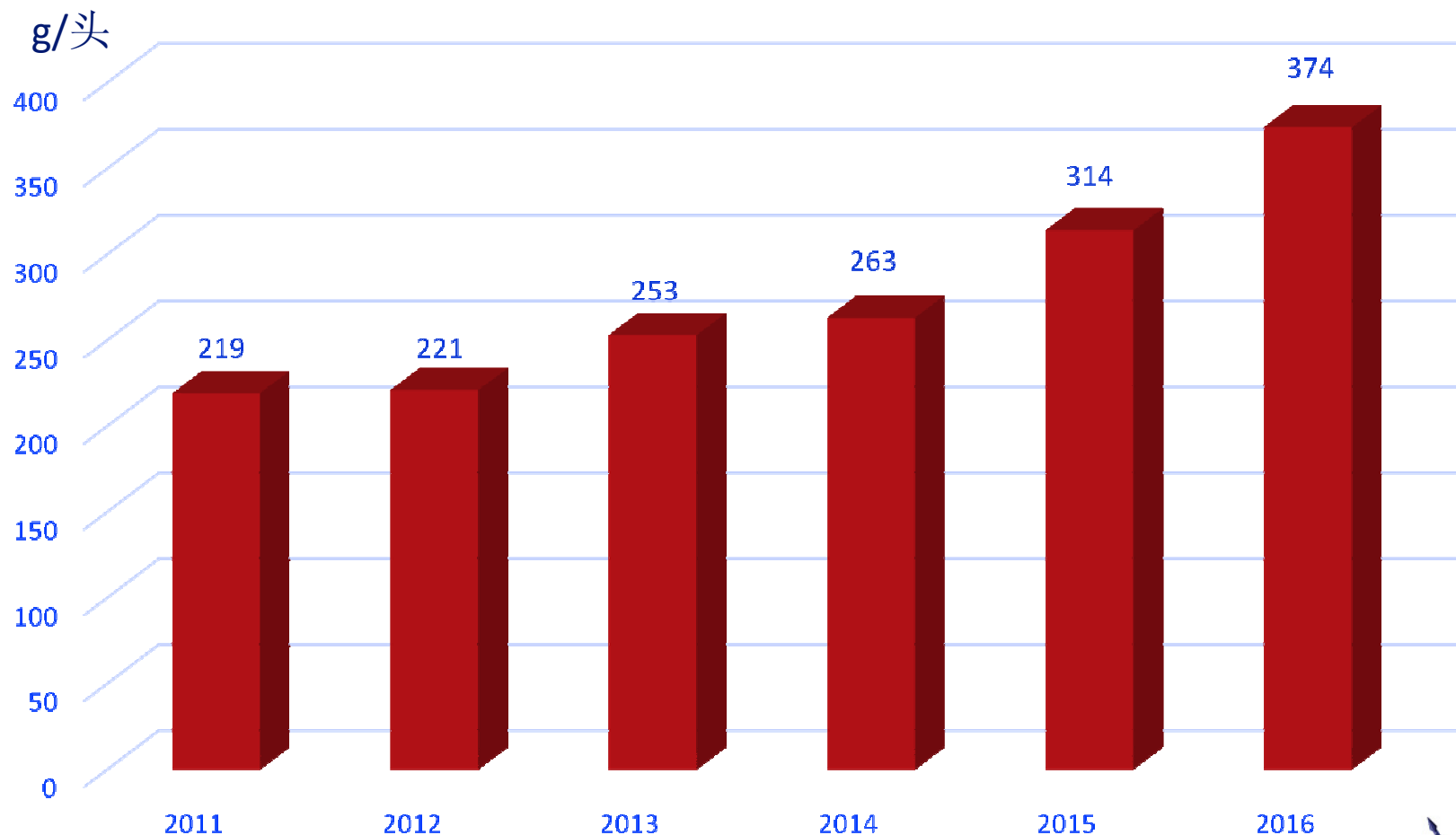
■ 美国 ■ 荷兰 ■ 法国 ■ 阿根廷



EU Sweet Whey vs US prices



中国每头猪每年的低蛋白乳清粉消耗量



平均每年每头猪的乳清粉消耗量以14.23%的速度增加。



Recommended Levels of Lactose in Swine Starter Feeds

- Day 0-7 20%
- Day 7-14 15%
- Day 14-21 7.5%



Lactose Recommendations

PIC and National Swine Nutrition Guide (NSNG)

12 lb pig	PIC	NSNG
Phase 1 Budget, lb feed	1	1
Phase 1 Pig Wt.	12-12.75	12-12.75
Phase 1 Lactose %	20	23
lbs of Lactose in Phase 1	0.20	0.23
Phase 2 Budget, lb feed	4	3
Phase 2 Pig Wt.	12.75-15.95	12.75-15.15
Phase 2 Lactose %	15	18
lbs of Lactose in Phase 2	0.60	0.54
Phase 3 Budget, lb feed	12	13.75
Phase 3 Pig Wt.	15.95-25	15.15-25
Phase 3 Lactose %	7.5	7.2
lbs of Lactose in Phase 3	0.90	0.99
Total lbs of feed	17	17.75
Total lbs of lactose	1.7	1.76



Lactose Consumption Recommendation

Required to reach 1.76 lb (0.80 kg) of total lactose consumption.

Lactose Source	% Lactose	Kg. per pig
Crystalline Lactose	95	0.84
Whey Permeate	80	1.00
Whey	70	1.14



美国和中国乳清粉在猪饲料中的使用量

- 根据美国饲料中的添加量，每头猪整个生命周期大约吃1公斤低蛋白乳清粉。
- 根据2016年中国的出栏头数和乳清粉进口量，每头猪使用了0.374 公斤。
- 中国只使用了美国使用量的37.4%. 仍然有增长空间。过去5年中每年以13%的速度提高。



Forecast

预测



USDA Forecasts 美国农业部预测

(Aug. 17, 2017)

➤ Sweet whey price: 甜乳清价格

- Q1 \$0.485/lb
- Q2 \$0.508/lb
- Q3 \$0.420 – 0.440/lb
- Q4 \$0.415 – 0.445/lb
- 年平均 \$0.455 – 0.475/lb
- 当前 (US central) \$0.340 – 0.450/lb



Private Industry Projection of Dairy Prices

— FORECAST/OUTLOOK —

Monthly Prices: Actual & Forecast, 2016 thru 2018

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ave
Cheese (\$/Lb)	2016	1.518	1.517	1.516	1.504	1.410	1.448	1.642	1.812	1.751	1.583	1.760	1.799	1.605
	2017	1.701	1.687	1.555	1.496	1.539	1.629	1.543	1.700	1.750	1.800	1.825	1.775	1.667
	2018	1.725	1.700	1.675	1.650	1.625	1.600	1.575	1.600	1.625	1.650	1.675	1.650	1.646
Whey (\$/Lb)	2016	0.235	0.247	0.248	0.247	0.251	0.260	0.274	0.285	0.306	0.330	0.369	0.399	0.287
	2017	0.442	0.489	0.524	0.524	0.509	0.492	0.451	0.430	0.420	0.410	0.400	0.390	0.457
	2018	0.385	0.375	0.370	0.365	0.355	0.350	0.340	0.330	0.340	0.350	0.360	0.375	0.358
Class III (\$/Cwt)	2016	13.72	13.80	13.74	13.63	12.76	13.22	15.24	16.91	16.36	14.82	16.76	17.40	14.86
	2017	16.77	16.88	15.81	15.22	15.57	16.44	15.45	16.73	17.15	17.58	17.82	17.24	16.56
	2018	16.80	16.43	16.11	15.81	15.50	15.12	14.90	15.20	15.44	15.69	16.02	15.82	15.74
Butter (\$/Lb)	2016	2.08	2.14	1.99	2.02	2.06	2.16	2.32	2.23	2.08	1.86	1.91	2.10	2.08
	2017	2.26	2.18	2.17	2.12	2.16	2.41	2.60	2.68	2.73	2.75	2.73	2.63	2.45
	2018	2.55	2.40	2.30	2.20	2.18	2.20	2.23	2.25	2.28	2.30	2.33	2.28	2.29
Nonfat Dry Milk (\$/Lb)	2016	0.78	0.77	0.75	0.73	0.76	0.79	0.84	0.86	0.88	0.92	0.91	0.96	0.83
	2017	1.02	0.99	0.85	0.84	0.87	0.91	0.90	0.89	0.88	0.88	0.90	0.91	0.90
	2018	0.93	0.95	0.98	0.98	0.99	1.00	1.03	1.05	1.08	1.10	1.13	1.15	1.03
Class IV (\$/Cwt)	2016	13.31	13.49	12.74	12.68	13.09	13.77	14.84	14.65	14.25	13.66	13.76	14.97	13.77
	2017	16.19	15.59	14.32	14.01	14.49	15.89	16.60	16.83	16.90	17.06	17.11	16.78	15.98
	2018	16.60	16.17	15.96	15.58	15.59	15.76	16.08	16.39	16.71	17.04	17.36	17.36	16.38



Private Industry Projection of Dairy Prices

Quarterly Averages (8 of 8 forecasters)							
08/02/17	1Q17	2Q17	3Q17	4Q17	2017	1Q18	2Q18
CME BLOCK							
High	\$1.58	\$1.55	\$1.74	\$1.79	\$1.76	\$1.74	\$1.72
Low	\$1.58	\$1.55	\$1.65	\$1.67	\$1.67	\$1.54	\$1.57
Average	\$1.58	\$1.55	\$1.70	\$1.74	\$1.72	\$1.64	\$1.64
CME BUTTER							
High	\$2.18	\$2.33	\$2.71	\$2.77	\$2.74	\$2.42	\$2.30
Low	\$2.18	\$2.33	\$2.59	\$2.30	\$2.44	\$2.05	\$2.10
Average	\$2.18	\$2.33	\$2.66	\$2.62	\$2.64	\$2.28	\$2.21
AMS NFDM							
High	\$0.95	\$0.87	\$0.91	\$0.95	\$0.93	\$0.98	\$1.04
Low	\$0.95	\$0.87	\$0.89	\$0.88	\$0.89	\$0.91	\$0.83
Average	\$0.95	\$0.87	\$0.90	\$0.92	\$0.91	\$0.94	\$0.96
AMS DRY WHEY							
High	\$0.49	\$0.51	\$0.44	\$0.43	\$0.44	\$0.44	\$0.48
Low	\$0.49	\$0.51	\$0.41	\$0.37	\$0.39	\$0.35	\$0.23
Average	\$0.49	\$0.51	\$0.43	\$0.41	\$0.42	\$0.40	\$0.38
CLASS III MILK							
High	\$16.49	\$15.74	\$16.59	\$17.82	\$17.20	\$16.75	\$16.75
Low	\$16.49	\$15.74	\$16.05	\$16.57	\$16.33	\$15.09	\$14.75
Average	\$16.49	\$15.74	\$16.31	\$17.11	\$16.71	\$16.01	\$15.63
CLASS IV MILK							
High	\$15.37	\$14.80	\$16.99	\$17.70	\$17.31	\$16.53	\$16.46
Low	\$15.37	\$14.80	\$16.51	\$15.72	\$16.11	\$14.64	\$14.37
Average	\$15.37	\$14.80	\$16.82	\$16.90	\$16.86	\$15.58	\$15.46



CME Futures Market (8/17/2017)

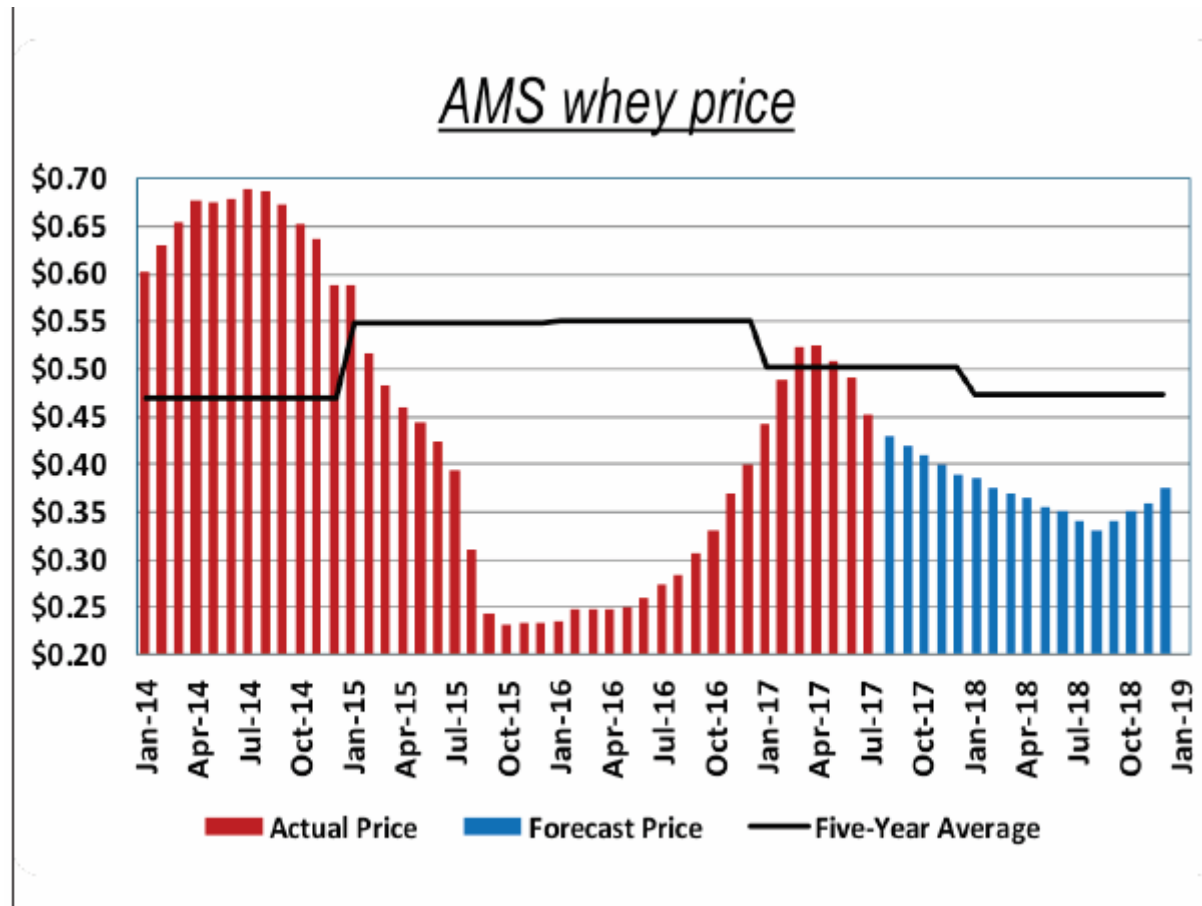
芝加哥商品期货市场

Month (2017 to 2018)	Price \$/lb 价格 (美元) /磅
Aug.	43.10
Sept.	41.55
Oct.	39.88
Nov.	38.50
Dec.	38.20
Jan. 18	38.25
Feb. 18	38.40
Mar. 18	39.50
Apr. 18	39.75
May 18	39.75
June 18	39.75



USDA Agriculture Market Service Price Forecast

美国农业部农业市场服务部价格预测



Whey Permeate Price

乳清渗透物价格

- Although new applications developed in human foods and more and more are used in food sectors, the major applications of whey permeate are still in animal and feed productions. 尽管有很多新的应用出现在人类食物上，且越来越多被应用在食品领域，但是乳清渗透物仍然是主要应用在动物和饲料生产。
- Starting in 3rd quarter , whey permeate price became soft in China market, which is lower than international markets. This is due to extra volume purchased in 2nd quarter and low hog prices which causes low usage rate. This resulted in extra inventory in China warehouse. 从第三季度开始，中国低蛋白乳清粉的价格出现疲软并低于国际价格。这主要是因为进口商第二季度进口量过高，且中国猪价下跌，造成货物积压。
- Low price of whey permeate has stimulated more usage in animal feed sectors. For Pig producers, it is good time to increase inclusion rates of lactose sources. 乳清渗透物低廉的价格亦促使其在动物饲料领域更多的使用。低廉的价格是养猪者提高乳糖源添加量的好时机。



Whey Permeate Price Trend

乳清渗透物价格走势

- China imports 56% of total USA whey permeate production. Thus, future price of whey permeate is really depending on the demand of China markets and world supply situations.

中国进口了美国低蛋白乳清粉产量的56%，因此，低蛋白乳清粉未来价格走势主要决定于中国市场需求和全球供应状况。



Summary

小结

- With abundant milk supply from major exporting countries, dairy powder prices will not be changing dramatically.
由于主要出口国充足的牛奶供给，乳粉价格将不会发生巨大变化。
- With down trends of sweet whey powder and lactose prices, the price of whey permeate is pressured and will remain at low prices in 4th quarter and early 2018. However, there will be no major swings in whey permeate prices.
由于甜乳清和乳糖价格有下降的趋势，低蛋白乳清粉的价格受到挤压。可能会在第四季度和明年早期保持在低价位水平。但是，不会有较大的波动。
- With reasonably low prices, swine feed producers should take the advantage of the low price and increase inclusion rates of whey permeates to maximize pig health and growth performance.
养猪生产者应该利用价格低廉的机会，提高低蛋白乳清粉的添加量，从而提高仔猪健康和生产性能。
- China and Asia demands of whey products will play a major role in future prices of these products.
中国和亚洲对乳清产品的需求将对这些产品未来的价格走势，产生重要影响。





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