FFI Consulting

为消费者提供优质营养的质量和安全的蛋类的考量

EGGS – QUALITY AND FOOD SAFETY CONSIDERATIONS
TO PROVIDE EXCELLENT NUTRITION TO CONSUMERS

Vincent Guyonnet - 古文森, DVM, Ph.D, Dipl. ACPV
Managing Director, FFI Consulting

食品安全协作中心
北京 – 中国 2019年9月17号

Walmart
食品安全协作中心

FFI Consulting

提纲 - AGENDA

- 中国蛋类的生产和消费

Egg production & Consumption in China

- 蛋的形成和可能的缺陷

Egg formation and possible defects

- 蛋类和食品安全-产前HACCP措施

Egg and Food safety – Pre-harvest HACCP measures

- 蛋类储藏和质量损失

Egg storage and quality losses over time

- Z一代的消费者和新需求

Gen Z consumers and new expectations

- 结论

Conclusions

FFI Consulting

中国蛋类的生产和消费

Egg production
& Consumption in China

FFI Consulting

中国和世界其他地区

3090万吨

30.9 million tonnes

(#17)

550万吨

5.5 million tonnes

(#18)

(#25)

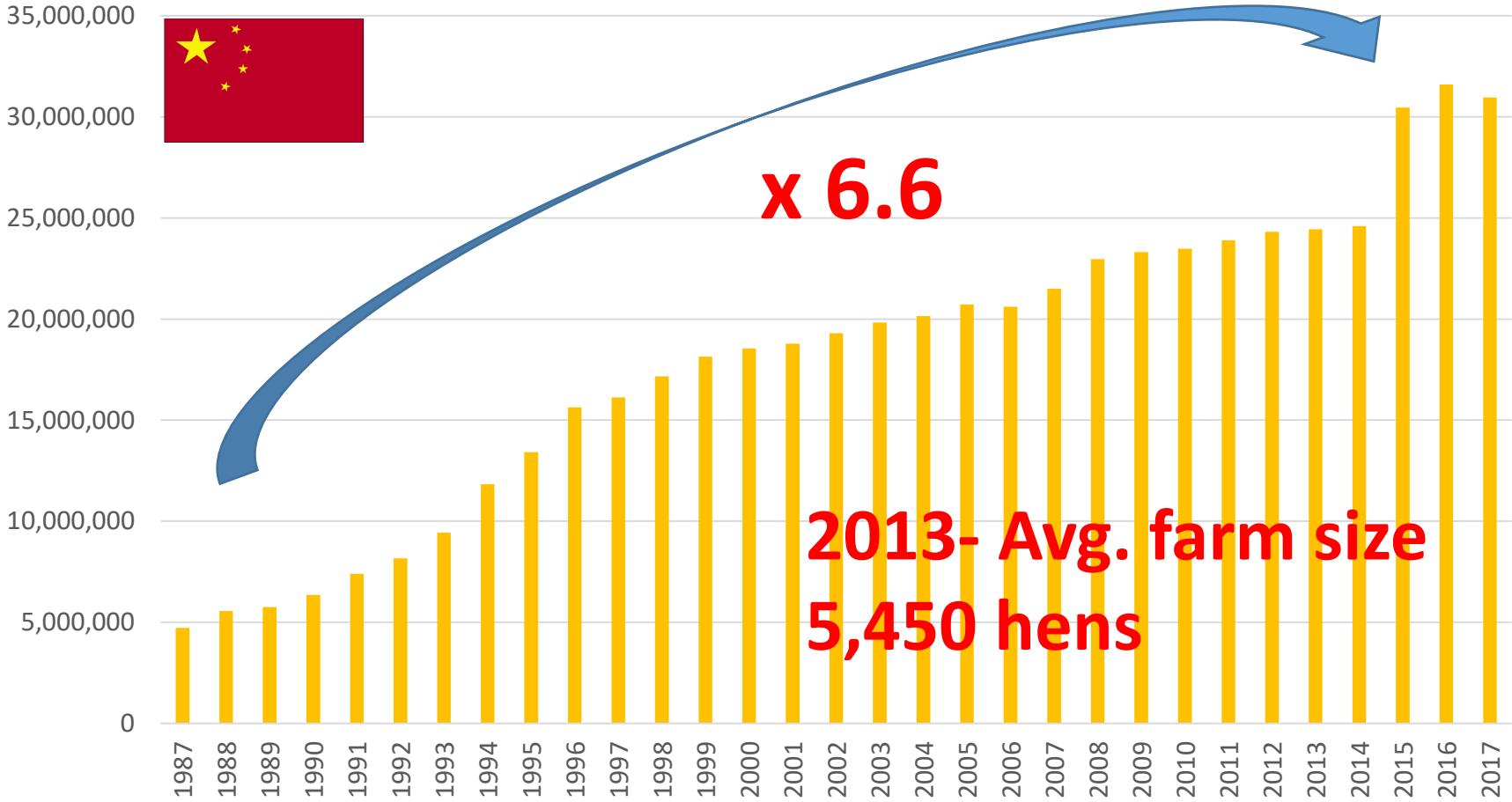
来源：粮农组织统计数据库，2019年6月11日

http://faostat.fao.org/

FFI Consulting

1987-2017年中国的鸡蛋生产

Egg production (metric tonnes)



来源：粮农组织统计数据库，2019年8月14日

http://faostat.fao.org/

FFI Consulting

生产集约化

Reasons for consolidation of the egg sector

- 污物处理 (2020) Farm Waste Management regulations
- 政府检验 Stricter on farm government verifications

- 投入规模经济学 - Economies of scale for input (feeds,...)
- 质量及生物安全 - Improved quality & biosecurity programs
- 加工的改进 - Development of the egg processing sector

- 零售业价格压力 - Cost pressure from retailers
- 危害分析和关键控制点和食品安全措施 - HACCP and Food safety measures

- 年轻消费者的市场成本 - Cost of Marketing to younger customers
- 民族品牌 - Development of national brands
- 质量和安全的高要求 - Higher expectations for safety and quality

FFI Consulting

满足消费者的多样化需求的蛋类

Many types of Eggs to satisfy consumers

FFI Consulting

笼养系统 Cage Systems

- 全球主要的鸡舍

Main housing system used globally

- 健康卫生的条件

Offer good conditions for health & higiene

- 管理好则低致畸率

Low mortality when well managed

- 有一些非自然的限制-可以加以改进

Present some restrictions to the natural behaviour of the birds for conventional cages – improved with new enriched cages

FFI Consulting

散养和有机饲养 Cage-free, Free-range & Organic systems

- 接触草地的可能性

  Different options with or without access to pastures

- 接近自然习性

More natural behaviours

- 更大健康风险

More health risks (fractures, mites, parasites and dust)

FFI Consulting

饲养方式的全面比较 Holistic approach to compare Housing Systems

指标 Indicator	Conventional Housing 传统	Enriched Colony Housing 新式	Cage-free Aviary 散养
致畸 Mortality			
致病 Disease			
骨骼强度 Bone strength			
伤害 Injuries			
习性 Behaviour			
饮水 Water inatke			
清洁 Bird cleanness			
畜牧业 Husbandry			
空气质量 Air Quality			
食品安全 Food Safety			
环境 Environment			
成本 Cost			

FFI Consulting

不同国家的饲养方式 (2017)

Housing systems in selected countries

国家	笼养 Cages	舍养 Barn system	散养 Free Range & Organic
澳大利亚 	54.5	9.1	36.4
中国 	95	0	5
法国 	65	6	29
印度 	100	0	0
日本 	95	4	1
墨西哥 	100	0	0
俄罗斯 	100	0	0
土耳其 	89	3	8
美国 	86.1	4.6	9.3
英国 	48	1.3	50.7

来源: IEC data, 2018

FFI Consulting

蛋品消费前5名国家（2017）

国家	消费量（年人均消费鸡蛋量）
墨西哥 	363
日本 	333
马来西亚 	315
巴拉圭 	320 (est.)
中国 	306 (est.)

来源：国际蛋品协会，2018

蛋白质、维生素和矿物质

Source of proteins, vitamins and minerals

- 高质蛋白，易于消化

High quality protein – quantity (6-7 g per egg) and quality (amino acids composition and digestibility)

- 多种脂溶性和水溶性维生素来源

Source of several fat soluble (yolk) and water soluble (egg white) vitamins;

- 一些叶黄素和类胡萝卜素

Some xanthophylls and carotenoids;

- 铁、磷、硒等矿物的来源

Source of minerals like iron (Fe), phosphorus (P) and selenium (Se);

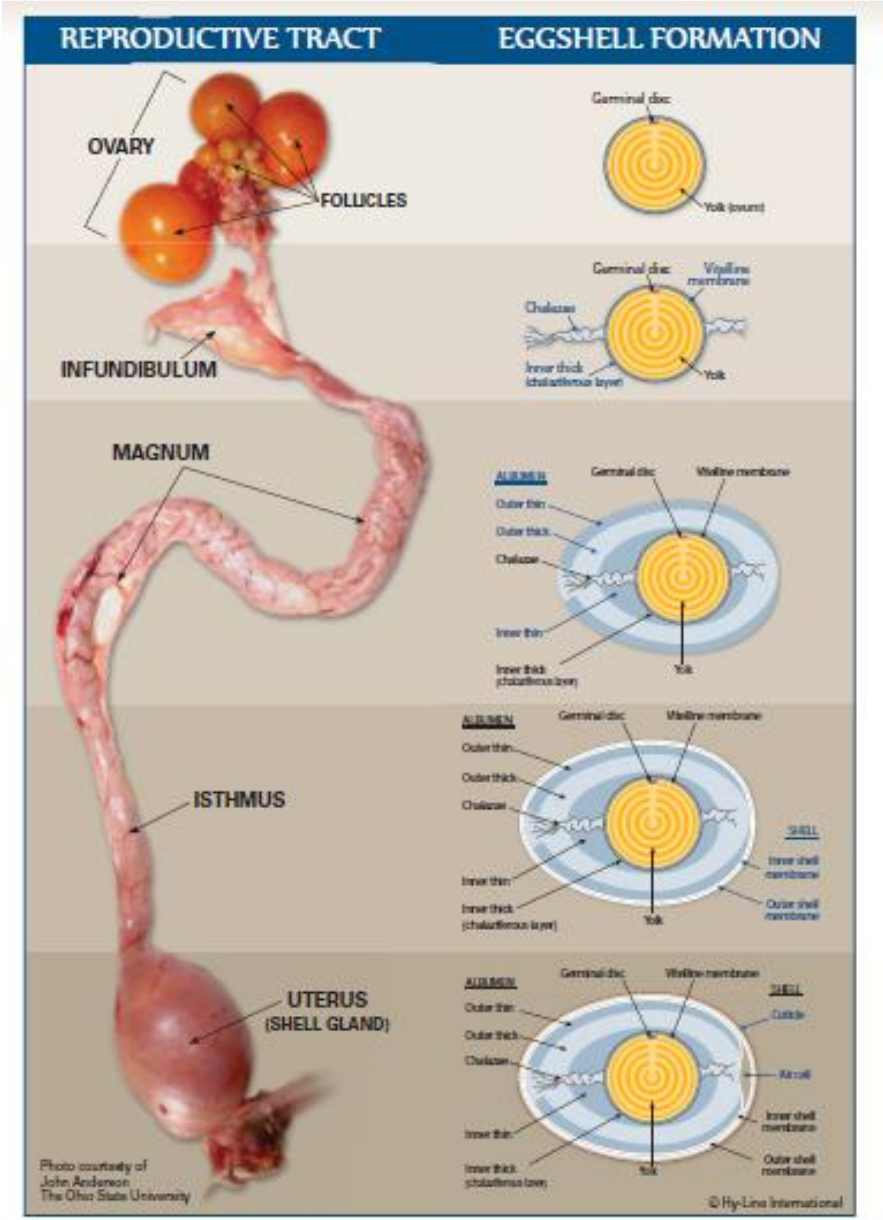
- 没有Vc No vitamin C;

FFI Consulting

蛋的形成和缺陷

Egg formation & possible defects

FFI Consulting



15-30 分钟

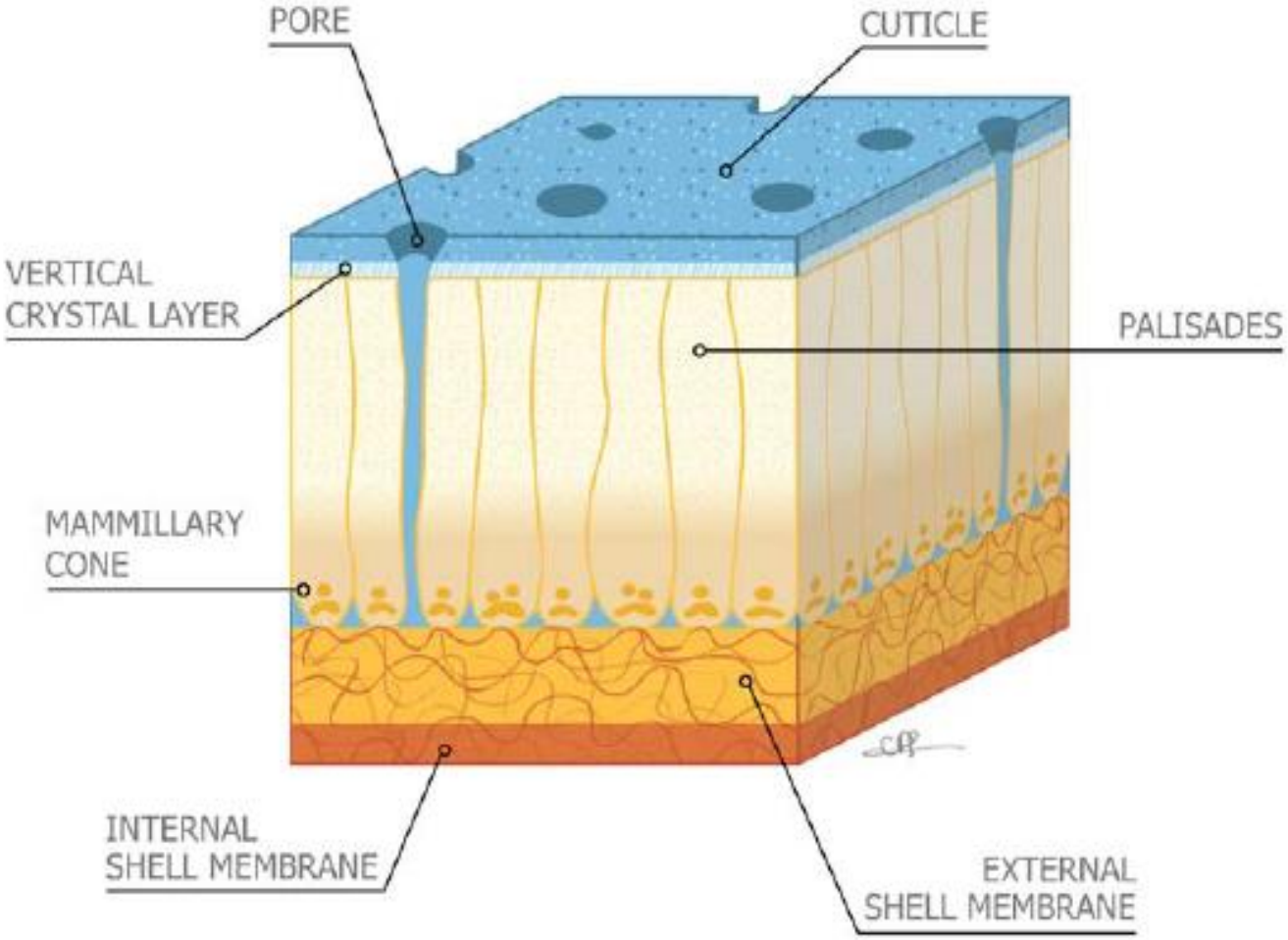
2-3 小时

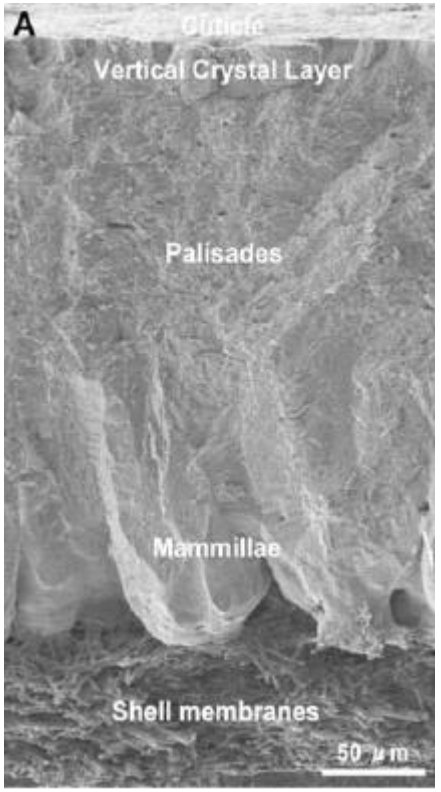
1 小时

18 -20 小时

来源： Hy-Line Technical update – The science of egg quality

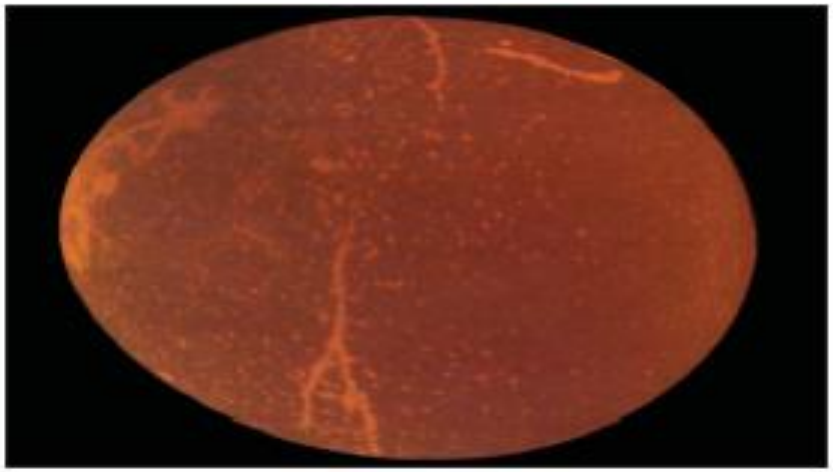
蛋壳结构 - Structure of the egg shell





来源: Hincke et al., 2012 – Frontiers in Bioscience 17: 1266-1280

蛋壳缺陷 Egg shell defects



细裂纹 - Hairline cracks

钙质化的小突起

Small lumps of calcified material

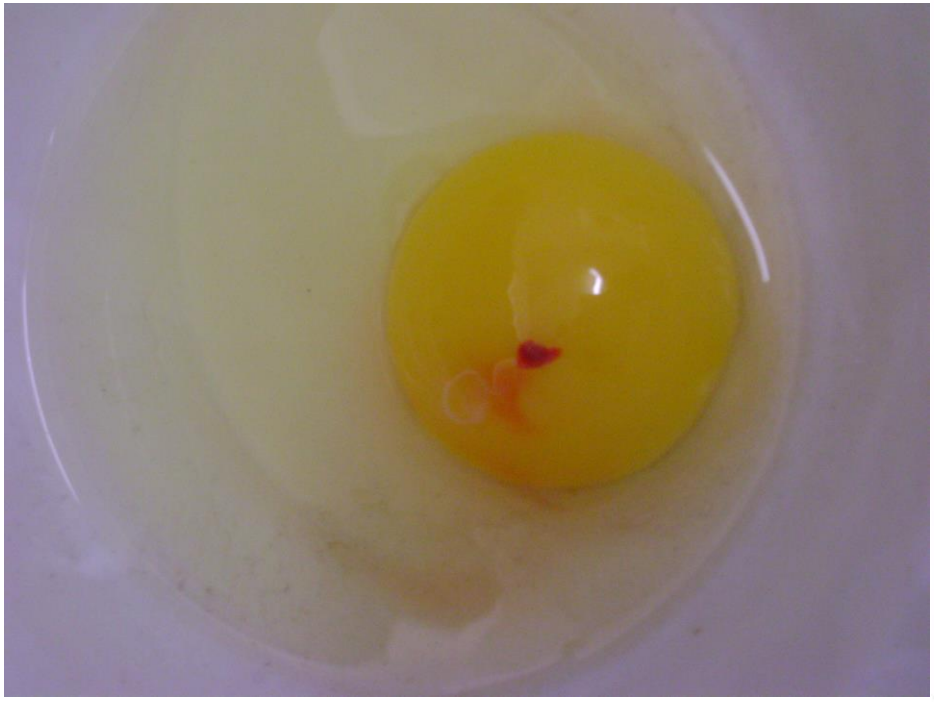
软蛋

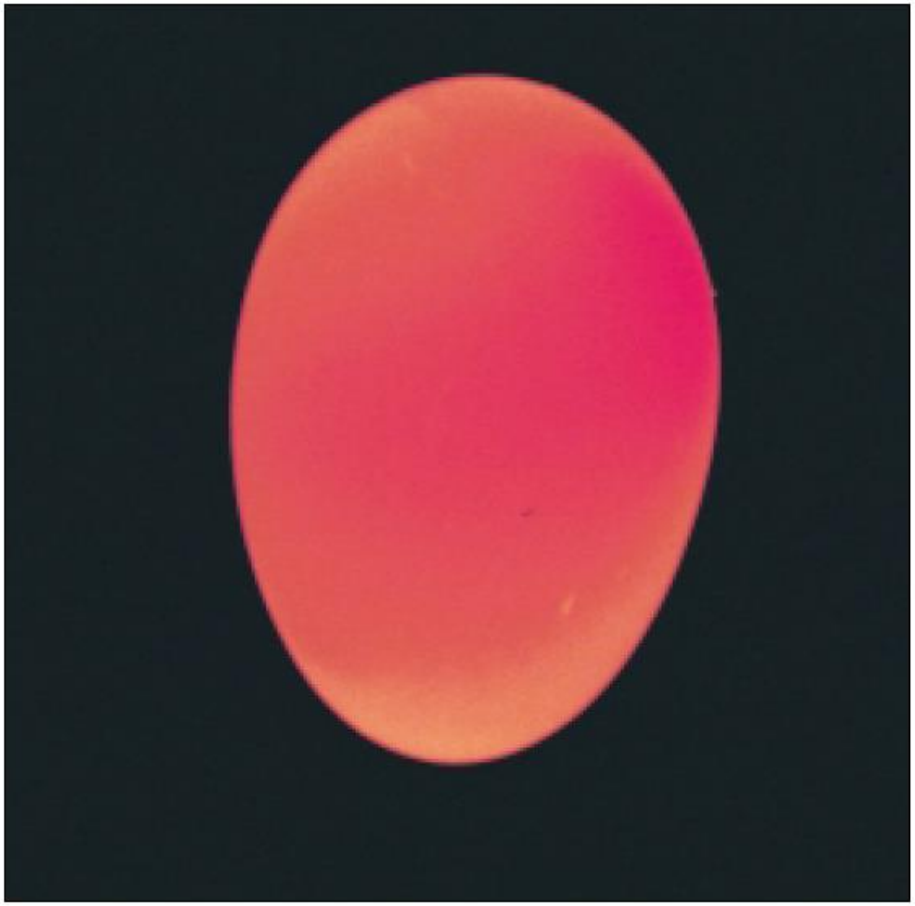
Thin-shelled eggs and shell-less eggs

FFI Consulting

质量缺陷 Egg – Quality defects

血蛋 Presence of blood





来源: USDA Egg-grading manual

FFI Consulting

蛋的缺陷 Egg – Quality Defects

- 在蛋清或蛋黄中有一块来自输卵管的组织

Presence of a piece of tissue from the oviduct in the egg white or egg yolk

- 发病率随着母鸡年龄和某些鸟类品种的增加而增

Incidence increases with the age of the hens and with certain breeds of birds

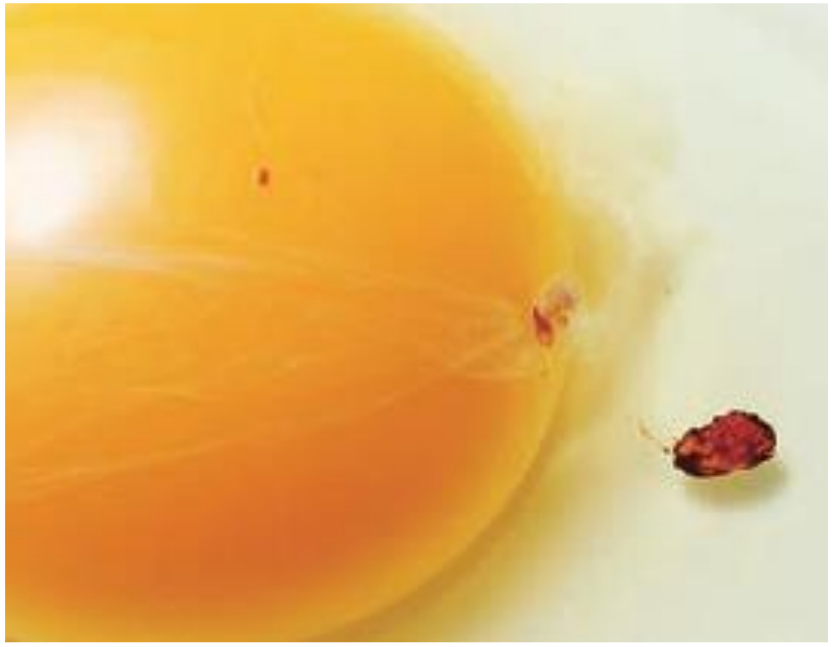
- 可以通过透光鉴定

Can be identified by candling of the eggs

- 非食品安全问题 Not a food safety

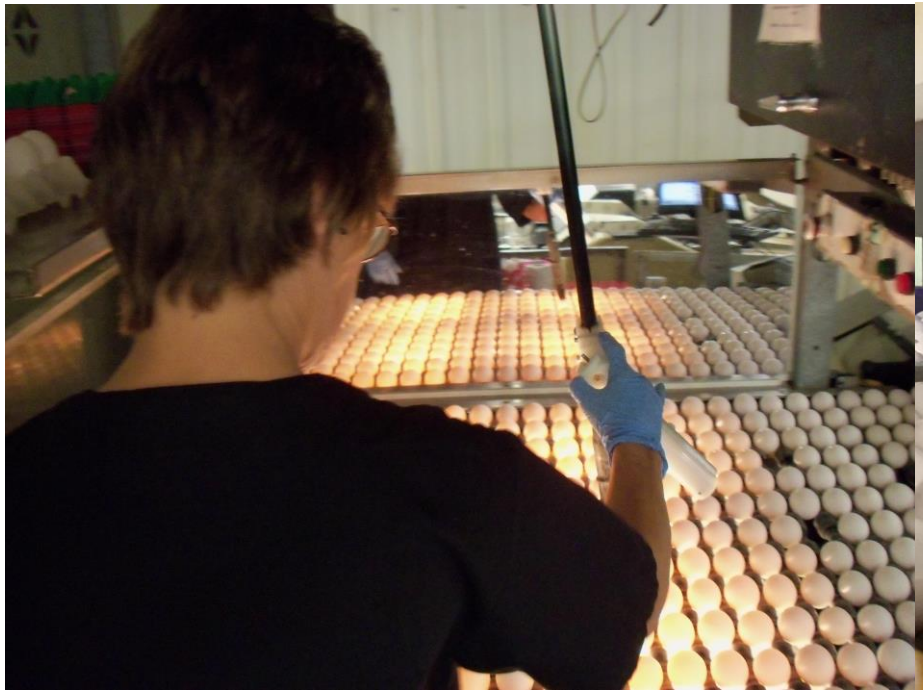
来源: DSM Optimum Egg quality – A practical approach

肉斑 Meat spots



FFI Consulting

鸡蛋质量检查 Egg Quality inspection



内外检查，移除脏蛋

Detection of external and internal defects

Removal of dirty eggs

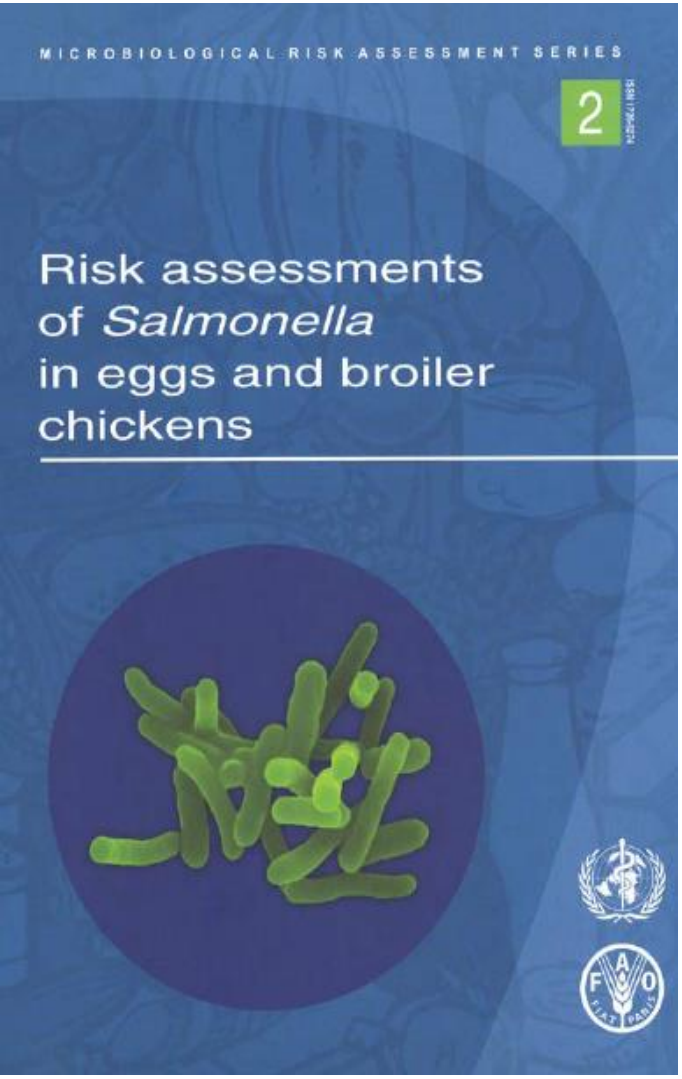
FFI Consulting

鸡蛋和食品安全 Eggs and Food Safety

食品安全始于农场

Food safety starts at the farm - "From farm to fork"

FFI Consulting



产前HACCP - Pre-harvest HACCP

- 饲料和其它添加剂

Feeds and other supplements (B and C)

- 水和空气质量

Water and air quality (B and C)

- 兽药等残留

Veterinary medicines and other residues (P and C)

- 生物安全和疾病预防

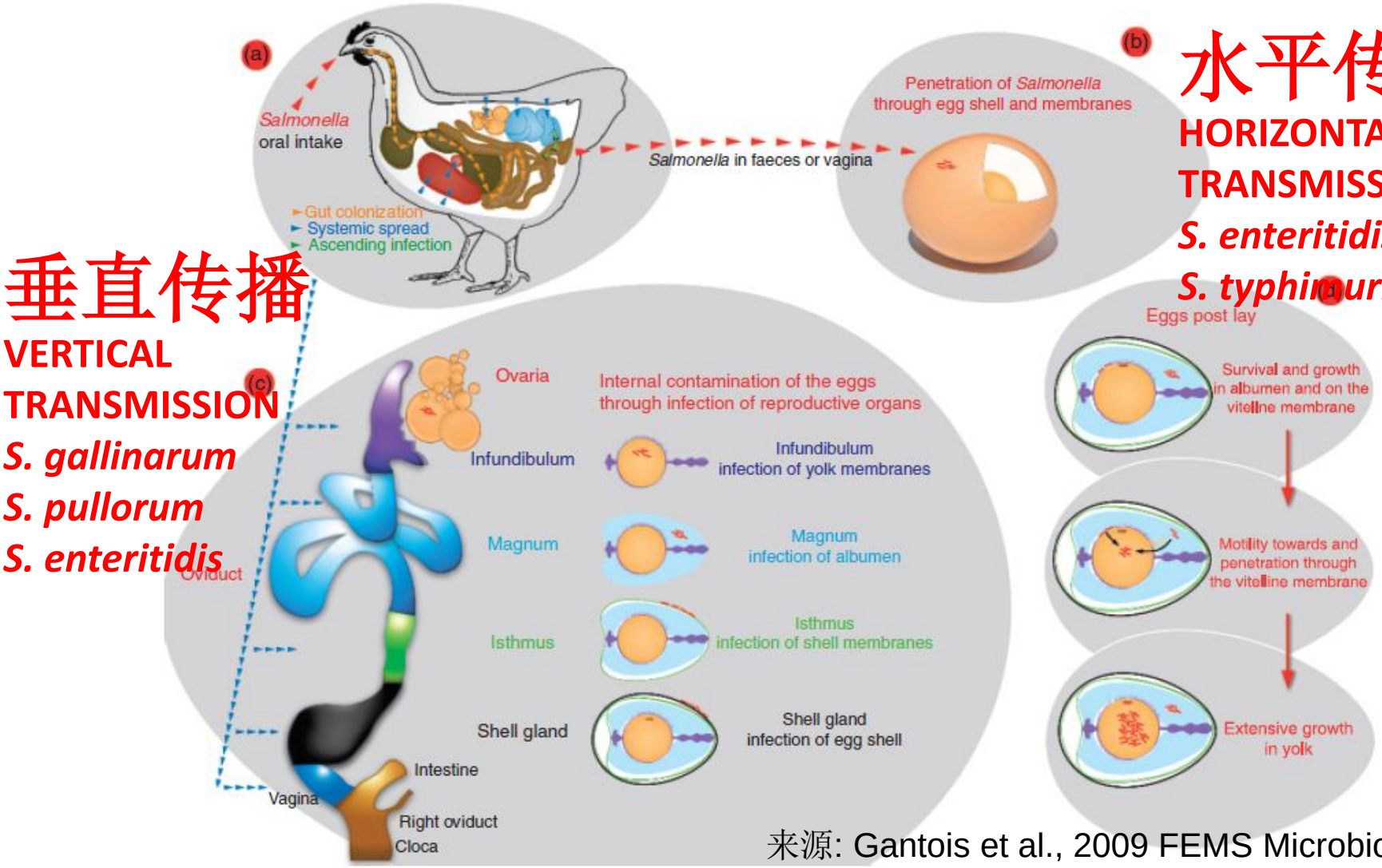
Biosecurity and disease prevention (B)

- 虫鼠害 Rodents and pest (B)

鸡蛋上的沙门氏菌 - *Salmonella spp.* and the Eggs

水平传播
HORIZONTAL TRANSMISSION
S. enteritidis
S. typhimurium

垂直传播
VERTICAL TRANSMISSION
S. gallinarum
S. pullorum
S. enteritidis



来源: Gantois et al., 2009 FEMS Microbiol Rev

FFI Consulting

鸡蛋上的沙门氏菌 - *Salmonella spp.* and the Eggs

风险因子 MAIN FACTORS

- 鸡群之间不彻底的清洁消

Insufficient cleaning & disinfection between flocks

- 鼠害

Rodents (rats, mice) in layer house

- 不好的管理和卫生状况

Poor Farm management & hygiene

- 不好的饲料管理

Poor Feed management

- 脏蛋，破蛋，漏蛋

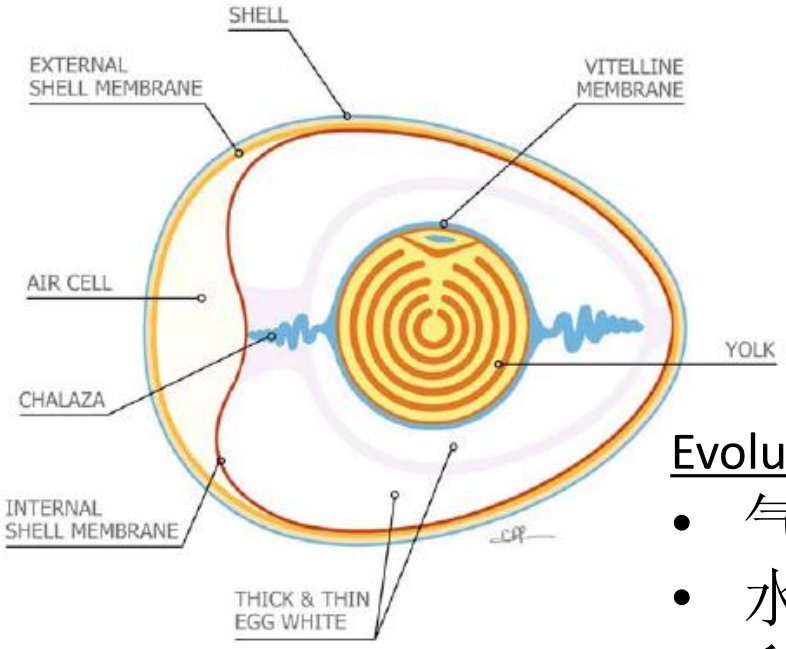
Dirty eggs with fecal materials, cracked and leaky eggs

FFI Consulting

质量和安全随时间而改变

Egg quality
& safety
over time

蛋白 Egg white



特点 – Characteristics:

- Egg white – 60% weight of the egg:
  - 11% proteins 蛋白质
  - 89% water 水
- Chalaze, thick egg white (60%) & liquid egg White (40%) 系带
- pH 5.6 – 7.5 (CO_2) 酸碱度

Evolution with length of storage: 储藏时间

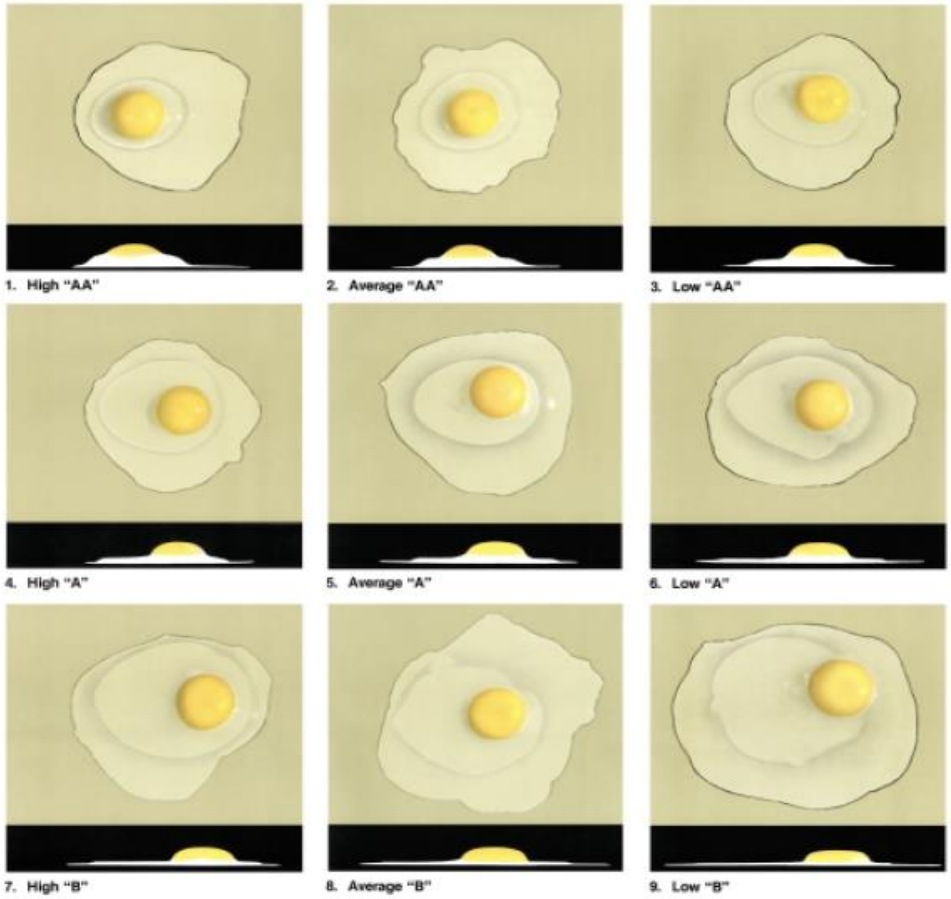
- 气体交换 Gas exchanges
- 水分和CO_2损失 Losses of H_2O & CO_2 -> pH 9.5
- 卵黄蛋白（糖蛋白）结构的变化

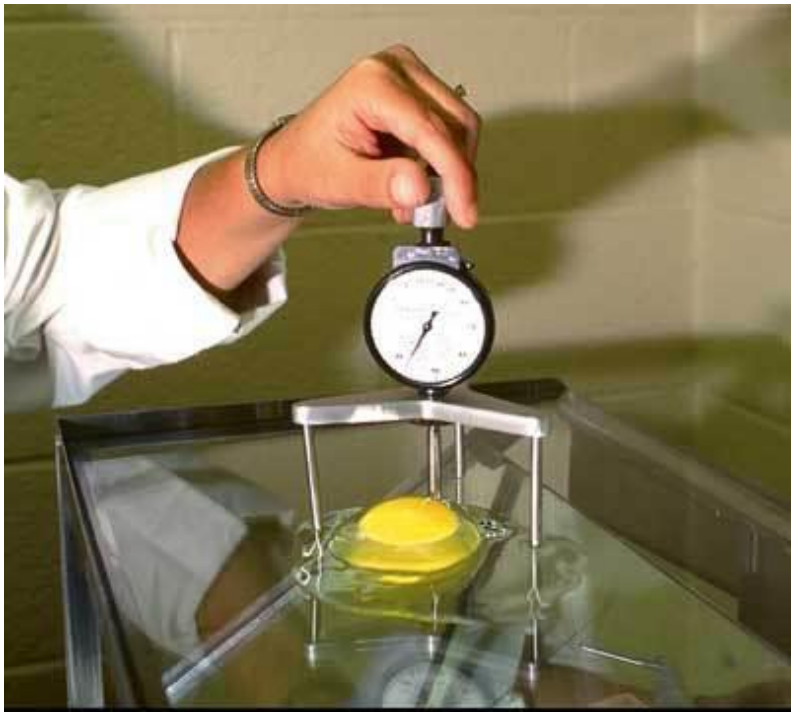
Change in structure of Ovomucin (glycoprotein)

->蛋清粘度损失 Loss in viscosity of egg white

蛋白质量的确定

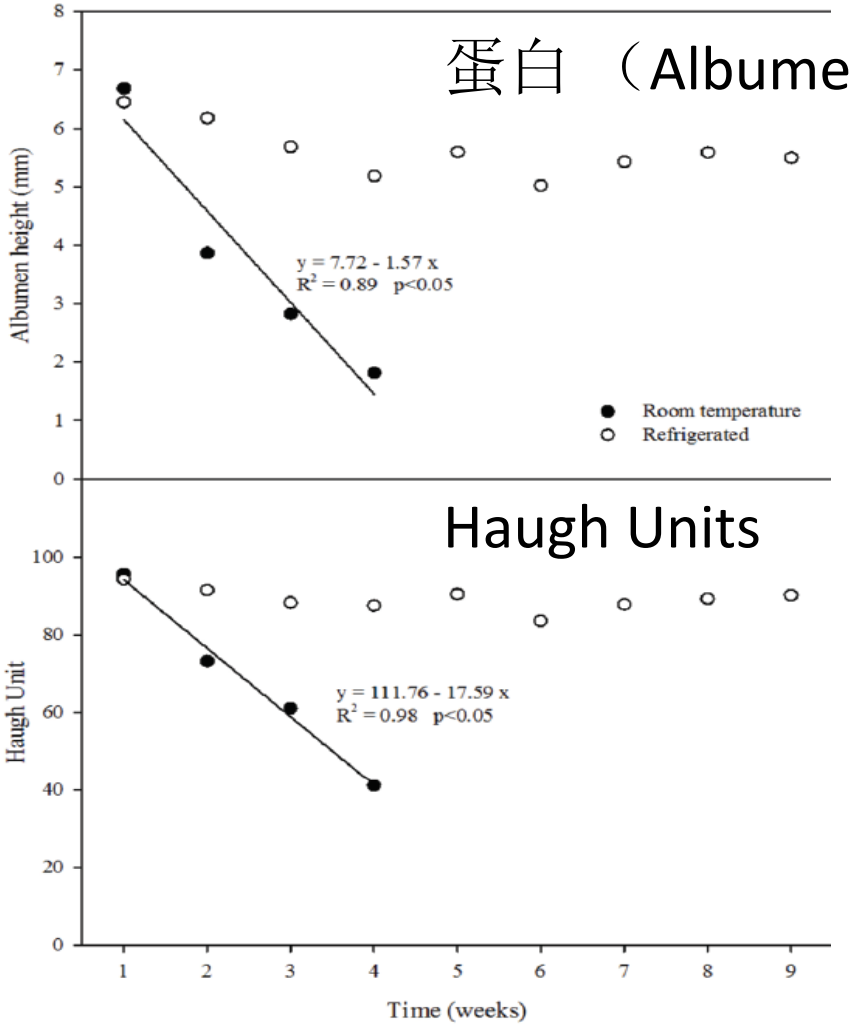
Egg white – Determination of quality





FFI Consulting

随着时间质量的损失 Loss of quality over time

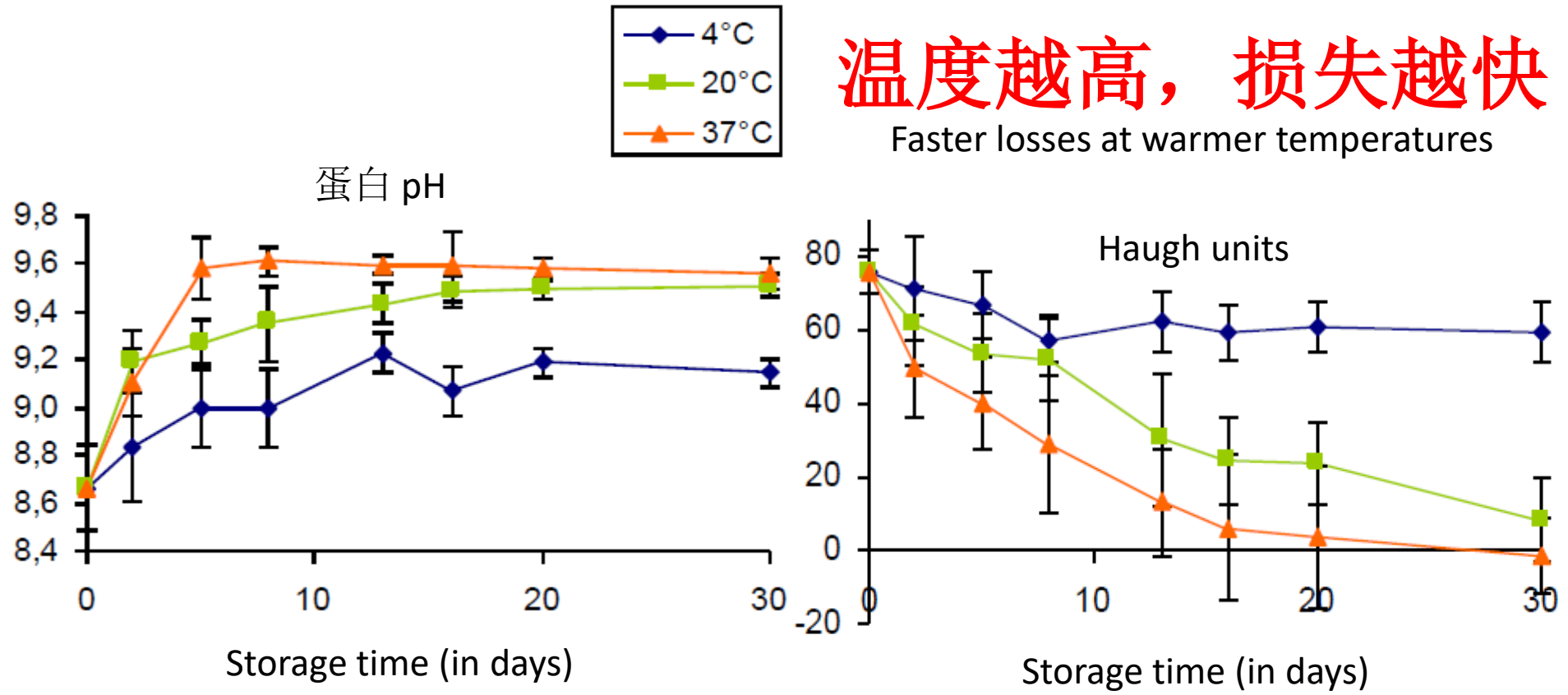


随着时间和储存温度的变化，蛋清和哈夫单位损失

Losses in the height of the albumen and Haugh Units over time and storage temperature

来源: Feddern et al. (2017). Ciência Agrotecnologia 41: 322-333

功能特性的损失 Loss of functional properties



来源: Nys (2017). WVEAPH Postgraduate program - Dakar, Senegal

蛋黄 Egg yolk

卵黄膜
Vitelline membrane

特性: Characteristics

- Yolk – 30% weight of the egg:
  - 50% water 水
  - 30% lipids 脂类
  - 17% proteins 蛋白
  - Vitamins & pigments 维生素和色素
- Yolk and vitelline membrane 蛋黄和膜

储藏时间带来的变化

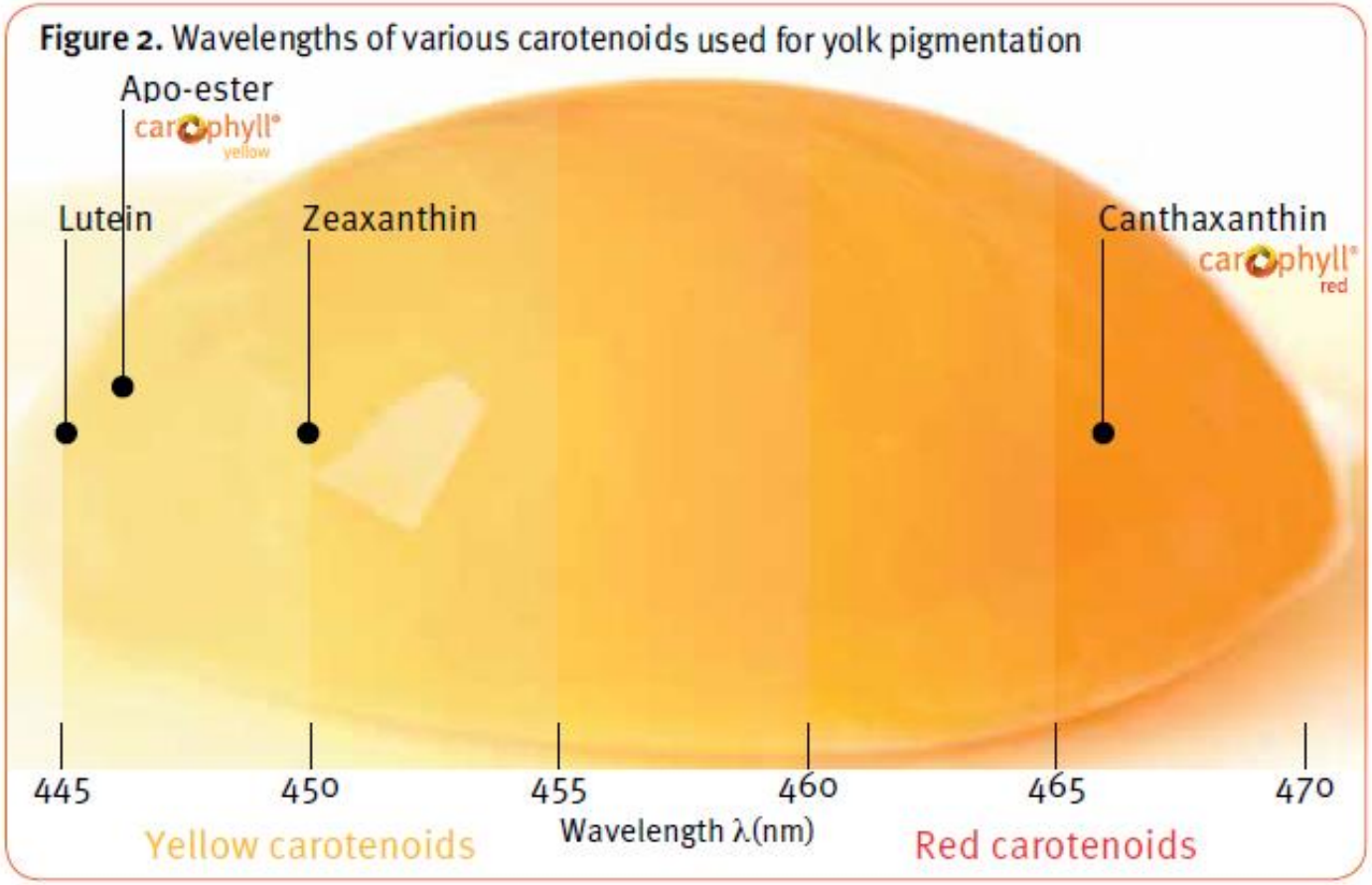
Evolution with length of storage:

- 蛋黄膜 Vitelline membrane fragilized
- 水分流动 Flow of water from egg white
- 体积变化，形状变化 Volume increased and shaped modified after opening the egg

FFI Consulting

蛋黄的颜色取决于母鸡的饲料配方

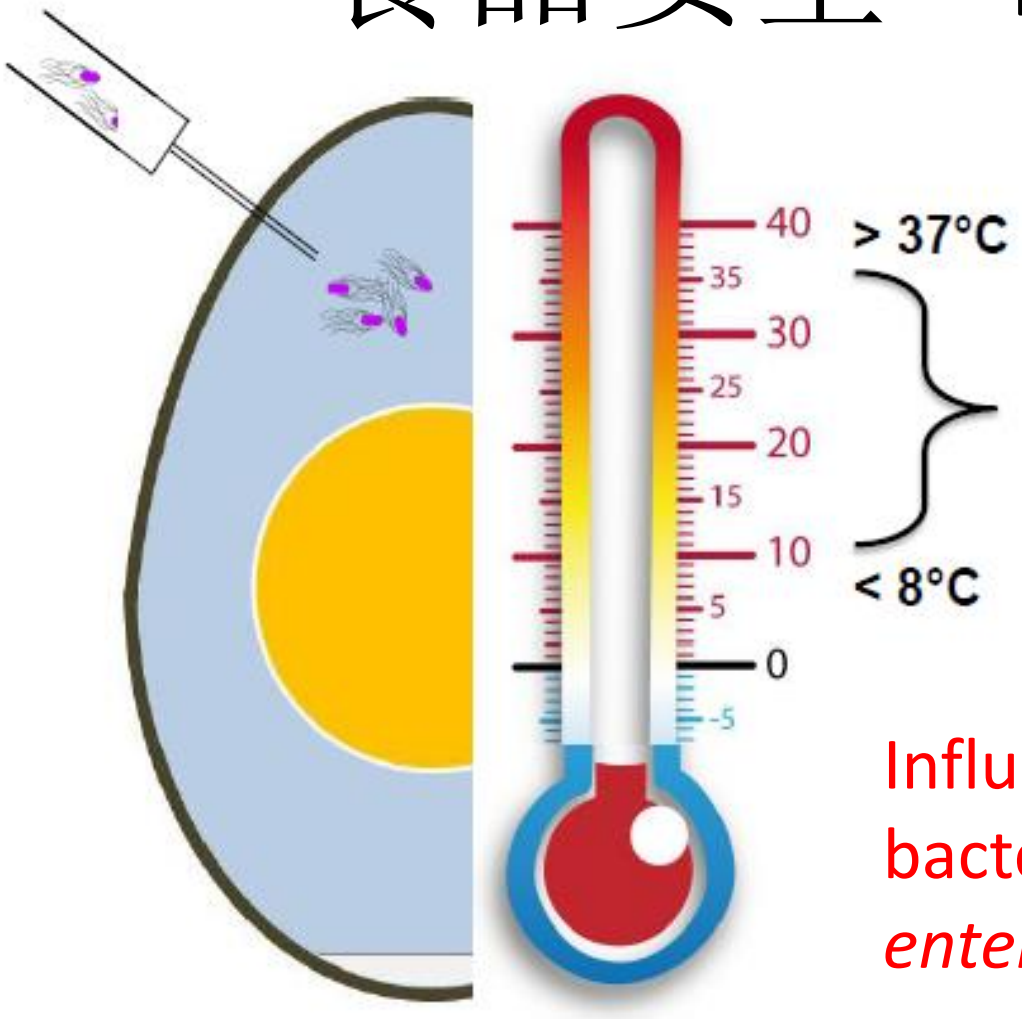
Yolk colour depends of hen diet formulation



来源: DSM egg yolk pigmentation guidelines 2016

食品安全

Loss in food safety



Influence of temperature on bacterial growth (*Salmonella enteritidis)*

来源: Nys (2017). WVEAPH Postgraduate program – Dakar, Senegal

FFI Consulting

食品安全 Loss in food safety

In the 1980s, Dr. Humphrey (Swansea University, UK) defined the shelf-life of shell eggs for safe raw consumption, with regards to the risk caused by *Salmonella enteritidis*

$$\text{Safe Shelf-life} = 86.939 - 4.109T + 0.048T^2$$

$T = 30^0C$	7 days
$T = 25^0C$	14 days
$T = 20^0C$	23 days
$T = 10^0C$	50 days

Data used in Japan to justify the safe consumption of raw eggs in many dishes

来源: Humphrey (1994). International Journal of Food Microbiology 21: 31-40

FFI Consulting

食品安全

Loss in food safety

- 细菌很容易从蛋壳裂缝侵入

Bacteria can easily penetrate through cracked egg shells

- 开裂鸡蛋应该用于加工（巴氏灭菌）

Cracked eggs should be diverted towards egg processing (Pasteurization)

北京食品市场 – 2019年7月

FFI Consulting

网络一代 –

Gen Z, new consumers = new expectations

FFI Consulting

不断变化的食品购买因素

Evolving buying factors for foods

传统因素

Traditional factors

- 价格 Price
- 味道 Taste
- 便利性 Convenience

新型因素

New factors

- 可靠性 - Authenticity
  - ✓ 食品产地 Food composition
  - ✓ 成分列表 List of ingredients
  - ✓ 健康度 Healthiness of foods
- 可持续性 - Sustainability
  - ✓ 农场实践 Farming practices
  - ✓ 动物福利 Animal welfare
  - ✓ 包装材料 Packaging materials
  - ✓ 食品浪费 Food waste

FFI Consulting

满足新需求的蛋 Eggs addressing new consumer needs

- 对特殊需要的承诺

Commitments to specific production standards (Animal welfare, Food Safety & Quality standards, Diet formulation)

- 无抗，无残留-真实性

Antibiotic-free production and absence of residues = Authenticity

- 减少对环境的影响-可持续发展

Use of feed ingredients improving productivity and reducing the impact of egg production on the environment = Sustainability

FFI Consulting

结论 Conclusions

- 生产集约化 The consolidation of egg production will allow farms to implement better food quality systems while also improve production efficiencies
- 质量缺陷可以发生在鸡蛋的形成过程中，但无食安问题 Defects can occur during the formation of the eggs but none cause health issues
- 细菌污染可以通过HACCP控制

Bacterial contamination of eggs is controlled through a series of programs based on HACCP principles

- 蛋的质量受控于储藏时间和鸡龄

The quality of eggs is affected by both the length of storage and the age of the birds

- 网络一代期待更多

Considering food safety as a given, Gen Z consumers expect more from the food system (healthiness and sustainable production & value chain)

FFI Consulting

丰羽咨询有限公司

Guwensen888

@VincentGuyonnet

Vincent.guyonnet18@gmail.com

Walmart 食品安全协作中心

Focus on improving animal production and nutrition in the developing world