Percezione del consumatore e qualità delle carni

UNIVERSITÀ DEGLI STUDI
DI PERUGIA

Agraria day, Perugia, 19 ottobre 2019

Alessandro Dal Bosco

La carne

Che cosa è la carne?

È IL PRODOTTO DI COMPLESSE MODIFICAZIONI BIOCHIMICHE CHE SI REALIZZANO A CARICO DEL TESSUTO MUSCOLARE DOPO LA MORTE DELL'ANIMALE E CHE DETERMINANO LA SUA TRASFORMAZIONE

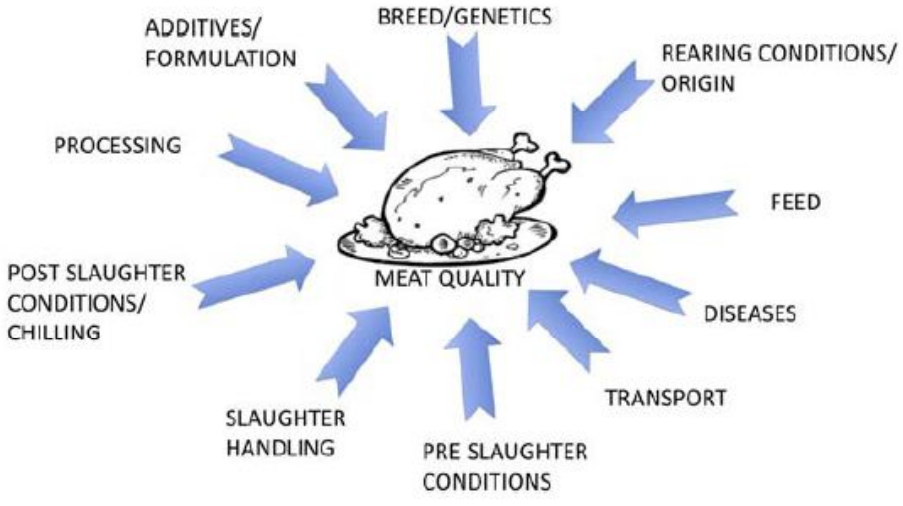
Fattori che influenzano la qualità della carne

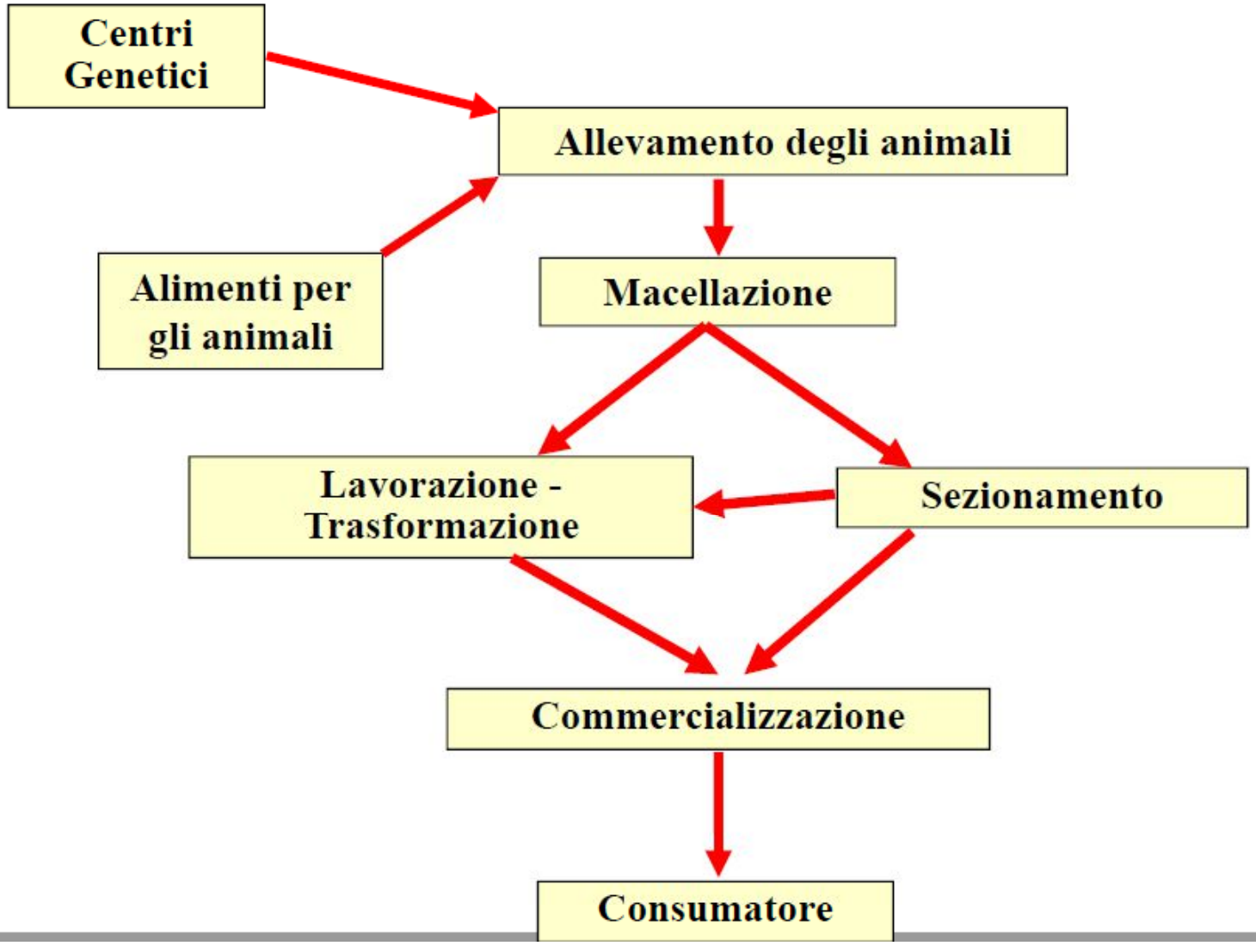
Fattori Endogeni

- Specie
- Razza
- Sesso
- Età
- Tipo di muscolo

Fattori esogeni

- Alimentazione
- Livello nutritivo
- Ambiente
- Stato sanitario
- Condizioni di trasporto
- Condizioni di macellazione
- Condizioni di refrigerazione
- Frollatura
- Tecniche di lavorazione
- Modalità di cottura




Centri Genetici
Allevamento degli animali
Alimenti per gli animali
Macellazione
Lavorazione - Trasformazione
Sezionamento
Commercializzazione
Consumatore

La QUALITÀ DELLA CARNE non è un EVENTO ISTANTANEO

bensì …

- **si PROGETTA nei centri genetici e nei mangimifici;**
- **si COSTRUISCE negli allevamenti;**
- **si TUTELA durante trasporto, macellazione, sezionatura, cottura … fino ad arrivare alla bocca del consumatore.**

Annals of Internal Medicine

CLINICAL GUIDELINE

Unprocessed Red Meat and Processed Meat Consumption: Dietary Guideline Recommendations From the NutriRECS Consortium

Bradley C. Johnston, PhD; Dena Zeraatkar, MSc; Mi Ah Han, PhD; Robin W.M. Vernooij, PhD; Claudia Valli, MSc; Regina El Dib, PhD; Catherine Marshall; Patrick J. Stover, PhD; Susan Fairweather-Taitt, PhD; Grzegorz Wójcik, PhD; Faiz Bhatia, PEng; Russell de Souza, ScD; Carlos Brotons, MD, PhD; Joerg J. Meerpohl, MD; Chirag J. Patel, PhD; Benjamin Djulbegovic, MD, PhD; Pablo Alonso-Coello, MD, PhD; Malgorzata M. Bala, MD, PhD; and Gordon H. Guyatt, MD

Description: Dietary guideline recommendations require consideration of the certainty in the evidence, the magnitude of potential benefits and harms, and explicit consideration of people's values and preferences. A set of recommendations on red meat and processed meat consumption was developed on the basis of 5 de novo systematic reviews that considered all of these issues.

Methods: The recommendations were developed by using the Nutritional Recommendations (NutriRECS) guideline development process, which includes rigorous systematic review methodology, and GRADE methods to rate the certainty of evidence for each outcome and to move from evidence to recommendations. A panel of 14 members, including 3 community members, from 7 countries voted on the final recommendations. Strict criteria limited the conflicts of interest among panel members. Considerations of environmental impact or animal welfare did not bear on the recommendations. Four systematic reviews addressed the health effects associated with red meat and processed meat consumption, and 1 systematic review addressed people's health-related values and preferences regarding meat consumption.

Recommendations: The panel suggests that adults continue current unprocessed red meat consumption (weak recommendation, low-certainty evidence). Similarly, the panel suggests adults continue current processed meat consumption (weak recommendation, low-certainty evidence).

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For author affiliations, see end of text.
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Contemporary dietary guidelines recommend limiting consumption of unprocessed red meat and processed meat. For example, the 2015–2020 Dietary Guidelines for Americans recommend limiting red meat intake, including processed meat, to approximately 1 weekly serving (1). Similarly, United Kingdom dietary guidelines endorse limiting the intake of both red and processed meat to 70 g/d (2), and the World Cancer Research Fund/American Institute for Cancer Research recommend limiting red meat consumption to moderate amounts and consuming very little processed meat (3). The World Health Organization International Agency for Research on Cancer has indicated that consumption of red meat is "probably carcinogenic" to humans, whereas processed meat is considered "carcinogenic" to humans (4).

These recommendations are, however, primarily based on observational studies that are at high risk for confounding and thus are limited in establishing causal inferences, nor do they report the absolute magnitude of any possible effects. Furthermore, the organizations that produce guidelines did not conduct or access rigorous systematic reviews of the evidence, were limited in addressing conflicts of interest, and did not explicitly address population values and preferences, raising questions regarding adherence to guideline standards for trustworthiness (5–9).

A potential solution to the limitations of contemporary nutrition guidelines is for an independent group with clinical and nutritional content expertise and skilled in the methodology of systematic reviews and practice guidelines, methods that include careful management of conflicts of interest, to produce trustworthy recommendations based on the values and preferences of guideline users. We developed the Nutritional Recommendations (NutriRECS) (7) international consortium to produce rigorous evidence-based nutritional recommendations adhering to trustworthiness standards (10–12).

To support our recommendations, we performed 4 parallel systematic reviews that focused both on randomized trials and observational studies addressing the possible impact of unprocessed red meat and processed meat consumption on cardiometabolic and cancer outcomes (13–16), and a fifth systematic review addressing people's health-related values and preferences related to meat consumption (17). On the basis of these reviews, we developed recommendations for unprocessed red meat and processed meat consumption specific to health outcomes.

METHODS

Guideline Development Process

We developed our recommendations by following the NutriRECS guideline development process (7),

See also:

Related articles
Editorial comment

Web-Only
Supplement
CME/MOC activity

Meat Science 84 (2010) 1–13

Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci

Review

Red meat consumption: An overview of the risks and benefits

Alison J. McAfee [a,*], Emeir M. McSorley [a], Geraldine J. Cuskelly [b], Bruce W. Moss [c], Julie M.W. Wallace [a], Maxine P. Bonham [a], Anna M. Fearon [c]

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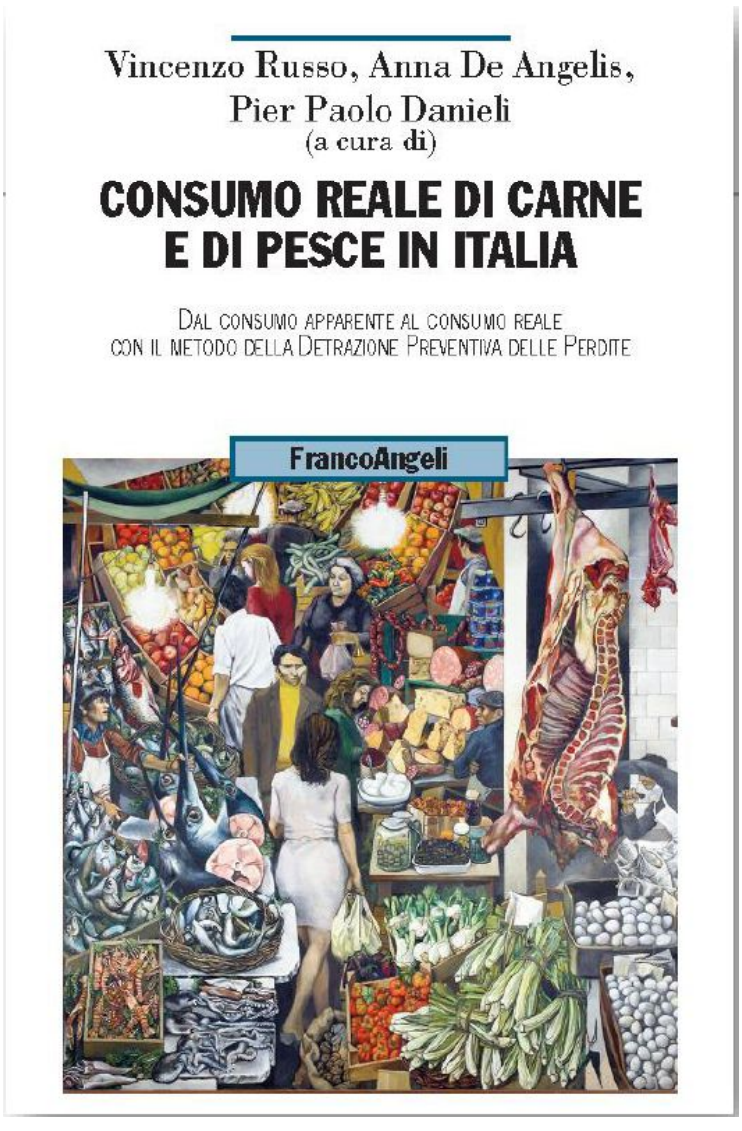
ABSTRACT

Red meat is long established as an important dietary source of protein and essential nutrients including iron, zinc and vitamin B12, yet recent reports that its consumption may increase the risk of cardiovascular disease (CVD) and colon cancer have led to a negative perception of the role of red meat in health. The aim of this paper is to review existing literature for both the risks and benefits of red meat consumption, focusing on case–control and prospective studies. Despite many studies reporting an association between red meat and the risk of CVD and colon cancer, several methodological limitations and inconsistencies were identified which may impact on the validity of their findings. Overall, there is no strong evidence to support the recent conclusion from the World Cancer Research Fund (WCRF) report that red meat has a convincing role to play in colon cancer. A substantial amount of evidence supports the role of lean red meat as a positive moderator of lipid profiles with recent studies identifying it as a dietary source of the anti-inflammatory long chain (LC) $n-3$ PUFAs and conjugated linoleic acid (CLA). In conclusion, moderate consumption of lean red meat as part of a balanced diet is unlikely to increase risk for CVD or colon cancer, but may positively influence nutrient intakes and fatty acid profiles, thereby impacting positively on long-term health.

PIANO CARNI: AZIONI A SOSTEGNO

LA CAMPAGNA WEB E SOCIAL: WWW.CARNEROSSA.INFO

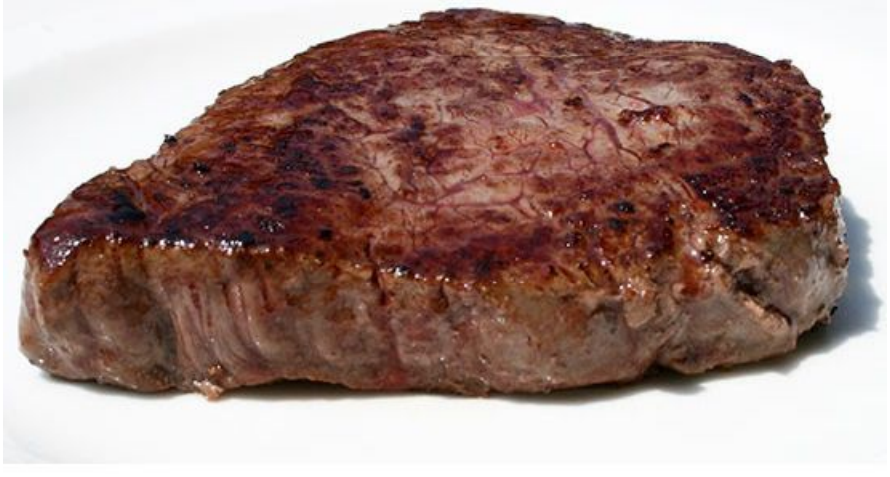

Vincenzo Russo, Anna De Angelis,
Pier Paolo Danieli
(a cura di)
CONSUMO REALE DI CARNE
E DI PESCE IN ITALIA
DAL CONSUMO APPARENTE AL CONSUMO REALE
CON IL METODO DELLA DETRAZIONE PREVENTIVA DELLE PERDITE
FrancoAngeli

PERCEZIONI

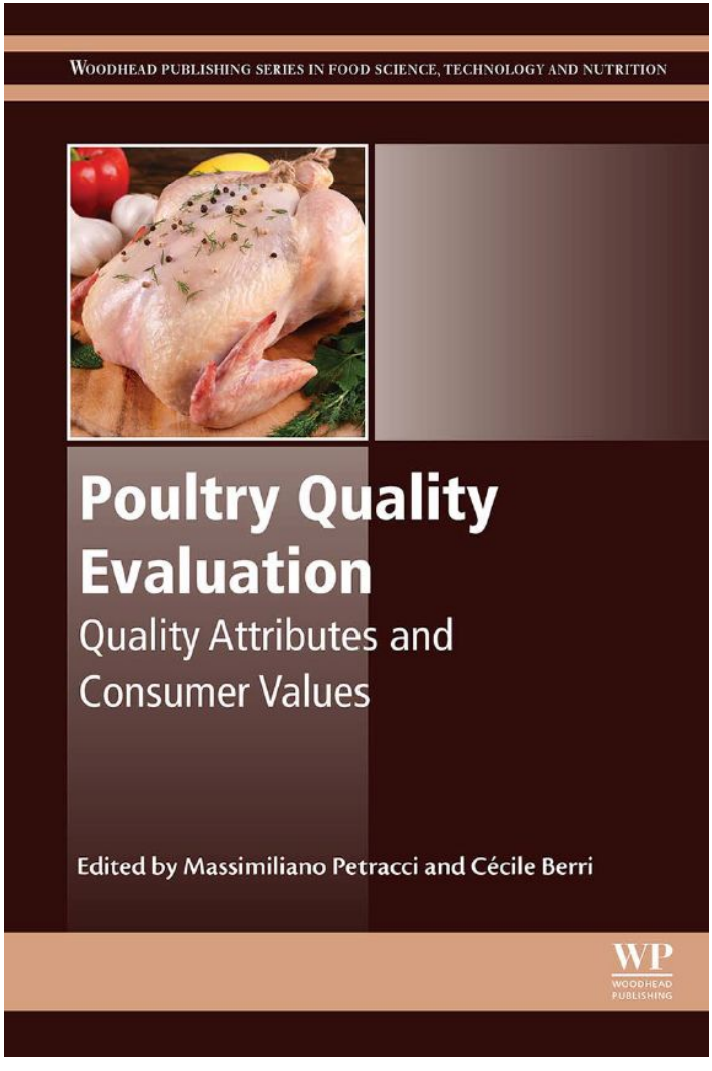
Come il consumatore percepisce oggi la qualità della carne?

Come la Scienza della Carne percepisce i segnali del consumatore?

Come l'industria del settore carne utilizza queste informazioni?




Lawrie's
Meat Science
Eighth Edition
Edited by Fidel Toldrá
WP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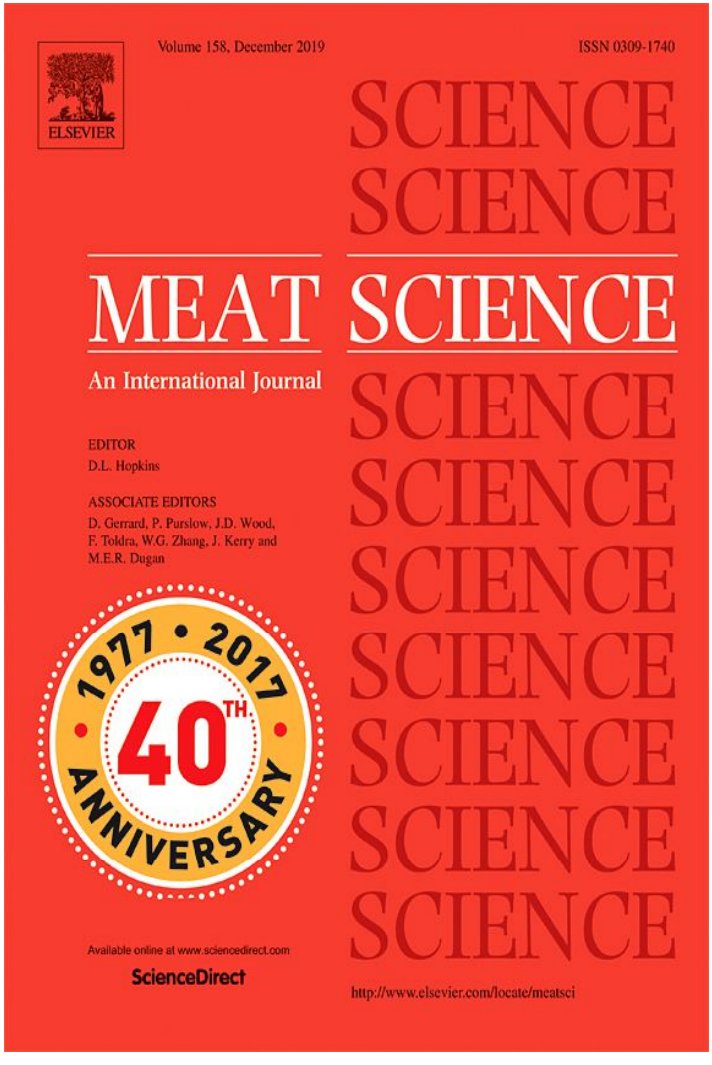

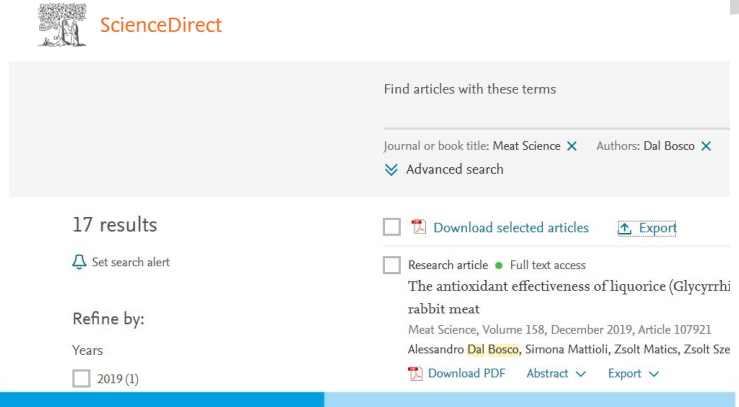

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Review

Consumer perception and the role of science in the meat industry

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ABSTRACT

The relationship between consumer perception of quality and the food industry's drive to satisfy consumer needs is complex and involves many different components. Science and innovation play a major role in equipping the industry to respond to consumer concerns and expectations.

This paper examines the main elements of consumer perception of meat with focus on the red meat sector. Emphasis is placed on perception at point of sale particularly the intrinsic quality cues of colour, packaging and degree of visual fat. The state of the art developments in increasing consumers' perception at this point are discussed. Experienced quality cues such as tenderness and flavour are well known as being of immense importance to consumers at point of consumption. The latest technological developments to enhance the quality experienced by consumers are discussed. The use of pre-rigor restraining techniques offers the industry a method for changing its conventional procedures of processing beef for instance. Background cues of safety, nutrition, animal welfare and sustainability are also discussed.

Finally opportunities and challenges facing the industry are outlined. It is concluded that the meat industry needs to invest in and embrace an innovation agenda in order to be sustainable. It must utilise emerging scientific knowledge and take a more proactive role in setting out a research agenda.

Contents

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La percezione è definita come un atto di apprendimento per mezzo dei **sensi** e/o di **esperienze acquisite**.

Quindi, la percezione non solo si riferisce ai sensi di base come attributi visivi, di gusto e di gusto, ma anche a qualcosa di precedentemente acquisito.

La percezione della qualità della carne da parte del consumatore è un concetto difficile da definire: **incredibilmente dinamico e difficile da misurare**.

In passato la percezione era legata ad aspetti igienico-sanitari o sensoriali.

Più recentemente si lega ad **aspetti nutrizionali**, al **benessere degli animali** e alla **sostenibilità delle produzioni**.

La definizione di qualità nutrizionale, associata alla carne, si riferisce sempre più spesso alla capacità di apportare composti bioattivi

ALIMENTI FUNZIONALI

I modelli che sono stati proposti fino ad oggi caratterizzano la carne come:

1. **ALIMENTO** (sicurezza, qualità nutrizionale e sensoriale, etica)
2. **OGGETTO DI COMMERCIO** (certificazione, tracciabilità, convenienza e prezzo)
3. **PRODOTTO PRIMA DELL'ACQUISTO** (costi, qualità estrinseca ed intrinseca)
4. **PRODOTTO SUCCESSIVO ALL'ACQUISTO** (preparazione della carne, qualità tecnologica e sensoriale)

Dal momento che i consumatori basano le proprie scelte di acquisto sulle **PERCEZIONI** nei confronti della qualità, è essenziale che la filiera della carne comprenda appieno:

1. quali sono questi **SEGNALI** e quali sono i più importanti;
2. cosa può fare la filiera (produttori, trasformatori e rivenditori), sulla base di questi **SEGNALI,** per mantenere o migliorare prodotti esistenti o crearne altri;
3. come attraverso l'utilizzo delle migliori conoscenze scientifiche e la tecnologia si possano migliorare tali **PERCEZIONI**.

Questi aspetti sono difficili da affrontare, ma le indicazioni fornite dagli Autori suggeriscono potrebbe avere un impatto positivo ed economico sulla competitività del settore rispondendo alle esigenze e ai desideri dei consumatori.

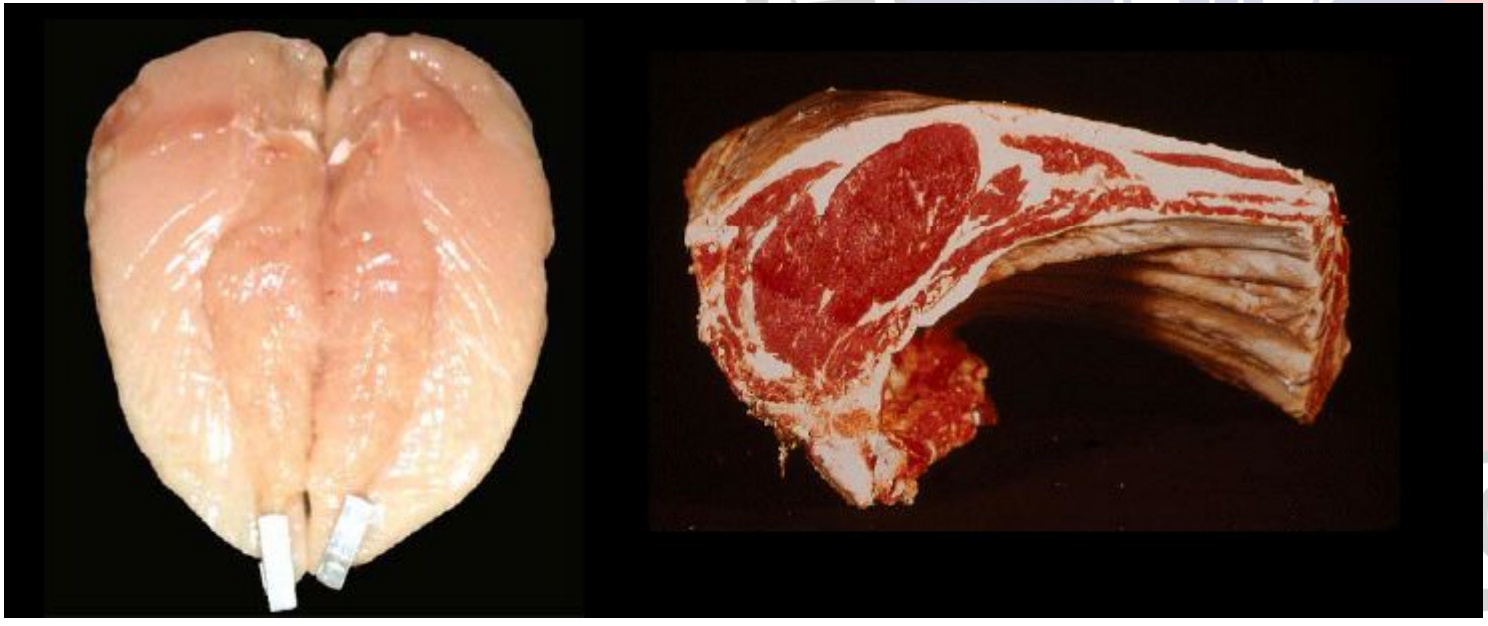
Table 1
Meat quality cues and attributes.

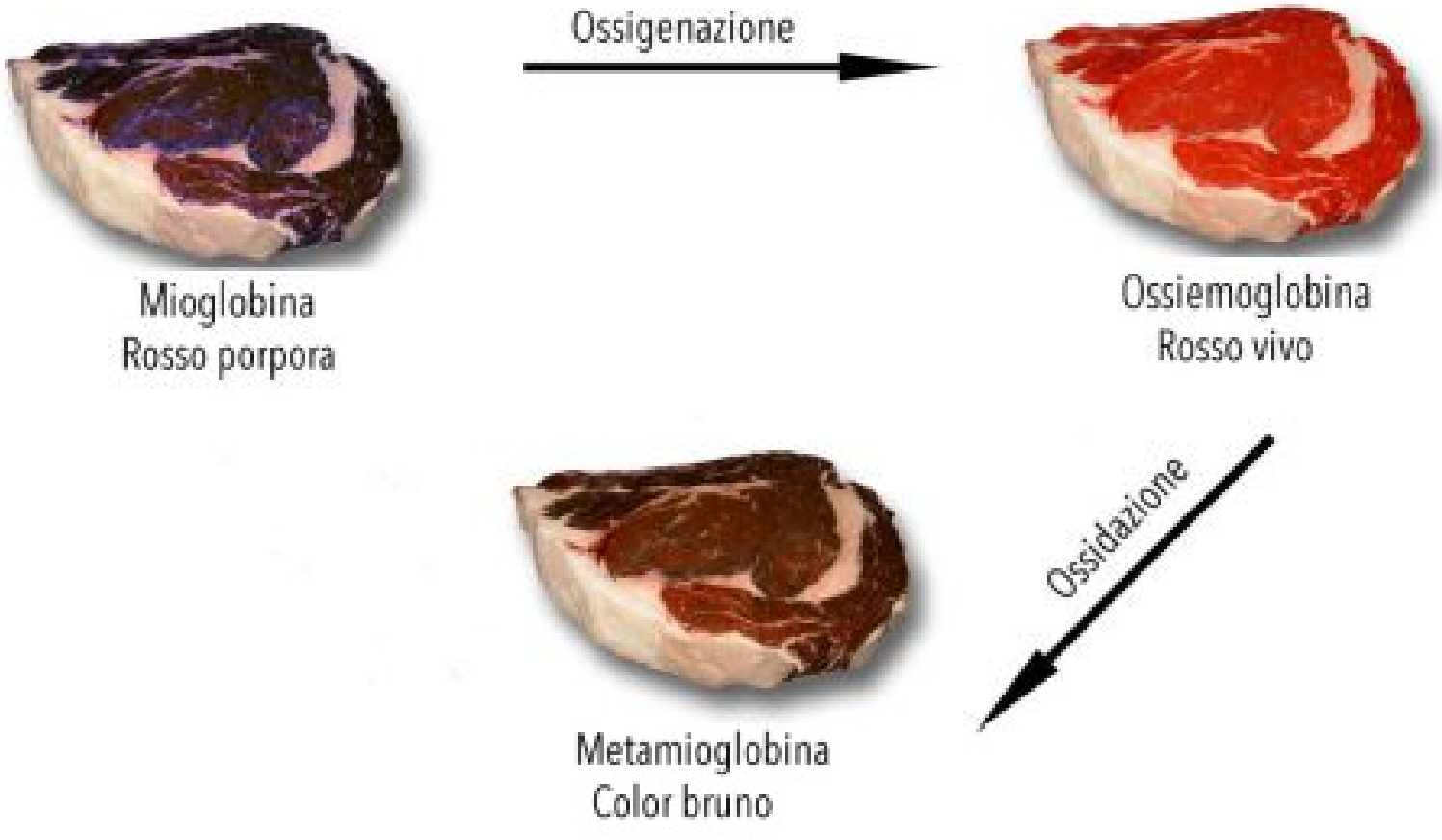
Point of sale
• Meat colour
• Packaged meat colour
• Visible drip
• Visible fat
Point of consumption
• Tenderness
• Flavour
• Juiciness
• Succulence
Major background cues
• Safety
• Nutrition
• Sustainability
• Ethics

Table 2
Consumer cues at point of sale: Scientific knowledge and uptake by industry.

Point of sale	Scientific knowledge	Uptake by industry
• Meat colour	• Meat colour chemistry+++ • Instrumentation and measurement++ • Pre- and post-slaughter factors++	• Adopted for best practice+++
• Packaged meat colour	• Material science++ • Packaging technologies++	• Adopted for best practice+++
• Visible drip	• Meat chemistry+++ • Packaging++ • Pre- and post-slaughter factors++	• Moderately adopted for best practice++
• Visible fat	• Pre-slaughter production factors++ • Market knowledge+	• Poorly adopted for best practice+

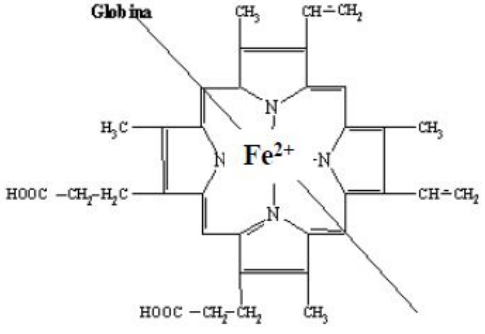
+++ extensive, ++ moderate, + limited.




Ossigenazione
Mioglobina
Rosso porpora
Ossiemoglobina
Rosso vivo
Ossidazione
Metamioglobina
Color bruno

Equilibri ossidoriduttivi della Mioglobina

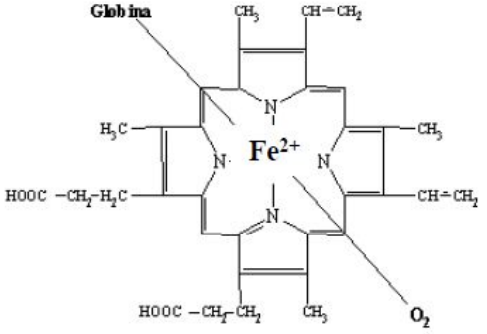
Mb (Rosso ciliegia)



Ossigenazione

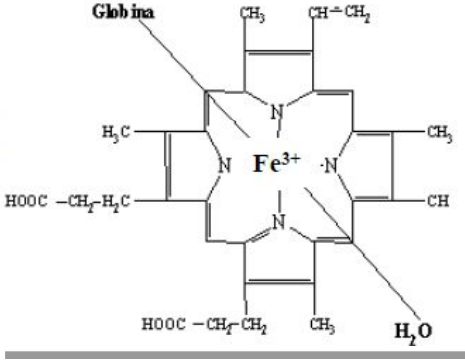
Deossigenazione

MbO_2 (Rosso vivo/rosa)



Rid. **Ossidazione**

MetMb (Bruno)



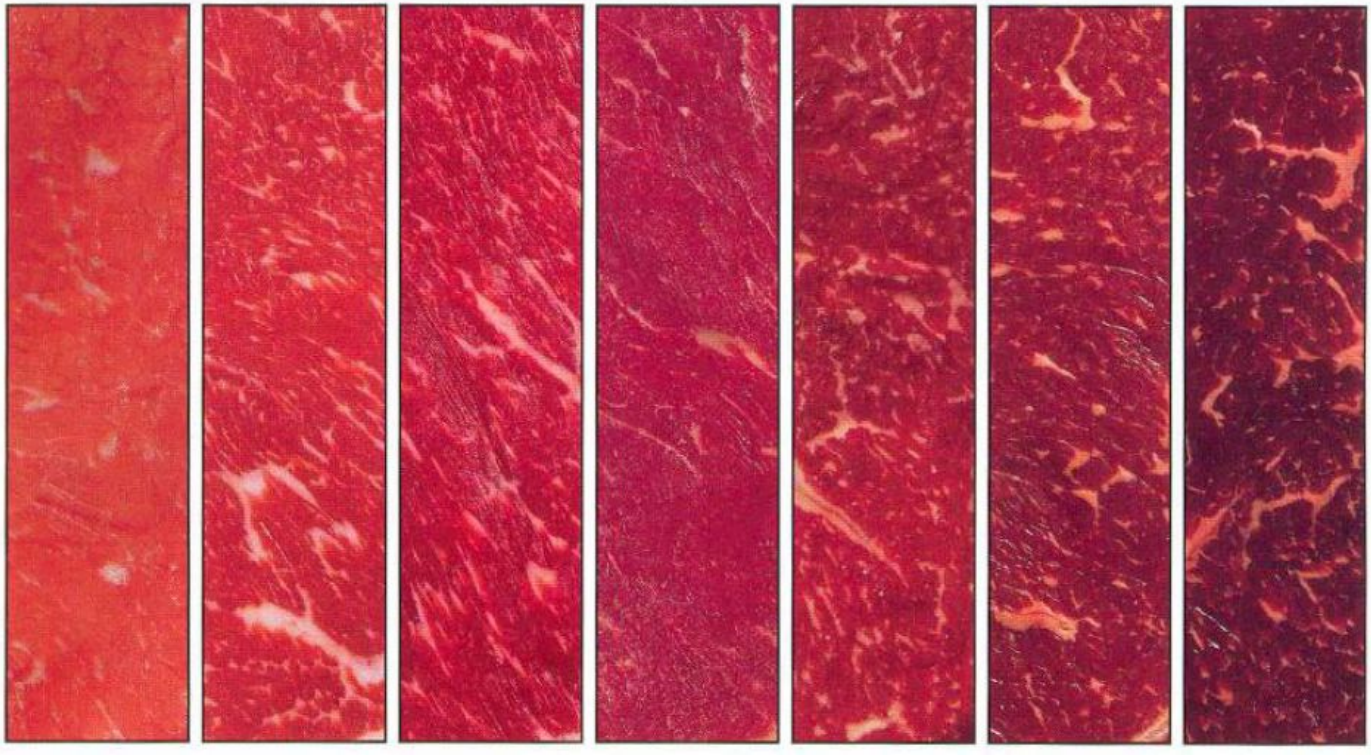
Ossidazione

Riduzione


POWER
KONICA MINOLTA

Colore/Grana

Rosa/fine ⟶ molto scuro/grossa



SUINO

basso — Marezzatura (*marbling*) — elevato

BOVINO

IL MANZO WAGYU E LA CARNE DI KOBE

MARMORIZZAZIONE

Beef Marbling Standard in Japan

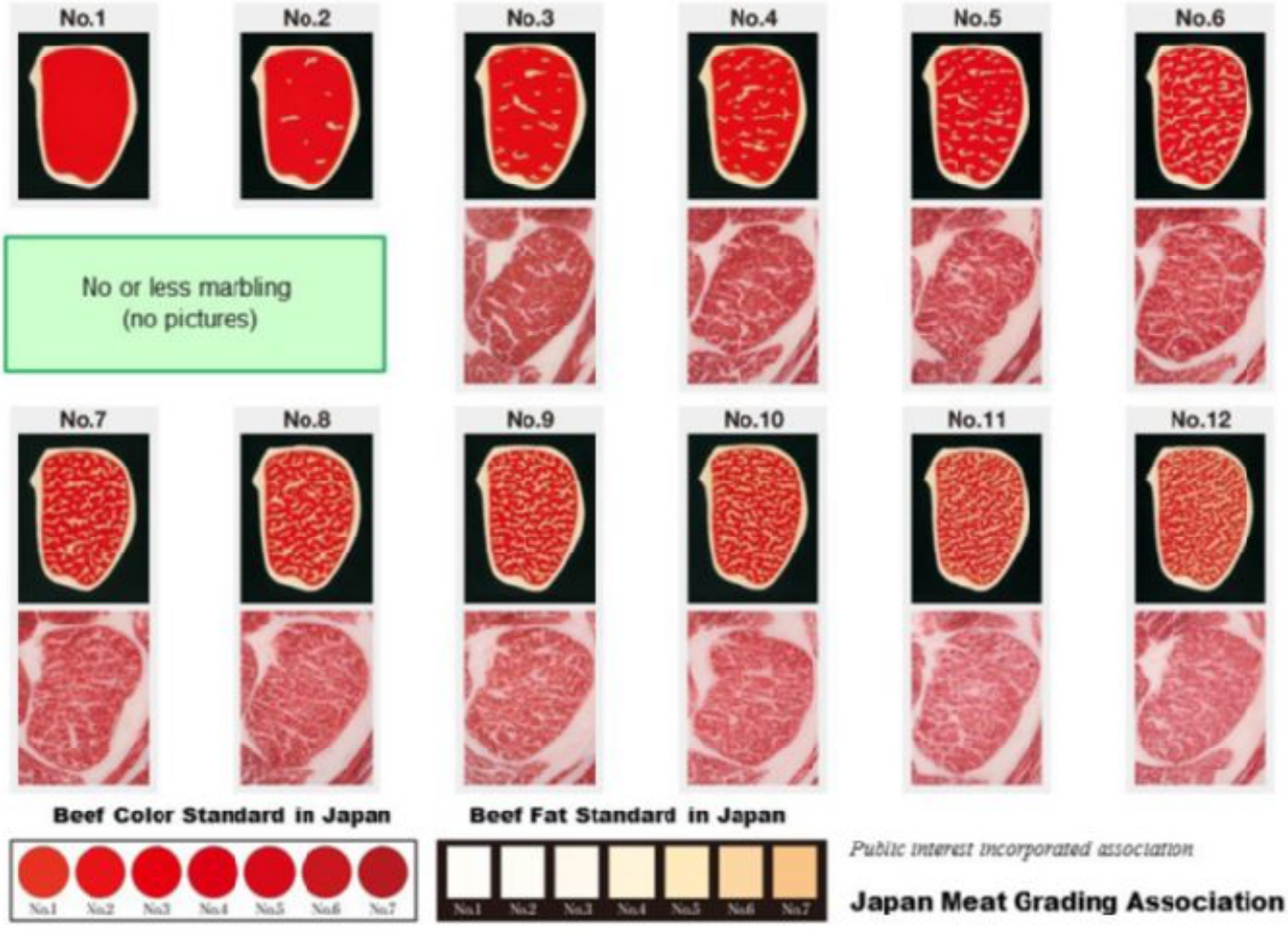


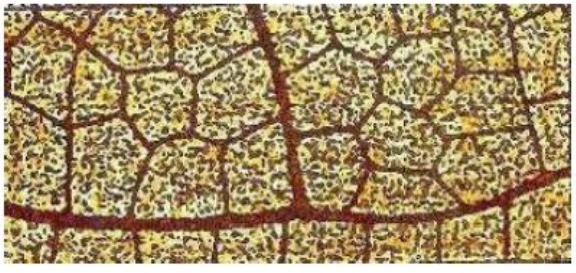
Table 3
Consumer cues at point of consumption: Scientific knowledge and uptake by industry.

Point of consumption	Scientific knowledge	Uptake by industry
• Tenderness	• Muscle biochemistry++ • Instrumentation and measurement+ • Pre- and post-slaughter factors++	• Moderately adopted for best practice++
• Flavour	• Flavour chemistry+ • Pre- and post-slaughter factors+	• Poorly adopted for best practice+
• Juiciness	• Meat chemistry+++ • Post-slaughter factors+	• Poorly adopted for best practice++
• Succulence	• Pre-slaughter production factors+	• Poorly adopted for best practice+

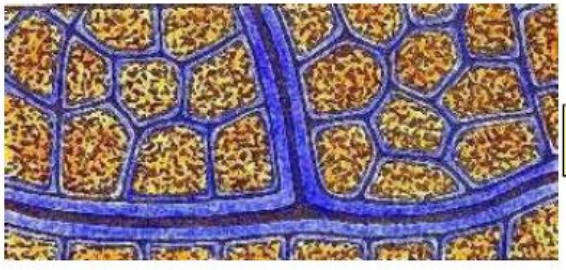
+++ extensive, ++ moderate, + limited.

1. Perdita di liquidi durante la lavorazione e conservazione

Muscolo *in vivo*

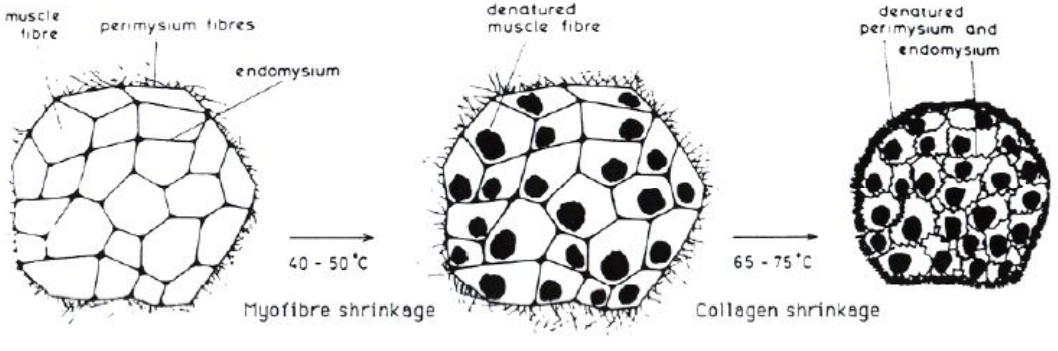


post mortem



DRIP

2. Perdita di liquidi durante la cottura



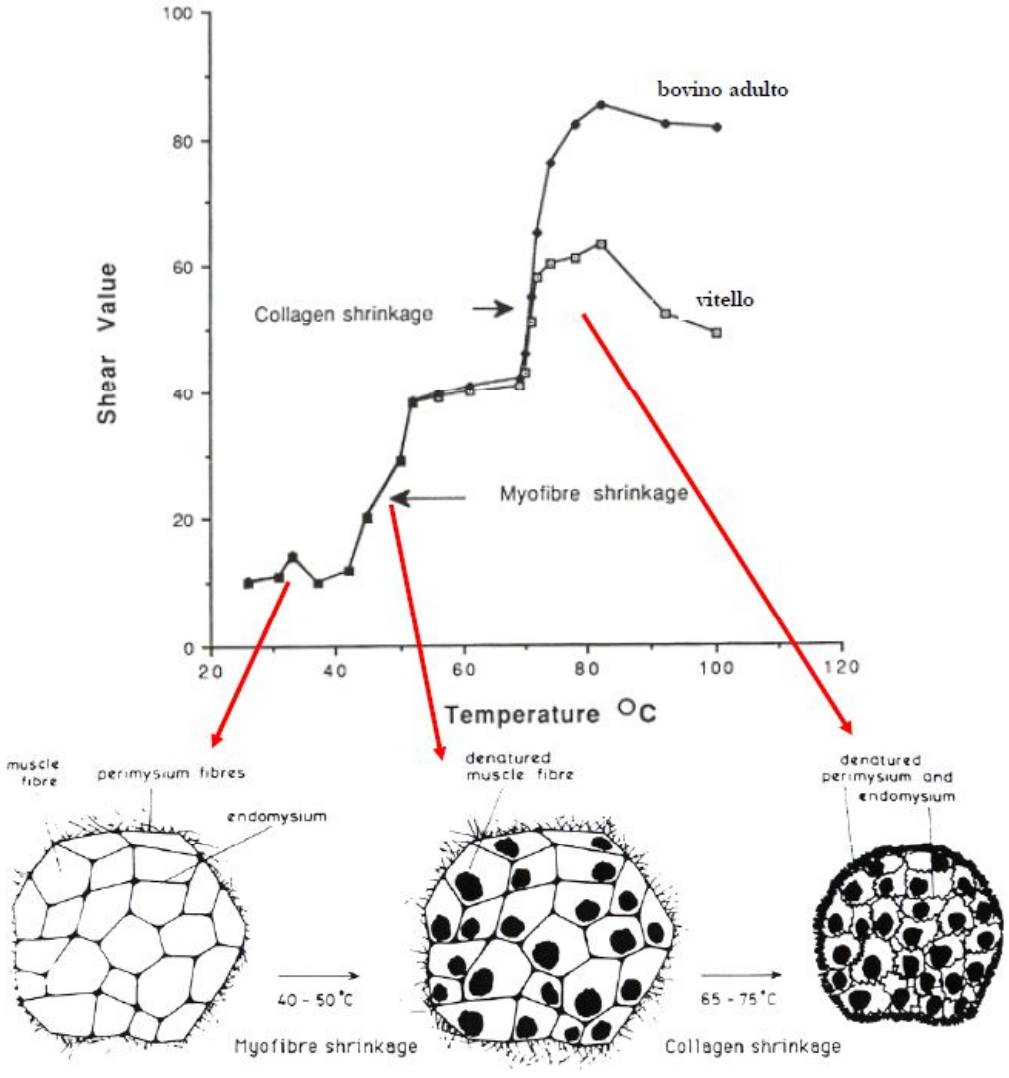

bovino adulto
vitello
Collagen shrinkage
Myofibre shrinkage
Shear Value
Temperature °C
100
80
60
40
20
0
20
40
60
80
100
120
muscle fibre
perimysium fibres
endomysium
denatured muscle fibre
denatured perimysium and endomysium
40 - 50°C
65 - 75°C
Myofibre shrinkage
Collagen shrinkage

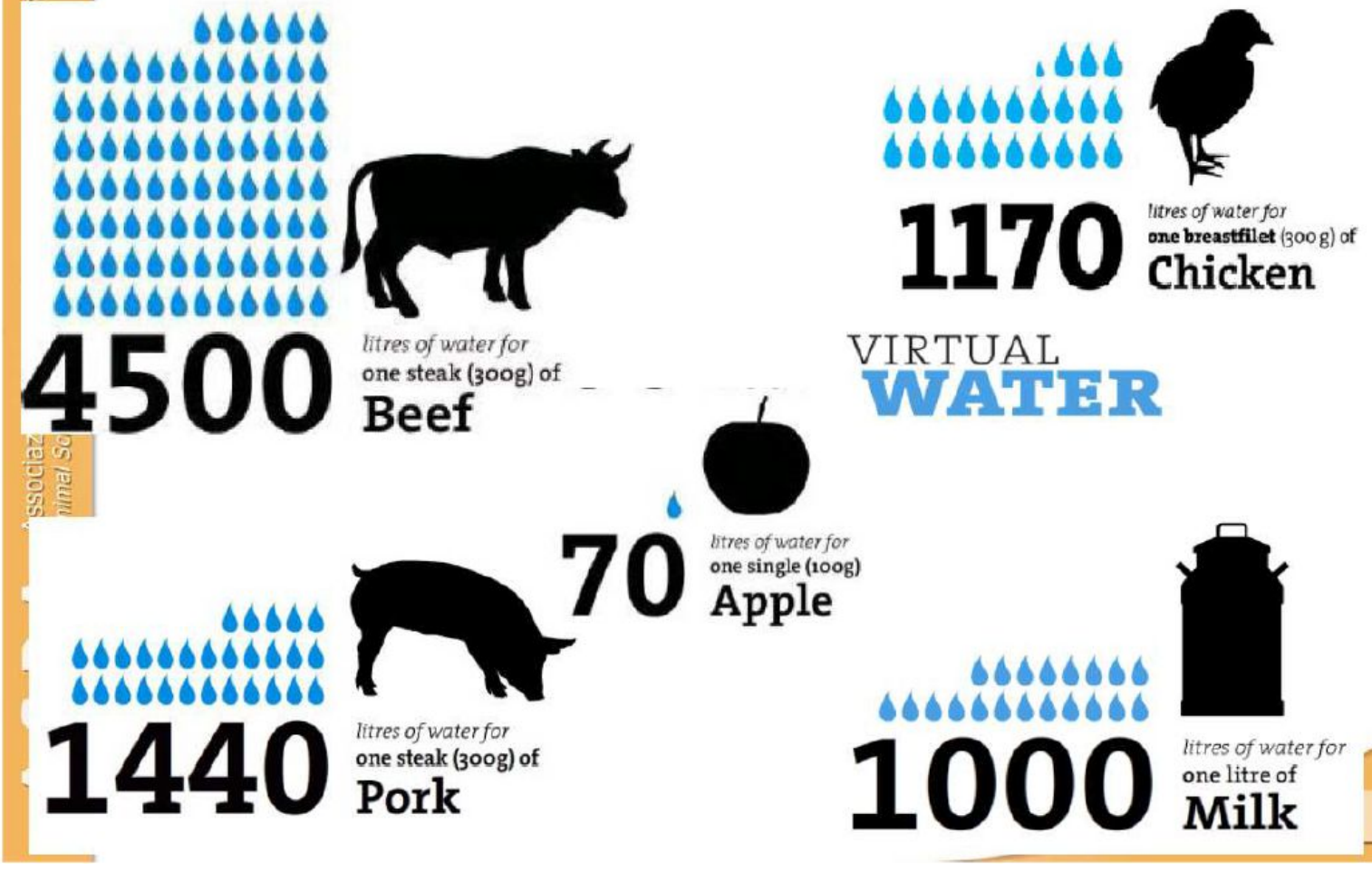
Table 4
Major background cues: Scientific knowledge and uptake by industry.

Major background cues	Scientific knowledge	Uptake by industry
• Safety	• Zoonotic pathogens+++ • Chemical contaminants++ • Traceability+ • HACCP	• Moderately adopted for best practice++
• Nutrition	• Nutritional composition+++ • Health implications+	• Poorly adopted for best practice+
• Sustainability	• Greenhouse gas emissions++ • Energy+ • Market knowledge+	• Poorly adopted for best practice++
• Ethics	• Animal welfare+++ • Biotechnology+	• Poorly adopted for best practice+

+++ extensive, ++ moderate, + limited.

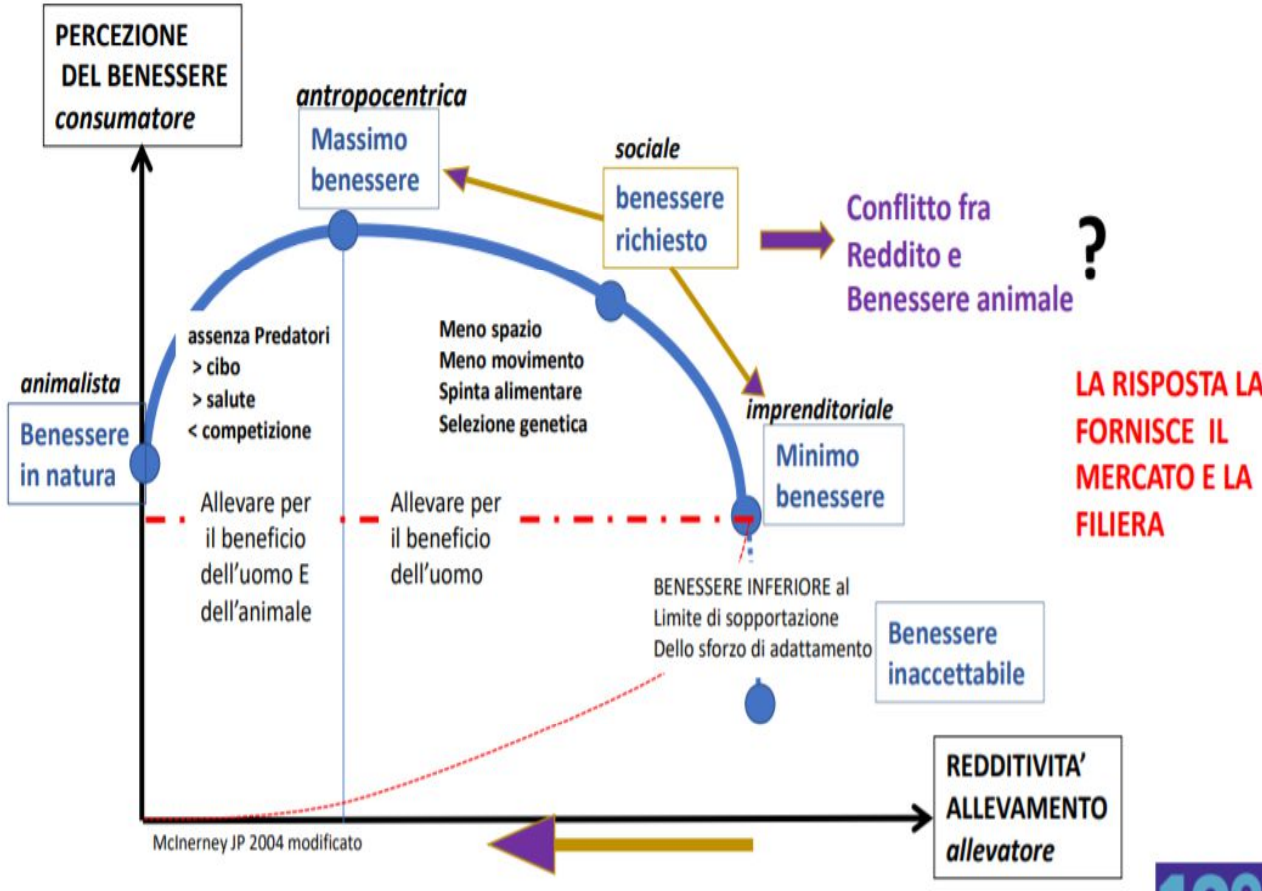
I prodotti zootecnici sono considerati ad altissima waterfootprint

(http://www.diseaseproof.com/VirtualWater.JPG)



BENESSERE ANIMALE: la percezione dei diversi attori sociali

CONSUMATORE, ALLEVATORE e POLITICA



LUIGI BERTOCCHI IZSLER – Centro di Referenza Nazionale per IL BENESSERE ANIMALE

Emerging Muscle Abnormalities	
Histological Features	
Profound degenerative myopathic changes	Kuttappan et al. (2009, 2013a), Sihvo et al. (2014, 2017), De Brot et al. (2016), Mazzoni et al. (2015), Soglia et al. (2016a), Clark and Velleman (2016), Kawasaki et al. (2016), Radaelli et al. (2016), Baldi et al., 2017
Presence of abnormal fibers exhibiting rounded profile	
Occasional regenerative processes	
Variability in fibers' cross-sectional areas	
Proliferation of loose connective tissue (fibrosis)	
Fat deposition (lipidosis)	
Interstitial edema	
Inflammatory cells infiltrates	
Vasculitis	

Quality Traits	
Impaired nutritional value	Petracci et al. (2014), Mudalal et al. (2014)
Higher amount of moisture, fat and collagen	Kuttappan et al. (2012), Soglia et al. (2016a,b), Zambonelli et al. (2016), Baldi et al., 2017
Reduced protein content and decreased protein solubility and functionality	Petracci et al. (2014), Mudalal et al. (2014, 2015), Bowker and Zhuang (2016)
Increased ion levels and altered sodium and calcium homeostasis	Sandercock and Mitchell (2004), Wallace and McNally (2009), Soglia et al. (2016a), Zambonelli et al. (2016)
Higher amount of linoleic acid	Soglia et al. (2016b)
Reduced Δ5 and Δ6 desaturase activity	Jordan et al. (1964), Soglia et al. (2016b)
Lower content of anserine, carnosine and creatine	Sundekilde et al. (2017)
Increased yellowness and pale color	Kuttappan et al. (2009), Soglia et al. (2016a)
Increased ultimate pH	Petracci et al. (2013b), Mudalal et al. (2015), Trocino et al. (2015), Abasht et al. (2016), Soglia et al. (2016a), Zambonelli et al. (2016), Tasoniero et al. (2016), Baldi et al. (2017), Baldi et al., 2017

(*Continued*)

Animal, page 1 of 9 © The Animal Consortium 2015
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animal

Fatty acid composition of chicken breast meat is dependent on genotype-related variation of *FADS1* and *FADS2* gene expression and desaturating activity

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In Western countries the dietary guidance emphasizes the need to decrease the intake of saturated fatty acids and to replace them with polyunsaturated fatty acids (PUFA), particularly long chain n-3 PUFA (LC-PUFA). The production of poultry meat having a lower fat content and healthier fatty acid (FA) profile is a hot topic for the poultry industry, and the possibility to identify genotypes able to produce meat with a higher LC-PUFA content deserves attention. The aims of the present study were to evidence in chicken (i) a genotype-related different expression of the desaturating enzymes delta-6 (Δ6, EC 1.14.99.25), delta-5 (Δ5, EC 1.14.19.) and delta-9 (Δ9, EC 1.14.19.1); (ii) the impact of the hypothesized different expression on the meat FA composition; (iii) the distribution of desaturase products in the different lipid classes. Slow (SG), medium (MG) and fast (FG) growing chickens fed the same diet were evaluated either for the relative expression of FADS1, FADS2 and SCD1 genes in liver (by q-PCR), or for the FA composition of breast meat. MG and particularly SG birds showed a greater expression of FADS2 and FADS1 genes, a higher Δ6 and Δ5 activity (estimated using desaturase indices), and consequently a higher LC-PUFA content in the breast meat than FG birds. The relationship between genotype and desaturating ability was demonstrated, with a significant impact on the PUFA content of breast meat. Due to the high consumption rate of avian meat, the identification of the best genotypes for meat production could represent an important goal not only for the food industry, but also for the improvement of human nutrition.

Keywords: chicken, fatty acid desaturases, n-3/n-6 PUFA, *FADS1*, *FADS2*

Implications

This study provides information regarding the ability of different chicken genotypes (slow-, medium- and fast-growing) to synthesize and accumulate in muscle tissue n-3 long chain polyunsaturated fatty acids, which have an important role in human health. It emerged that slow-growing birds have a higher desaturating activities which allow them to convert with a better efficiency the dietary fatty acid precursors of the n-3 families (linolenic acid) into long-chain derivatives EPA and DHA. This study highlights the possibility of a genotype-based selection of chicken strains to produce meat with increased nutritional value.

Introduction

The production of meat with lower overall fat content and a healthier fatty acid (FA) profile is of great interest for the meat industry. Consumers' awareness of the relationship between health and food choices is increasing, as well as the demand of food having a good nutritional profile. A US survey indicates that 63% of consumers are trying to consume less animal fat and 41% of consumers decreased their consumption of beef, since they consider meat a source of high amount of lipids having unhealthy characteristics (I.F.I.C. Foundation, 2009).

Meat from different animal species is characterized by different FA composition, and within the same species the FA profile reflects endogenous biosynthesis as well as the composition of the diet. This relationship is stronger in monogastrics (pigs, poultry and rabbits) than in ruminants, where dietary FA are hydrogenated in the rumen (Kouba and Mourot, 2011).

Animals are unable to synthesize essential fatty acids (EFA), linoleic acid (LNA;18:2n-6) and α-linolenic acid (ALA 18:3n-3) from acetyl-CoA, but they can convert EFA supplied by the diet to more unsaturated FA with a longer carbon chain. This process is catalyzed by the elongating and desaturating

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Dietary fish oil and flaxseed for rabbit does: fatty acids distribution and Δ6-desaturase enzyme expression of different tissues

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Standard feeds are imbalanced in term of n-6/n-3 polyunsaturated fatty acids (PUFA) ratio, with a low proportion of the latter. The reproductive system appears to be strongly affected by administration of n-3 PUFA, and ingredients rich in α-linolenic acid (ALA; i.e. vegetable sources) or EPA and DHA acids (i.e. fish oil) can be included in animal diets to balance PUFA intake. The aim of this study was to evaluate the effect of dietary supplementation with flaxseed (ALA) or fish oil (EPA and DHA) on PUFA metabolism in rabbit does. A total of 60 New Zealand White female rabbits were assigned to three experimental groups: control group, FLAX group fed 10% extruded flaxseed and FISH group fed 3% fish oil. Blood, milk, liver and ovaries were collected from the does to assess the lipid composition; furthermore, FADS2 gene expression was assessed in liver and ovary tissues. Reproductive performance of does was also recorded. The fertility rate and number of weaned rabbits improved with n-3 dietary supplementation: does at first parity showed the lowest reproductive results, but the administration of n-3 reduced the gap between primiparous and multiparous does. Feed consumption and milk production were not affected by the feeding regime. The fatty acid composition of milk, plasma, liver and ovaries were widely influenced by diet, showing higher concentrations of n-3 long-chain PUFA (LCP) in does fed with n-3 enriched diets. FISH diet resulted in the highest n-3 LCP enrichment, whereas in the FLAX group, this increase was lower. Blood and milk showed low levels of LCP, whereas liver and ovaries were the main sites of n-3 LCP synthesis and accumulation. Accordingly, although the liver is the main metabolic centre for LCP synthesis, ovaries also have a prominent role in LCP generation. FADS2 expression in liver and ovary tissue was downregulated by FISH administration. In conclusion, the enrichment of diets with n-3 PUFA could be an effective strategy for improving the reproductive performance of does.

Keywords: rabbit, n-3 long-chain fatty acids, *FADS2*, liver, ovary

Implications

The role of n-3 fatty acids is relevant for many physiology activities; however, well-defined dietary recommendations for animals are not yet provided. Dietary n-3 could be supplied by precursors (e.g. vegetal source of α-linolenic acid (ALA)) and/or by long-chain polyunsaturated fatty acids (LCP) (fish oil rich in EPA, dosapentaenoic acid (DPA) and DHA). This paper clearly shows that the enrichment of diets with n-3 PUFA (both as precursor or LCP), improves the reproductive performance of rabbit does mainly during critical phase of production (primiparous). This better performance is obtained without hormonal treatment or intensification of reproductive rhythm, thus consistent with the general principles of animal welfare.

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Introduction

The extent of linoleic acid (LA, C18:2n-6) and ALA (C18:3n-3) conversion into LCP (≥20 carbons) greatly depends on expression and activity of desaturase and elongase enzymes, which are the same for both n-3 and n-6 fatty acid series (Barceló-Coblijn and Murphy, 2009; Gregory *et al.*, 2011). Elongase (2 and 5) lengthens the carbon chain, whereas delta 6- (Δ6d) and delta 5-desaturase (Δ5d) introduce double bonds and are encoded by *FADS2* and *FADS1* genes, respectively (Nakamura and Nara, 2004). The Δ6d is considered to be the rate-limiting enzyme in the synthesis of

animals

MDPI

Article

Dehydrated Alfalfa and Fresh Grass Supply in Young Rabbits: Effect on Performance and Caecal Microbiota Biodiversity

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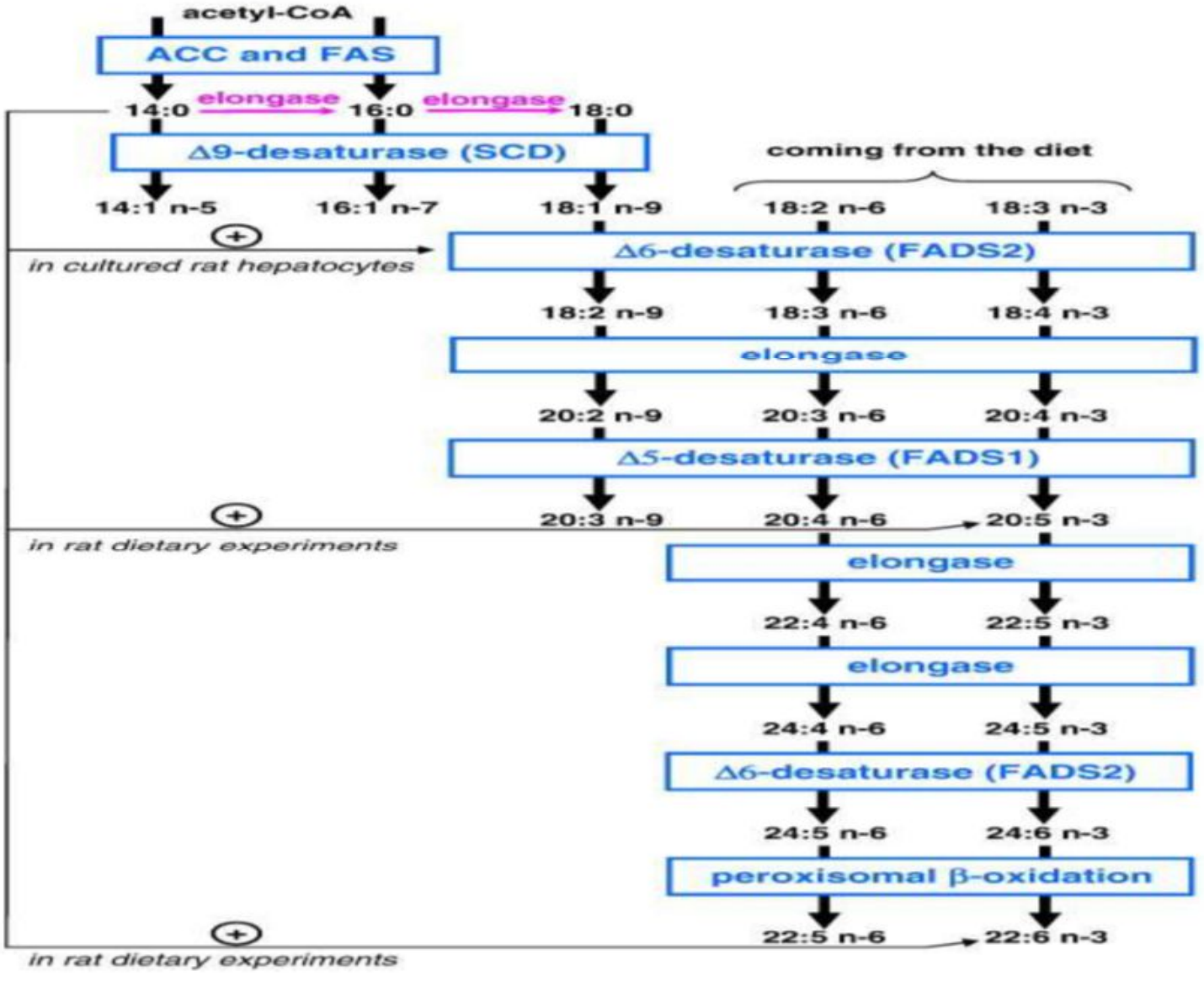
Simple Summary: The weaning of young rabbits is a critical period that is often accompanied by digestive troubles. Innovations in feeding strategy are urgently needed to preserve rabbit health and to reduce the use of antibiotics. We show here that providing dehydrated alfalfa during weaning is a promising solution to manage health status by favoring the establishment of a proper digestive microbiota.

Abstract: The improvement of rabbit gut microbiota by modifying nutritional components of the feed or favoring its early intake of feed has been previously investigated. The early administration of dehydrated alfalfa (A) or fresh grass (G) for rabbits, during the peri-weaning period (30 and 45 days of age), and their effect on performance and caecal microbiota compared to a standard diet (C) were evaluated. Until 15 days of age, nine litters/group were housed in the maternal cage and milked once per day. From 15 to 30 days, the young rabbits could consume both milk and solid feed (pelleted for C or supplemental feed for A and G). At 30 days of age, the rabbits were weaned and, until 45 days, were kept in single cages following the same dietary protocol. No significant changes were found in the milk intake or the individual weight of young rabbits at 30 and 45 days. The caecal Firmicutes/Bacteroidetes (bacterial phyla ratio) increased with age (from 2.43 to 6.05 on average, at 30 and 45 days). The Ruminococcaceae/Lachinospiraceae (bacterial family ratio) was highest in the A group at both ages, followed by G then C. The early administration of dehydrated alfalfa is a promising solution to improve health status by favoring an appropriate digestive microbiota.

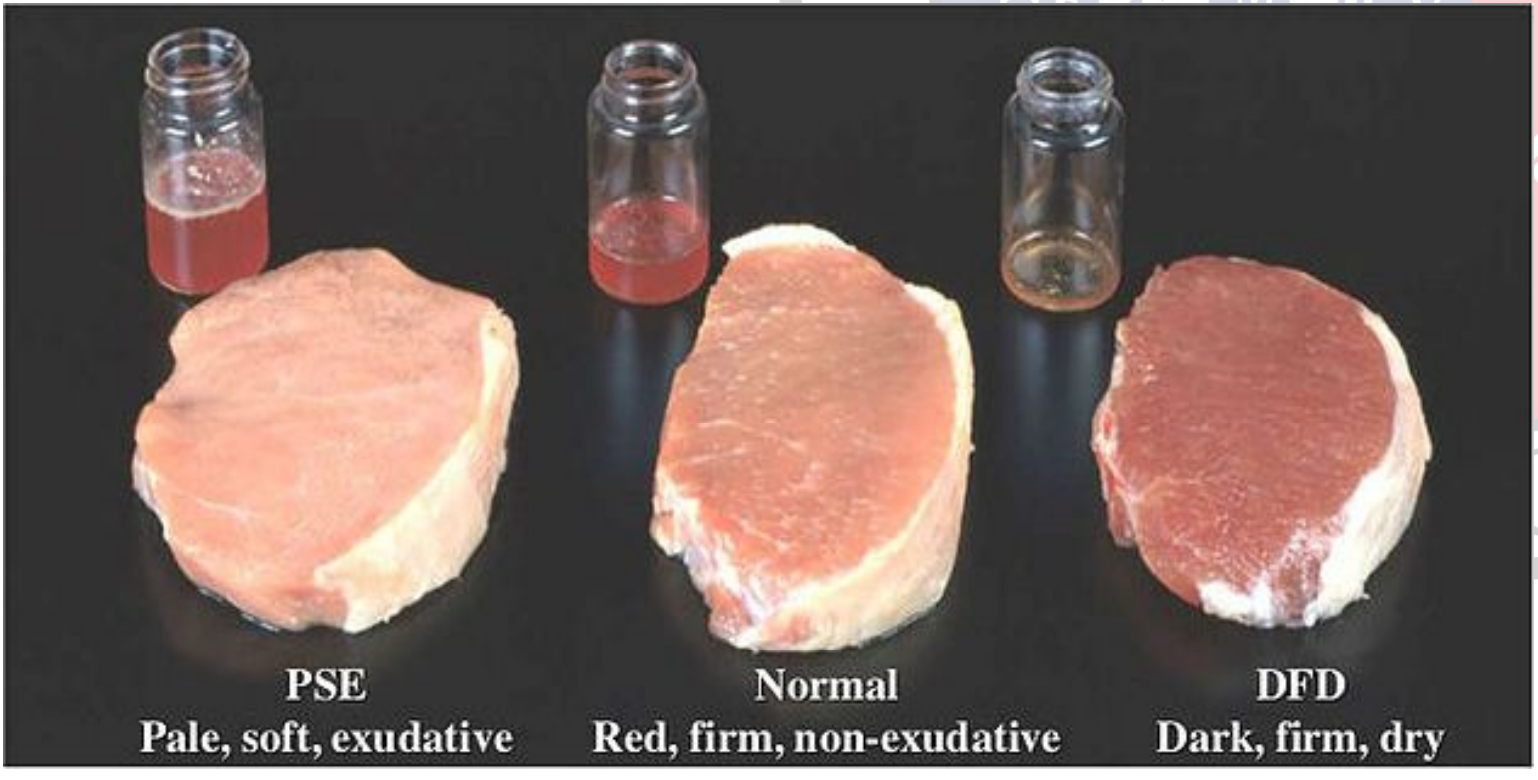
Keywords: rabbit; peri-weaning feeding; caecal microbiota; dehydrated alfalfa; fresh grass

1. Introduction

The high incidence of digestive disease during the post-weaning period of young rabbits is a relevant problem worldwide; the etiology of digestive diseases is poorly understood and is often related to an unbalanced microbiota composition [1]. Due to this, anti-microbials are frequently used as therapy or disease prevention to limit the occurrence of these digestive troubles [2]. However, the use of such anti-microbials in animal production is critically viewed because of their impact on the development of resistant bacteria [3]. There are many documented cases of the transmission of antibiotic resistance from animals to humans and the environment [4].


acetyl-CoA
ACC and FAS
14:0
elongase
16:0
elongase
18:0
Δ9-desaturase (SCD)
coming from the diet
14:1 n-5
16:1 n-7
18:1 n-9
18:2 n-6
18:3 n-3
in cultured rat hepatocytes
Δ6-desaturase (FADS2)
18:2 n-9
18:3 n-6
18:4 n-3
elongase
20:2 n-9
20:3 n-6
20:4 n-3
Δ5-desaturase (FADS1)
20:3 n-9
20:4 n-6
20:5 n-3
in rat dietary experiments
elongase
22:4 n-6
22:5 n-3
elongase
24:4 n-6
24:5 n-3
Δ6-desaturase (FADS2)
24:5 n-6
24:6 n-3
peroxisomal β-oxidation
22:5 n-6
22:6 n-3
in rat dietary experiments

Emerging Muscle Abnormalities	
Reduced and altered profile of muscular contractile and sarcoplasmic proteins	Mudalal et al. (2014), Soglia et al. (2016a); Bowker and Zhuang, 2016, Baldi et al., 2017
Reduced oxidative stability	Soglia et al. (2016b)
Technological Properties	
Reduced water holding and water binding capacities: impaired marinate uptake, cooking loss and yield	Mudalal et al. (2014), Petracci et al. (2014), Mudalal et al. (2015), Trocino et al. (2015), Tijare et al. (2016), Soglia et al. (2016a,b), Tasoniero et al. (2016)
Increased proportion and mobility of extra-myofibrillar water fraction	Soglia et al. (2016b), Baldi et al., 2017
Elevated compression and MORSE forces (raw meat)	Petracci et al. (2013b), Mudalal et al. (2015), Soglia et al. (2016a), Chatterjee et al. (2016), Tasoniero et al. (2016)
Increased TPA hardness and chewiness (cooked meat)	


PSE
Pale, soft, exudative
Normal
Red, firm, non-exudative
DFD
Dark, firm, dry

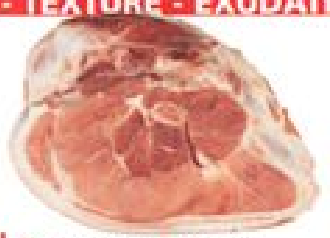
PORK QUALITY STANDARDS

Quality of fresh pork varies greatly. The quality levels shown below will appear differently to consumers, taste differently when cooked, and perform differently when converted to processed products. High quality pork has greater monetary value than low quality pork. Quality can be evaluated by simply visual appraisal, or it can be determined more accurately by scientific tests. This chart may be used to help identify variations in pork quality. Color and Marbling Standards cards are also available.

pork The Other White Meat.

COLOR - TEXTURE - EXUDATION

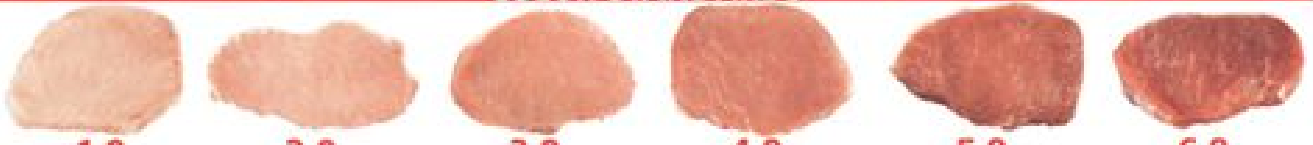
PSE Pale pinkish gray, very Soft and Exudative. Undesirable appearance and shrinks excessively.



RFN Reddish pink, Firm and Non-exudative. "IDEAL". Desirable color, firmness and water-holding capacity.

DFD Dark purplish red, very Firm and Dry. Firm and sticky surface, high water-holding capacity

COLOR STANDARDS



1.0	2.0	3.0	4.0	5.0	6.0
Pale pinkish gray to white	Grayish pink	Reddish pink	Dark reddish pink	Purplish red	Dark purplish red
Minolta L* Value[1] 61	55	49	43	37	31

MARBLING STANDARDS[2]

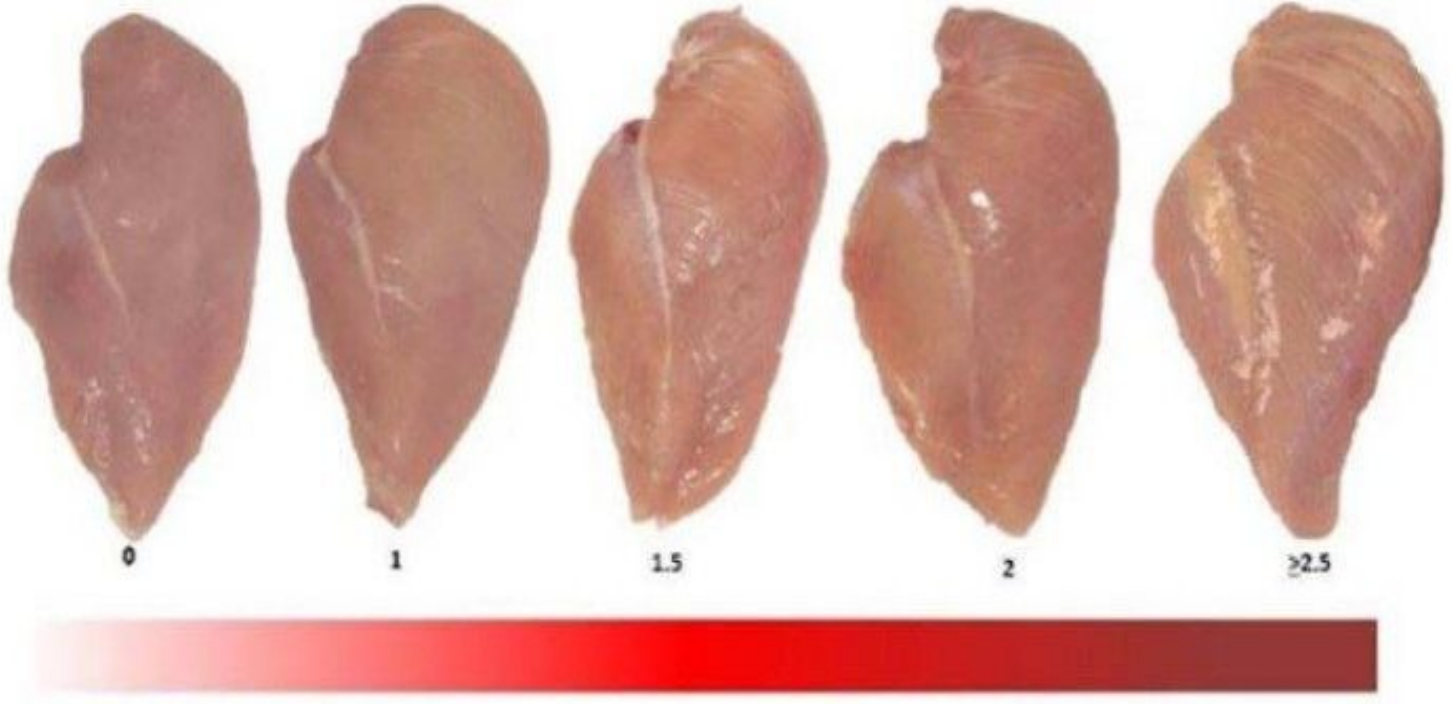
1.0	2.0	3.0	4.0	5.0	6.0	10.0

Color and marbling scores are as described in "Composition & Quality Assessment Procedures", 1999, NPPC.
1. Minolta L* values use D65 daylight light source.
2. Marbling scores correspond to intramuscular lipid content

For more information contact:
National Pork Producers Council

Courtesy of National Pork Producers Council.

Figure 1 - Degrees of White Striping, from Normal (0) to Severe (2 and 2.5)
Source: Owens, CM and Alvarado, CZ Arkansas Nutritional Conference 2015 proceedings



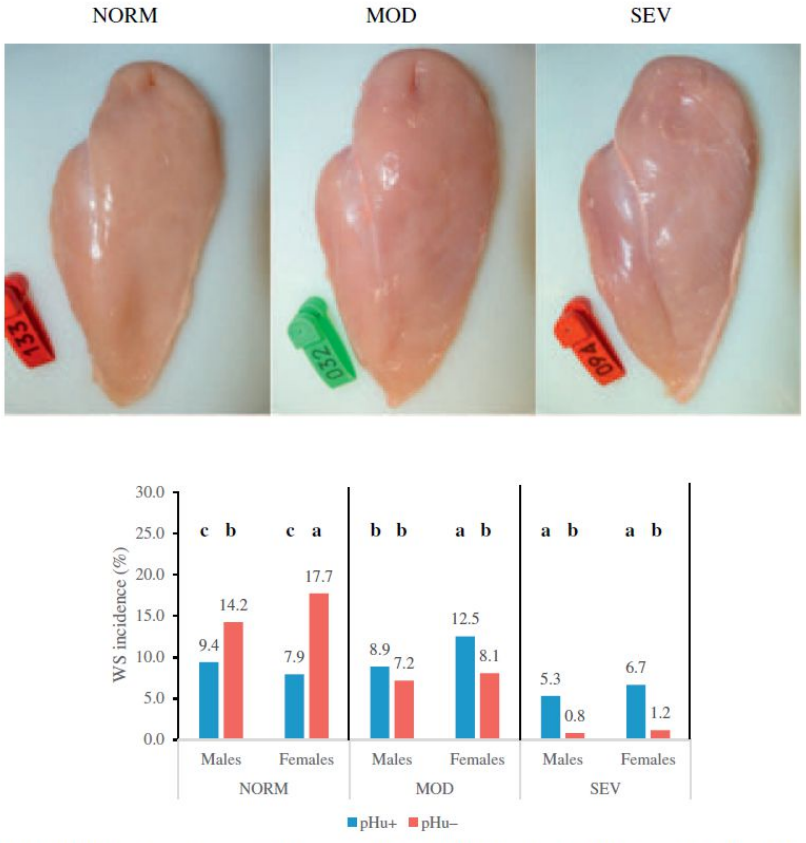


FIGURE 8.3 Scoring of normal breast fillets (NORM), breast fillets moderately affected (MOD) and severely affected (SEV) by white striping (WS) in the pHu + line selected for high value of ultimate pH and the pHu − line selected for low value of ultimate pH. The pHu − birds exhibit higher percentage of normal breast fillets while the pHu + birds exhibit a higher percentage of breast fillets severely affected by white striping. Observed frequencies per line and sex have been compared within each category of WS. Different letters indicate significant difference ($P < .05$) within each WS category. *From Alnahhas, N., Berri, C., Chabault, M., Chartrin, P., Boulay, M., Bourin, M.C., et al., 2016, Genetic parameters of white striping in relation to body weight, carcass composition, and meat quality traits in two broiler lines divergently selected for the ultimate pH of the pectoralis major muscle. BMC Genet. 17, 61.*

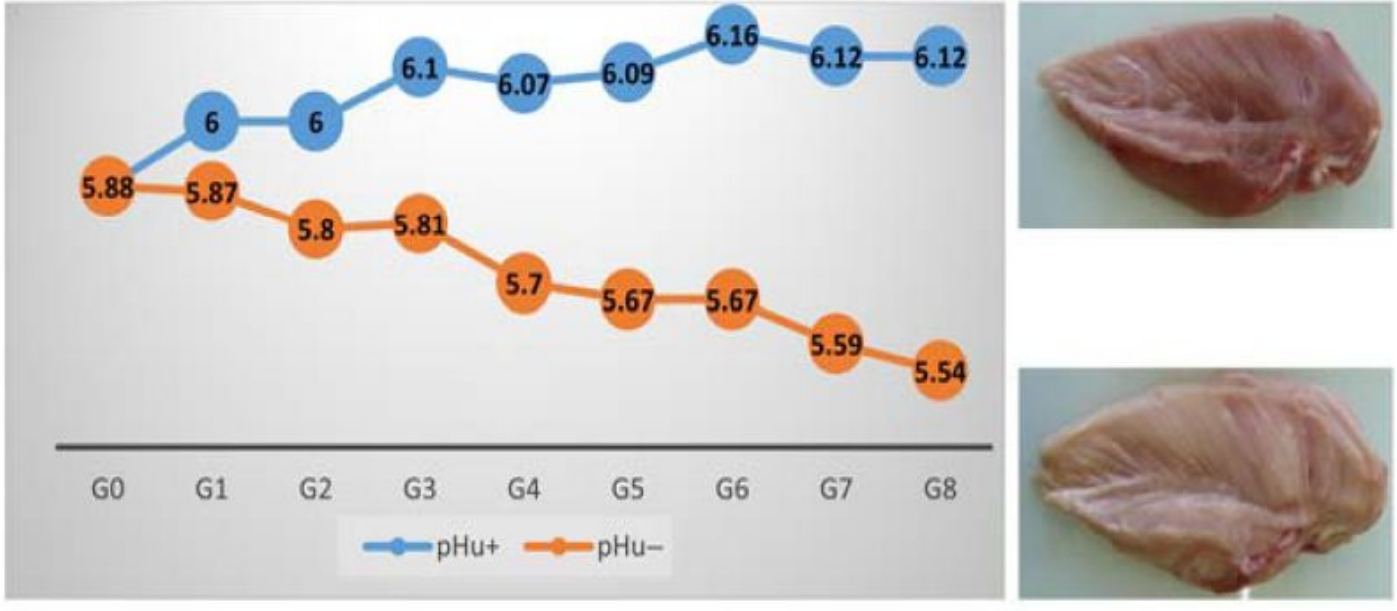


FIGURE 8.2 Breast meat ultimate pH can be efficiently modified by selection as shown by the phenotypic response observed over eight generations in the divergent pHu + and pHu − lines.

Table 5
Current status of specific technological uptake by industry.

Name of technology		Level of uptake
Colour systems	Visual scoring systems/cards	+
	Colorimetry	+
	Hennessey probe	++
pH evaluation		+++
Packaging systems	Overwrapping	+++
	Gas flushing	+++
	Vacuum packing	+++
	Controlled atmospheres	+
Chilling		+++
Tenderstretch hanging methods		+
Electrical stimulation	High voltage ES	+
	Low voltage ES	++
Hot-boning		+
Muscle restraining systems	Mechanical devices	+
	Pi-Vac elasto-pack system	+
Dry-ageing		+

+++ extensive, ++ moderate, + limited.

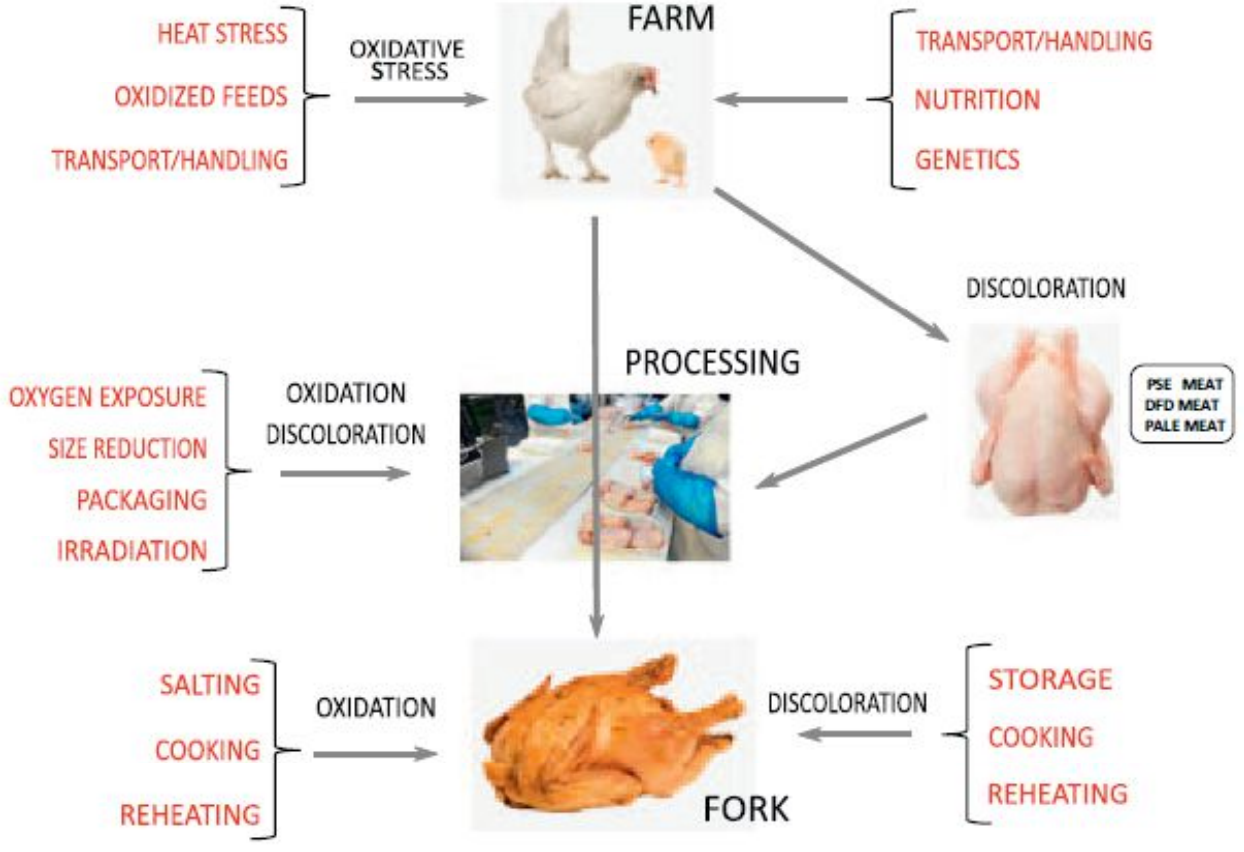


FIGURE 6.2 Sources of oxidative stress and discoloration to poultry and poultry meat from farm to fork.

Un laureato viene chiamato da un'Azienda che lo pone di fronte a diverse situazioni critiche

ESITO	DESTINO
Non individua il problema	Va a casa
Individua il problema ma non lo risolve	Ha un contratto a tempo determinato
Individua il problema e lo risolve	È assunto
Trasforma il problema in opportunità	Fa carriera

GRAZIE PER L'ATTENZIONE