Quality management for processed poultry products and food safety

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Food quality is a sensory property that includes appearance, taste, nutritional value (nutrient content), health benefit (functional ingredient) or safety (chemical, physical, biological).

It includes those attributes which affect consumer’s choice for a product.
Objective of quality managements of poultry products:

Safeguard the health of the people through production, distribution and consumption of safe poultry products

Prevent avoidable losses and increase profitability

Promote national and international trade
“Processed poultry product" includes a range of products – namely, a slaughtered carcass to a further processed product such as sausage, fillet, hot wings, nugget and so on.

Consumer demand for variety is forcing constant expansion of the processed poultry product range.

Preferences of the consumers have shifted towards healthy, tasty foods, which are readily available, ready to eat and easily stored.
Ready-to-eat (RTE) products, which are safe to consume regardless of the form when purchased by customers - While most RTE meat and poultry products are covered by specific lethality performance standards

Not-ready-to-eat (NRTE) products require cooking by consumers for safety
Poultry production system for the finished product, poultry must be viewed as an integrated system, from the farms to the food itself. Everyone including farmers, processors and regulators have a responsibility to assure consumers that poultry product is safe and suitable for consumption.

A poultry pathway
Major challenge for poultry industry is to maintain the quality as perceived by the consumers.
RECENT REGULATIONS AND NETWORKS IMPACTING THE PRODUCT RECALL LANDSCAPE INCLUDE:

- **Canada**
  - Safe Food for Canadians Act

- **US**
  - Consumer Product Safety Improvement Act; Food Safety Modernization Act; US TREAD Act

- **Singapore**
  - Consumer Protection (Safety Requirements) Regulations; Consumer Protection (Consumer Goods Safety Requirements) Regulations

- **South Korea**
  - Food Safety Basic Act; Food Sanitation Law; Functional Health Food Act; Consumer Protection Act; Agricultural and Fishery Products Quality Control Act

- **Japan**
  - Food Safety Basic Law; Food Sanitation Law; Food Labeling Law; Product Liability Law; Consumer Product Safety Act

- **China**
  - Food Safety Law; Auto Recall Regulations

- **Taiwan**
  - Agricultural Production and Certification Act; Health Food Control Act; and Food Safety Protection Fund Act

*Source: Allianz Global Corporate & Specialty*
The International Organization for Standardization (ISO) is a worldwide group that organizes and standardizes quality requirements. The American National Standards Institute (ANSI) and European Committee for Standardization (CEN) do not produce standards, but member groups voluntarily submit standards for standardization and compliance.
Government of the People's Republic of Bangladesh

Ministry of Food

NOTIFICATION

Dated the 17 April 2016

S.R.O. No. 98-Law/2016—In exercise of the powers conferred by section 89 of the Food Safety Act, 2013, the Government is pleased to publish the following English translation of the Act to be called the Authentic English Text of the Act, and it shall be effective from the date on which the Act comes into force under sub-section (2) of section 1 of the Act:

The Food Safety Act, 2013
(Act No. 43 of 2013)

[10th October, 2013]
Poultry products are among the highest-risk categories, as evidenced by frequent recalls and safety scandals that impact public health.
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0183641

R = 1 - e^{-P^*} 
\text{P} = I + D \times (x + \alpha)^n \text{ } \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k} 
\text{R} = \frac{AF_p - (1 - \phi)}{1 - \frac{(1 - \phi)}{(1 - \phi)}} 
\text{AF} = (RR - 1) / RR 

Figure 2. Dendrogram showing the cluster analysis on the basis of XbaI-PFGE of the 30 Salmonella Kentucky and 30 non-serotyped isolates obtained from commercial layer poultry farms in Bangladesh, 2009–2010.

http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0035914
QUALITY MANAGEMENT SYSTEM
• Quality assurance resides independent of manufacturing and operations and resides within process management

• Proactive activities

• Intended to prevent the production of noncompliant poultry products

• Quality control resides within manufacturing and operation

• Reactive activities

• Detect and set aside noncompliant poultry products using inspection and testing, and quality control
Quality assurance

- Safe and quality input materials
- Calibration and cleaning of essential equipment
- Waste removal
- Vehicle inspection
- Good manufacturing and good hygienic practice audit
- Managing product-testing and results
- Packaging and label auditing
- Managing customer complaints
- Visiting customer establishments
- Shelf life studies
- Nutritional profiling.

Quality control

- Meat identification
- Freshness control
- Grading
- Identify residues and biotoxins,
- Standard size control
- Defectives check
- Identifying indicator organisms and pathogens

\[
R = 1 - e^{-\frac{AF}{I+D}} \\
P = I + D \\
(\alpha + \beta X_i + \epsilon)_k = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}
\]
Microbiological tests:

- Indicator organisms: Coliforms, Enterobacter species, Staphylococcus, lactic acid bacteria, yeast and mold
- Pathogens: Salmonella, Campylobacter, Listeria, E. coli, STEC

Chemical tests:

- Contaminants: pesticides, antibiotics, drugs, veterinary residues, heavy metals
- Allergens, including gluten
- Proximates (ash, fat, protein, moisture salt)
Nutritional tests and quality indicators:

- Full nutritional panels (calories, carbohydrates, fat and fatty acids)
- Minerals (calcium, iron, phosphates, sodium nitrate)
- Bone percentage
- Added water, added phosphate
A poultry pathway

GAP, GHP
Quality management system

Self-developed system
Quality programs used in the industry

General quality management systems provide quality control tools used in the industry

• These include Total Quality Management (TQM)
• Zero-defect systems
• Six sigma,
• HACCP

Only portions of the systems have been implemented to any extent after tailoring in the poultry-processing industry

(Dr. Fred Benoff, in Broiler Industry Magazine)
General quality management systems are based on statistical principles, it is applied during the production process in the attempt to provide real-time data to allow the process to be corrected before many defects are created.

X bar charts, R bar charts, histograms, attribute charts, moving-average and range charts, process capability charts, Pareto diagrams, and other tools. Using one or more of these enables a process operator the opportunity to take data, analyze them.

Risk analysis and Simulation
Regardless of self-developed system or quality programs used in the industry

The processor should maintain

• Quality department and

• Comprehensive quality management manual - that includes quality assurance and quality control and other functions
The economics of quality

Value chain

Consumer satisfaction

A company should conduct periodic audits to determine the financial, as well as other, benefits of the quality program.
Challenge to poultry industries – providing poultry originated foods in a form suitable for distribution and mass production without affecting texture, flavour, and color, is technically complex and expensive.
Best Practices Goals

• Mitigate food safety risks
• Ensure high quality products
• Meet customer specifications
• Exceed customer expectations
• Grow business
Thank You!

Denmark

Danpo, Aars
- Slaughterhouse (air-chilled)
- Cutting
- Fresh whole bird
- Fresh/Frozen cuttings
- 75 contracted, independent Danish chicken farmers
- Slaughter capacity 55 million
- chicken/year
- Capacity 26,000 tons/year

Danpo, Farre
- Headquarter Denmark
- Value-adding processing
- Cooked, fried, battered...
- and much more!

\[ R = 1 - e^{-\frac{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon}{\sigma^2}} \]
\[ P = I \ast D \]
\[ (x + \alpha)^n = \sum_{k=0}^{n} \binom{n}{k} x^k \alpha^{n-k} \]