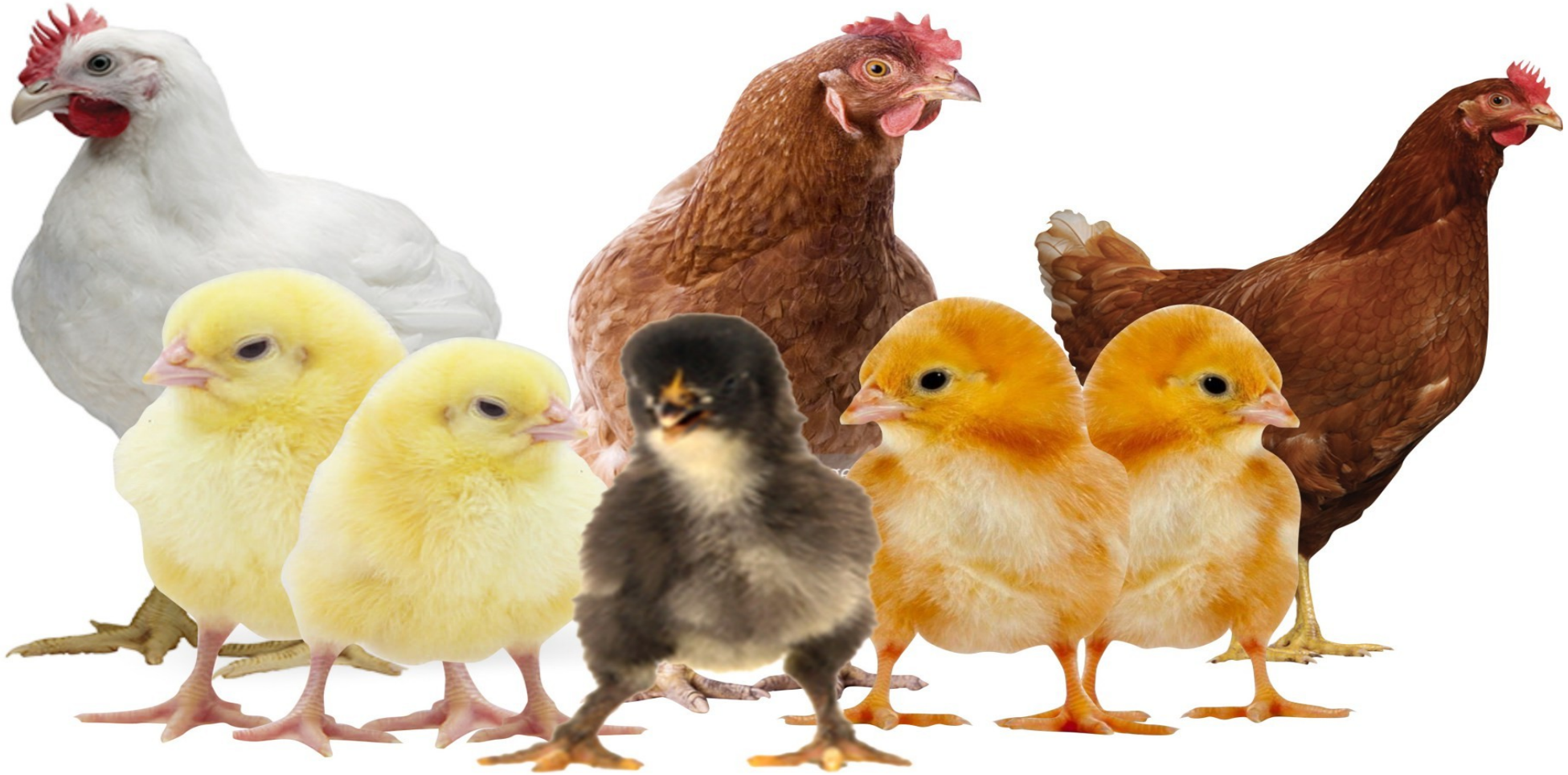
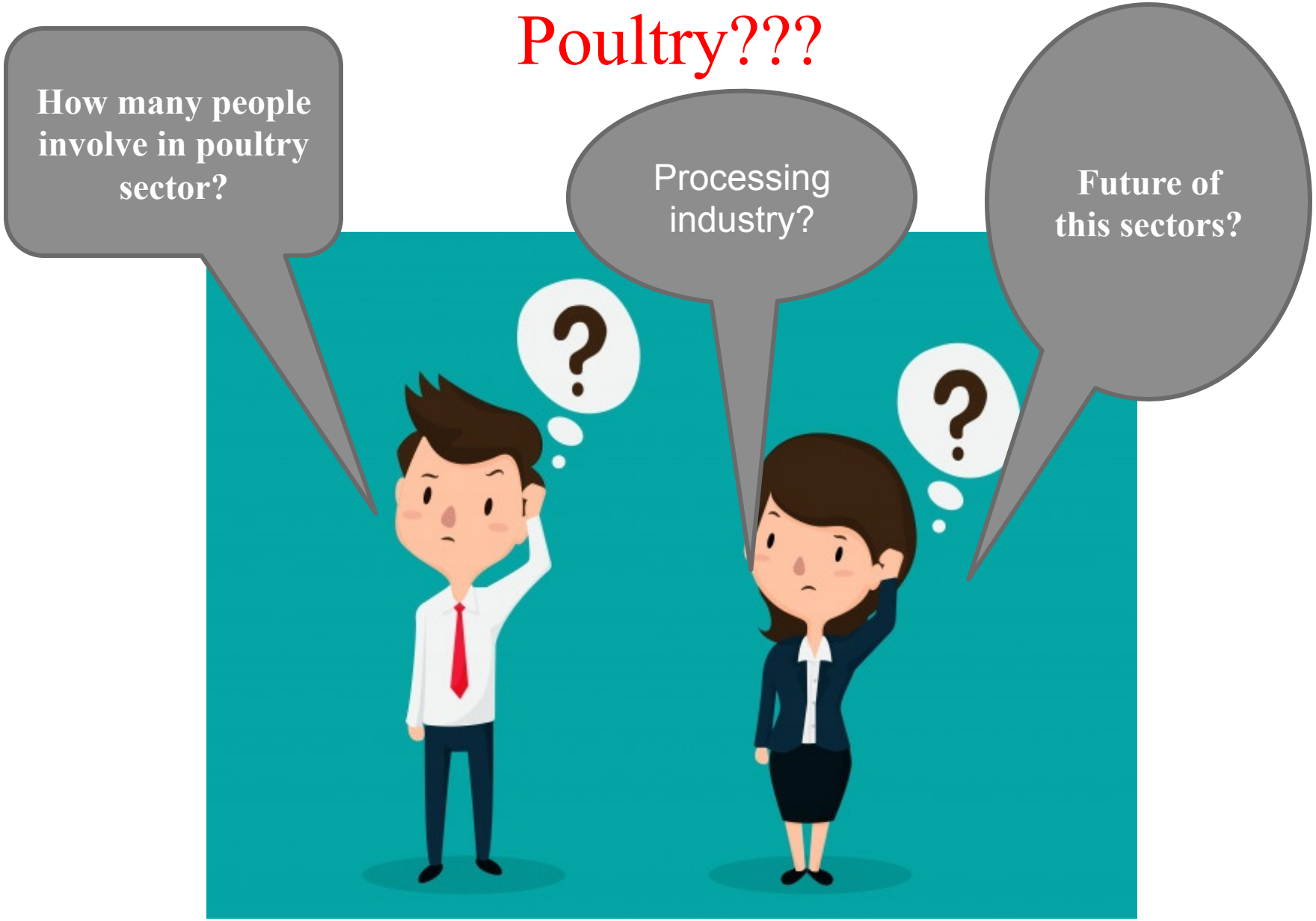
Poultry Processing



Poultry???


How many people involve in poultry sector?
Processing industry?
Future of this sectors?

Current Information

Bangladesh's poultry sector is gearing up to export eggs and poultry meat by 2024.

One million entrepreneurs and eight million people, involved in poultry sector.

The country will require 17 billion eggs, 2 million tons of poultry meat, 85.8 million day-old chicks, and 7.9 million MT of feed to meet the demand by 2021,

Department of Livestock under the Livestock and Fisheries Ministry, says country is already producing 15.52 billion eggs against the current annual demand of 17.13 billion.

The poultry sector supplies 36-40% of total protein intake through meat and egg consumption. Yearly, 95 eggs are eaten per capita, while consumption of chicken stands at 6.5kg.

Over 400 mills are supplying 3.61 million tons of feed, meeting up to 96% of annual poultry feed demand while the remaining 4% demand is met by imported feed and homemade feed-mix.

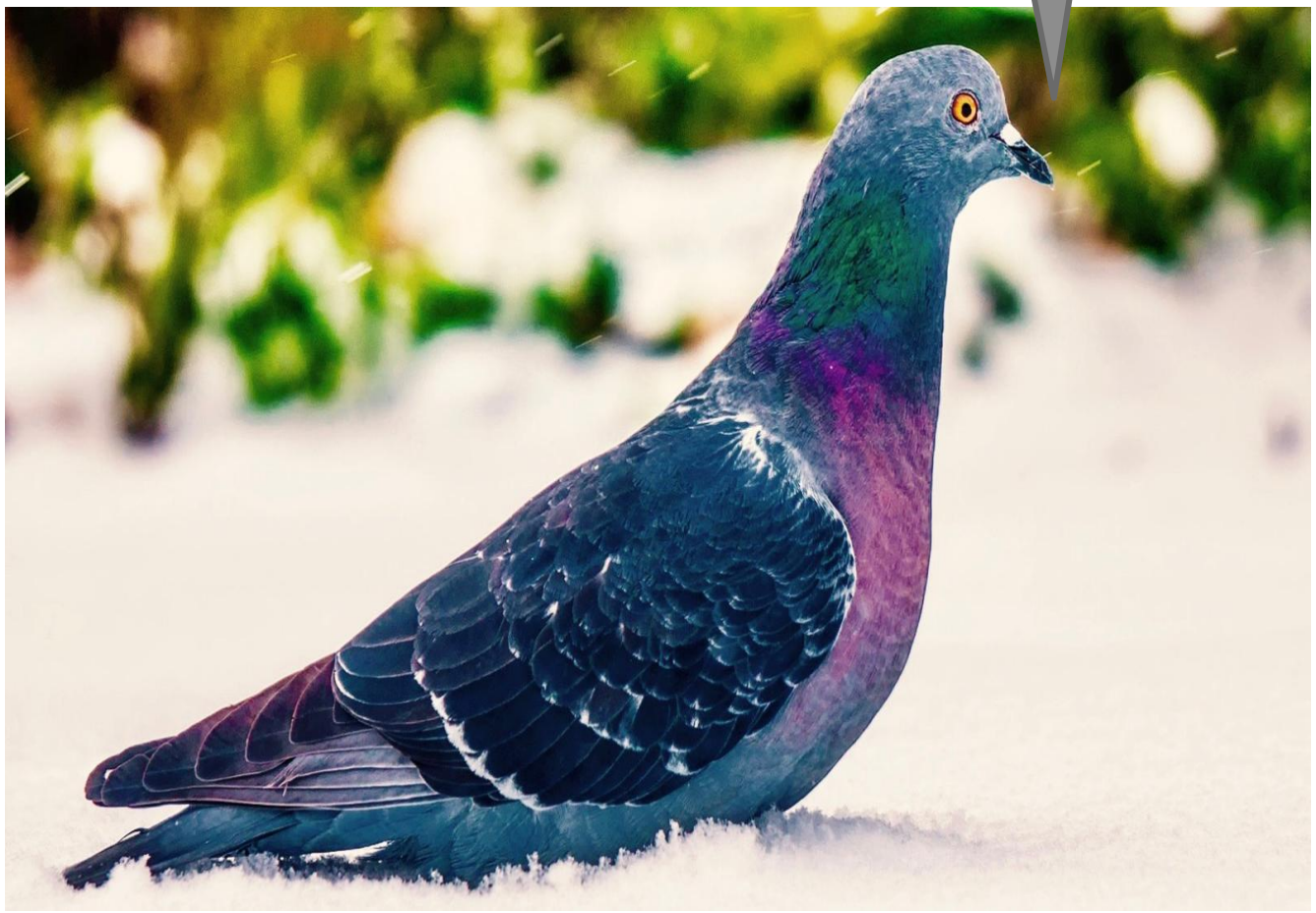
Source: (United States Department of Agriculture (USDA)

Poultry

Poultry can be defined as domestic fowls, including chickens, turkeys and ducks, raised for the production of meat or eggs and used as food.

Poultry is the generic term used for farmyard birds, notably chicken, turkey, duck, goose, guinea fowl and squab.

Is Pigeon A Poultry?



Classification of Chicken on The Basis of Production

1. Layer: Layer is for egg production. Some popular layer breeds are Leghorn, Minorca, Fayoumi, Isa Brown, Babycock, Star Cross etc.

2. Broiler: Broiler chicken are only for meat production. Plymouth rock, Cornish, White rock, Sussex, Dorking, Cochin, Brahma, Asil, Star Brow, Hi-line etc. are popular broiler breeds.

3. Egg and Meat: This types of breed are used for the purpose of both egg and meat production. Rhode island red, New Hampshire, Plymouth Rock etc. are popular breeds for both meat and egg production.

Classification of Chicken According to Origin

Asiatic: Brahma, longson, cochin, asil etc.

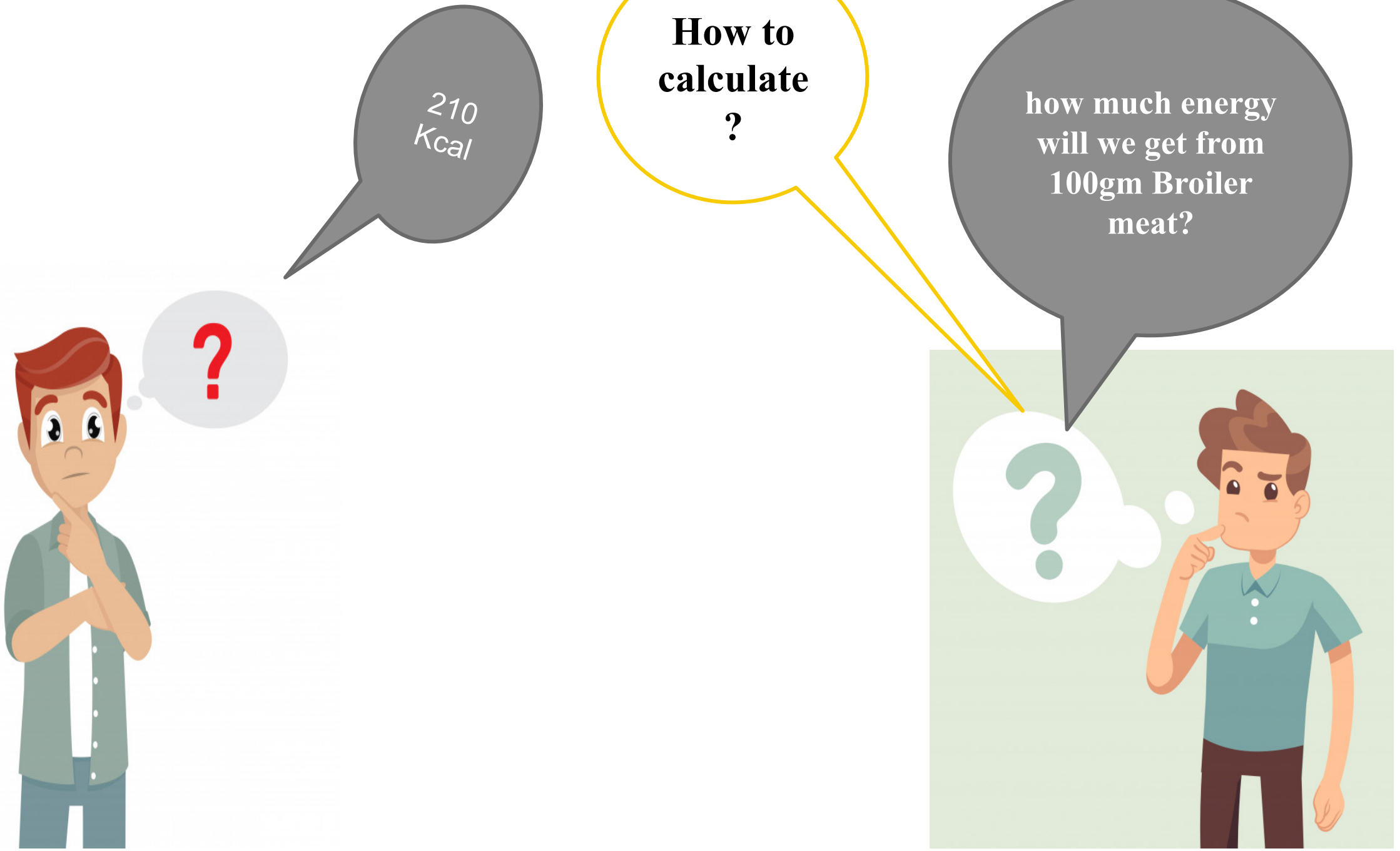
Mediterranian: Leghorn, minorca, fayoumi etc.

American: Rhode island red, new hampshire, plymouth rock etc.

*****Mediterranean Country: Spain, France, Italy, Slovenia, Croatia, Bosnia and Herzegovina, Montenegro, Albania, Greece, Turkey, Syria, Lebanon, Israel, Egypt, Libya etc.**

Composition of Meat (100gm Edible Portion)

Nutrient	Broiler	Turkey	Duck
Water	65-66	70-71	48-49
Protein	18	20	11-12
Total Lipid	15	8	39-40
Carbohydrate	Nill	Nill	Nill
Fibre	Nill	Nill	Nill
Ash	0.80	0.90	0.68
Energy (Kcal)	210	155	404


210 Kcal
?
How to calculate ?
how much energy will we get from 100gm Broiler meat?
?

How To Calculate, How Much Energy Will We Get From 100gm Poultry Meat?

We Know that,
1gm carbohydrate gives = 4Kcal
1gm Protein gives = 4Kcal
1gm fat gives = 9Kcal
Now,
Energy= carbohydrate x 4 + Protein x 4 + Fat x 9

= 0 x 4 + 18 x 4 + 15 x 9
= 72 + 135
= 207 Kcal.

Composition of Meat

Water 65%

Protein18%

Total Lipid15%

Carbohydrate 0%

Fibre0%

Ash 0.8

Energy(Kcal) 210

Nutritional Value of Poultry Meat

Good source of protein above 12%

Lower percentage in fat

Excellent source of essential amino acids

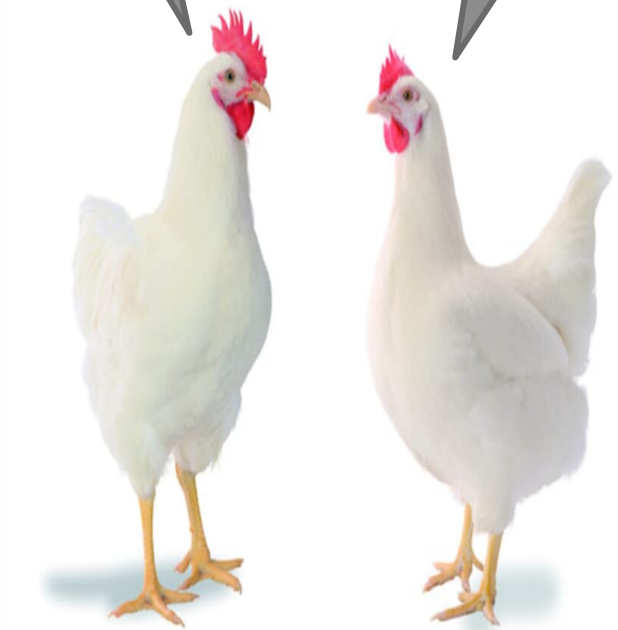
Also a good source of

- Phosphorus, iron, copper, zinc, B vitamins (B_{12} & B_6)

Poultry skin have higher in fat.

How to process me?

Don’t worry. It involves many steps.



Processing

Processing Steps

Pre-slaughter Care and Handling

Ante-mortem inspection

Shackling of each bird by the legs

Stunning with halal method/others

Bleeding

Scalding

Picking

Removal of pinfeathers

Evisceration

Chilling in ice water

Post-mortem inspection (Quality)

Packaging

Pre-slaughter Care and Handling

A great care has to be exercised in catching and crating the birds. All feeders, waterers and other accessory equipment should be moved to one corner of the house before catching and assembling is undertaken.

- The broilers are generally caught at night under very dim light.
- Culled and .spent hens are caught in the cooler hours of the day, preferably in the afternoon.

Transportation

- Crates, coops or cages are used to transport bird in vans from the farm to poultry dressing plant. Special attention is paid to prevent overcrowding and suffocation.
- The loading of birds is carried out in dim light either early morning or late evening to avoid excitement and transported in the cool period without much exposure to sun to prevent excessive shrinkage.
- Birds should be kept off feed for 12 hrs before slaughter but enough shrinkage water should be made available.

Ante-mortem Inspection

The term ante-mortem means “before death.”

Ante-mortem inspection is the inspection of live animals and birds prior to being slaughtered.

All livestock must receive ante-mortem inspection.

Ante-mortem inspection of poultry is performed on a lot basis.

Ante-mortem (AM) inspection is performed either by a Food Inspector under veterinary supervision.

Which Criteria Should Check During Inspection?

Inspection is carried out to two sides of body, both when the animals make moves and when they do not.

Inspection result is only valid for 24 hours;

If slaughter is delayed, a new inspection should be carried out.

Animals which are considered sick with no clear information of the disease should be under surveillance and separated from other healthy animals,

The things to inspect include:

- general behavior,
- nutrition status,
- body cleanliness, and
- symptoms of disease or abnormality.

Which Criteria Should Check During Inspection?

1.**Unfit for slaughter:** Birds with morbid condition due to clinical evidence of a contagious disease, heat stroke or traumatic injury which cannot be treated are declared unfit for slaughter.

2. **Suspects:** Birds affected with disease conditions not advanced enough to declare unfit are passed for slaughter as suspect.

Table: Ante mortem significance of poultry disease

Disease	Unfit for slaughter	Passed for slaughter as suspect
Fowl cholera	Birds with septicemia form	All others
Fowl pox	Birds in debilitated and febrile condition	All others
Fowl typhoid	All affected birds	-
Infectious bronchitis	Birds in advanced stage.	Recovered birds.
Infectious enter hepatitis (Black head disease of turkey)	Birds showing symptoms	Slight involvement and Recovered birds.
Ornithosis	All affected birds	-
Infectious laryngotracheitis	Birds in advanced stage with cyanosis.	Birds with initial signs of disease or evidence of recovery

Shackling

Poultry meat processing is initiated by hanging, or shackling, the birds to a processing line.

Birds are transferred from coops or transport cages to a dark room

- where they are hung upside down from shackles attached to an automated line.

Stunning

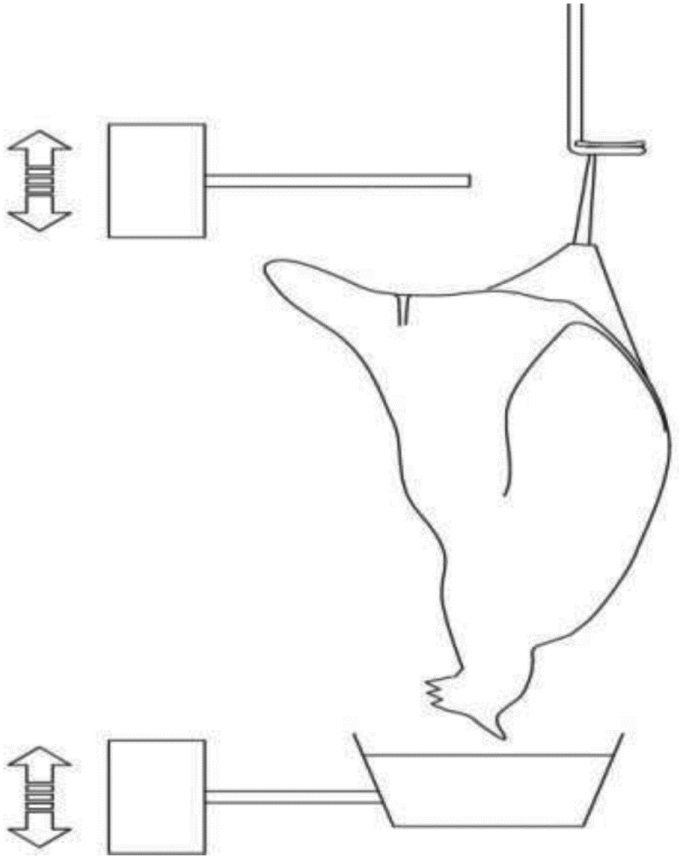
Electrical stunning: Delivers a current through a water bath to deem the bird unconscious. The current should be compliant with minimum recommended current / bird.

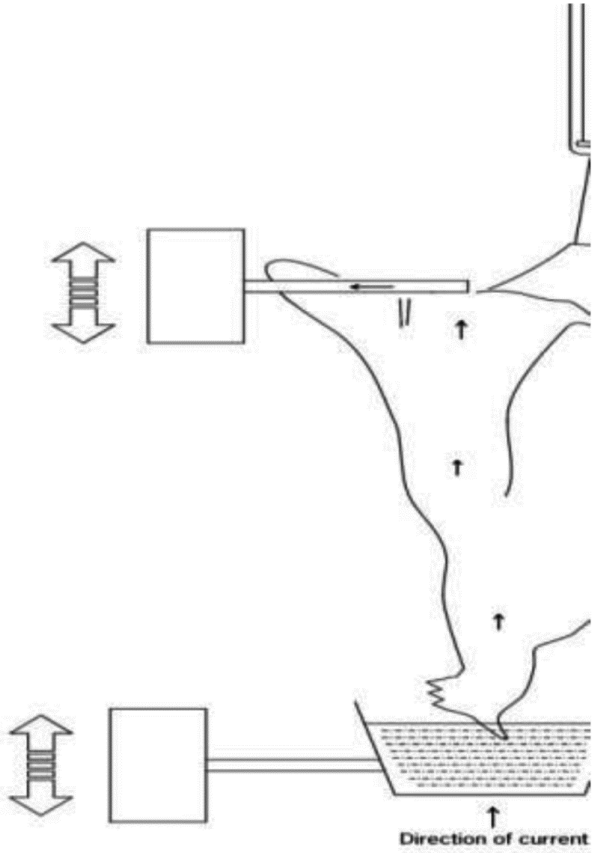
Controlled Atmosphere Stunning: Gas stunning is another form of stunning. Birds are immersed in an approved gas or mixture of gases (i.e., CO2) in order to displace Oxygen and render the bird unconscious.

Minimum Electricity Load For Effective Stunting

Example 1:	**Broiler chicken** (thinner, softer skull; wide, soft-scaled shanks that fit closely in shackle)
Voltage applied:	250 V RMS
Electrical resistance of circuit, including bird:	2500 Ω
Resulting current:	100 mA RMS
Outcome for bird welfare:	Effective stun
Example 2 (Wotton & Wilkins, 2004; AWTraining, 2008)**:**	
Voltage applied:	160 V RMS
Electrical resistance of circuit, including bird:	1600 Ω
Resulting current:	100 mA RMS
Outcome for bird welfare:	Effective stun

Electrical Stunning



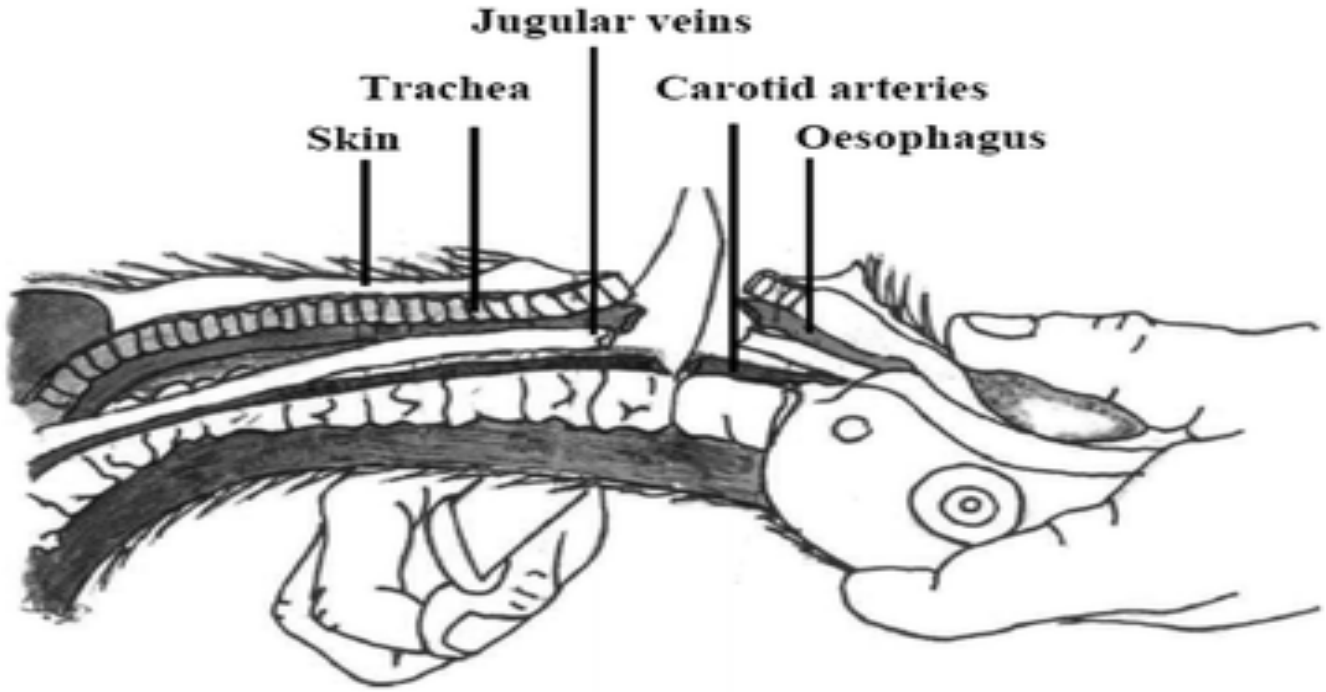


Bleeding

After stunning, the birds are passed through an automated knife that makes an incision on the neck to cut the jugular vein.

With the carcass hanging upside down and the jugular vein cut, the majority of the blood is drained from the carcass.

Bleeding: In. general, a bleeding time of 1.5 to 2.0 minutes is allowed incomplete bleeding retards the keeping quality of dressed chicken.



Scalding

Broiler and young birds are Scalded at 55°C for 1.5 minutes whereas culled birds and spent, hens are scalded at 60°C for 2 minutes. Scalding helps to loosen the feathers to facilitate their removal.

This high water temperature serves to loosen the connection of feathers to the skin.

Picking

- Picking is a term that refers to feather removal.
- The picker removes the feathers on the carcass.
- The picker is an automated machine that contains rubber finger-like projections that rotate in a circular motion to remove feathers without damaging the carcass. Removal of feet, head, neck and oil glands.
- Feet are removed at the knee joints.
- The head is cut and removed.
- The neck is cut by machine.

Evisceration

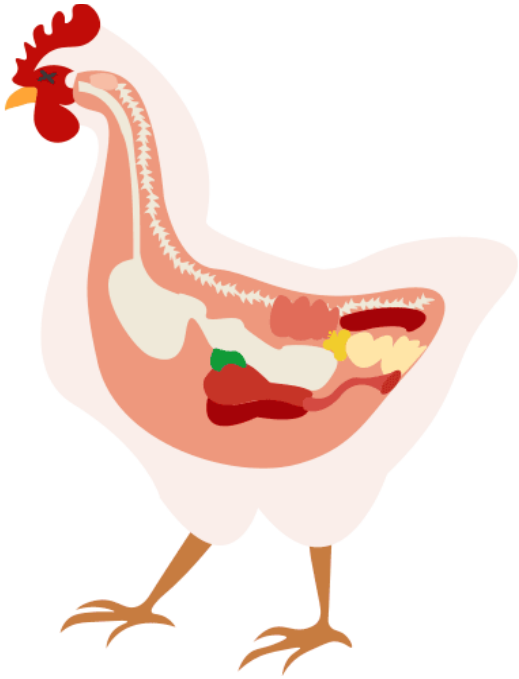
- Evisceration refers to the removal of internal organs.
- The inedible viscera consists of the spleen, esophagus, lungs, intestines and reproductive organs.
- The intestines (viscera) are federally inspected for signs of disease or other problems.
- Identified disease or other problems results in the removal, or condemnation, of the carcass from the processing line.
- The edible viscera, or giblets, consists of the heart, liver, and gizzard.
- The giblets are packaged in the carcass or sold separately.

Washing The Carcass

The carcasses are cleaned for microbial and visible concerns.

Washing of the carcass done by water.

When processing chicken, microbial bacteria such as E. Coli and Salmonella are analyzed.



Chilling

- **The carcass temperature must be reduced to prevent microbial growth.**
- **Chilling& Draining: After washing, the dressed birds are chilled in a chilling tank Containing slush ice or crushed ice for 30-45 minutes in order to cool the carcasses to an internal temperature of about 4°C**
- **The USDA specifies the amount of chilling for specific bird sizes.**
  - ✓4 lb broiler: 40F within 4 hours
  - ✓4-8 lb broiler: 40F within 6 hours.
  - ✓ >8 lb broiler: 40F within 8 hours.
- **Submerging the carcass in an ice (chilled) water bath is the most common method of carcass chilling.**
- **Carcass can also be chilled by air chilling.**
- **Air chilling occurs by passing cold air over the carcass.**
- **This is a more expensive process but some consumers are willing to pay more for air chilling.**

Packaging


PERDUE
FRESH CUTS
THIN SLICED
CHICKEN BREAST
NO ANTIBIOTICS EVER
PERDUE
CHICKEN BREAST STRIPS
NO ANTIBIOTICS EVER
ALL NATURAL
PERDUE
CHICKEN BREASTS
NO ANTIBIOTICS EVER
5 INDIVIDUALLY WRAPPED PIECES
ALL NATURAL
PERDUE
CHICKEN BREASTS
NO ANTIBIOTICS EVER
PERDUE
GROUND TURKEY
NO ANTIBIOTICS EVER
PERDUE
GROUND CHICKEN
PERDUE
CHICKEN BREAST TENDERLOINS
NO ANTIBIOTICS EVER

Halal Cutting of Chicken

Islamic law requires that animals intended for human consumption be slain in a certain manner.

Halal slaughter is was one of the more humane methods available to the meat industry and the only method acceptable for Muslim consumers.

The conditions for Halal slaughter can be summarized as follows:

- The animal to be slaughtered must be from the categories that are permitted for Muslims to eat.
- The animal must be alive at the time of slaughter.
- In general, all forms of stunning and unconsciousness of animals are disliked.
- Stunning through a device with a non-penetrating round head, in a way that does not kill the animal before its slaughter, is permitted.

Halal Cutting of Chicken

- The animal must be slaughtered by the use of a sharp knife. The knife must not kill due to its weight. If it kills due to the impact the meat may not be permissible.
- The windpipe (throat), food-tract (oesophagus) and the two jugular veins must be cut.
- The slaughtering must be done in one stroke without lifting the knife. The knife should not be placed and lifted when slaughtering the animal.
- Slaughtering must be done by a sane adult.
- The name of Allah must be invoked (mentioned) at the time of slaughtering by saying: Bismillah Allahu Akbar. (In the Name of Allah; Allah is the Greatest.)

Halal Cutting of Chicken

- If at the time of slaughtering the name of anyone else other than Allah is invoked (i.e. animal sacrificed for him/her), then the meat becomes Haram “unlawful.”
- If a Muslim forgets to invoke the name of Allah at the time of slaughtering, the meat will remain Halal. However, if he intentionally does not invoke the name of Allah, the meat becomes Haram.
- Skinning or cutting any part of the animal is not allowed before the animal is completely dead.
- Slaughtering must be made in the neck from the front (chest) to the back.

Halal Cutting of Chicken

- The slaughtering should not be done on a production line where pigs are slaughtered. Any instrument used for slaughtering pigs should not be used in the Halal slaughtering.

Storage, Processing and Transport of Halal Meat

- Meat chilled or frozen for export to Muslims should be stored in separate cold stores other than those in which pork or other non-Halal meat is stored.

Kosher Slaughter

Kosher describes what is 'fit and proper' for people of the Jewish faith to consume.

- Kosher food laws are based on interpretation of the Bible and the Torah, the Judaic scriptures, and set out a range of beverages and foods (including meat) that are acceptable to drink and eat.
- For meat to be Kosher, the animal must be slaughtered in a particular way, so the Rabbi in a Kosher abattoir is a specially trained religious slaughterer.
- The animal must be killed so it feels little pain.
- A very sharp knife is used to cut the oesophagus, the trachea, carotid arteries and jugular veins in one smooth action.
- There must be no pause during the action nor excessive pressure on the blade.
- Failure to meet these specific requirements renders the animal unkosher.
- Animals must be effectively stunned (unconscious) prior to slaughter

Spoilage of Poultry Meat

Sources of contamination

- **Fecal** contamination from intestines.
- Unhygienic **processing area**
- Contamination from **Cutting board**
- **Conveyor belts**
- Due to high **Temperature**
- Delay **between** storage and distribution

Spoilage Types

A. Slimy spoilage

This occurs on the surface and is caused by the buildup of cells of **yeasts, lactobacilli, enterococci** or ***Brochothrix thermosphacta***.

Washing the slime off with **hot water** can restore the product quality.

B. Sour spoilage

Results from **growth of lactic acid bacteria** (which originate from contaminated ingredients like milk solids.

These organisms ferment **lactose and other carbohydrates** to produce organic acids. **Taste** is adversely affected but the product is not harmful if eaten.

C. Greening

This occurs due to **H_2O_2 or H_2S** production.

Because greening indicates more extensive product breakdown, it is **not recommend eating.**

Poultry Products

Fresh poultry

The birds are generally cut into a number of pieces, which are placed on plastic foam trays and covered with a plastic film. Fresh poultry should be used within 14 to 21 days after slaughter and generally should not be kept in the home refrigerator for more than three days.

Poultry Products

Frozen Poultry

It is vacuum-packed in plastic bags and then frozen in high-velocity freezers.

The birds are kept in cold storage until needed.

Before freezing, poultry may be injected with various salts, flavorings, and oils in order to increase the juiciness of the meat. Injections are usually done with a multi-needle automatic injector, and information about the added ingredients is indicated on the package label.

Poultry Products

Processed Poultry

Poultry may be further processed into other products.

Battering and breading

Some poultry products are battered (e.g., with beer batter) or battered and breaded (e.g., with cracker meal, bread crumbs, or cornmeal) for frying.

The meat may be either cooked or raw prior to coating. For battered and breaded poultry, the pieces are passed through a flour-based batter containing leavening and then through the breading ingredients.

To hold the breading to the poultry, the product is deep-fried for a short time.

If the poultry is fully cooked in this process, the consumer will only have to heat the product before eating it. Eg: Chicken nuggets

Poultry By-products

A. Poultry dressing plant waste (on live weight).

i. Feathers 6%

ii. Blood 3.5%

iii. Offal

a. Heads 3%

b. Feet 4%

c. Inedible viscera 9% (intestines, lung, pancreas, spleen etc.)

B. Hatchery waste: Infertile eggs, dead in germs, dead embryos, egg shells.

C. Egg processing unit waste: Unsound eggs and egg shells.

D. Poultry manure

E. Dead birds

Poultry By-products

Because **prions** that cause bovine **encephalopathy** (Mad Cow Disease) have not been identified in birds, poultry by-products can be fed to all animals.

Prions are **misfolded proteins** with the ability to transmit their misfolded shape onto normal variants of the same protein.

Feathers

As Fertilizer: As fertilizer Feathers are crushed and cooked under pressure to yield a good quality fertilizer. In places where cooking is not cost effective but irrigation is not a problem, feathers can be ploughed in the soil to slowly decompose and release nitrogen.

As livestock feed: Poultry feathers are hydrolyzed to yield feather meal in by-product processing plant. Since feather meal has a poor amino acid profile, feathers are generally processed with blood.

Poultry By-products

Blood

As fish bait: Blood can also be used as a bait during fishing operations.

As livestock feed: blood meal alone is not so palatable to the livestock, blood and feathers are usually cooked together in a by-product processing plant. Blood and feather meal has a rich amino acid profile and very good digestibility.

Other by-products from the processing of poultry are also combined into **animal feed ingredients.**

The **viscera** (internal organs), head and feet are available from all poultry.

In addition, further processing of poultry produces **bones** from the whole bird.

Poultry **by-product meal** has a high percentage of viscera and low percentage of bone. As a result, the protein is high, and the mineral or ash content is lower.