

SAIT

Polytechnic

Equipment, Testing Devices and Critical Production Hurdles

Fermented and Dry Cured Meats

Equipment in the Charcuterie Lab

- pH Testing
- Aw Testing
- Fermenting Chambers
- Pathogen Safety Hurdles
- Product Classifications
- Production Logging Procedures

Equipment in the Charcuterie Lab - pH Testing

- pH refers to the acidity of a product
- Pathogen growth can be controlled by controlling pH of a product
- pH affects flavour of a product & bacterial growth
 - The lower the pH the more tangy (acidic) the flavour

Equipment in the Charcuterie Lab - pH Testing



Equipment in the Charcuterie Lab - pH Testing



Equipment in the Charcuterie Lab - pH Testing

- Take many samples from the product using a freshly calibrated machine . Product with larger fat particulation may cause a challenge in getting a consistent reading. Fat will not drop in pH as the protein will.



*Operate as per the manufactures manual.

Equipment in the Charcuterie Lab - Aw Testing

- Water activity is the water in food which is not bound to food molecules. This can allow the growth of bacteria, yeasts and molds (fungi). The term water activity (aw) refers to this unbound water.



Equipment in the Charcuterie Lab - Aw Testing

With a calibrated Aw meter, product is diced very fine and placed in low sample cup. The meter is placed over the cup and the test is started. The meter will alarm & display the result when finished.

*Operate as per the manufacture's manual.



Equipment in the Charcuterie Lab - Fermenting



Equipment in the Charcuterie Lab - Fermenting

- Small to very large operations



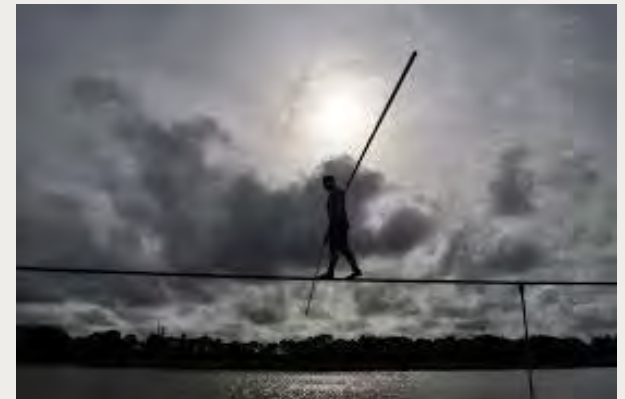
Equipment in the Charcuterie Lab - Fermenting

- To hobby fermenting



Equipment in the Charcuterie Lab - Fermenting

- Fermentation is the time in production of fermented meat product where all the general food safety rules are NOT obeyed.
- Temperatures and humidity are at levels where bacterial growth is being greatly promoted.
- Only through a drop in pH and monitoring of temperature and time can this transformation be done in a safe manner.



Pathogen Safety Hurdles

Pathogen	Min Aw (using salt)	Max pH
Bacillus	.92	4.3
C. Bot	.935	4.6
C. Perfringens	.93	5
E-coli	.95	4
Listeria	.92	4.4
Salmonella	.94	3.7
Staphylococcus	.83	4

Aw and pH are taken separately

A_w and pH Requirements for Pathogen Control

Shelf Stable

- pH of 4.6 or less regardless of A_w
- A_w of .85 regardless of pH
- pH <5.3 and A_w <.90

A_w and pH Requirements for Pathogen Control

Fermented Dry

- Does not require refrigeration
- CFIA listed starter culture
- pH <5.3 and A_w <.90
- Min 2.5% salt
- Complies with degree hours
- 100-200ppm nitrate/ nitrite

A_w and pH Requirements for Pathogen Control

Fermented Semi-Dry

- Must be refrigerated
- pH <5.3
- A_w >.90
- Min 2.5% salt
- Complies with degree hours
- 100-200 ppm nitrate/ nitrite

A_w and pH Requirements for Pathogen Control

Air Dried/ Dehydrated

- Beef products must undergo heat treatment for e-coli, prior to drying
- Pork products must undergo trichinosis control measure
- Dependent on a_w
- Uncooked air dried product must meet requirements of fermented – dry products

Alberta Processed Meat Products Quick Facts

- [http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/fs14754/\\$FILE/quickfactsprocessedmeatproducts.pdf](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/fs14754/$FILE/quickfactsprocessedmeatproducts.pdf)

Hurdle Technology

- The use of varied techniques (together) to limit the opportunity for pathogen growth
 - Refrigeration
 - Cooking
 - pH
 - Aw
 - Water Binding
 - Spicing
 - Fermentation
 - Packaging and storage

Microbial Control by Refrigeration

- All raw materials are perishable at room temperature
- Room temperature is ideal for microbial growth
- By refrigerating product ($<4^{\circ}\text{C}$) bacterial growth is retarded
 - Listeria can grow at refrigerated temperatures

Microbial Control by Cooking

- Most pathogens are destroyed through cooking
- Spores produced by pathogens may survive
 - *Clostridium botulinum*
 - *Clostridium perfringens*

Limiting Temperatures for Pathogen Growth

Pathogen	Min Temp (C)	Max Temp (C)
Staph	7	50
E-coli	6.5	49.4
Botulism	3.3	48
Clostridium Perfringens	10	52
Salmonella	5.2	46.2
Listeria	-0.4	45

Microbial Control by pH

- Bacteria need proper pH to survive
- By lowering or raising pH certain bacteria can be controlled
 - pH 4.6 determines high and low acidity of products
 - Low acid products (meats, vegetables) have pH4.6 or higher
 - High acid products (fruits) have pH4.6 or lower

Limiting Pathogen Growth by pH Control

Pathogen	Min pH	Max pH
Staph	4	10
E-coli	4	10
Botulism	4.6	9
Clostridium Perfringens	5	9
Salmonella	3.7	9.5
Listeria	4.4	9.4

Microbial Control by A_w

- Water activity is concerned with unbound water remaining in and around cells
- Limiting free water limits the ability for microbes to grow

Microbial Control by Water Binding

- The use of non-meat ingredients to utilize water energy making it unavailable for microbial growth (of pathogens)
 - Salting and sugaring products are examples of water binding



Limiting Pathogen Growth by A_w Control

Pathogen	Min Water Activity (A_w) using salt
Staph	.83
E-coli	.95
Botulism	.935
Clostridium Perfringens	.93
Salmonella	.94
Listeria	.92

Spice Utilization to Limiting Pathogen Growth

- Some spices have the ability to inhibit microbial growth

	Staph	Botulism	Clos. P	Salmonella	E-coli
Allspice		X			X
Cinnamon	X				X
Clove	X	X	X	X	X
Cumin	X	X		X	X
Garlic	X		X	X	X
Onion	X				X
Rosemary	X	X			
Sage	X	X			
Thyme	X				X

Microbial Control by Fermentation and Biopreservation

- Fermenting meat products lowers pH and A_w
- Biopreservation is the addition of safe bacteria (starter cultures) to a product to compete with pathogens for limited growth resources
 - FATTOM



Parasite Control

■ Trichinella Control by heat

Minimum Internal Temperature (°C)	Minimum time
49	21 hrs.
50	9.5 hrs.
52	4.5 hrs.
53	2.0 hrs.
54	1.0 hr.
55	30 min.
56	15 min.
57	6 min.
58	3 min.
59	2 min.
60	1 min. ²
62	1 min. ²
63	Instant ²

Parasite Control

- Control by Freezing

Product Internal Temperature (°C)	Minimum Time (hours)
-18.00	106
-21.00	82
-23.50	63
-26.00	48
-29.00	35
-32.00	22
-35.00	8
-37.00	1/2

Mold Growth

- As a result of spoilage mold ammonia can be a byproduct which will alter/raise pH of fermented meat products.



Mold Growth

- Introduction of surface ripening molds can be very beneficial as well as adding an artisanal appearance.



Questions????



Resources

Quick Facts: Processed Meat. Retrieved March 5, 2014 from the Government of Alberta site

[http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/afs9851/\\$FILE/quick_facts_processed_meat_products_oct_2012.pdf](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/afs9851/$FILE/quick_facts_processed_meat_products_oct_2012.pdf)

FDA: Bacterial Pathogen Growth and Inactivation. Retrieved march 5, 2014 from the FDA site

<http://www.fda.gov/downloads/Food/GuidanceRegulation/UCM252447.pdf>