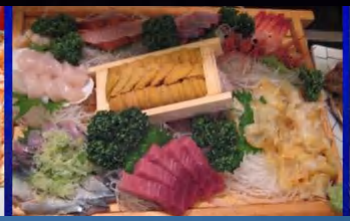
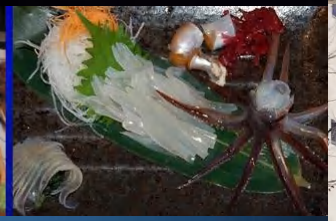
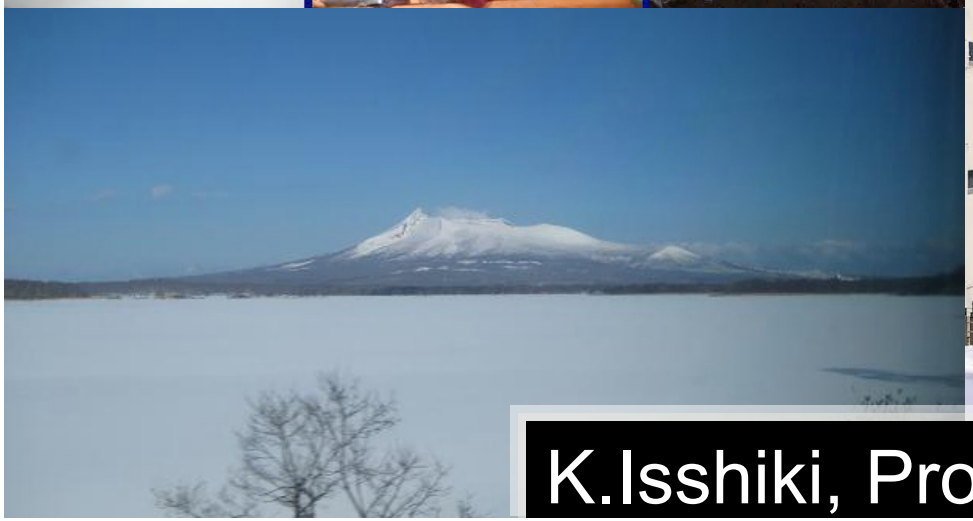
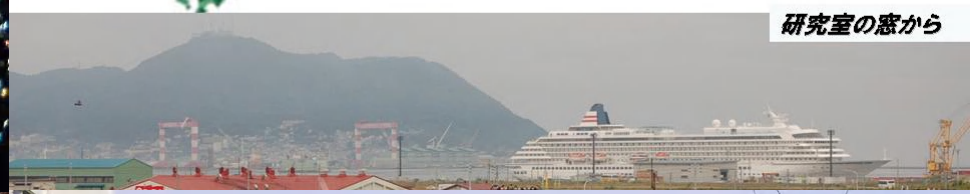
Hurdle technology for protecting foods in Japan









K.Isshiki, Prof.Ph.D, Hokkaido University

Various kinds of foods are eaten in Japan.
People can enjoy good foods easily in all seasons.

Outbreaks of Food Poisoning in Japan (2010, Population=127million)

	Outbreaks	Patients	
Total	**1,254**	**25,972**	**0**
Bacteria	580	23,803	0
Virus	403	14,700	0
Chemicals(Histamine etc)	9	55	0
Animal toxin	34	53	0
Plant toxin	105	337	0
Others	28	29	0
Unknown	95	2,079	0

Only a small percentage of actual foodborne illness cases ever get reported.

Jan.2011
One person was dead after eating *boiled-Fugu liver*.

The Fugu liver was cooked by a chef without Fugu-cooking license.

Enterohemorrhagic *E.coli* : EHEC Food Poisoning

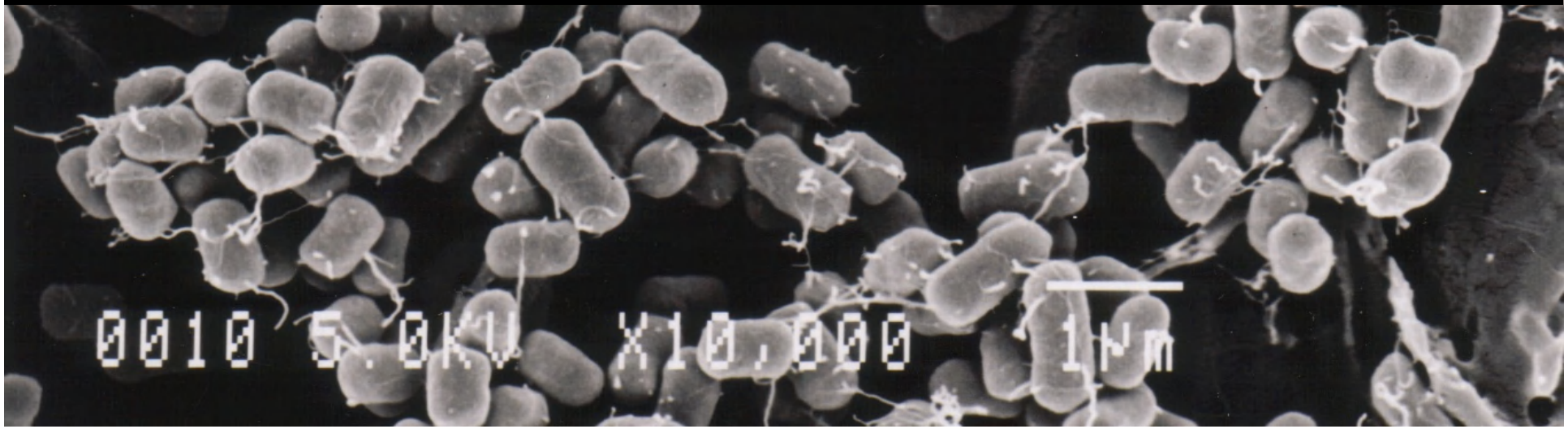
Japan

April 2011, O111, Raw beef, 5 deaths, >100 patients

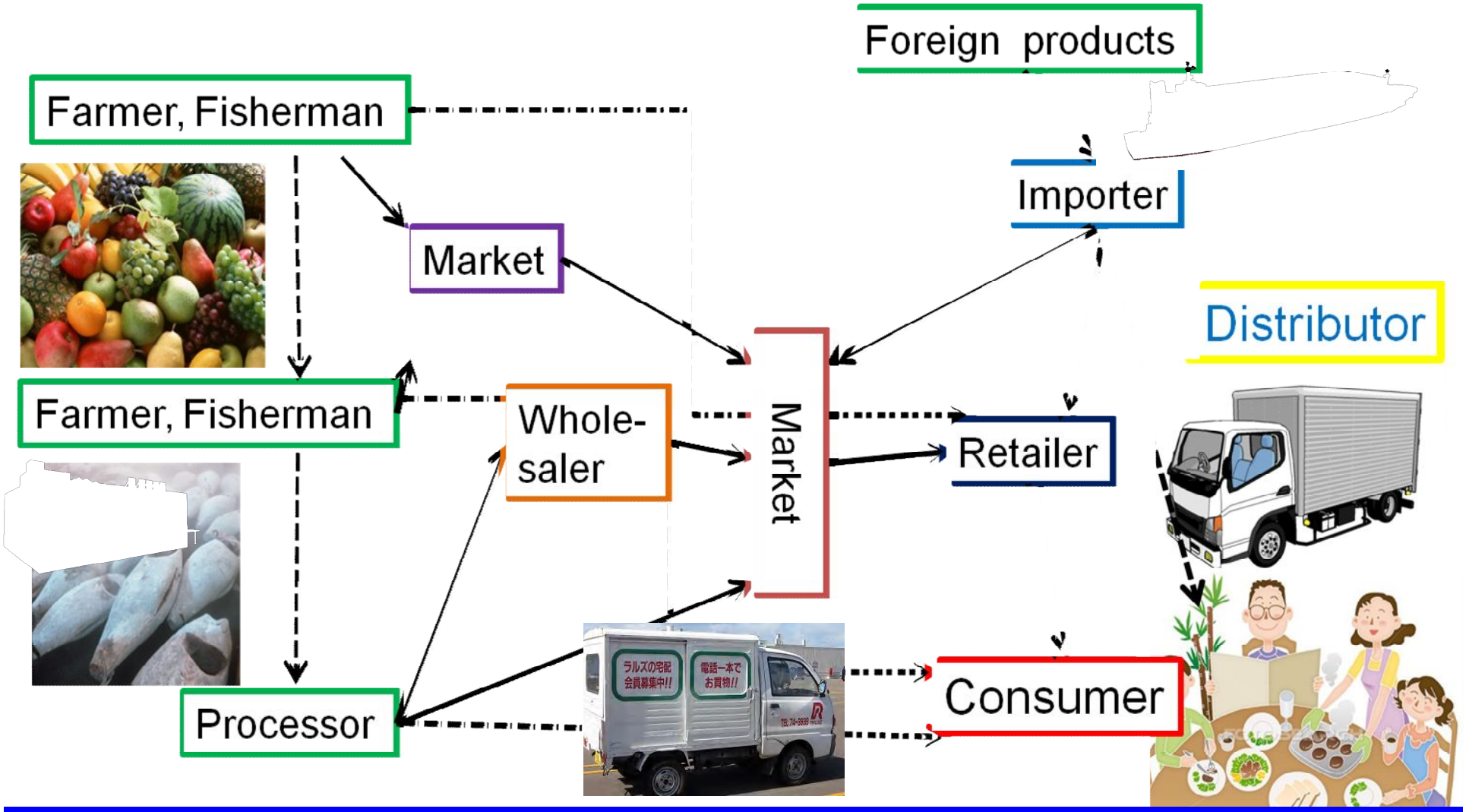
May 2011, O157, Dumpling, 1 deaths, >200 patients

EU

May 2011, O104, Sprouts, 52 deaths, >4000 patients



Food chain of Japan is world-wide.



Japan eats various kinds of foods including raw.
There is rare troubles such as food poisonings.

Japan has been developing cold-chain systems

Old fashioned refrigerators

Cold-room

Cold-truck

Cold-show case

Modern cold-chain system

The Standard for Seafood to Prevent Food Poisoning Caused by *Vibrio parahaemolyticus* (2001)

Cooking standard in general:
Washing with potable water.

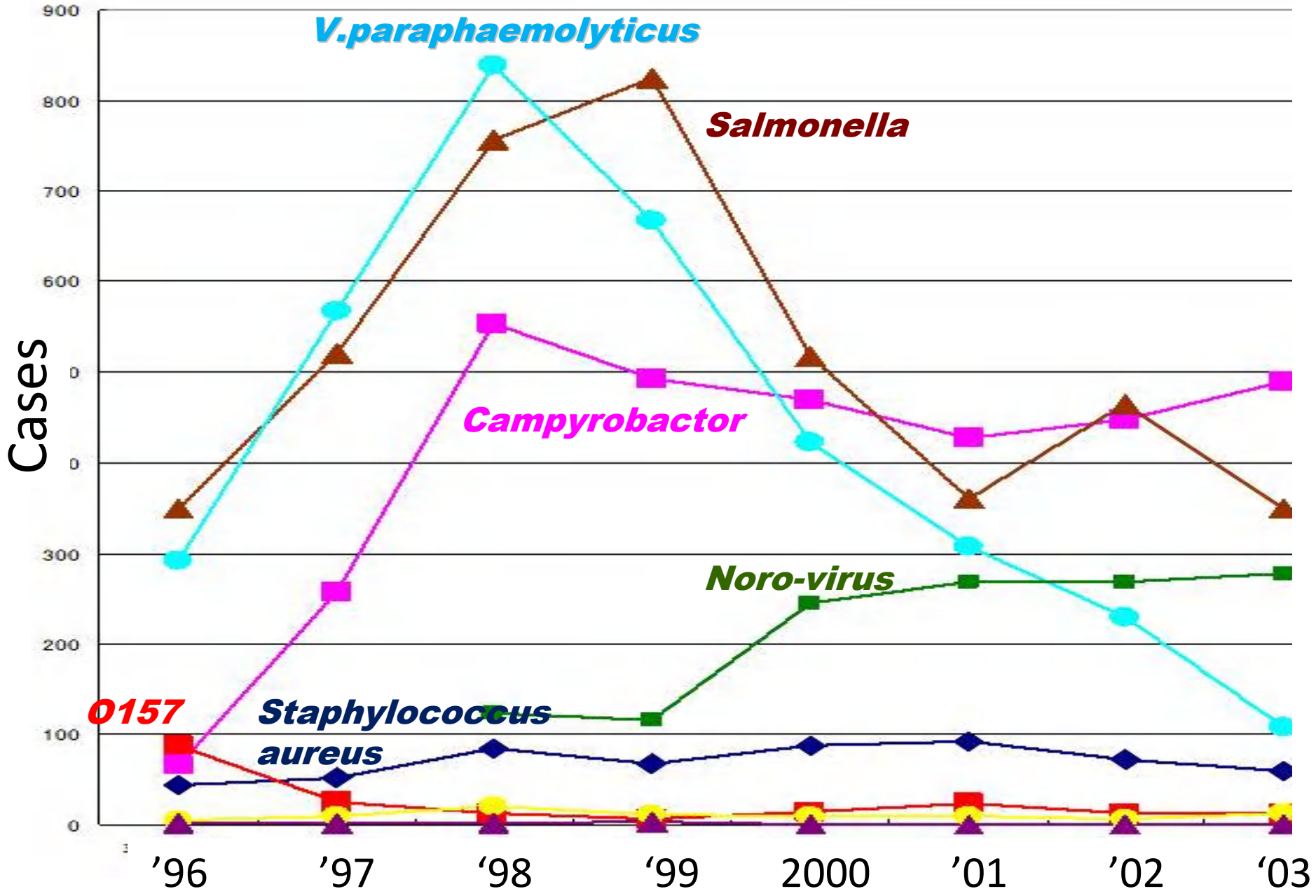
Ingredient standard:
Number of *V.paraheamolyticus* must be equal to or less than 100/g.

Processing standard:
Use potable water. When using sea-water, use sterilization sea-water or artificial sea-water.

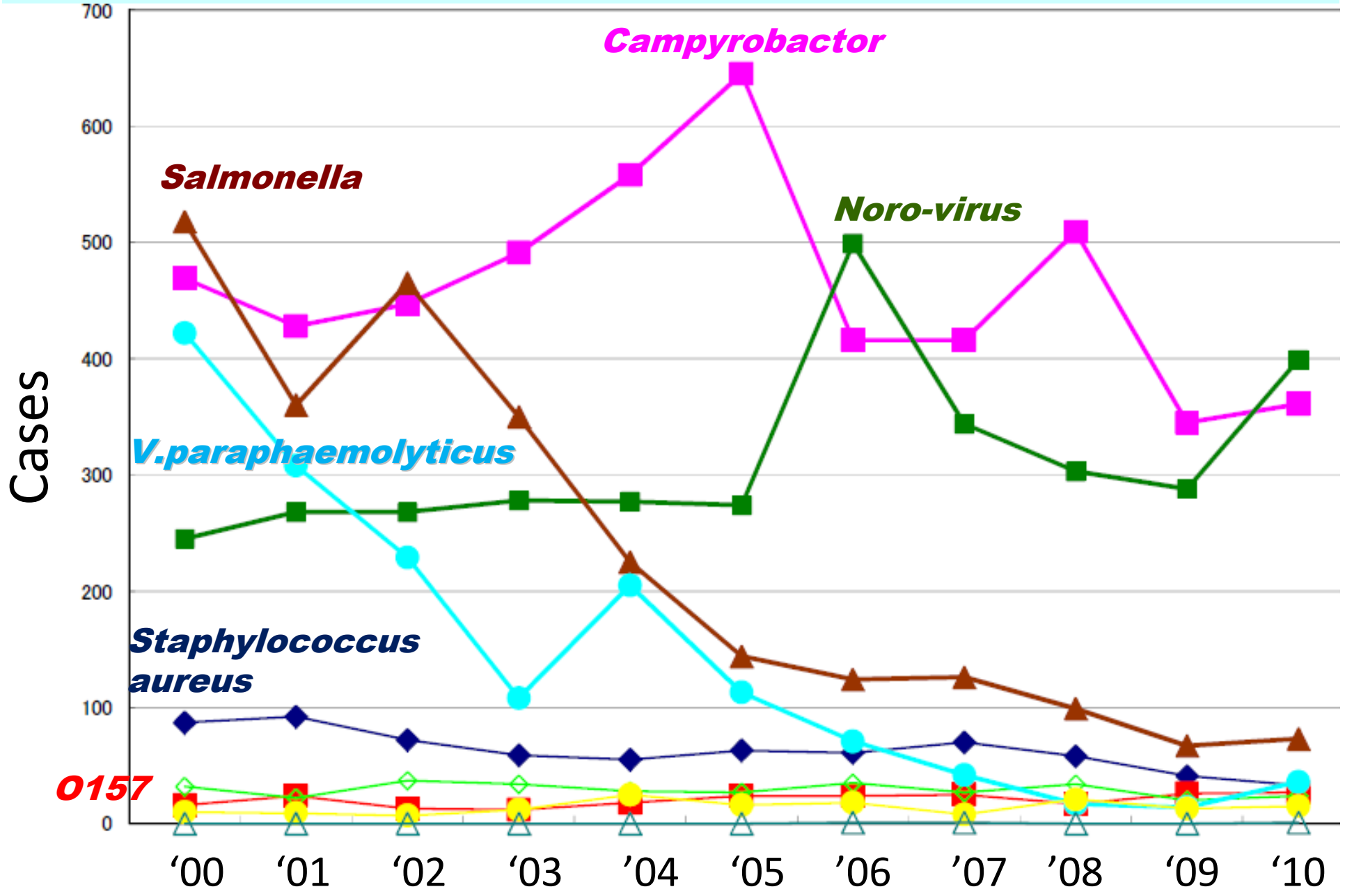
Preservation standard:
Fresh fish and shellfish product must be keep at equal to or less than 10℃.

Labeling standard:
It is necessary to show that it is able to eat in raw and keep it at equal to or less than 10℃.

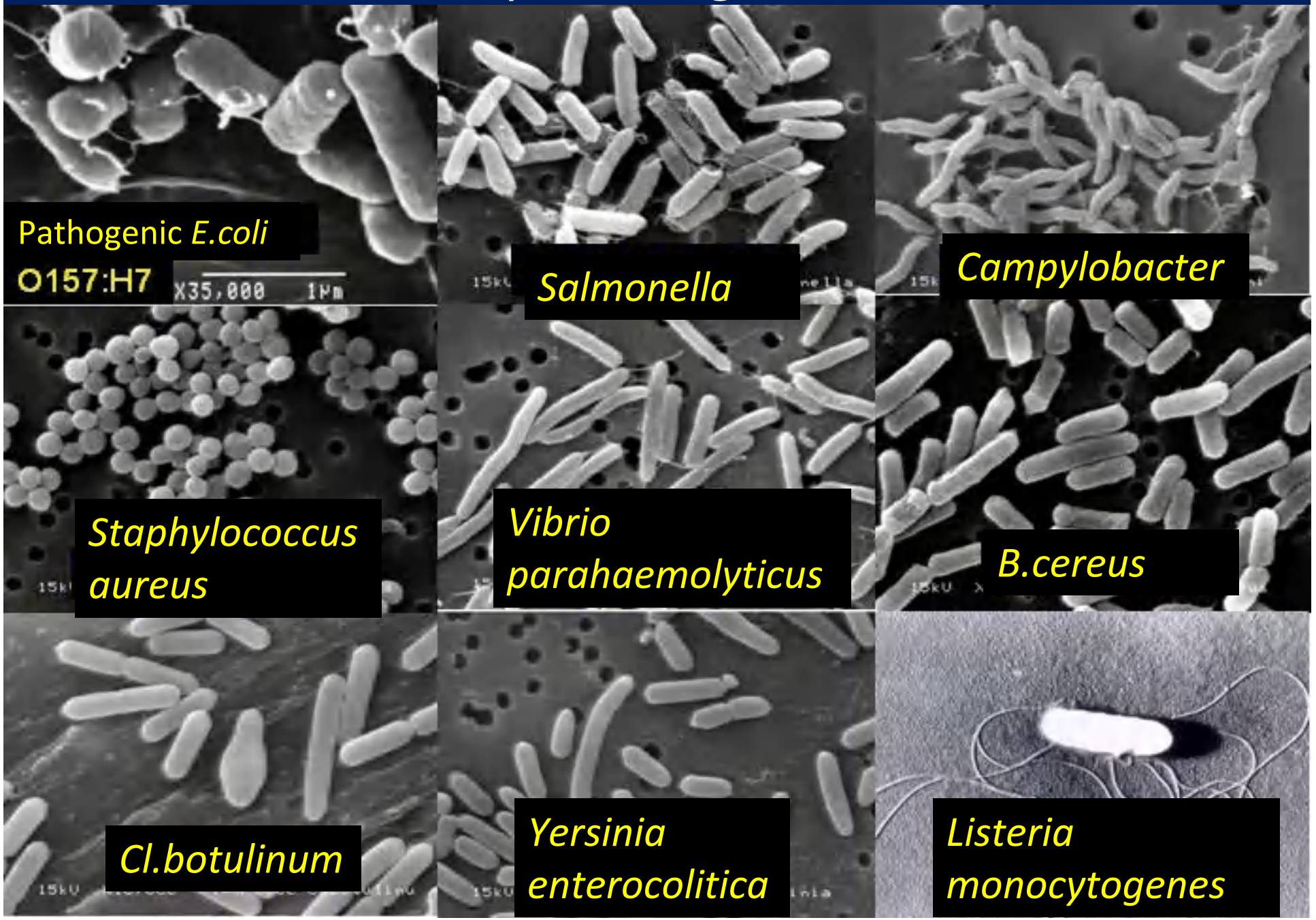
Trend in microbial food poisoning in Japan



Trend in microbial food poisoning in Japan



Food poisoning bacteria



Listeria monocytogenes

- Widespread
- Grows at refrigeration temperatures
- Listeriosis
  - Severe, life threatening systemic infections
  - ~ 500 deaths, 2000 additional cases per year in US
  - Immunocompromised
  - Mostly sporadic cases
  - 2-3 weeks incubation (or more)

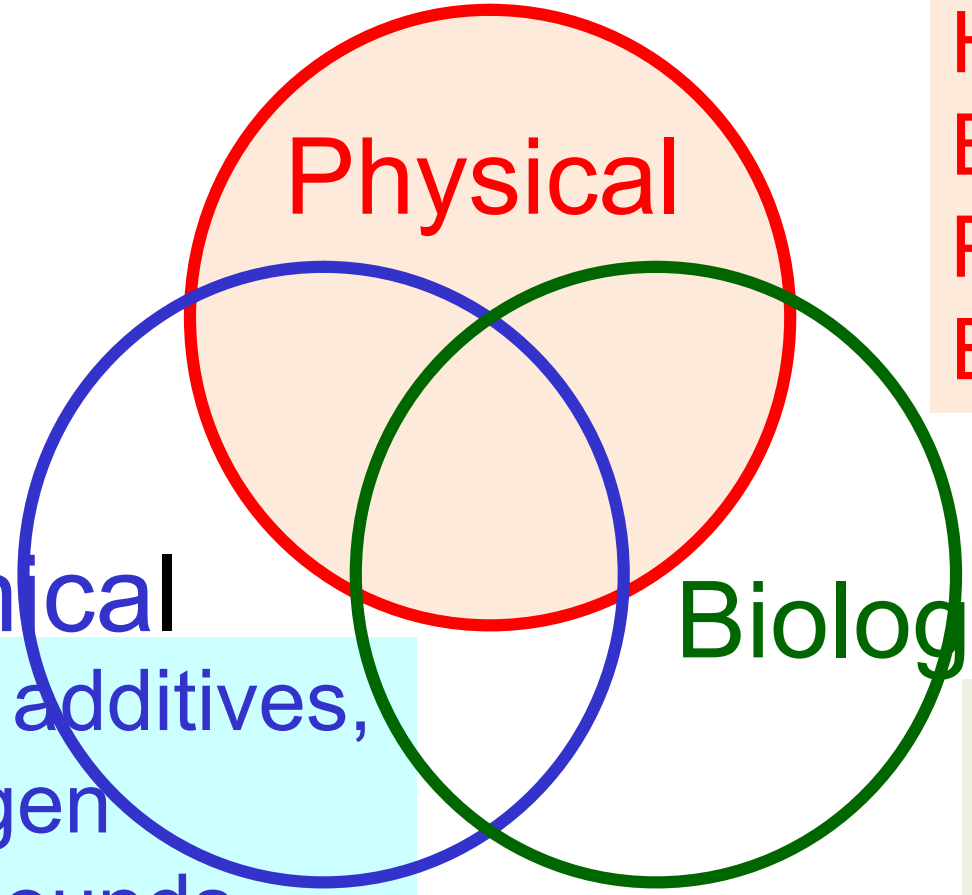
From this summer, USA has been suffering from *L.monocytogenes* food poisoning. 29persons were killed. Causative food is Cantaloupe melons.

Japan had the great earthquake and tsunami on March 11, 2011.

Food chain was disturbed. Cold chain became useless by electric power failure.

（山形新聞、2011年3月17日）

Three groups of technologies for safer food

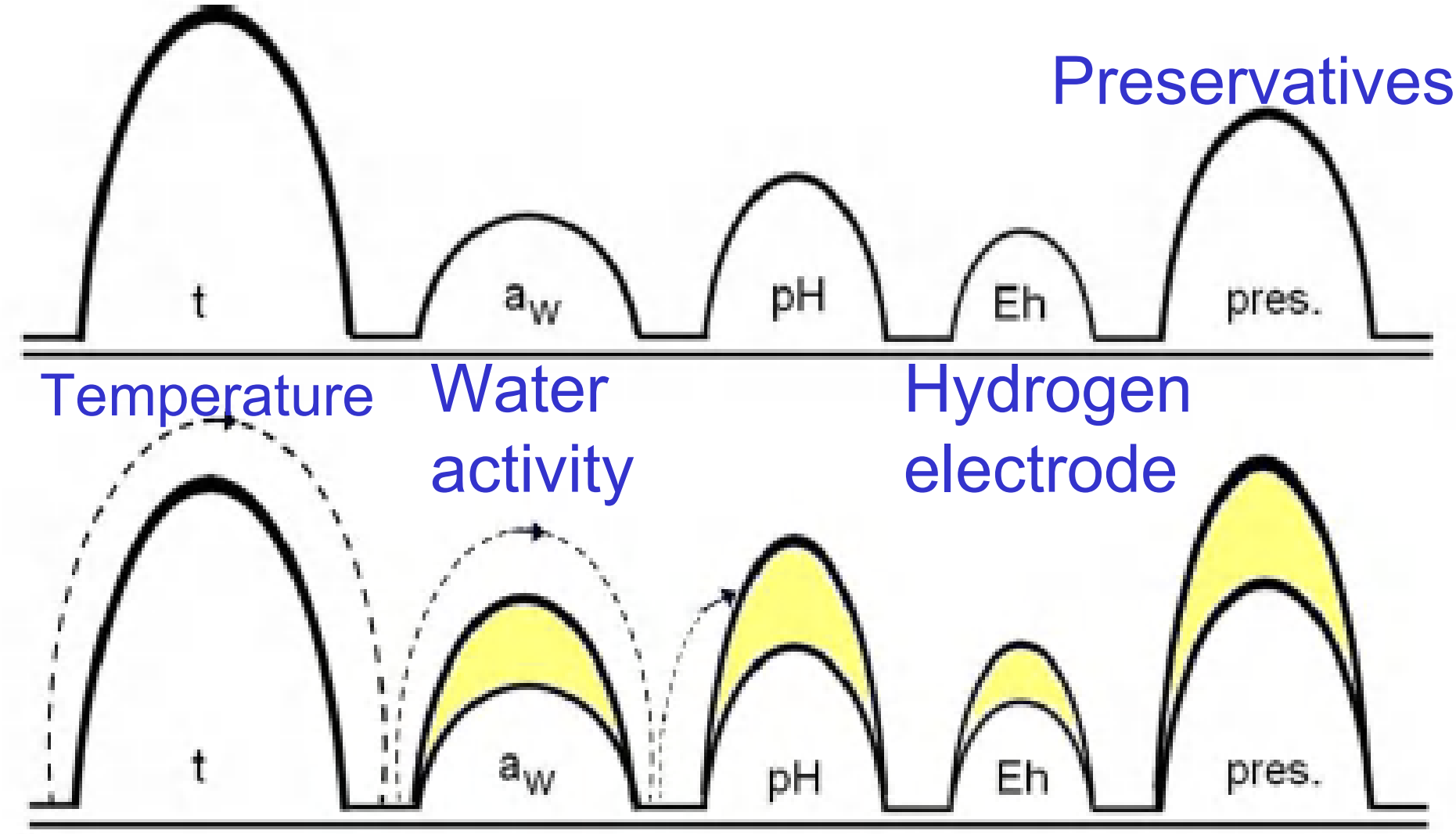


Heat(hot, cold), Electricity, Light, Pressure, UV, Electron, etc.

Food additives, Halogen compounds, Acids, Alkaline, Ozone, etc.

Fermentation, Competitive microbes, Enzymes, Phages, etc.

Hurdle technology for food preservation



Packaging technology is also necessary for food protection.

Food preservation-Temperature control

>60℃	heat treatment
10～60℃	dangerous zone
2～10℃	refrigeration, cooling
2～5℃	chilling
-2～2℃	super chilling
-3～-5℃	partial freezing
<-5℃	freezing
<-15℃	frozen food in Japan
<-18℃	frozen food, international

Food preservation by addition to food

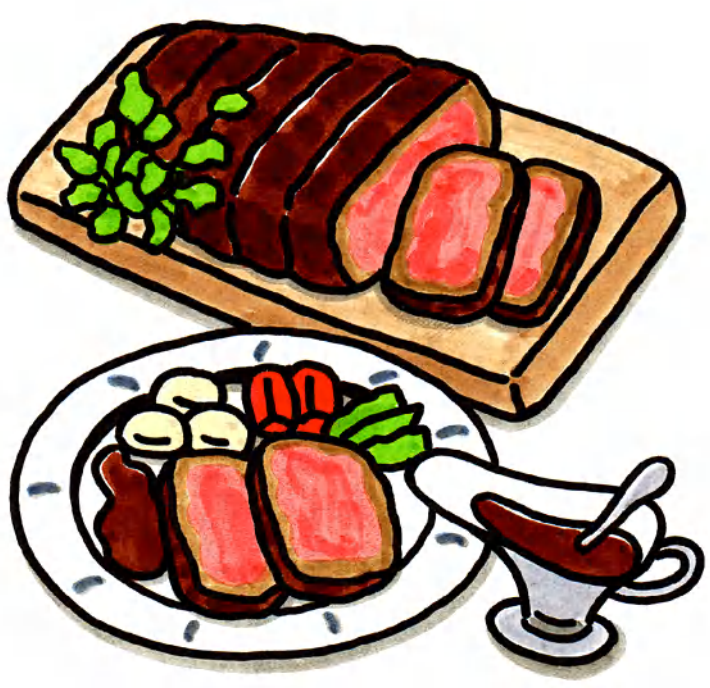
- Water activity control:

  Salts, Sugars, Sorbitol, Glycerin, Propylene glycol, etc.

Food preservation-addition to food

- pH adjustment: Acids, Alkaline

Clostridium botulinum



Food preservation-addition to food

- Microbial growth suppressor:

Ethanol, Glycine, Pectine, Lysozyme, Allyl isothianate, Suger-fatty acid esters, etc.

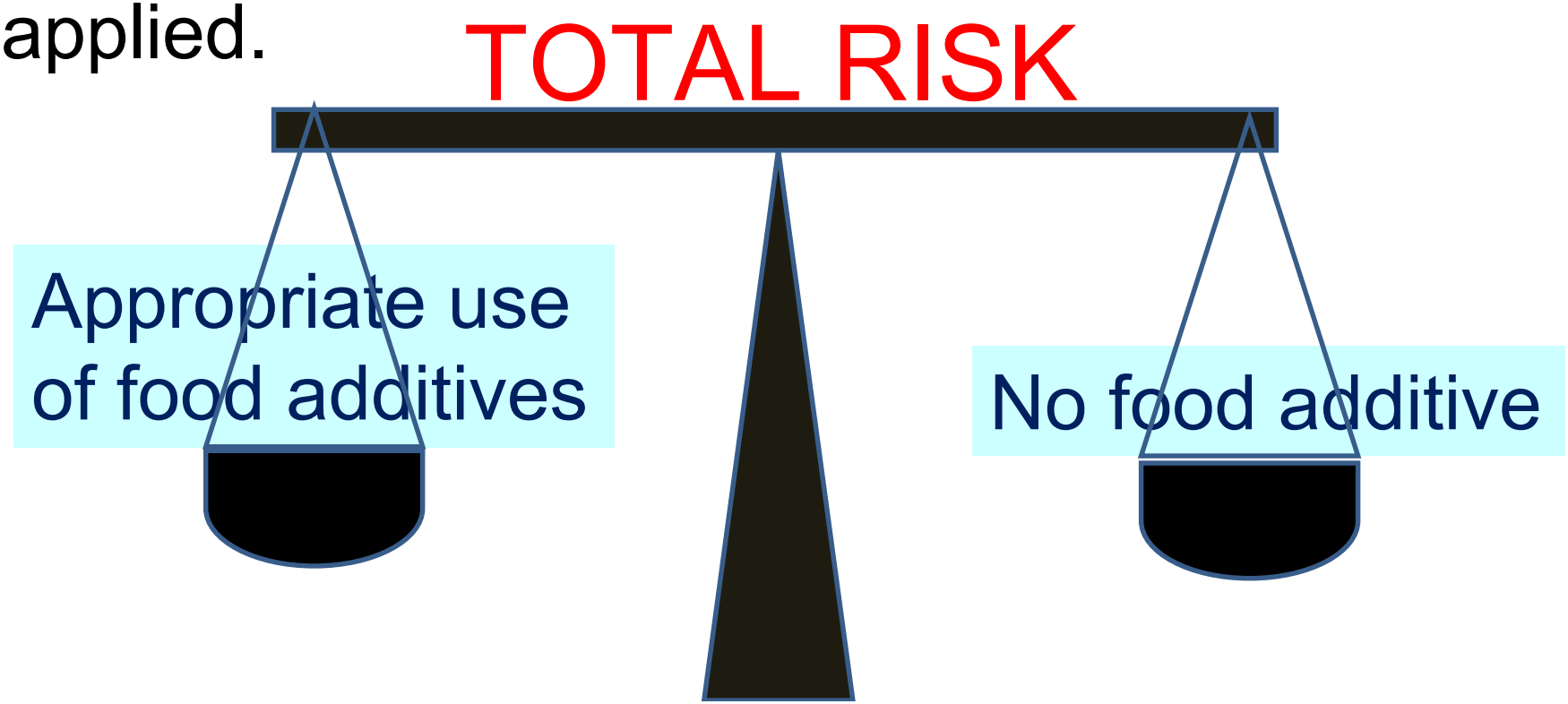
Food preservation-addition to food

- Preservatives: Sorbic acid, Benzoic acid, Protamine, Polylysine, etc.

- Hydrogen electrode modifier: N_2, CO_2, Oxigen absorbers, etc.

Positive list system for food additives

Food additives are regulated legally to protect consumer under the system of risk analysis. Total risk of food should be compared when food additives are applied, or when they are not applied.



Food Hygiene (WHO)

"All measures necessary to ensure the safety, soundness and wholesomeness of food at all stages from its growth, production or manufacture until its final consumption"


We continue to eat food.
We have to continue the proactive research for food safety.
Thank you for your attention.