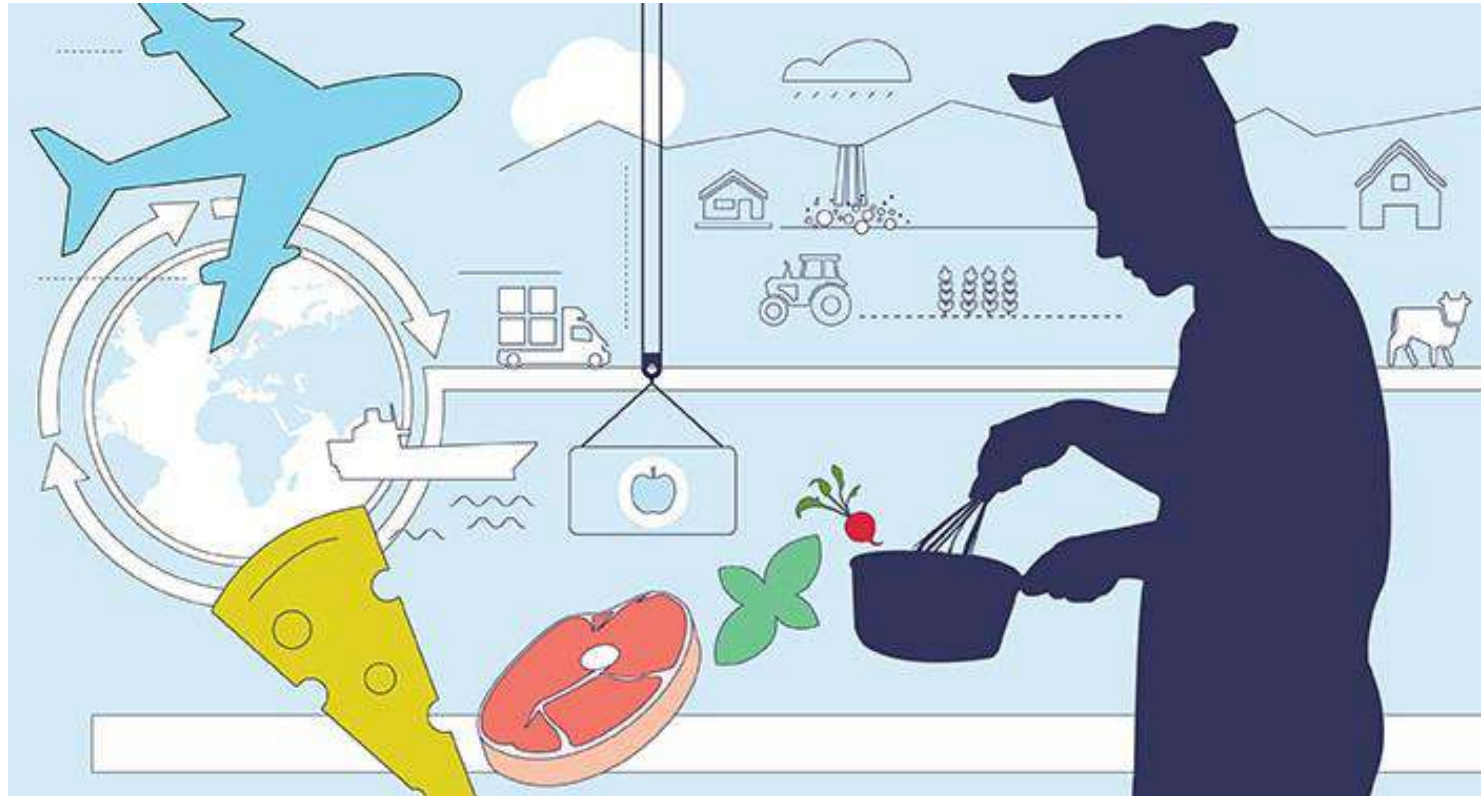


AIR, FOOD AND WATER-BORNE HUMAN INFECTIONS



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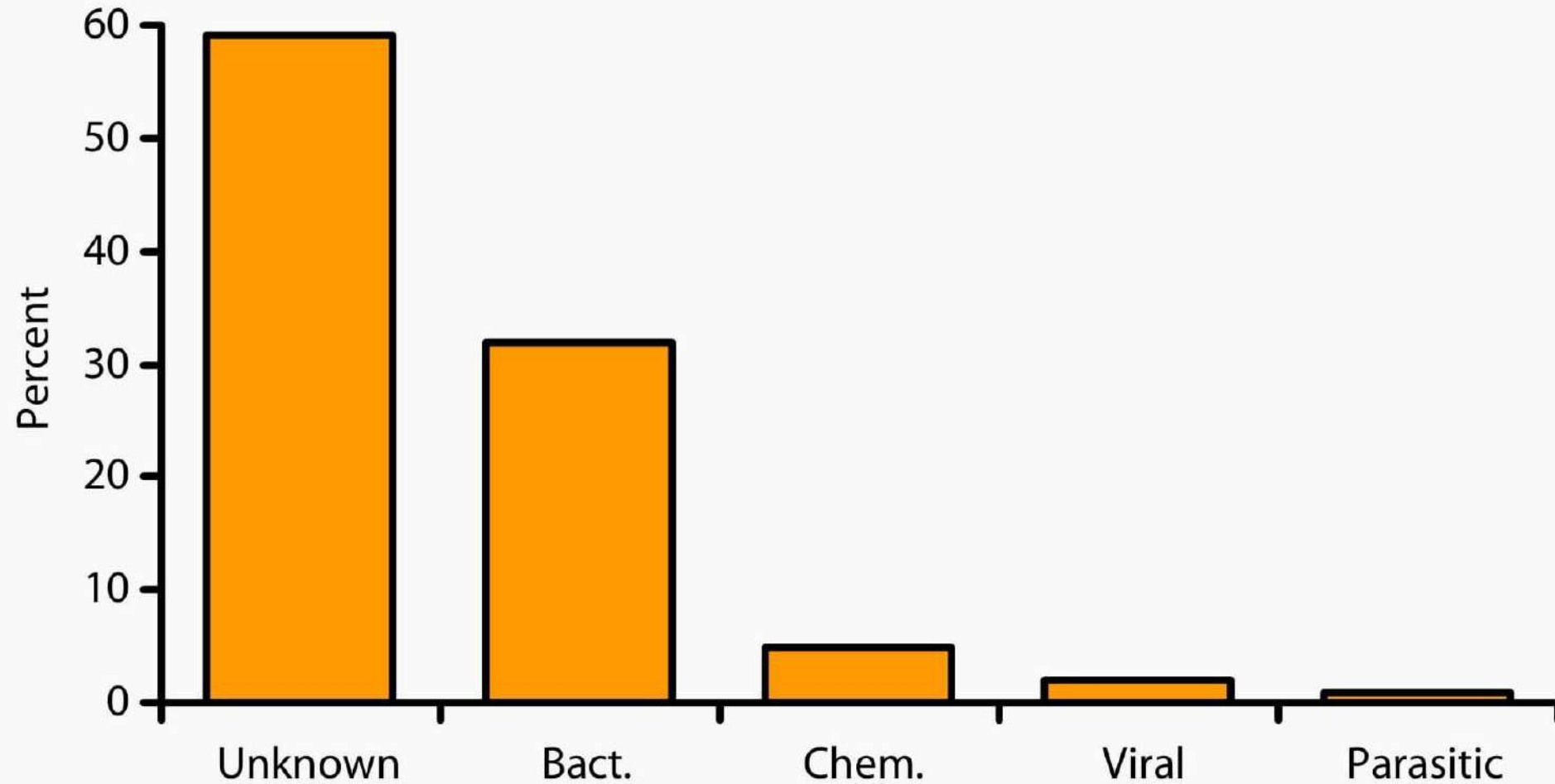
FOOD-BORNE DISEASES



DEFINATION

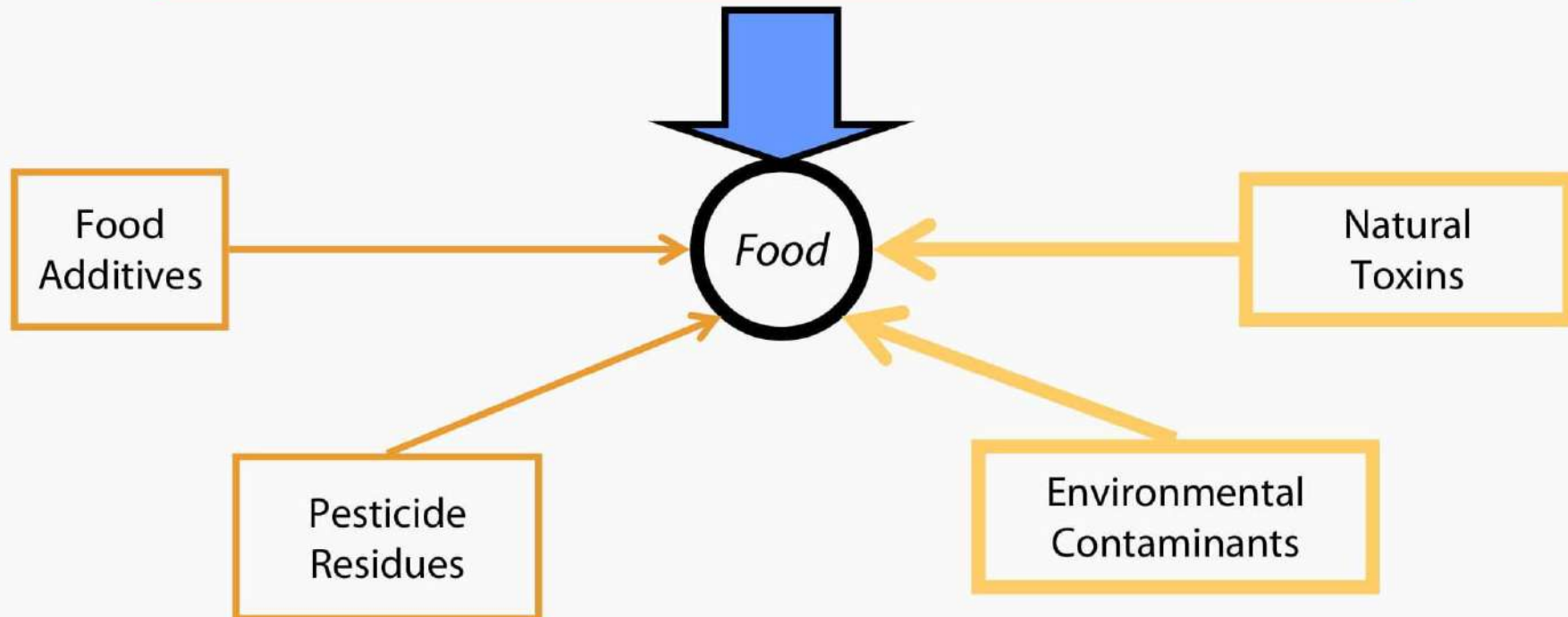
- Food-borne diseases
 - Those resulting from consumption of any solid food or milk, water, or other beverage
- Outbreak (CDC)
 - Two or more persons experiencing a similar illness after ingestion of a common food or beverage
 - Epidemiologic analysis implicates the food/beverage as the source of illness

CAUSES OF FOOD-BORNE DISEASES



FOOD SAFETY

Microbial
Contamination

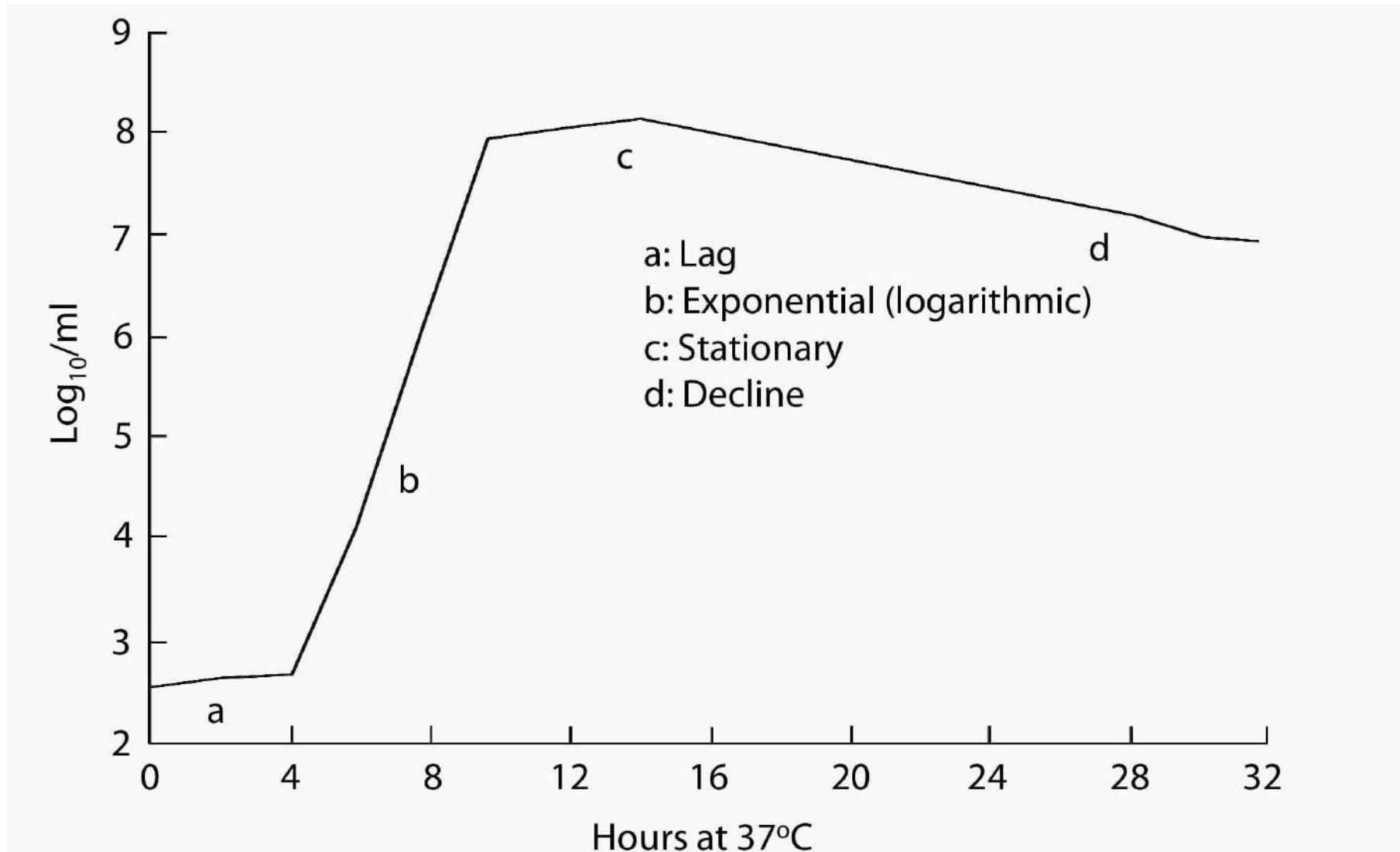


INFECTIOUS AGENTS AND THEIR PREFERRED HABITAT

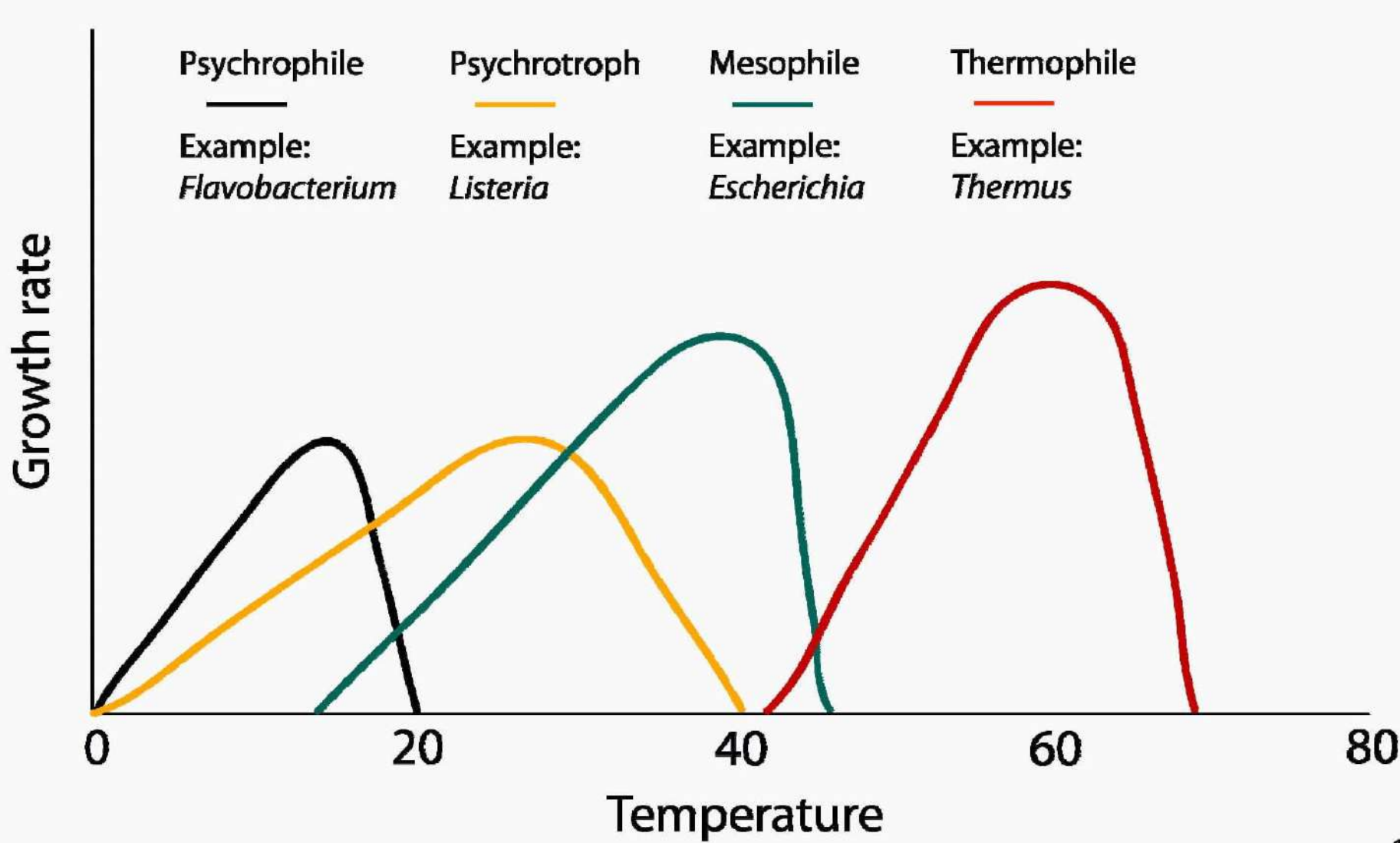
Microorganism	Main habitat
<i>Bacillus cereus</i> , <i>Clostridium botulinum</i>	Ubiquitous in soil and on vegetables
Campylobacter	Intestine of animals, fowl, and humans
<i>E. coli</i> , Salmonella	Lower intestine of humans, warm-blooded animals, birds
Shigella	Intestine of humans and primates
<i>Staphylococcus aureus</i>	Common on human skin and oropharynx
<i>Vibrio cholerae</i>	Intestine of humans

Microorganism	Main habitat
<i>Giardia lamblia</i>	Intestine of humans, beavers, and muskrats
Cryptosporidium	Intestine of humans and warm-blooded animals
<i>Trichinella spiralis</i>	Striated muscle of carnivorous and omnivorous animals
Hepatitis A virus	Intestine of humans
Norwalk virus	Intestine of humans

BACTERIAL GROWTH



TEMPERATURE AND BACTERIAL GROWTH RATES



COLD STORAGE AND EXTENSION OF SHELF-LIFE FOR RAW FOODS

Food	Average useful storage life (days)	
	0°C (32°F)	22°C (72°F)
Meat	6–10	1
Fish	2–7	1
Poultry	5–18	1
Fruits	2–180	1–29
Leafy vegetables	3–20	1–7
Root crops	90–300	7–50

MOISTURE REQUIREMENT FOR GROWTH

- Water activity; a_w

$$A_w = \frac{\text{Water vapor pressure of food}}{\text{Water vapor pressure of pure water}}$$

- Free water in food is necessary for microbial growth
- Each microbial species has an optimum, maximum, and minimum a_w for growth
- In general, a higher a_w facilitates microbial growth

WATER ACTIVITY OF VARIOUS FOODS

Food	a_w
Fresh fruit, vegetables, meat, fish	≥ 0.98
Cooked meat, bread	0.95–0.98
Cured meats, cheeses	0.91–0.95
Sausages, syrups	0.87–0.91
Rice, beans, peas	0.80–0.87
Jams, marmalades	0.75–0.80
Candies	0.65–0.75
Dried fruits	0.60–0.65
Dehydrated milk, spices	0.20–0.50

FOODS ASSOCIATED WITH FOOD-BORNE ILLNESSES

Food vehicle	Microorganism
Beef and pork	<i>Salmonella, S. aureus, E. coli, B. cereus, T. spiralis, L. monocytogenes</i>
Poultry	<i>Salmonella, Campylobacter, S. aureus, L. monocytogenes</i>
Dairy products	<i>Salmonella, Campylobacter, E. coli, L. monocytogenes, Brucella</i>
Eggs	<i>Salmonella, S. aureus</i>
Dried cereal	<i>B. cereus</i> and other <i>Bacillus spp.</i>

Food vehicle	Microorganism
Vegetables	<i>C. botulinum</i> , <i>C. perfringence</i> , Salmonella, Shigella, <i>B. cereus</i> , Norwalk virus
Fish	<i>C. botulinum</i> , <i>C. perfringence</i> , ciguatera and scombroid toxins
Shellfish	<i>V. parahaemolyticus</i> , <i>V. cholerae</i> , Hepatitis A, Norwalk virus, neurotoxic and paralytic shellfish poisoning
Chinese food	<i>B. cereus</i> (in fried rice)

- Internal content of eggs
 - *Salmonella enteritidis*
- Apple cider (low pH)
 - *E. coli* O157:H7
- Imported raspberries
 - *Cylospora*
- Oysters
 - Norwalk-like virus



HOST SUSCEPTIBILITY

Factors that affect host susceptibility to food-borne illness

- Immunosuppression
- Diseases such as AIDS
- Organ transplantation
- Ageing
- Hygiene
- Gastric acidity
- Specific immunity



The End

