Biliary Signature of a Bacterial Pathogen
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Listeria monocytogenes
Listeria fear prompts largest U.S. meat recall

By Anita Manning, USA TODAY

PHILADELPHIA - This weekend's recall of more than 27 million pounds of turkey and chicken sandwich meats is the latest, and largest, in a series of food recalls that suggest routine testing for the bacteria listeria is needed, consumer advocates say.

A row of Wampler foods trailers sit in a lot at the Pilgrims Pride meat processing plant in Franconia, Pa., on Monday.

By Chris Gardner, AP

Wampler Foods, owned by Pilgrim's Pride, launched a recall last week when listeria was detected on a product sample taken by the

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The Deadly Deli

Listeria Hysteria at Jamba Juice

Wed, 12/06/2006 - 4:10pm by FitSugar

Consumers in the U.S. Southwest are being warned that Jamba Juice Co. smoothies containing strawberries may be contaminated with the potentially deadly *Listeria monocytogenes* bacterium (commonly known just as Listeria), which can cause potentially deadly infections in children, the elderly and other people with weakened immune systems. It is also known to cause still births and miscarriages in pregnant women.
Spectrum of Listeriosis

- Mild fever and malaise
- Mild to severe gastritis
- Severe meningitis in newborns
- Bacteremia and sepsis in newborns
  - Osteomyelitis and arthritis
    - Endocarditis
  - Asymptomatic carriage
- Age-dependent (young and old)
- More frequent in pregnancy
- Immune status is critical
L. monocytogenes Intracellular Life Cycle
Tilney and Portnoy
Organs Infected by L. monocytogenes

- Intestine
- Lymph nodes
  - Liver
  - Spleen
- Brain
  - CNS
  - Bones
  - Heart

How can one hope to monitor all of these in every animal?
In Vivo Bioluminescence Imaging (BLI)

Xenogen Corp.
Alameda CA, USA

Photorhabdus luminescens
1 LD_{50} (4 \times 10^4 CFU)

Hardy et al., Science 303:851-3
Localization of Focal Signal to the Gall Bladder Lumen

1. BLI Signal
2. Excised gall bladder
3. Colonies from lumen on a petri dish
4. Bacteria in the lumen by histology

Hardy et al., Science 303:851-3
Oral Infection

Hardy et al., Science 303:851-3
Frequency of Gall Bladder Signals

20 CD1 female mice given 5x10^5 CFU of Listeria, imaged on Day 2

Hardy et al., Infect. Immun. 74(3): 1819-27
Unusual Morphology of Intraluminal L. monocytogenes

Pauline Chu, Comparative Medicine
Intralumenal L. monocytogenes
The Gall Bladder

Liver

Bile duct

Gall Bladder

Intestine

Cholic acid (hydrophobic)

Glycocholic acid (amphipathic)
Questions at this Point

• What is the food source of the bacteria?
• Do they adhere to mucus, and if so, how?
• What genes are expressed?
• Does this process contribute to disease?
• What effects are seen on the tissue and contents of the organ?
• How do the bacteria mitigate the toxicity of the bile salts and other components of bile?

Can they ever GET OUT?
Alan Hofmann
Daughters of 542.3

147.3
Daughters of 542.3

m/z 542.3 = Monosodium 18:2 Lysophosphatidylcholine
18:2 Lysophosphatidylcholine

R' = 18-Carbon chain with two double bonds

Choline group
Uninfected Animals
L. monocytogenes Grows in Pure Bile

Human Bile
1:3 in H₂O
+10⁶ CFU of Listeria

T=0
30 min
60 min
90 min
120 min
20 hours
Proteins in Mouse Bile

- Pancreatic amylase
- Immunoglobulins (antibodies)
- Pancreatic lipases
- Sterol esterases
- Carboxypeptidases
- Collagen

- $\alpha$ Andrenergic receptor?
- Transcription initiation factor TFIID?
The Future

- More in vitro cultures with mouse bile, which is cleaner and has less variation
- More mice with the attenuated strain which grows for a long time without making the mice sick
- More protein data from both in vitro and mouse samples to look for Listeria proteins (!)
- Use pure substances and look for changes upon culture, which will be tricky
- Use bacterial mutants such as phospholipase mutants
People to Thank

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