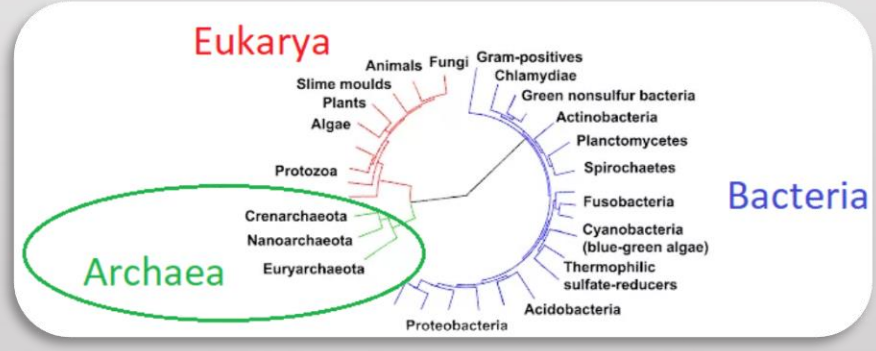
Ultra-Archaea®

Safe, Versatile, Proven Bioremediation

ULTRATECH INTERNATIONAL, INC.

What are Archaea

- One of the 3 domains of life (along with bacteria and eukaryotes)
- The oldest living organisms on the planet
- Can survive in a wide range of living conditions, including extreme environments (such as hot springs and salt lakes)

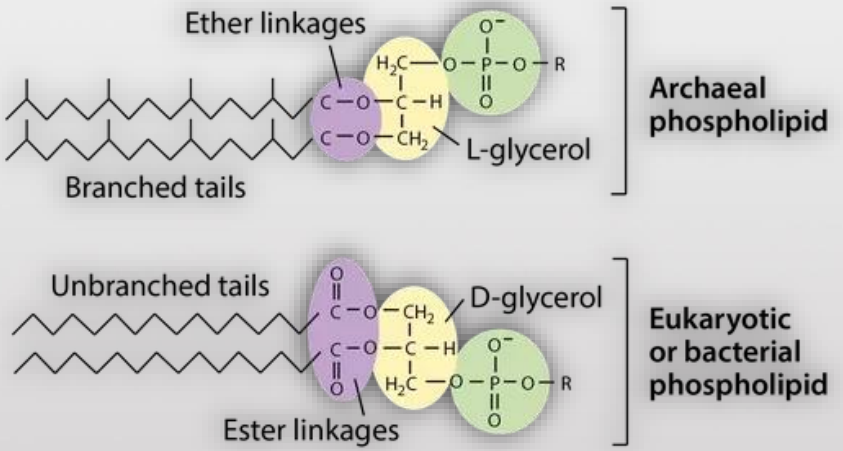


Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Archaea Compared to Bacteria

- Hardiness based on more stable makeup of their cellular membrane
- Cell membranes lack receptors for “phages” which carry virulent genes to animals and humans
- More diverse metabolism - one species of Archaea can target a wide range of compounds



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

What are Ultra-Archaea

- Consortium of over 100 naturally occurring species, that can thrive in harsh climates
- Mixture of aerobic, anaerobic, and facultative anaerobic species
- Affinity for breaking down hydrocarbons
  - Including polycyclic aromatic hydrocarbons (PAHs)



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Markets for Ultra-Archaea

- Oil Spills
- Soil Remediation
- Agricultural Waste
- Algae Control
- Wastewater (Fats, Oils, and Grease)









Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Remediating Hydrocarbons

- Unbranched chains can be degraded quickly in a matter of days or weeks.
  - Diesel Range Organics (DRO)
    - Gasoline, kerosene, fuel oils
  - Oil Range Organics (ORO)
    - Lubricating oils, greases
  - Alkanes
    - Hexane, octane
- More complex, branched compounds are more difficult to break down and will take longer.
  - PAHs
    - Naphthalene, pyrene, anthracene

Ultra-Archaea (Product D) Heavily weathered crude, nutrients

Component	Week 0 mg/kg	Week 12 mg/kg	week 12 % reduction
Alkanes	13667	17	99.9
PAHS	586	9	98.5
TPH	14253	26	99.8
DRO	9227	17	99.8
ORO	9568	2.7	100

Laboratory Screening of Commercial Bioremediation Agents for the Deepwater Horizon Spill Response submitted by Ralph J. Portier, Ph.D. Professor of Environmental Sciences Louisiana State University

Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Ultra-Archaea in Action

Protected wetlands in Halifax, MA

A leaking pipe poured thousands of gallons of kerosene into the wetlands, adjacent to cranberry bogs

After initial recovery of 38,000 gallons of surface kerosene, Ultra-Archaea were used in the soil to clean the sensitive environment



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Ultra-Archaea in Action

After 24 hours: Strong kerosene odor eliminated.

After 56 days: Contaminant levels reduced by 85%

After 1 year: TPH levels dropped from 310,000 ppm to 21,400 ppm

After 5 years: Full recovery with no detectible contaminants



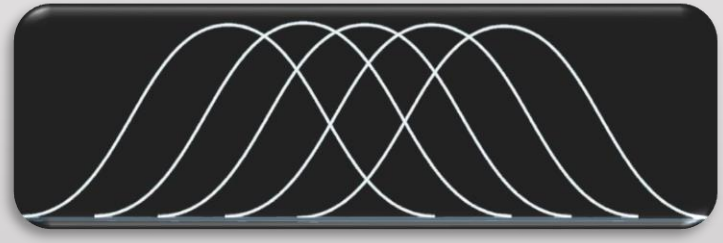
Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Treatment Planning

- Remove surface contamination (vacuum, booms, skimmers, Ultra-X-Tex) – then apply Ultra-Archaea
- Ultra-Archaea live 90 days, population decline begins after approximately 8 weeks
  - Stagger treatments every 4-6 weeks to maintain steady growth





Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Treatment Planning

- All sites are different and require a unique plan
- Site considerations
  - Water bodies: flow rate, salinity, pH, shoreline involvement, contaminant type and concentrations
  - Soil: groundwater involvement, soil type, outcroppings, contamination type and concentrations



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Farm and Agricultural Waste

- Consumes ammonia (from urine) and manure.
- Outcompetes coliform bacteria, lowering their population and potential to cause disease
  - Can heal animals with hoof disease
- Consumes fly larvae that grows in manure, also eliminating disease potential
- Complementary product: Ultra-PhosFilter

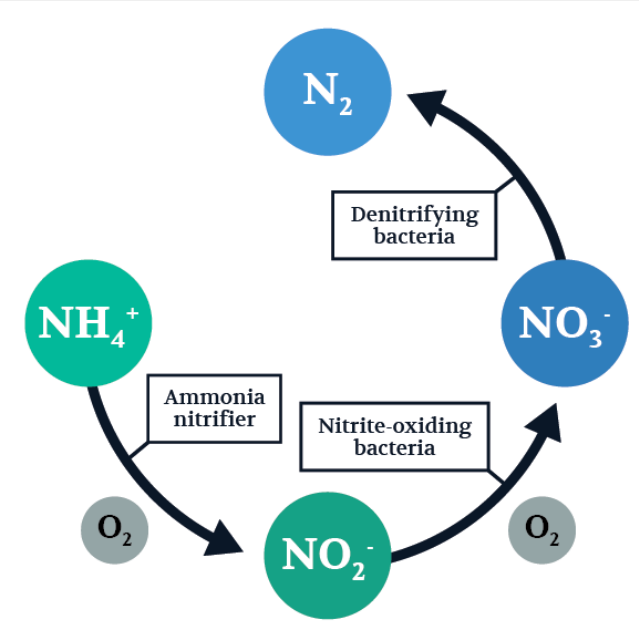


Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Ammonia Control in Wastewater

- Nitrogen from urine and the breakdown of organic material is present in all wastewater
- High levels of nitrogen in water can lead to algae blooms and toxic concentrations of pollutants
- Ultra-Archaea can act as all three types of bacteria needed to release nitrogen from the water (because of how they are cultivated)



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Algae Control

- Due to the ability and affinity to utilize nitrogen in water to break down organic waste
- Nitrogen and phosphorus in water (in warm weather) are the nutrients that breed algae blooms
- Dose in late winter/early spring to control algae growth in ponds (they outcompete the algae for the food)
- Needs to be done after algae has died for season or been physically removed
- Cranberry bog case study
- Complementary product: Ultra-PhosFilter



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Wastewater FOG

- Grease traps and lift stations
- FOG = Fats, Oils, and Grease
- Clogs infrastructure and creates problems at treatment plant
- Dose weekly or monthly to control buildup on piping
- Town of Marion case study
- Complementary product: Ultra-S3

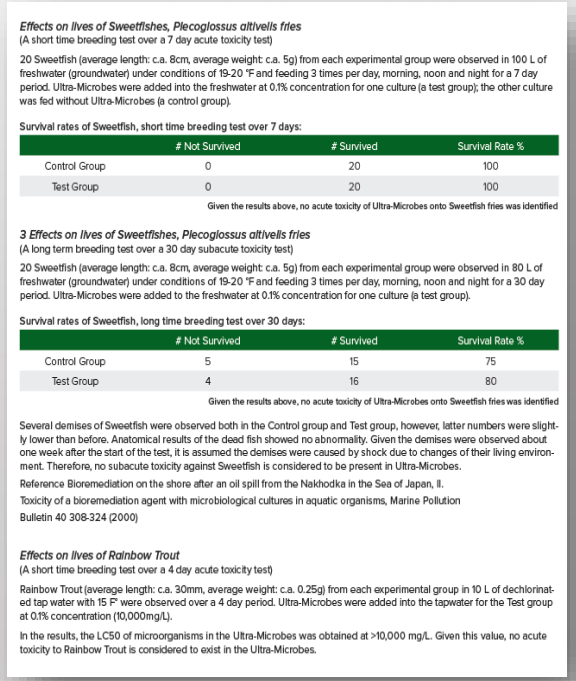


Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Do Ultra-Archaea Affect the Ecosystem?

- Not hazardous to humans
- Not hazardous to indigenous microbial ecology
- Ultra-Archaea will work with indigenous populations to remediate the foreign contamination
- Once remediation is complete, the natural ecology returns to traditional state



Effects on lives of Sweetfishes, Plecoglossus altivelis fries
(A short time breeding test over a 7 day acute toxicity test)

20 Sweetfish (average length: c.a. 8cm, average weight: c.a. 5g) from each experimental group were observed in 100 L of freshwater (groundwater) under conditions of 19-20 °F and feeding 3 times per day, morning, noon and night for a 7 day period. Ultra-Microbes were added into the freshwater at 0.1% concentration for one culture (a test group); the other culture was fed without Ultra-Microbes (a control group).

Survival rates of Sweetfish, short time breeding test over 7 days:

	# Not Survived	# Survived	Survival Rate %
Control Group	0	20	100
Test Group	0	20	100

Given the results above, no acute toxicity of Ultra-Microbes onto Sweetfish fries was identified

3 Effects on lives of Sweetfishes, Plecoglossus altivelis fries
(A long term breeding test over a 30 day subacute toxicity test)

20 Sweetfish (average length: c.a. 8cm, average weight: c.a. 5g) from each experimental group were observed in 80 L of freshwater (groundwater) under conditions of 19-20 °F and feeding 3 times per day, morning, noon and night for a 30 day period. Ultra-Microbes were added to the freshwater at 0.1% concentration for one culture (a test group).

Survival rates of Sweetfish, long time breeding test over 30 days:

	# Not Survived	# Survived	Survival Rate %
Control Group	5	15	75
Test Group	4	16	80

Given the results above, no acute toxicity of Ultra-Microbes onto Sweetfish fries was identified

Several demises of Sweetfish were observed both in the Control group and Test group, however, latter numbers were slightly lower than before. Anatomical results of the dead fish showed no abnormality. Given the demises were observed about one week after the start of the test, it is assumed the demises were caused by shock due to changes of their living environment. Therefore, no subacute toxicity against Sweetfish is considered to be present in Ultra-Microbes.

Reference Bioremediation on the shore after an oil spill from the Nakhodka in the Sea of Japan, II.

Toxicity of a bioremediation agent with microbiological cultures in aquatic organisms, Marine Pollution

Bulletin 40 308-324 (2000)

Effects on lives of Rainbow Trout
(A short time breeding test over a 4 day acute toxicity test)

Rainbow Trout (average length: c.a. 30mm, average weight: c.a. 0.25g) from each experimental group in 10 L of dechlorinated tap water with 15 F° were observed over a 4 day period. Ultra-Microbes were added into the tapwater for the Test group at 0.1% concentration (10,000mg/L).

In the results, the LC50 of microorganisms in the Ultra-Microbes was obtained at >10,000 mg/L. Given this value, no acute toxicity to Rainbow Trout is considered to exist in the Ultra-Microbes.

Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Ultra-Archaea – Living Conditions

- Water
- Food source – hydrocarbons and/or organic material
- Ideal temperature range: greater than 32°F
- pH range: 5.5 – 10.0
- Salinity up to 25%
- Oxygen – minimum 1%, but more is better



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Ultra-Archaea Shelf Life

- Sold in powder form
  - Ship dormant in a bentonite clay carrier
  - Competitors ship in liquid or frozen form which can lead to short shelf life or shipping concerns
- 5-year shelf-life



Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Product Offering

- Standard Products:
  - Ultra-Archaea
    - 5 billion Archaea/gram; clay base; small shakers and 25-lb bags; booms
- Specialty Products (off list)
  - Ultra-Nutrients
    - Use to boost microbial performance – specifically for soil remediation
  - Ultra-Biocatalyst Activator
    - Difficult soil remediation (Nigeria, cleaning old gas station land, etc.)
  - Ultra-Archaea Super Concentrate
    - 90 billion Archaea/gram; sugar base; 25-lb bags; 6-month shelf life

Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.

Thank you!

Ultra-Archaea®

ULTRATECH INTERNATIONAL, INC.