



Raw Milk Risk Management

About Raw Milk Institute

- Non-profit 501c3, founded in 2011
- Mission - To improve the safety and quality of raw milk and raw milk products through:
 - Farmer training and mentoring
 - Establishing raw milk guidelines and standards
 - Educating consumers about health benefits of raw milk
 - Collecting data for raw milk research



About Raw Milk Institute (cont.)

- RAWMI has trained hundreds of raw milk farmers across the USA and Canada
- RAWMI training has been shown to reduce outbreaks and illnesses, increase safety, and lower insurance costs
- RAWMI has LISTED 23 farms, who are committed to producing low-risk raw milk and submit test data to RAWMI monthly

Universal Access to Safe Raw Milk



Introductions

- Mark McAfee – mark@rawmilk institute.org
 - Founder and chairman of RAWMI
 - Owner of Organic Pastures Dairy Company, largest organic raw dairy in the USA
 - Risk reduction HACCP plan specialist
 - Retired premed trained paramedic and medical educator



Introductions (cont.)

- Joseph Heckman, PhD - jheckman@njaes.rutgers.edu
 - Board member of RAWMI
 - Professor of Soil Science at Rutgers University
 - Researcher on optimizing nutrition and soil quality in support of plant, animal, and human health
 - Organic farmer in Hunterdon County, New Jersey
 - Co-author of *Fresh Milk Production, The Cow Edition* and *Fresh Milk Production, The Goat Edition*



Introductions (cont.)

- Sarah Smith – sarah@rawmilk institute.org
 - Board member and secretary of RAWMI
 - Raw milk consumer for 15+ years, with herd share and retail sales
 - Homeopath, homesteader, and blogger
 - Former NASA aerospace engineer specializing in oxygen safety and materials testing



Attendees

- Dairy farmers:
 - Cows
 - Goats
 - Sheep
- Already producing raw milk?
- Producing pasteurized as well as raw milk?
- Producing other raw milk products (cream, kefir, butter, cheese, etc.)?

Overview

- Raw milk history
- Commodity vs. organic milk
- Raw milk opposition
- Raw milk benefits and risks
- RAWMI method for low-risk raw milk
- Grass-to-glass risk management
 - Small-scale raw milk production
 - Large-scale raw milk production
 - Grass
 - Cows
 - Milking
 - Management
 - Glass
- Raw milk testing
- How and why to become RAWMI LISTED

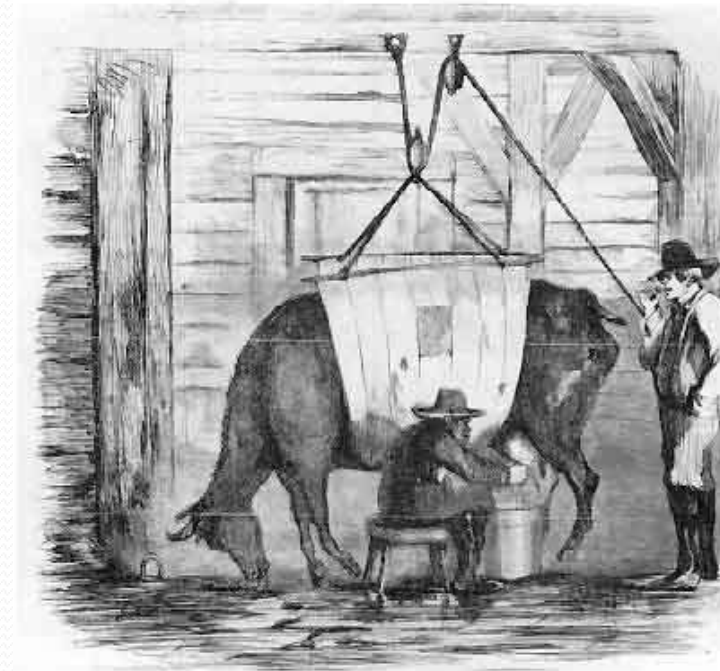
Raw Milk History

- Humans have been drinking raw ruminant milk for 10,000+ years
- Archaeological evidence shows infants were fed raw milk at least 8,000 years ago



Raw Milk History (cont.)

- Late 1800's
 - Urban environments have little pasture or forage
 - Milk cows fed swill from whiskey production
 - Cows unhealthy and emaciated



**unhealthy cows + unsanitary milking conditions =
high rates of illness and disease from raw milk**

Raw Milk History (cont.)

- Two solutions
 - Pasteurized milk
 - Technological solution to a manmade problem
 - Certified medical milk
 - Hygienic production of healthy raw milk for human consumption and medical therapeutic use
 - American Association of Medical Milk Commissions certified clean, safe raw milk from 1893-1999

Certified medical milk was used in hospitals around the USA to treat **chronic diseases**, including cardiovascular disease, liver disease, asthma, arthritis, tuberculosis, and diabetes

Raw Milk History (cont.)

- Walker-Gordon farm in New Jersey
 - Largest certified medical milk dairy in the world
 - Produced certified raw milk from 1887-1971
 - Barn was simple, sanitary, and kept immaculately clean



Reported outbreaks in over 80 years of
Producing certified raw milk: **none**

Raw Milk History (cont.)

- Pasteurization became the norm
 - Anti-raw milk articles and campaigning with scare tactics and misinformation
 - Pasteurized milk is subsidized and cheap
- Pasteurization is now done on a massive scale that benefits milk processors
- Dairy farms are in crisis



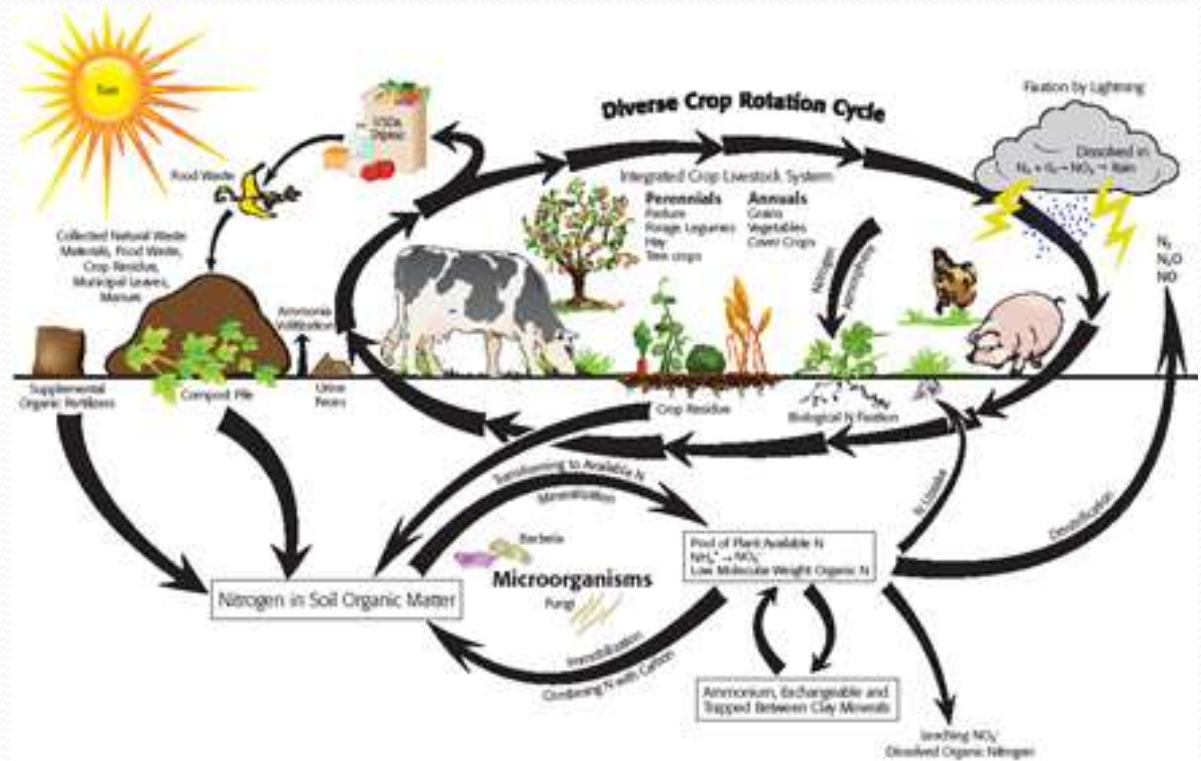
*“The **WAR** in the soil is the result of a conflict between the birthright of humanity - fresh food from fertile soil - and the profits of a section of Big Business” ~ Howard, 1946*

Commodity Milk

- Largely produced in concentrated animal feeding operations (CAFOs)



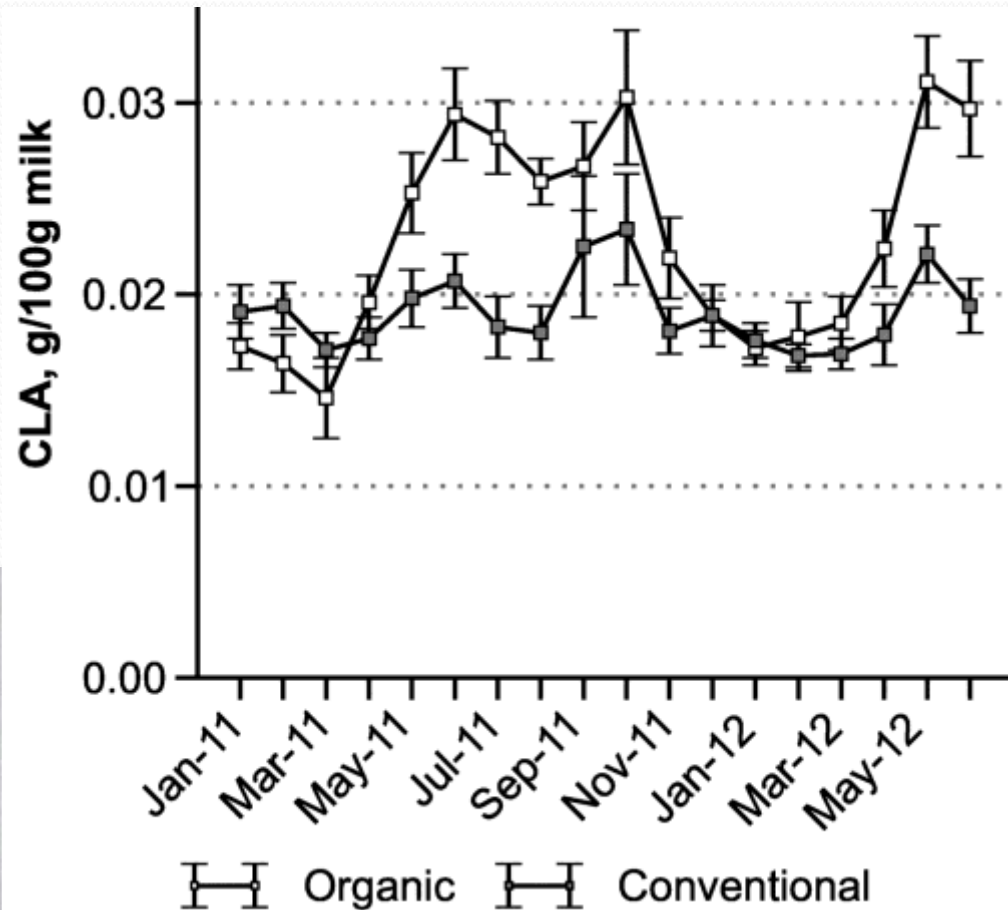
Commodity vs. Organic Milk



“It is not organic to produce milk organically, and then to pasteurize it.” ~Rodale, 1958

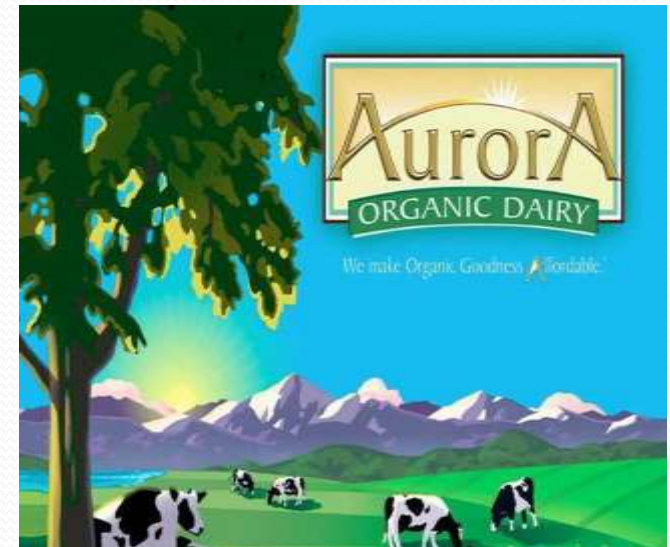
Commodity vs. Organic Milk

- Organic production enhances milk nutritional quality
- Fatty acid composition is superior in organic milk



Erosion of Organic Milk

- Massive corporate takeover of organic dairy industry
 - Corporate Green-Wash with 15,000 cows, NO pastures and ultra-high temperature (UHT) processing



“There is just a big misunderstanding, with the growing organic consumer demand, this is just the industrial solution”

Gregory Ibach USDA Sept 23rd 2018 WA DC

Loss of Organic Integrity and Farms

- USDA no longer requires “pasture rule” enforcement and CAFO is allowed
- Now 8 massive CAFOs operate and displace hundreds of compliant organic dairies
 - Organic pay prices were \$45 CWT in 2013-14, now \$22-28 CWT with massive CAFO over-supply
 - Break-even point for smaller operations is >\$32+ CWT

Everyone loses...
soils, cows, compliant farmers,
organic logo and consumers!



Raw Milk Opposition Has a United Voice



Raw Milk Opposition (cont.)

CDC: “Raw milk can carry harmful bacteria and other germs that can make you very sick or kill you. While it is possible to get foodborne illnesses from many different foods, raw milk is one of the riskiest of all.”

FDA: “raw milk is unsafe because it can contain disease-causing pathogens”

American Academy of Pediatrics: “advises pregnant women, infants and children to consume only pasteurized milk, cheese and other milk products, and supports a ban on the sale of raw milk”

Raw Milk in North America

50 states with 50
different shades
of raw milk
chaos...

....Chaos
encouraged by
the FDA &
processing
industry

In Canada... simply
illegal to sell raw
milk, but you can
own your own
cow or goat!



But customers love it!



Raw Milk Benefits

- Raw milk is nutritionally superior

Nutrients and Immune Factors	RAW Human Milk	RAW Cow's Milk	Pasteurized and Ultra Pasteurized Cow Milk	Pasteurized Almond Milk	Pasteurized Soy Milk
Beneficial Enzymes	ACTIVE	ACTIVE	INACTIVE	NONE	NONE
Diverse Probiotics	ACTIVE	ACTIVE	DESTROYED	NONE	NONE
Lactase-Producing Bacteria	ACTIVE	ACTIVE	DESTROYED	NONE	NONE
Healthy Fats	ACTIVE	ACTIVE	DAMAGED	DAMAGED	DAMAGED
AA, CLA, DHA, & EPA	ACTIVE	ACTIVE	DAMAGED	NONE	NONE
Proteins	ACTIVE	ACTIVE	DAMAGED	DAMAGED	DAMAGED
Bioavailable Vitamins	ACTIVE	ACTIVE	REDUCED	ALTERED	ALTERED
Bioavailable Calcium	ACTIVE	ACTIVE	INHIBITED	INHIBITED	INHIBITED
Bioavailable Phosphorus	ACTIVE	ACTIVE	INHIBITED	ALTERED	ALTERED
IgA/IgG Immunoglobins	ACTIVE	ACTIVE	DESTROYED	NONE	NONE

Breastmilk is Raw Milk!

- Raw milk and breast milk similarities
 - Contain beneficial nutrients, enzymes, vitamins, and minerals, in their natural form which is most easily utilized by the body
 - Designed to provide excellent nutrition and strengthen immune system



Pasteurization of Breastmilk and Cow's Milk

“Feeding preterm infants pasteurized as compared to raw own mother’s milk reduced fat absorption. When the infants were fed raw milk, they gained more in knee-heel length compared to when they were fed pasteurized milk.”

Feeding Studies with Pasteurized vs. Raw Breastmilk and Cow's Milk

- Preterm infants fed pasteurized breastmilk had reduced fat absorption and less growth than infants fed raw breastmilk (Andersson et al., 2007)
- Children fed raw certified milk had greater weight gain than children fed either pasteurized milk or pasteurized milk with cod liver oil and orange juice (Arch Ped 1926 JUN; 43:380)



Raw Milk Benefits (cont.)

- Numerous studies show that raw milk consumption is correlated with:
 - Easier digestion
 - Stronger immune systems
 - Fewer ear infections
 - Less asthma
 - Fewer allergies
 - Reduced eczema
 - Less fever and respiratory infections
 - Improved gut health
 - Improved lung function



Raw Milk Benefits (cont.)

> *Food Funct.* 2020 Jun 24;11(6):4982-4993. doi: 10.1039/d0fo01175d.

Loss of allergy-protective capacity of raw cow's milk after heat treatment coincides with loss of immunologically active whey proteins

Suzanne Abbring¹, Ling Xiong², Mara A P Diks¹, Ton Baars³, Johan Garssen⁴, Kasper Hettinga², Betty C A M van Esch⁴

Abstract

The allergy-protective capacity of raw cow's milk was demonstrated to be abolished after heat treatment. The heat-sensitive whey protein fraction of raw milk is often implied to be the source of this allergy-protective effect, but a direct link between these proteins and the protection against allergic diseases is missing. This study therefore aimed at investigating the mechanistic relation between heat damage to whey proteins and allergy development. Raw cow's milk was heated for 30 min at 50, 60, 65, 70, 75, or 80 °C and the native whey protein profile of these differentially heated milk samples was determined using LC-MS/MS-based proteomics. Changes in the native protein profile were subsequently related to the capacity of these milk samples to prevent the development of ovalbumin-induced food allergy in a murine animal model. A substantial loss of native whey proteins, as well as extensive protein aggregation, was observed from 75 °C. However, whey proteins with immune-related functionalities already started to denature from 65 °C, which coincided with the temperature at which a loss of allergy protection was observed in the murine model. Complement C7, monocyte differentiation antigen CD14, and polymeric immunoglobulin receptor concentrations decreased significantly at this temperature, although several other immunologically active whey proteins also showed a decrease around 65 °C. The current study demonstrates that immunologically active whey proteins that denature around 65 °C are of importance for the allergy-protective capacity of raw cow's milk and thereby provides key knowledge for the development of microbiologically safe alternatives to raw cow's milk.

- Raw whey correlated with allergy protection
- Heating to 149°F results in denaturing of whey protein and loss of allergy protective capacity

Raw Milk Benefits (cont.)

Clinical & Experimental Allergy / Volume 37, Issue 5

Free Access

Inverse association of farm milk consumption with asthma and allergy in rural and suburban populations across Europe

M. Waser, K. B. Michels, C. Bliel, H. Flöistrup, G. Pershagen, E. Von Mutius, M. Ege, J. Riedler, D. Schram-Bijkerk, B. Brunekreef, M. Van Hage, R. Lauener, C. Braun-Fahrlander ... See all authors

Methods Cross sectional multi-centre study (PARSIFAL) including 14 893 children aged 5–13 years from five European countries (2823 from farm families and 4606 attending Steiner Schools as well as 5440 farm reference and 2024 Steiner reference children). A detailed questionnaire including a dietary component was completed and allergen-specific IgE was measured in serum.

Results Farm milk consumption ever in life showed a statistically significant inverse association with asthma: covariate adjusted odds ratio (aOR) 0.74 [95% confidence interval (CI) 0.61–0.88], rhinoconjunctivitis: aOR 0.56 (0.43–0.73) and sensitization to pollen and the food mix fxS (cut-off level of 3.5 kU/L): aOR 0.67 (0.47–0.96) and aOR 0.42 (0.19–0.92), respectively, and sensitization to horse dander: aOR 0.50 (95% CI 0.28–0.87). The associations were observed in all four subpopulations and independent of farm-related exposures. Other farm-produced products were not independently related to any allergy-related health outcome.

Conclusion Our results indicate that consumption of farm milk may offer protection against asthma and allergy. A deepened understanding of the relevant protective components of farm milk and a better insight into the biological mechanisms underlying this association are warranted as a basis for the development of a safe product for prevention.

- Consumption of raw milk correlates to lower rates of asthma and allergies
- However, study concludes *“At this stage, consumption of raw farm milk cannot be recommended as a preventive measure”*
- This is why RAWMI training is necessary!

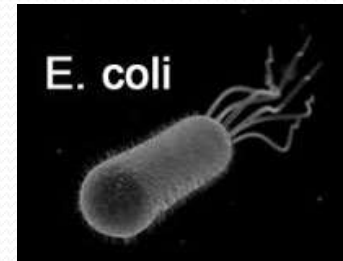
Raw Milk Risks

- Raw milk can harbor pathogens that lead to infection, serious illness, and death
 - *E coli* 0157:H7
 - *Salmonella*
 - *Campylobacter*
 - *Listeria monocytogenes*
- For human illness to occur four things must align:
 - Pathogen must be present
 - Pathogen must be virulent
 - Pathogen load must be high enough
 - Host must be susceptible

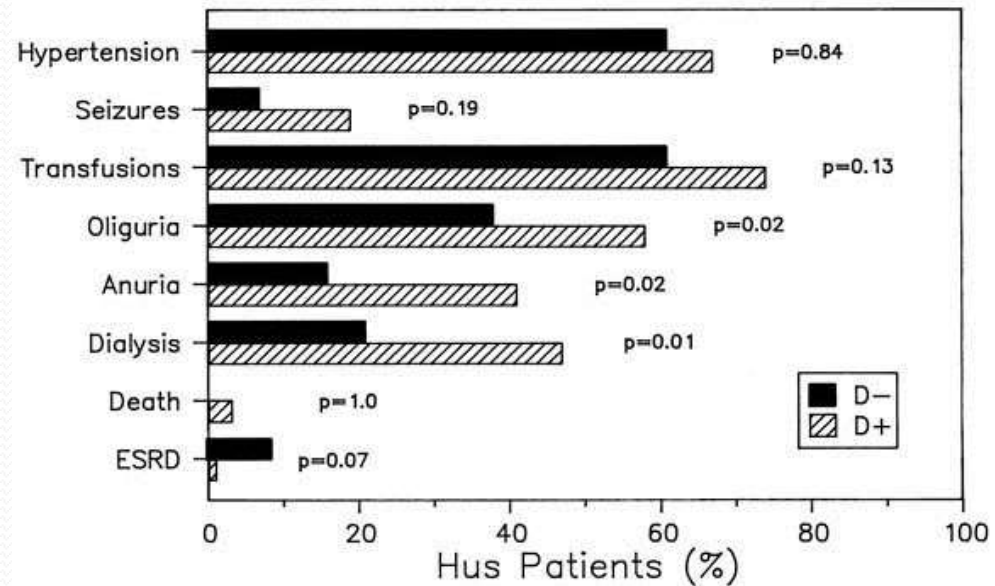


Raw Milk Risks (cont.)

- Shiga-toxin producing *e Coli* 0157:H7 (STEC) has lowest cell count threshold for illness
- As few as five cells can cause hemolytic urema syndrome (HUS)
 - HUS = kidney damage



Clinical Features of HUS Patients



Safe, low risk raw milk is
achievable!

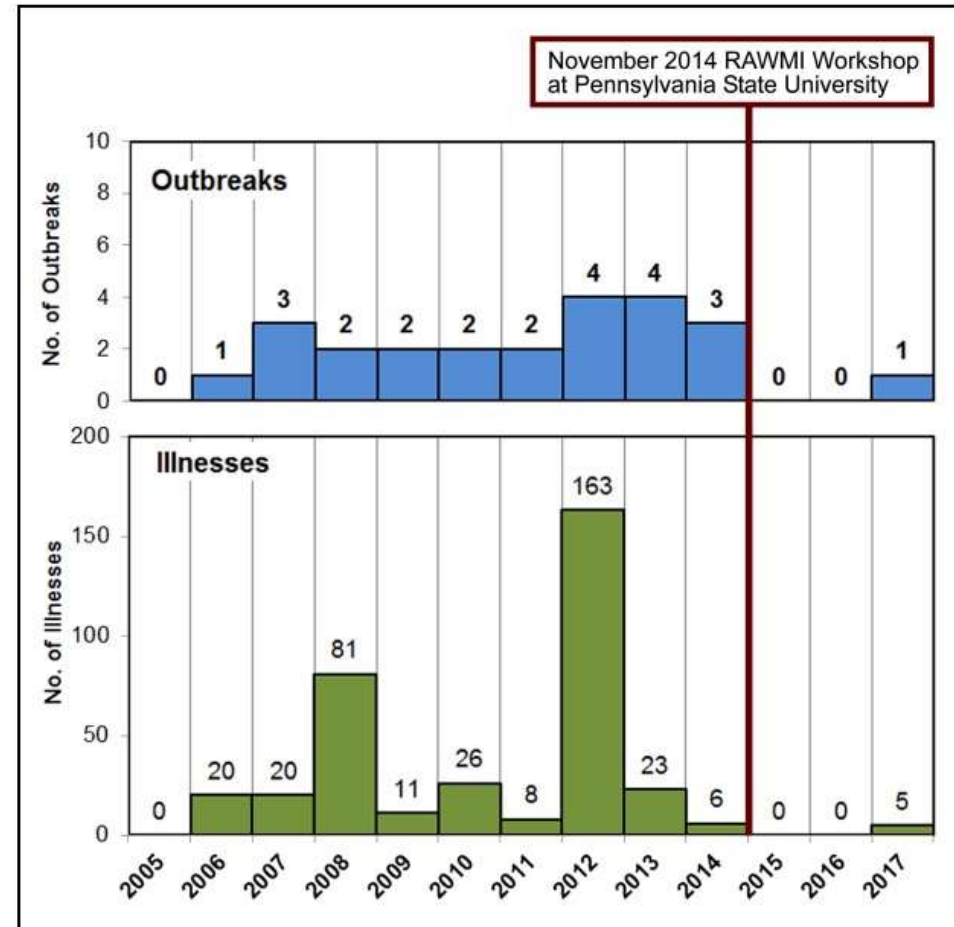
RAWMI Method for Low-Risk Raw Milk

- Develop Risk Assessment and Management Plan (RAMP)
 - Helps you identify and understand the risks on your own farm
- One-on-one mentoring in optimizing your risk management
- Test milk monthly for coliforms and standard plate count to make sure RAMP is working

The RAWMI Effect

- RAWMI training reduces outbreak rates by 78% meanwhile there has been an increase in raw milk permits issued over the same time period

Thirteen-year timeline of outbreaks and illnesses in Pennsylvania, showing the effect of RAWMI Training:



Annual number of outbreaks and illnesses related to raw milk in Pennsylvania, 2006-2017. [NOTE: outbreak in 2017 was from an unlicensed farm.]

Reference: Whitehead J, Lake B. Recent Trends in Unpasteurized Fluid Milk Outbreaks, Legalization, and Consumption in the United States. PLOS Currents Outbreaks. 2018 Sep 13.

Two Types of Raw Milk



Used milk filters from
Organic Pastures Dairy,
a dedicated raw milk farm

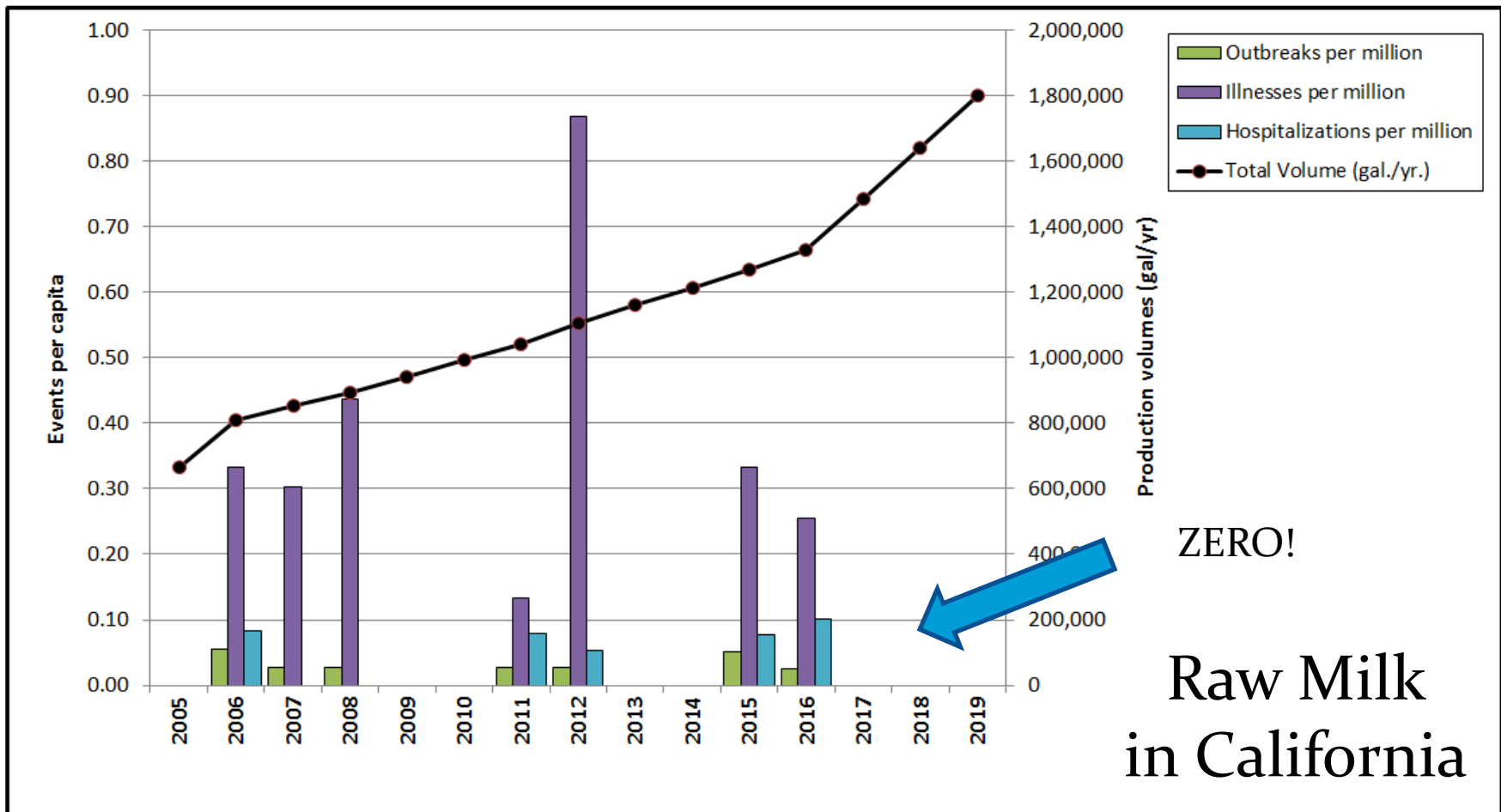


Used milk filters from
a conventional dairy farm

Two Types of Raw Milk (cont.)

Raw Milk Pathogen Detection Data				
Study	# milk samples tested	# pathogens tested ^[1]	total # pathogen tests	% samples with one or more pathogens
Pre-pasteurized milk produced using conventional dairying methods				
Del Collo et al (2017)	234	1	234	25
Jayarao and Henning (2001)	131	5	524	27
Jayarao et al (2006)	248	5	992	11
Rohrbach et al (1992)	292	4	876	33
Steele et. al. (1997)	1720	4	6880	4.1
Van Kessel et al (2004)	861	2	1722	9.1
Van Kessel et al (2008)	183	1	183	11
Raw milk produced using RAWMI methods				
BC Herdshare Assoc. (2020)	183	4	732	0.0
Organic Pastures Dairy (2019)	3926	4	4252	0.0

Outbreaks Decreasing While Raw Milk Consumption is Rising



Size Doesn't Matter

- Raw milk producers of ALL sizes need to follow strict sanitary practices to prevent illness
 - Micro dairies as well as large dairies



Grass-to-Glass Risk Management

The Basis of Raw Milk Safety: Conditions, Conditions, Conditions



Good

Bad



- All conditions matter: pasture, cows, udders, internal milk system, external milk lines

UK Raw Milk Failures

- 25% failure rate for 170 UK permitted dairies - RAWMI visit in 2018
- When visiting, found the problem in 15 minutes
- Raw milk being commingled with milk intended for pasteurization



Grass-to-Glass Continuum

Keep:
Clean clean
Cold cold
Hot hot
Green green

Grass

Cows

Milking

Management

Glass



Water

Wild Animals

Udders

Cleaning

Chilling

Training

Pasture conditions

Animal health/feed

Temperatures

Testing



Quick Checklist

- When best practices are being used:
 - Cows are in good health with good body conformation, udders, coat, etc.
 - Cows get sunshine and have access to outdoors and grass
 - Udders are cleaned very well, stripped, pre-dipped, and dried before milking begins
 - Everything involved in milking process looks very clean, including milking parlor, all milking equipment, milk jars/bottles, etc.
 - Milk is chilled to below 38 F in less than an hour
 - Milk is tested regularly for SPC and coliforms
 - Shelf life of milk is at least 2 weeks without souring
 - No rising bubbles in milk (which would indicate high presence of coliform bacteria)

An Example of a Simple, Small-Scale Raw Milk System



#1 Mindset

- Dedication to excellence
- Diligence
- Plan for success



#2 Conditions

- Healthy cows
- Maintained areas



#3 Organized and Clean Milking

- Clean dry udders
- Milk is checked
- Monitor the process
- Stress-free conditions



#4 Sanitary Management of Milk

- Bacteria counts double every 20 minutes





#5 Rapid Chilling in Ice Bath

- Below 38 degrees F in <1 hour)

#6 Keep Cold

- Below 38 degrees F



An Example of a Large-Scale Raw Milk System



#1 Mindset

- Dedication to excellence
- Diligence
- Plan for success



#2 Conditions

- Healthy cows
- Maintained areas



#3 Organized and Clean Milking

- Clean dry udders
- Milk is checked
- Monitor the process
- Stress-free conditions



#4 Sanitary Management of Milk

- Milk lines are clean inside and out
- All surrounding areas are kept clean





#5 Rapid Chilling

- Below 38 degrees F in <1 hour)

#6 Keep Cold

- Below 38 degrees F



Risk Minimization - Grass

Pasture

- Adequate space
- Cows rotated through pasture
- Soil fertility monitored



Keep Green Green

Pasture (cont.)

- Winter or wet conditions
 - Dry pack bedding to keep cows clean and dry
 - High, dry, and shaded



Pasture (cont.)

- Perimeter fencing is secure and allows for minimum 3-yards gap between neighboring livestock
 - Lesson learned from LISTED farm: *E. coli* O157:H7 from neighbor's beef cows



Pasture (cont.)

- Chickens and pigs pose risks
 - Lesson learned from LISTED farm: *campylobacter* from chickens



Water

- Pasture regularly watered via rain or irrigation
- Water is a transfer mechanism for bacteria and pathogens
 - Water tested at least annually



Risk Minimization - Cows

Cow Health

- Cows fed appropriately to maintain good body condition
- Tested negative for tuberculosis, brucellosis, etc.



Cows with Health Risks

- Recommended to separate cows with health risks (such as mastitis) from herd
- Freshening cows are at greatest risk for carrying pathogens, mastitis, etc.
 - Risks of using milk from freshening cows for direct human consumption
 - Lesson from LISTED farm – Campylobacter and E coli 0157:H7 from fresh cow
 - Can be used for cheese and butter



Biosecurity

- Biosecurity is essential to protect the herd from infectious diseases
- Infectious animal disease can be transmitted by:
 - Contact with infected animals, their secretions and discharges
 - Mother to offspring, including via milk and in uterus
 - Contaminated equipment, food, pasture or water
 - Contaminated dosing and injecting equipment
 - Insects and wildlife
 - Humans and their vehicles (including transport vehicles)



Biosecurity (cont.)

- Biosecurity measures include:
 - If possible, maintain a closed herd
 - Only purchase non-lactating animals for replacement, preferably heifers
 - Not purchasing a lactating cow and putting her directly with your lactating cows
 - Not sharing bulls between herds
 - Ensuring prospective animals have tested negative for diseases



Biosecurity (cont.)

- Biosecurity measures (cont.)
 - Isolation area/paddock for sick or new cows
 - Separate airspace, water supply, or drainage with other animals
 - Equipment for use only in isolated area
 - Minimum of 3 yards away from other livestock areas
 - New or returning livestock isolated for 21 days
 - Clean hands and boots, and change clothes, before going to other areas

Risk Minimization - Milking

Cleanliness

- Build a culture of cleanliness
- No chickens or birds in milking areas
- Easy access hand washing facilities
- Boots wash station and/or boots are regularly cleaned (such as 1x/day)



Keep Clean Clean

Cleanliness (cont.)

- All confinement areas need to be maintained and clean
- NO chickens or birds in milking areas



Cleanliness (cont.)

- The closer to milking, the more important the clean

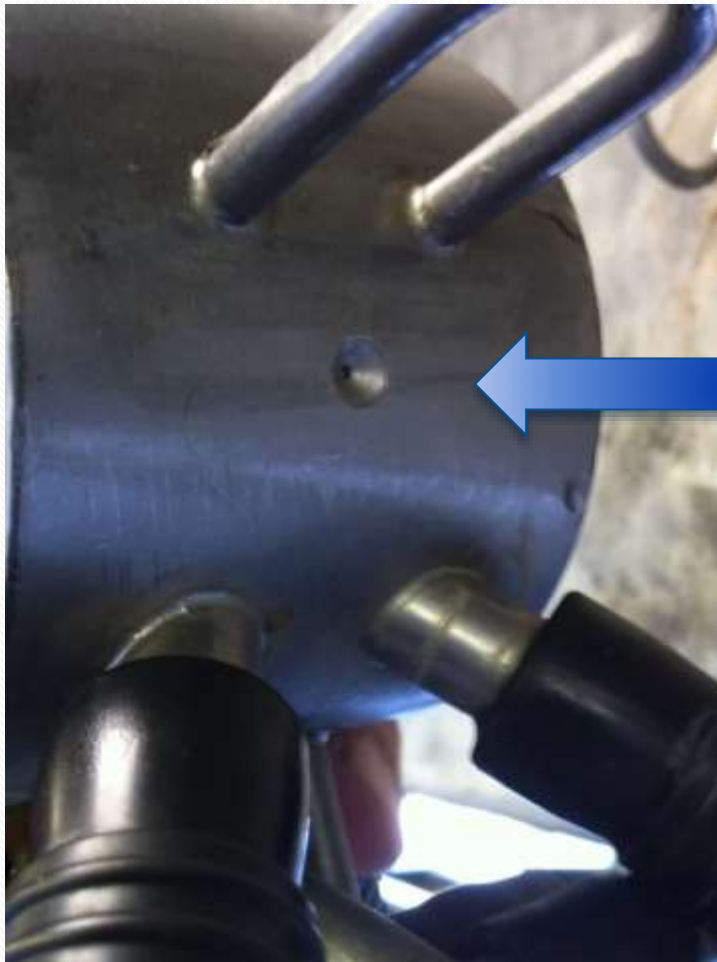


Milking Equipment

- All milking equipment is kept clean
- Inflation liners are replaced per manufacturer's recommendations
 - Lesson learned from LISTED farm: Listeria from torn inflation liner
- Vacuum pressure management
 - High vacuum pressures are associated with increased mastitis



Milking Equipment (cont.)



This vacuum hole goes directly into the milk flow:

Is this wet?

Is this clean all the time?

What's wrong here?



Udders

- Before milking
 - Brush or wash very well
 - Dry udder and teats with clean udder cloth, starting with the teats first and then moving to outer areas last, not retouching the clean dry teats
 - Predip teats with teat dip solution and wait for 30 seconds
 - Wipe off predip
 - With clean hands or gloves, strip teats to eliminate foremilk and observe milk quality



Udders (cont.)

- **Shower Power!**

- No belly fly habitat...organically
- Mostly clean udders
- Refreshed happy cows
- They leave their manure in spray pen



Udders (cont.)

- Water moves bacteria – Dry is good!
- Trim hair and tail



Wet



Hairy

Udders (cont.)

- Is your teat dip a contaminant?
- Keep it clean... Use a spray bottle!



Udders (cont.)

- After milking
 - Post dip with iodine-based teat dip
- Protect your clean udder rags
- Beware of contamination
 - Use separate bucket for soiled rags



Risk Minimization - Management

Details make all the difference
between low-risk raw milk
and risky raw milk!

Mistakes Add Up

- No animal health documentation for brucellosis and tuberculosis
- Beef cattle contact with wild elk
- No water or wastewater system available at milk barn for milking operations or cleaning
- No hand washing sinks available for cleaning and sanitizing
- No bacteriological test results available for the farm's well-water system
- Multiple instances providing for the opportunity for cross-contamination
 - Mud/manure with standing water at entrance to the milk barn parlor
 - Milking bucket in direct contact with unclean surfaces during milk production
 - No separate milk processing area from domestic kitchen



E coli 0157:H7
Southern
Washington
2005

Management

- Keep Clean Clean
- Keep Green Green
- Keep Hot Hot
- Keep Cold Cold

Bacteria Counts

Environmentals
Feed
Health
Udders



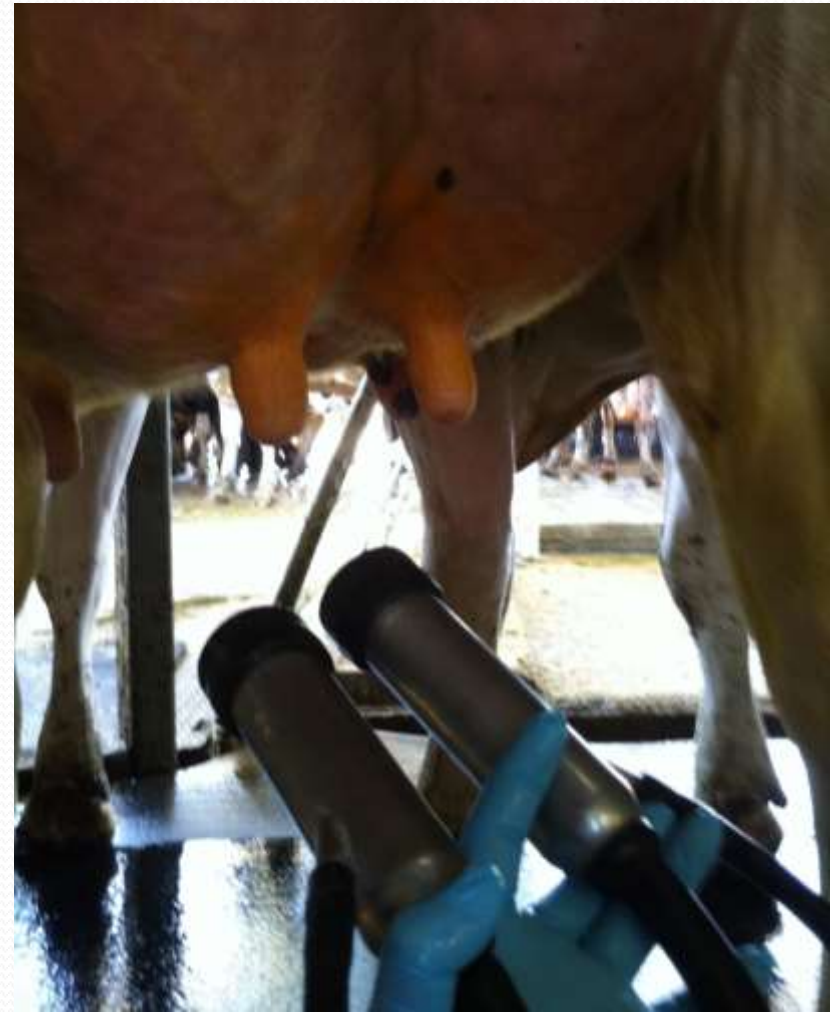
LOW POINT

All up from here



Milk system
Management
Chilling

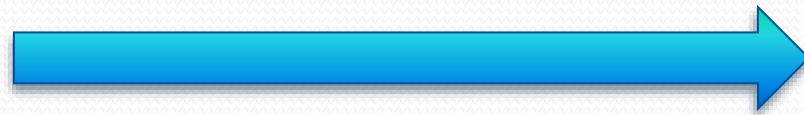
Udder Meets Machine



KISS

KEEP IT “SHORT” AND SIMPLE

Short distance between
cow and milk container



Cow-Bucket-Container!

Space Management

- Separations between livestock and milk processing areas
- Clean, washable walls and work surfaces in milk room
- Proper storage of clean equipment

Proper Space Management

- Smooth, cleanable, dry
- Inventories protected from contamination
- Well lighted
- Covered



Lighting

- Ensure adequate lighting



Buckets

- Easy to clean and operate



Not OK



OK

Buckets (cont.)

- Grade A stainless steel buckets
- Proper storage and drying



Equipment Management

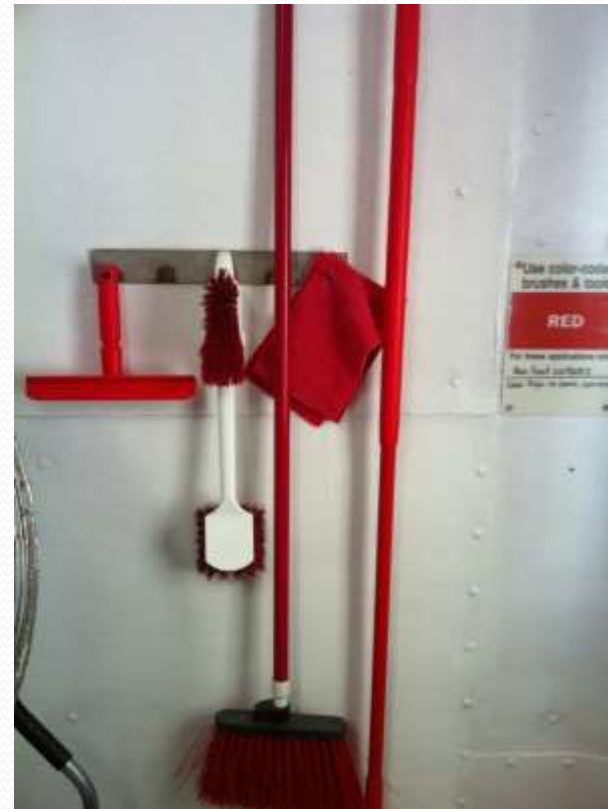
- Know what is clean and keep it clean
- Know what is not clean
- Keep them separated
- If they ever cross-contaminate, discard and start over

Equipment Management (cont.)

- Separate equipment for food vs. other uses



Food contact



Floors and non-food contact

Floors

- Floors flow to a drain
- No puddles



Floors (cont.)

- Wet floors cause condenser to freeze up – Loss of Chilling!



Air Management

- Trap the cold air - Cold air is expensive yet essential for raw milk freshness



Air Management (cont.)

- Positive air pressure in the filling room
- Keeps out flies, dust, etc.



Keep Your Equipment Spotless

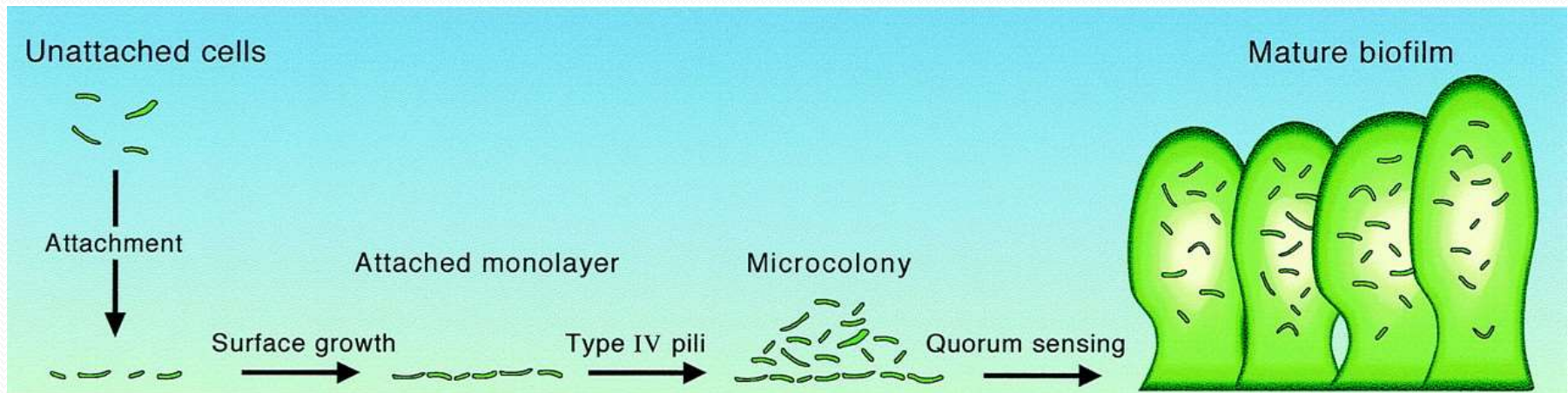
Whatever you have...
...take good care of it

Inside and out!



Biofilms

- In milk production, biofilms are symbiotic colonies of bacteria that adhere to the inside of the milk lines, valves, crevices, etc



Biofilms (cont.)

- Quorum Sensing
 - Bacteria within biofilms are protected from sanitizers due to multispecies cooperation
 - Biofilms are hard to kill!
- Biofilms provide a safe haven for pathogens
 - E coli 0157:H7
 - Salmonella
 - Campylobacter
 - Listeria monocytogenes
- Pieces of biofilm can detach and contaminate the milk

Pipelines and Tanks

- Big challenges
 - Valves
 - Gaskets
 - Low points
 - Bends
- All create opportunities for biofilm growth



Pipelines and Tanks (cont.)

- Valves, gaskets, etc. need to be completely disassembled and cleaned very often
 - Valve on milk tank needs to be completely disassembled and cleaned every time the milk tank is emptied



Pipelines and Tanks (cont.)

- Clean-in-place (CIP) protocols need to include both alkalines and acids
- Biofilms can become resistant to specific cleaners
 - ~Once per month: use different cleaners to target cleaner-resistant biofilms



Pipelines and Tanks (cont.)

- Clean-in-place (CIP) protocols work best with cool water first, followed by very hot water with alkaline sanitizers
 - Starting with cool water reduces the chance of milk coagulation in the lines
- Measure temperature of hot water at exit from system to ensure it is hot enough
- After alkaline sanitizer, clean with acid sanitizer
- Avoid quaternary ammonias

Keep Hot Hot

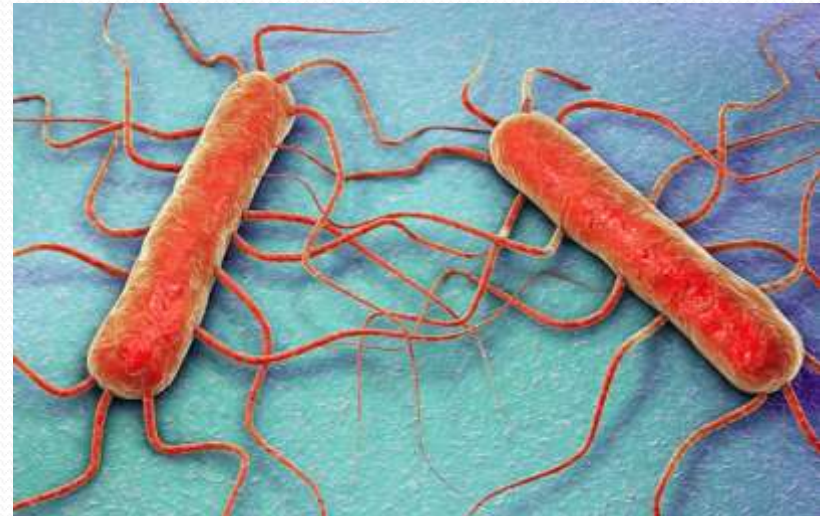
Milk Stacking

- Milk stacking occurs when milk from multiple milkings is placed in the same tank
- Milk stacking increases the chance of having a bacterial problem
 - One bad batch can contaminate the rest!
- Recommended to avoid milk stacking as much as possible



Pasteurized Milk Risks

- Producing both pasteurized and raw milk is risky!
- Pasteurized milk provides an ideal growth environment for *Listeria monocytogenes*
 - No beneficial bacteria to outcompete the *Listeria*
- Care needs to be taken to keep pasteurized milk completely separated from raw milk



Crate Management

- Crates washed and kept clean
- Sunlight can help with sanitation



Bird Nests

- Birds can spread Campylobacter and Salmonella
- Inspectors do not like bird nests near creameries



Risk Minimization - Glass

Milk Bottling

- It's clean this far... don't mess up now!



Bottle Washing

- Improperly cleaned bottles can cause bacterial issues!
- Storage of clean jars and containers needs to be managed



Bottle Lids

- Metal lids can shed rust
- Rust feeds iron-loving pathogens
- Consider using plastic lids instead



Keep it Cold!

- Quick and short cold chain



Inspections

- Inspectors inspect everything!



Successful FDA Inspection

- Organic Pastures Dairy - 2019
- Purpose of inspection to:
 - Assure compliance with 10-year-old court order which mandated no shipping of raw dairy products over state lines
 - Assure that dairy was in compliance with new FDA Food Safety Modernization Act (FSMA) regulations
- Inspectors spent four days examining paperwork and swabbing surfaces in on-farm creamery plant
- Total of ~200 samples – swabbed everything, everywhere, searching for pathogens:
 - Under door mats
 - Inside drains
 - Behind doors
 - Behind sinks
- Inspection results: FDA found NO pathogens in any of their tests!



Raw Milk Testing

Even Raw Milk From Clean Conditions Can Have Pathogens

Most common sources of raw milk pathogens in clean conditions:

- Torn inflation liners
- Biofilms
- Mastitic cows with an internal pathogen infection

Campylobacter, Ecoli 0157:H7, Salmonella and Listeria have all been detected from inside udders.

Try testing the milk filters to really discover pathogens!



Don't be fooled!

About RAWMI Common Standards

- Developed by RAWMI in conjunction with international group of:
 - Medical doctors, epidemiologists, and nutritional consultants
 - Veterinarians
 - Food safety experts and scientists
 - Raw milk producers and customers
- No standards can guarantee perfectly safe food
- However, when followed diligently, these guidelines dramatically reduce the risk of illness from consumption of raw milk

RAWMI Common Standards

- Develop a Risk Assessment and Management Plan (RAMP) for your individual farm
 - Grass-to-Glass risk management:
 - Animal welfare, health, and management
 - Milking hygiene
 - Product handling
 - Critical Control Points (CCP) and Standard Sanitary Operating Procedures (SSOP) to ensure risks are well-managed
- Sell raw milk for direct human consumption only from your own farm
 - No commingling of raw milk from other dairies

RAWMI Common Standards (cont.)

- Test for coliform bacteria at least monthly
 - Target: a rolling three-month average of < 10 coliforms per ml raw milk
- Test for Standard Plate Count (SPC)* at least monthly
 - Target: a rolling three-month average of < 5,000 per ml raw milk
- Test regularly for pathogens, including:
 - *Salmonella spp.*
 - *E. coli* 0157:H7
 - *Campylobacter spp.*
 - *Listeria monocytogenes*

*SPC data is preferred; however, Bactoscan data is acceptable.

Why Test Monthly?

- The RAMP, SSOP, and CCP ensure that there is a plan in place for producing low-risk raw milk
- Follow the RAMP, SSOP, and CCP, but also test milk regularly
- Monthly testing can help identify trouble spots such as:
 - Biofilms growing in milk lines due to improper cleaning
 - Cracked inflation liners, leading to biofilm growth
 - Teats not being cleaned properly
 - Milk not being cooled quickly enough

Standard Plate Count (SPC)

- SPC is a measure of the total number of aerobic bacteria in the milk
 - High SPC can indicate dirty milking equipment, poor cooling, and/or poor udder prep



Coliforms

- Coliform bacteria is a way to measure the overall hygiene and cleanliness of the milk
 - High coliform counts can indicate environmental or fecal contamination on the udders or milking equipment
 - High coliform counts are likely to correspond to the presence of pathogens in the milk
 - Coliforms assess “Haystack” conditions not the “needles in the Haystack”



Interpreting Test Data

<u>IDENTIFICATION</u>	<u>SAMPLE DATE</u>	<u>DATE PLATED</u>	<u>COLI</u>	<u>SPC</u>
AM Tk A	6/4/2012	6/6/2012	<1	380
PM Tk B	6/4/2012	6/6/2012	<1	980
PM Tk A	6/4/2012	6/6/2012	2	330
AM Tk B	6/4/2012	6/6/2012	<1	500
PM Tk A	6/5/2012	6/6/2012	<1	880
AM Tk A	6/5/2012	6/6/2012	2	130
AM Tk B	6/5/2012	6/6/2012	7	530
PM Tk A	6/5/2012	6/6/2012	1	250

<u>IDENTIFICATION</u>	<u>SAMPLE DATE</u>	<u>DATE PLATED</u>	<u>COLI</u>	<u>SPC</u>
Tank A Am	6/15/2012	6/18/2012	3	1000
Tank A Pm	6/15/2012	6/18/2012	2	600
Tank B Am	6/15/2012	6/18/2012	23	780
Tank B Pm	6/15/2012	6/18/2012	47	3900
Tank A Am	6/16/2012	6/18/2012	2	760
Tank A Pm	6/16/2012	6/18/2012	16	630
Tank B Am	6/16/2012	6/18/2012	21	810
Tank A Am	6/17/2012	6/18/2012	3	560
Tank A Pm	6/17/2012	6/18/2012	6	930
Tank B Am	6/17/2012	6/18/2012	43	800

Pathogen Tests

- Regular testing for pathogens gives you further insight into the quality and cleanliness of your milk
- On-farm pathogen testing is dangerous and not recommended
- Have a plan in place for how you will respond in case of a positive pathogen detection

Test Protocols

- Test both the bulk tank and the finished product regularly
- Use proper shipping or transport protocols
 - Ensure that samples are cold when they arrive at lab

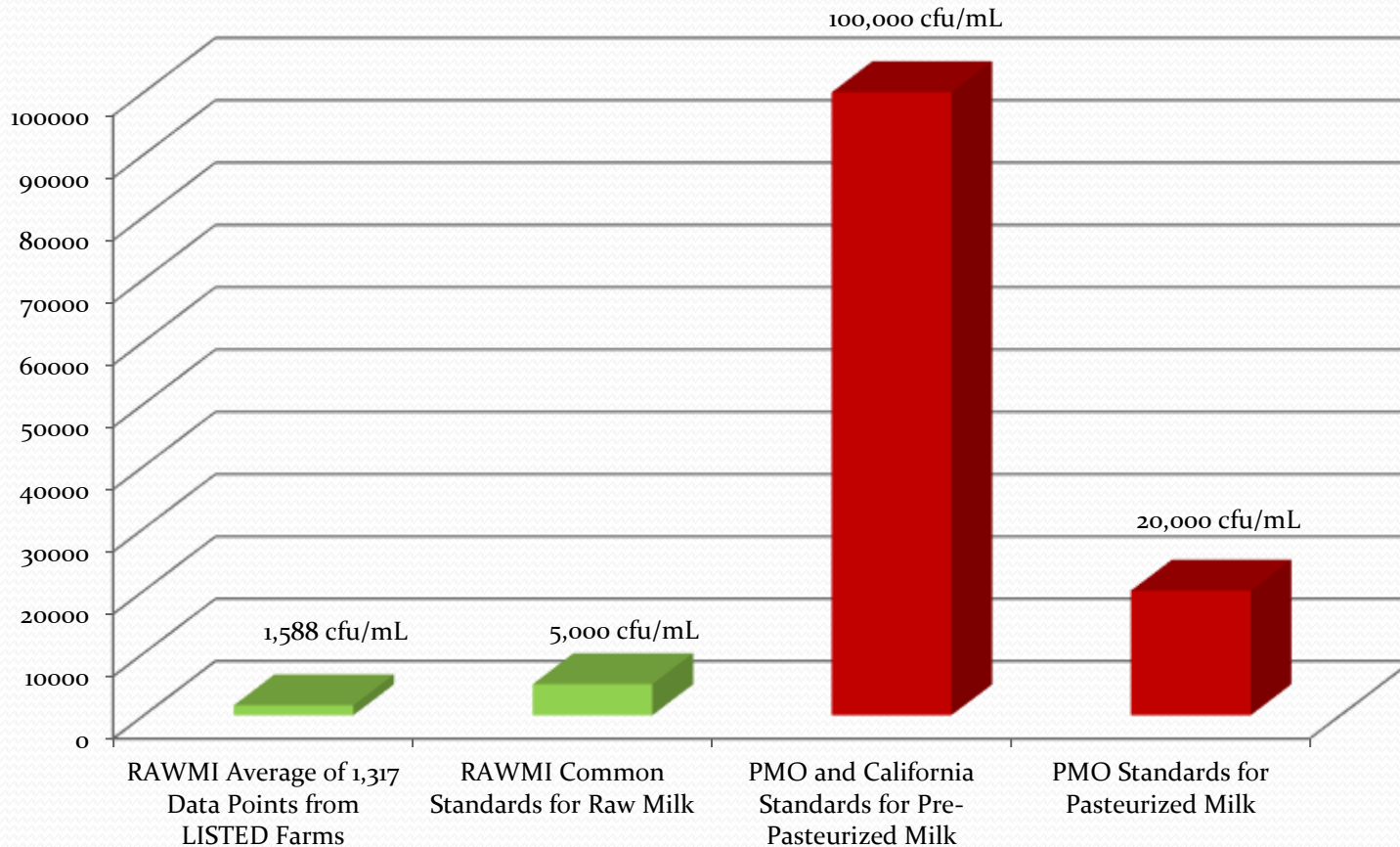




*Low-risk raw milk IS
achievable!*

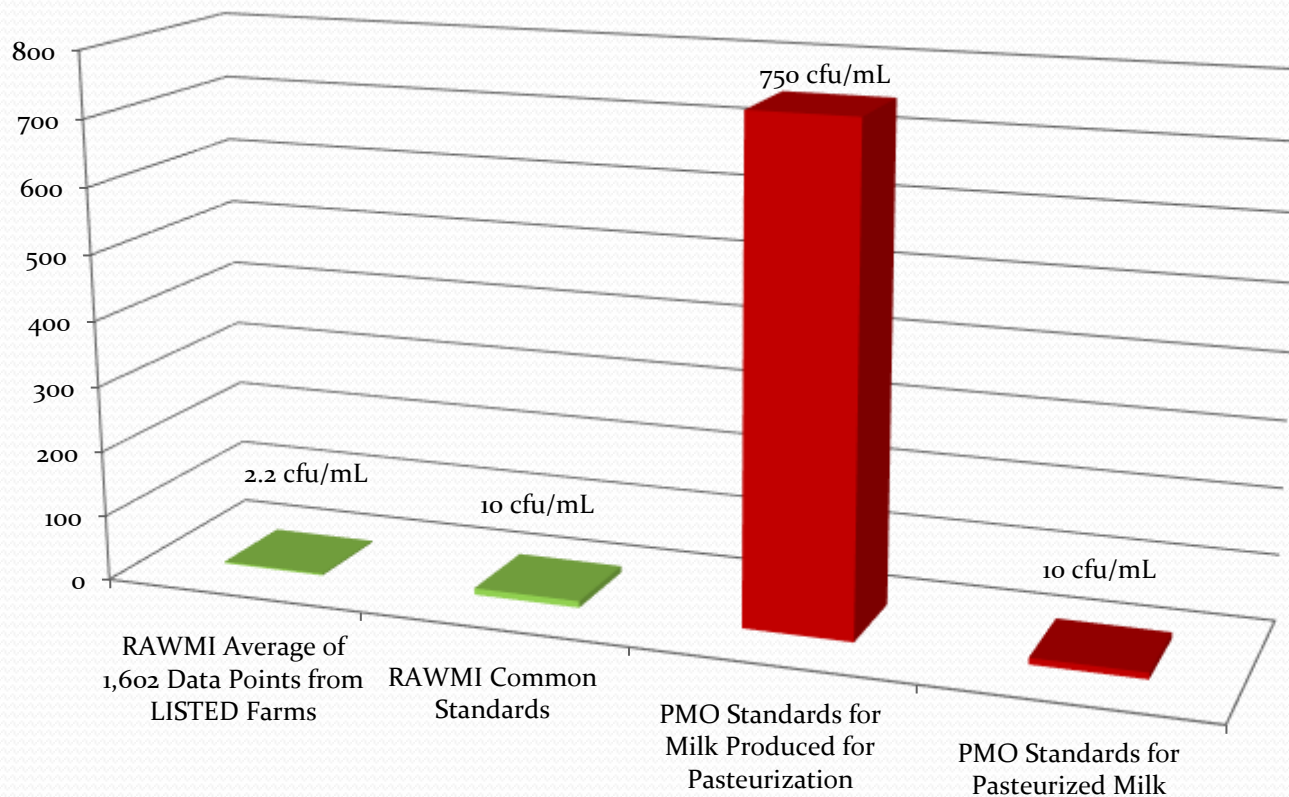
RAWMI Standards and Data vs. FDA Standards

SPC Standards and Data Comparison



RAWMI Standards and Data vs. FDA Standards (cont.)

Coliform Standards and Data Comparison



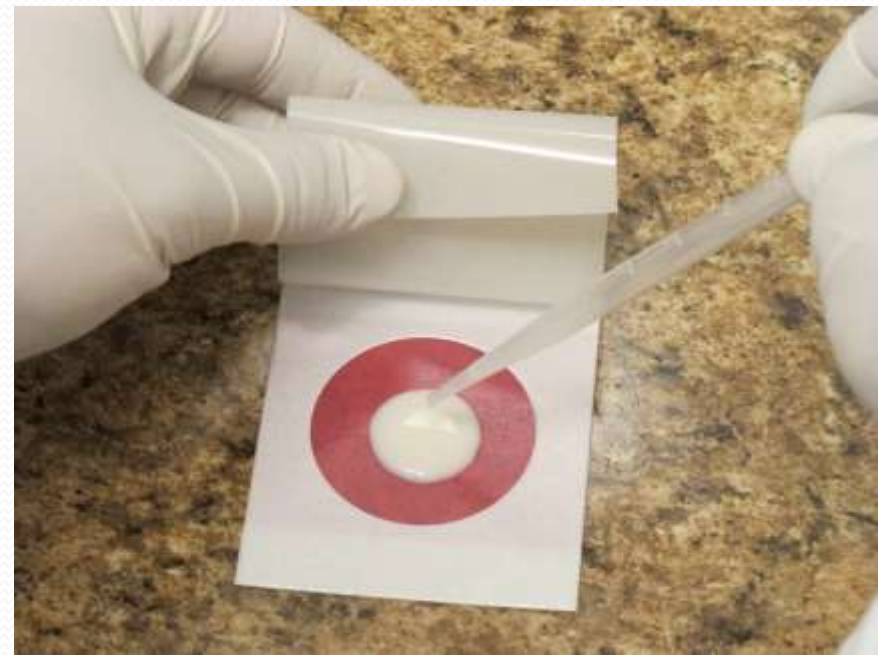
Testing Doesn't Have to Be Expensive

- Edwin Shank, from The Family Cow, has pioneered on-farm testing for SPC and coliforms
- On-farm pathogen testing is NOT recommended

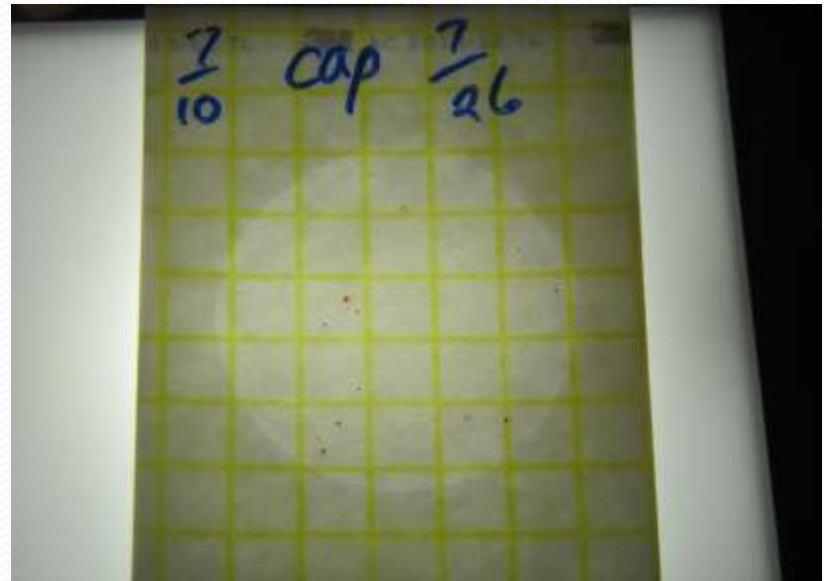
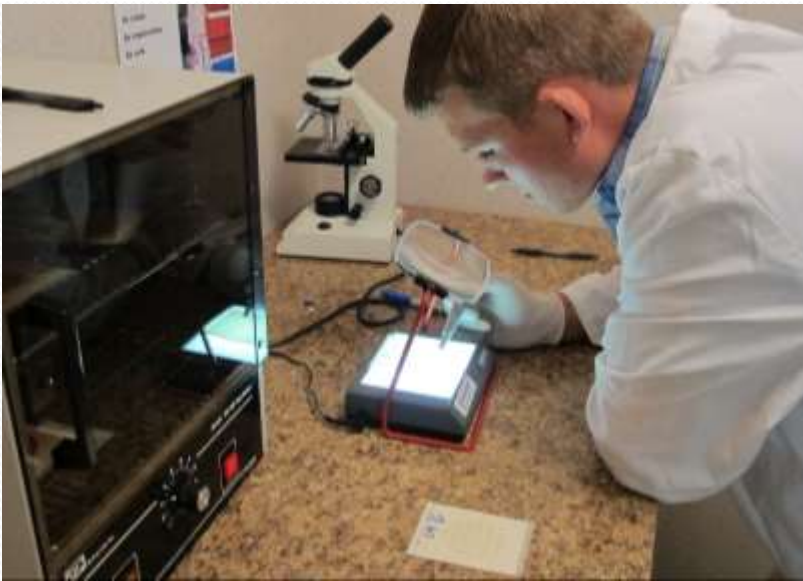


On-Farm Testing

- Initial set-up costs are just a few hundred \$\$
- Inexpensive in the long-run
- Allows you to test as often as you'd like
- Allows you to troubleshoot problems much more efficiently



On Farm Testing (cont.)



How and Why to Become RAWMI LISTED

The Gold Standard for Raw Milk Producers

- RAWMI LISTED Farms are dedicated to producing clean, safe raw milk
- RAWMI LISTED Farms:
 - Develop a plan for managing the health and hygiene of their farm
 - Test their milk regularly to ensure compliance with the RAWMI Common Standards



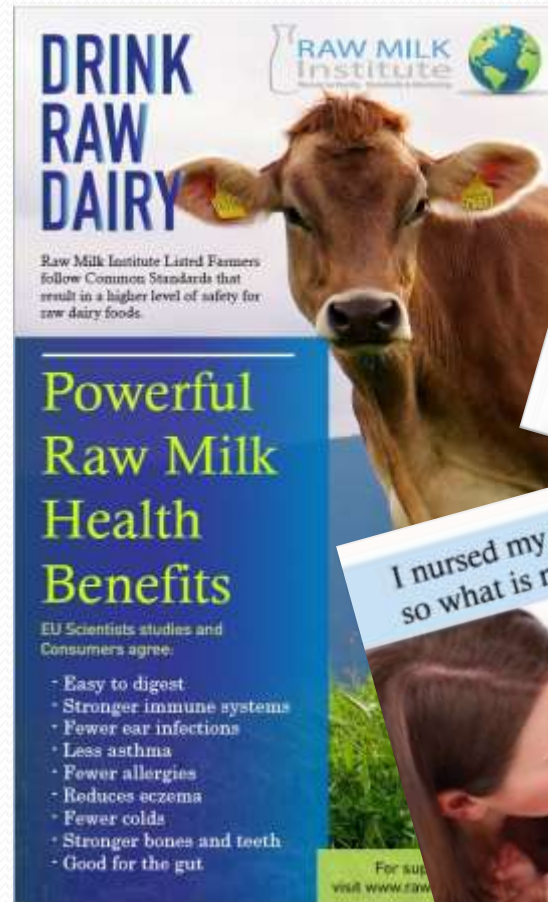
Benefits of RAWMI Listing

- Farmer support
 - Continuing education for best practices
 - RAWMI LISTED farmers form a like-minded community, providing resources and mutual support



Benefits of RAWMI Listing (cont.)

- Farmer support (cont.)
 - Assistance with trouble-shooting, potential recalls, and media communications
 - Access to RAWMI brochures and posters



Benefits of RAWMI Listing (cont.)

- Customer confidence
 - Informed customers seek out milk from RAWMI LISTED farms
 - Milk is regularly tested, delicious, and has longer shelf life



Benefits of RAWMI Listing (cont.)

- Insurance and inspection
 - Lower liability insurance rates
 - Improved relationships with regulators and inspectors

How to Become RAWMI LISTED

- Fill out and submit application
 - Application provides general details about the location, climate, size of herd, etc.

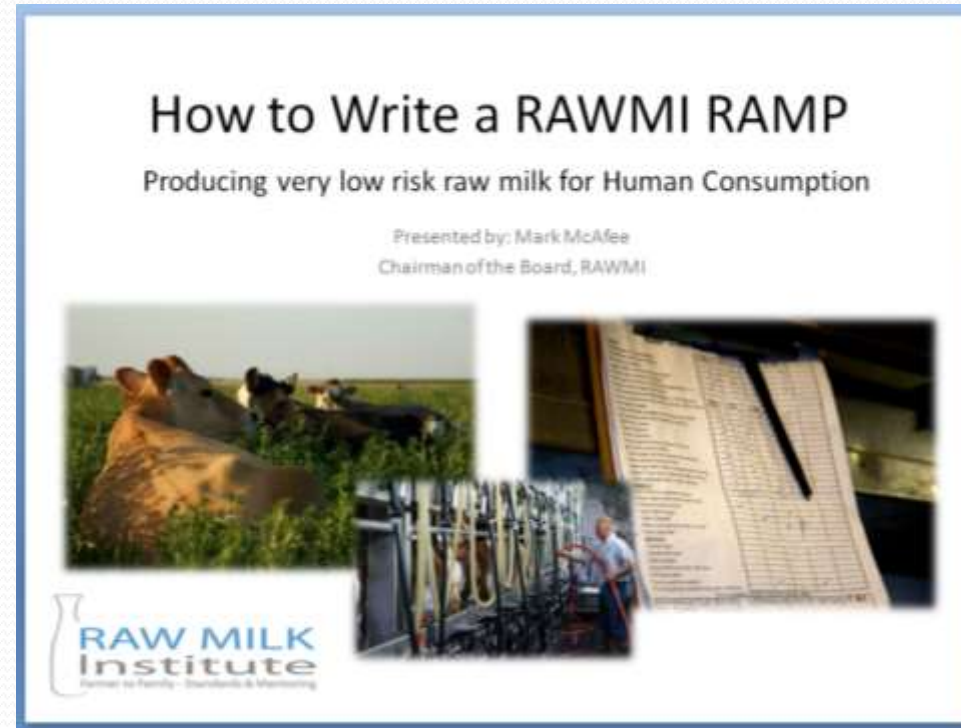


Farmer Application for RAWMI LISTING

	<i>Please type all information/answers in this column (Column B)</i>
Farm Contact Information	
Date:	
Farm name:	
Owner:	
Farm manager:	
Street address:	
City:	
State:	
Zip Code:	
Telephone number (farm office):	
Telephone number (cellular):	
Email:	
Website:	
Other internet communication forum (URLs for Facebook, Twitter, etc.):	
Herd Information	<i>Please type all information/answers in this column (Column B)</i>
Are you currently producing raw milk?	
When did you begin producing raw milk for human consumption?	
Have you been in continuous production since that time?	
Total herd size:	
Lactating cow herd size:	
Owner Experience and History	<i>Please type all information/answers in this column (Column B)</i>
What type of farm or dairy experience did you have prior to producing human milk?	
What off-farm expertise do you have (any prior careers and/or special skills)?	
Why do you produce raw milk?	
What is your personal motivation to produce raw milk?	
Environmental Location and Conditions	<i>Please type all information/answers in this column (Column B)</i>
Describe the climate:	
Temperature range in summer:	
Temperature range in winter:	
Summer rain (in inches):	

How to Become RAWMI LISTED (cont.)

- Create your Risk Assessment and Management Plan (RAMP)
 - Gain knowledge of potential risks in your production system
 - Biosecurity (protecting herd from transmission of disease)
 - Animal welfare, health, and management
 - Milking hygiene
 - Product handling



How to Become RAWMI LISTED (cont.)

- One-on-one mentoring with RAWMI
 - Identifying potential trouble spots
 - Refining your RAMP, Standard Sanitary Operating Procedures (SSOP), and Critical Control Points (CCP)
 - Optimizing your overall operation for low-risk raw milk



How to Become RAWMI LISTED (cont.)

- Test your milk for compliance with RAWMI Common Standards
- Join the community of RAWMI LISTED Farmers!



Dairy Together

- Price
- Supply
- Trade



Our common future depends on these elements. We must work together to save American dairies!

Strive for Excellence

- Safe raw milk production requires dedication and integrity
- Safe raw milk is a long-term mission
 - Never fully completed or fully perfected
- There will always be something to learn and much to teach



Questions/Discussion