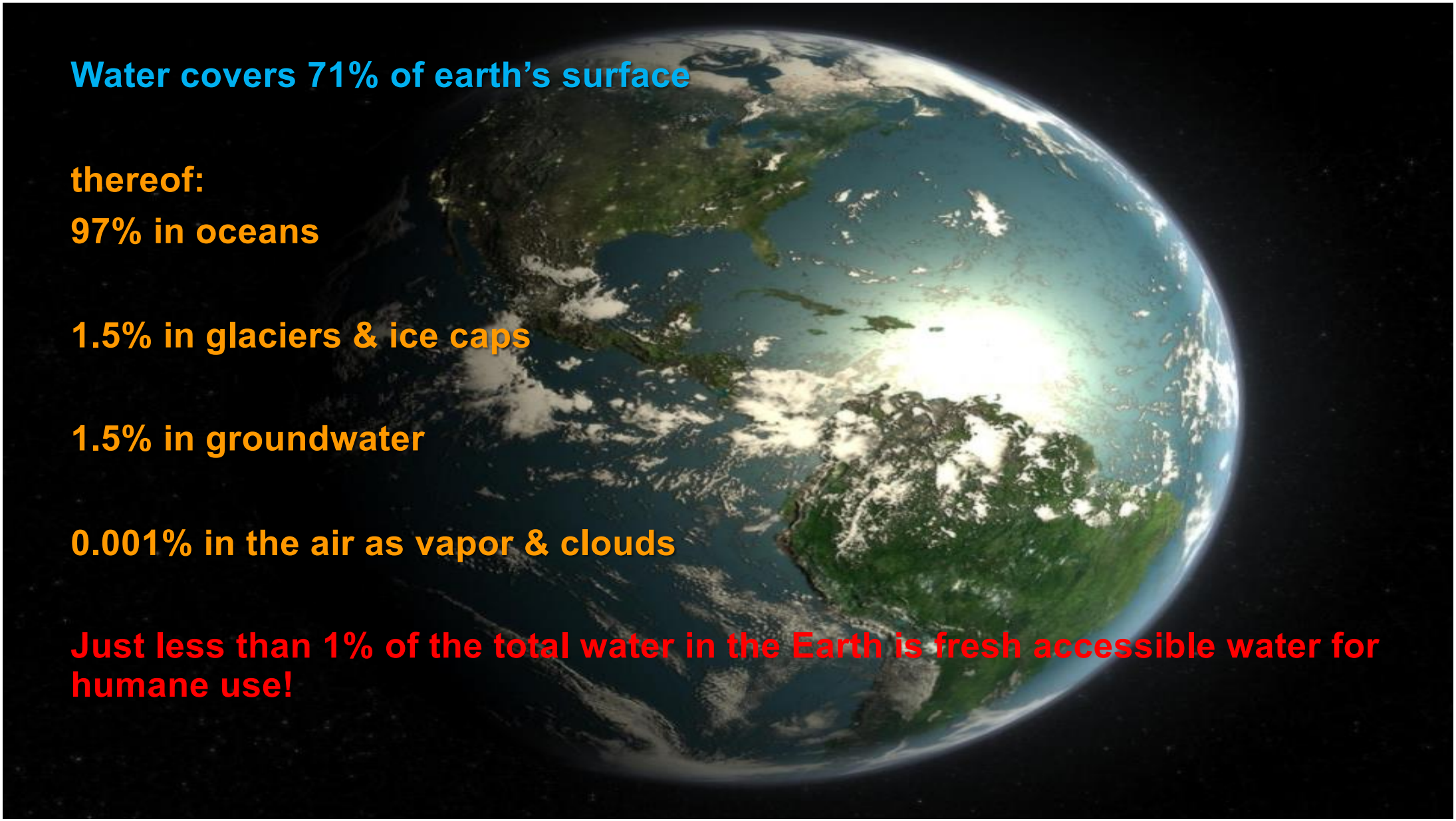

Water covers 71% of earth's surface
thereof:
97% in oceans
1.5% in glaciers & ice caps
1.5% in groundwater
0.001% in the air as vapor & clouds
Just less than 1% of the total water in the Earth is fresh accessible water for humane use!

INTERNATIONAL

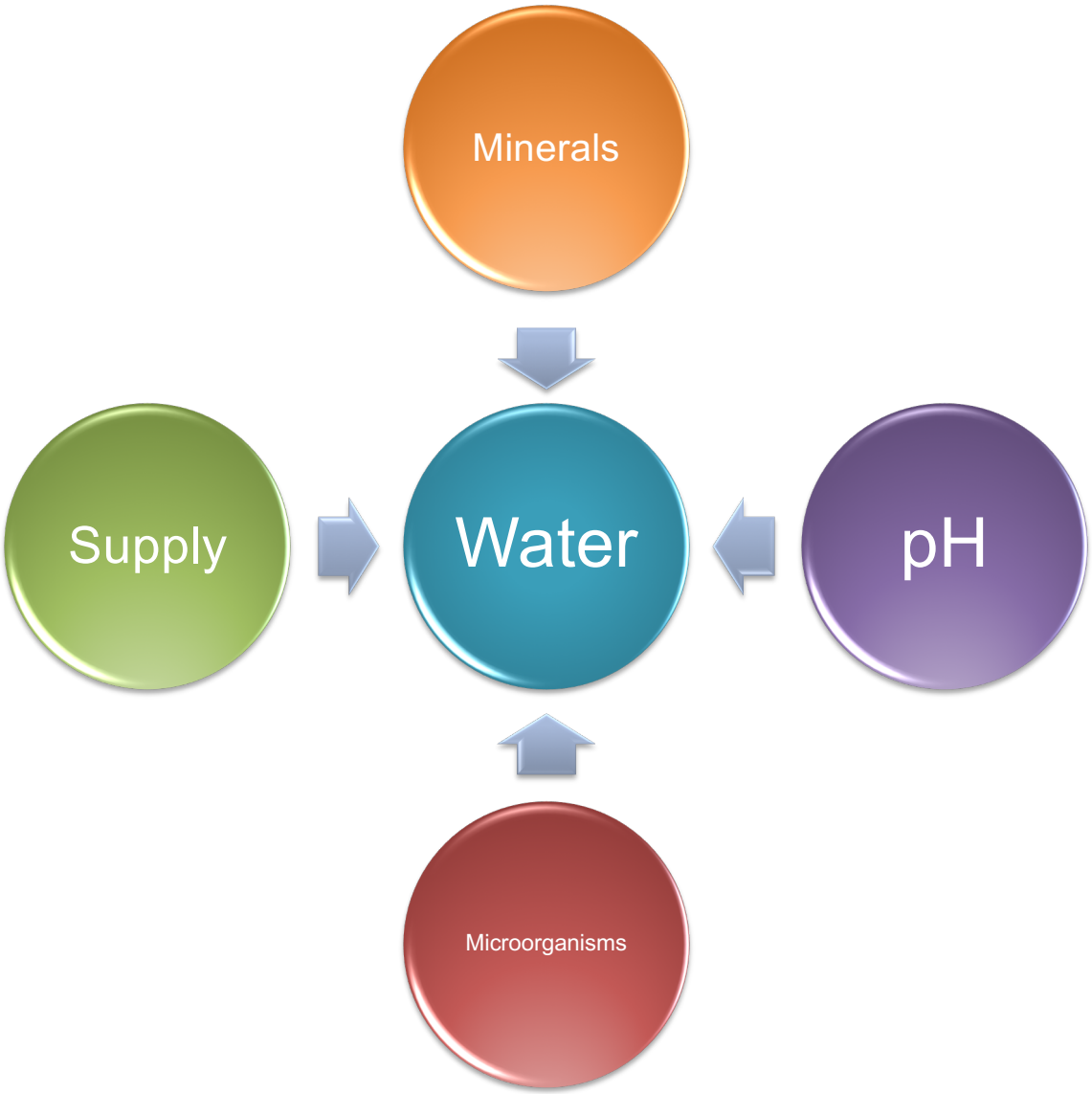
The key to your profit!

Water Quality and its Risks

H&N Layer Academy Asia 2021
Maurice Raccoursier DVM MSc
Global Technical Team

Water in poultry

- Birds typically drink 1.6 to two times the equivalent weight of feed, and, if water intake is limited, then feed intake declines.
- Poor water means less than expected results from even the best quality feed.
- 90% of the egg is water
- Several factors impact on water consumption.
- **Water requirements = feed requirements**


Minerals
Supply
Water
pH
Microorganisms

Minerals: standard values

Calcium	60 - 75 mg/L	No limit
Copper	0.6 - 1 mg/L	2 mg/L
Iron	0.2 - 0.3 mg/L	0.2 mg/L
Magnesium	50 - 75 mg/L	-
Manganese	0.1 mg/L	0.05mg/L
Nitrate	15 mg/L	50 mg/L
pH	6 – 8	6.5 – 9.5
Phosphorus	0.1 mg/L	-
Potassium	250 - 500 mg/L	-
Sodium	50 mg/L	200 mg/L
Sulfate	100 – 200 mg/L	240 mg/L
Alkalinity	100 mg/L	
Hardness	60 – 180 mg/L	-

- Levels that are higher than optimal must be corrected.

Maharjan, 2018

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Possible impacts of exceedance of the standard values (Depending on age and body size)

- GI problems.
- Impact on water system.
- Growth of microorganisms.
- Impact on vaccine and medications

Water Alkalinity

- Associated with bicarbonate, sulphates and calcium carbonate
- Can give water a bitter taste which makes it undesirable to the birds.
- High levels can make it difficult to lower the pH
- Can be corrosive to evaporative cool cell pads.
- Control it by **water acidification.**
- **We must know this value** (< 100 mg/l)

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Water Total Hardness

Minerals

Classification	Total hardness mg/ml of $CaCO_2$
Soft	0 - 75
Somewhat hard	76 - 150
Hard	151 - 300
Very Hard	> 300

Maharjan, 2018

- Produce scale that reduces pipe volume and nipples are hard to trigger or leak.
- Calcium and Magnesium
- How to deal with hard water:

a) Water acidification < 6.5 pH
b) Conditioning agents (sequestering Ca).
c) Water softener (evaluate first the Na level in the water).

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Filtration options

1. Mechanical
2. Absorption.
3. Sequestering (bind-up).
4. Ion exchange.
5. Reverse osmosis.

The best option depends on the analysis of the water sample. Many system are a mix of different types of filters

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Water pH

- Must know the water pH
- Ideal pH: 6.0 to 6.8 but can tolerate between 4.8 to 8.0
- > 8.0 impacts on water intake (bitter taste), feed intake, GI disorders, bacteria growth, sanitizer efficiency (chlorine activity – best pH 4.0-6.5).* Organic or mineral acids
- < 4.0 harms vaccines, medications, water intake and performance. * Baking soda.

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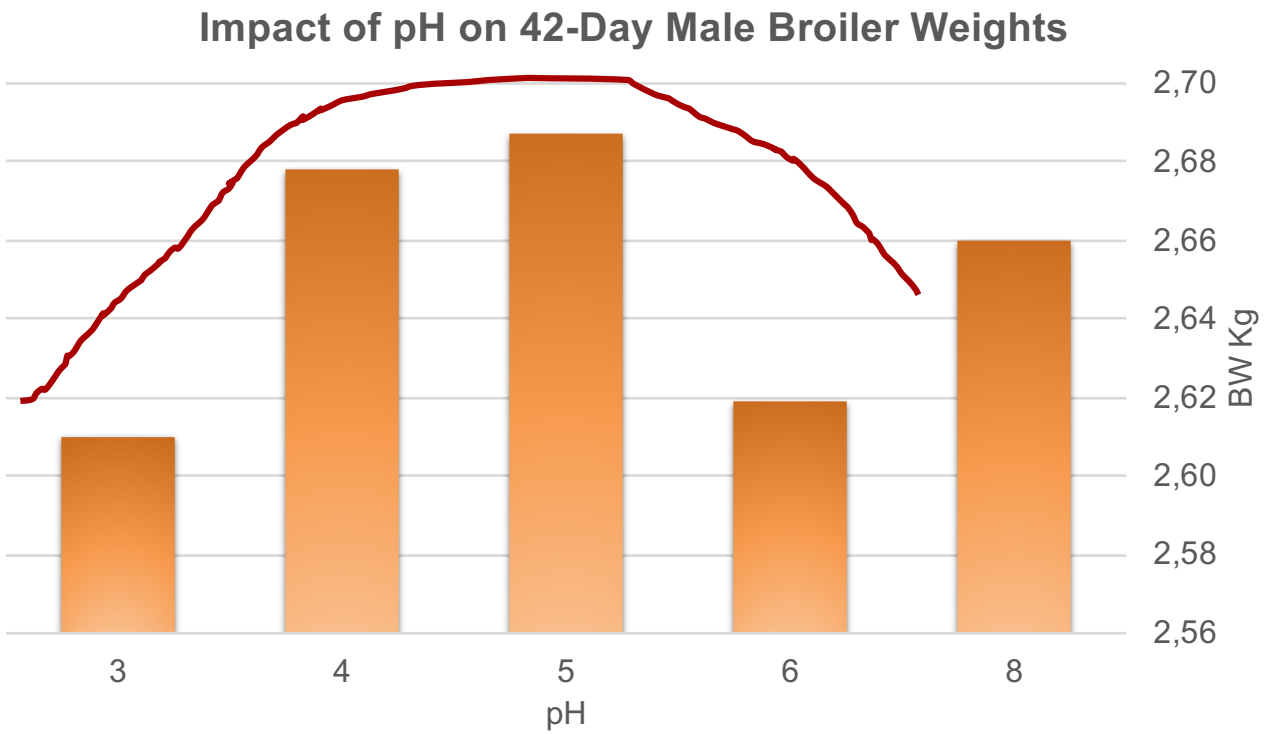
Water pH and Body weight



Watkins, 2008. PWT used to adjust pH

Water pH

- Waters with high pH need to be acidified but:

1. Acidifiers are not sanitizers
2. Most acidifiers need lots of contact time to damage or kill bacteria
3. During high water usage, contact time is minimal
4. Some bacteria may be resistant even thrive on it
5. Doses and products varies depending on water pH and water alkalinity (organic vs mineral).

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Water acidification as sanitizer

Product	pH	APC Count CFU/ml
Control	8	8.2 mil
Citric Acid	7	5.6 mil
CA	6	4.4 mil
CA	5	4.0 mil
CA	4	2.3 mil

Watkins, 2008. 5 minutes exposure

Product	pH	APC Count CFU/ml
Control	8	8.2 mil
PWT	7	4.9 mil
PWT	6	2.8 mil
PWT	5	2.7 mil
PWT	4	2.9 mil

Watkins, 2008. 5 minutes exposure

- Water acidification could be not enough to clean water lines.
- Laying birds refuse to drink water at low pH levels

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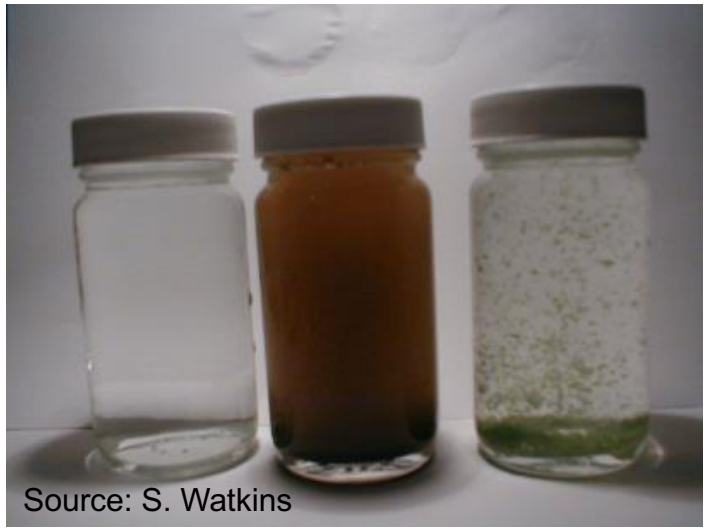
Water is Perfect Carrier of Health Challenges

- Water supplies can harbor many health challenges
  - Bacteria
  - Viruses
  - Protozoa
  - Worms..


Source: S. Watkins

- Poultry drinking systems easily contaminated
  - Water is slow moving/ warmed during brooding
  - Water systems/lines have many hiding places-pinch points
  - Water often contains food the organisms need
  - We add food

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Water quality: bacteriology

- Drinking water standard for poultry

Parameter	Unit	good	Maximum acceptable
Total aerobic plate counts	In 1 mL	0	< 1000
Total coliforms	In 1 mL	0	< 50
Fecal coliforms	In 1 mL	0	0
Escherchia Coli	In 1 mL	0	0
Pseudomonas	In 1 mL	0	0

Maharjan, 2018

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Total Bacteria
Inexpensive Test for Quality Assurance >1,000 cfu/ml- potential problem

Farm	Source	End of line in poutry barn
	Colony forming units of bacteria/ml	
A	2.700	26.600
B	203.000	2.340.000
C	0	4.775.000
D	0	0

Watkins, 2008

How to sample?

Microorganisms

- For bacteria count tests the sample should arrive the laboratory **within 24 hours** otherwise the water sample should be frozen!
- **Drip method in Glass bottles** is the most common..but
- What about the **Biofilm**?

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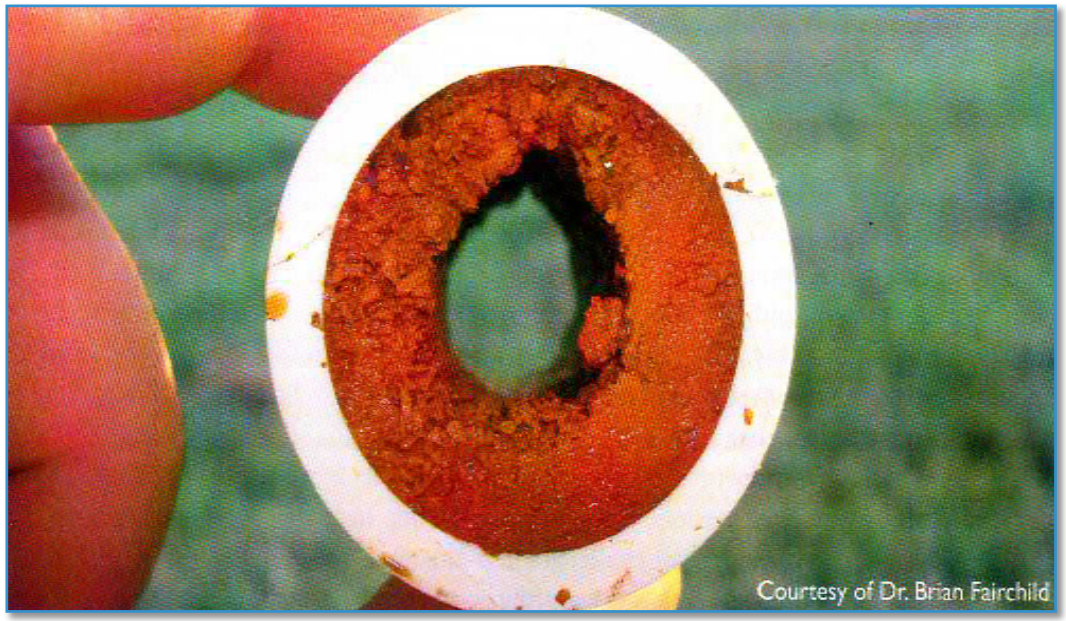
Biofilm

Microorganisms

- Biofilm is a mixture of Fungi, Algae and Bacteria and organic contaminants e.g. sugar bound together stuck on the inner surface of the pipelines and water system!



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What Promotes Bio-film?

- Natural contaminants
  - Iron, manganese, sulfur
- Vitamins
- Electrolytes
- Organic acids
- Products with nutrients like carbohydrates
- Vaccines and vaccine stabilizers
- Probiotics and Antibiotics
- Are lines cleaned after the use of these products?
- Is water sanitation sacrificed so water can be delivery route for products?

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Negative impacts caused because of Biofilm

- Reduce flow
- Increase pressure
- Negative impacts on Medications & Vaccines applied through drinking water
- An optimum medium for pathogenic germs (Salmonella + Campylobacter …). Protection and food.
- Negative impact on production parameters
- Increased mortality
- Negative impact on drinking system specially nipple drinkers

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Look For the Source of Problems:
Line Swab Procedure

Microorganisms

Source: S. Watkins

1.Insert sponge into line approximately 8-10 cm

Source: S. Watkins

2. Return sponge to 25 ml BPD or sterile water

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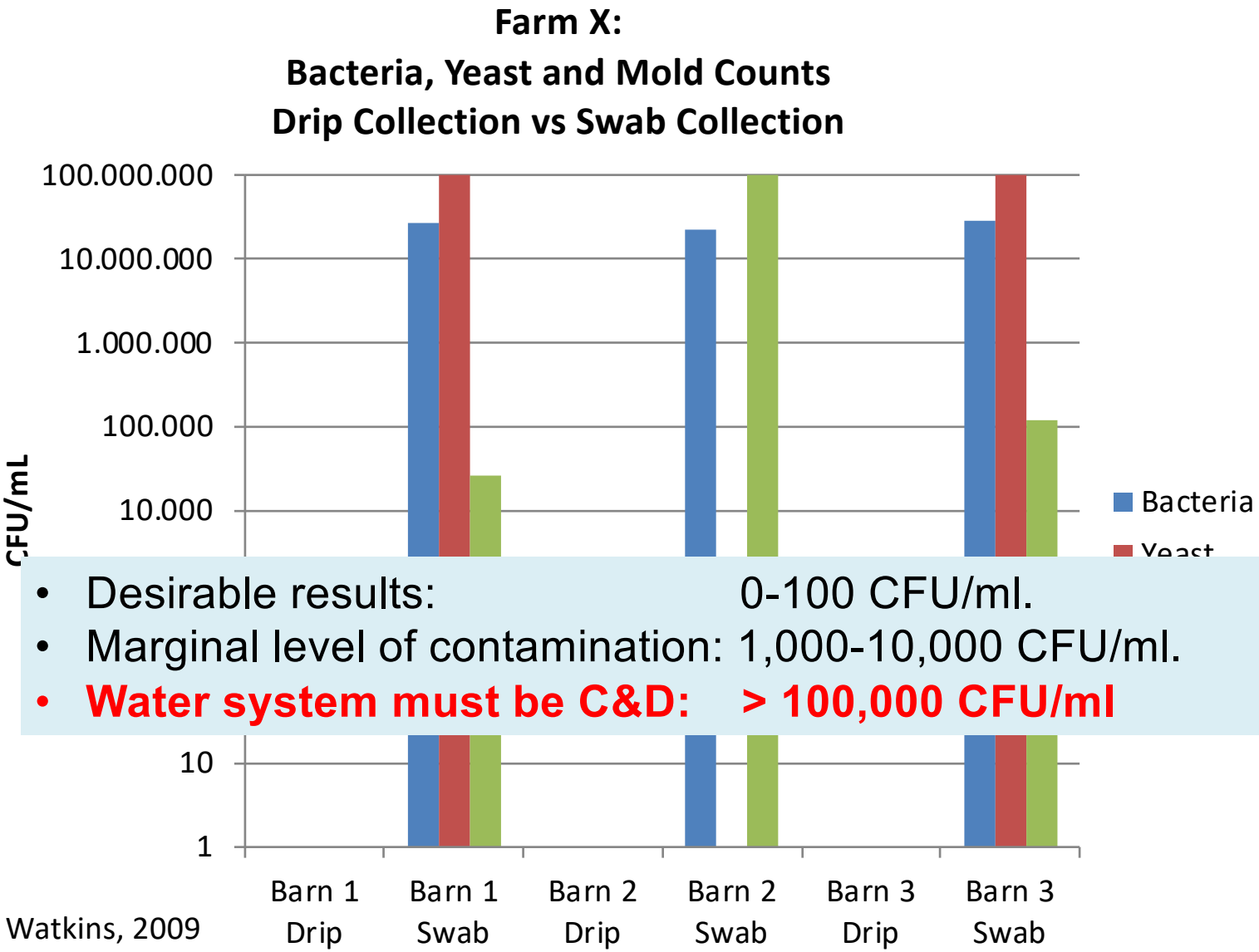
Microorganisms



- Desirable results: 0-100 CFU/ml.
- Marginal level of contamination: 1,000-10,000 CFU/ml.
- **Water system must be C&D: > 100,000 CFU/ml**

Watkins, 2009

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Treatments to eliminate or reduce impurities, scale and lime build-ups, biofilm and bacteria count.

Chemical Treatments

a) Chlorination (unsafe, bad smell, not completely effective)

b) Hydrogen Peroxide

c) Polyphosphate Compounds

d) Organic Acids (not completely effective)

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Water Line Cleaning Essentials

- Right concentration of an effective cleaner left the proper amount of time is the key to success
- Cleaning the whole system is essential
- There are lots of great products, DOCUMENT which one is best for your operation(s)
- **Flush system after cleaning with sanitizer and/or applying medications.**

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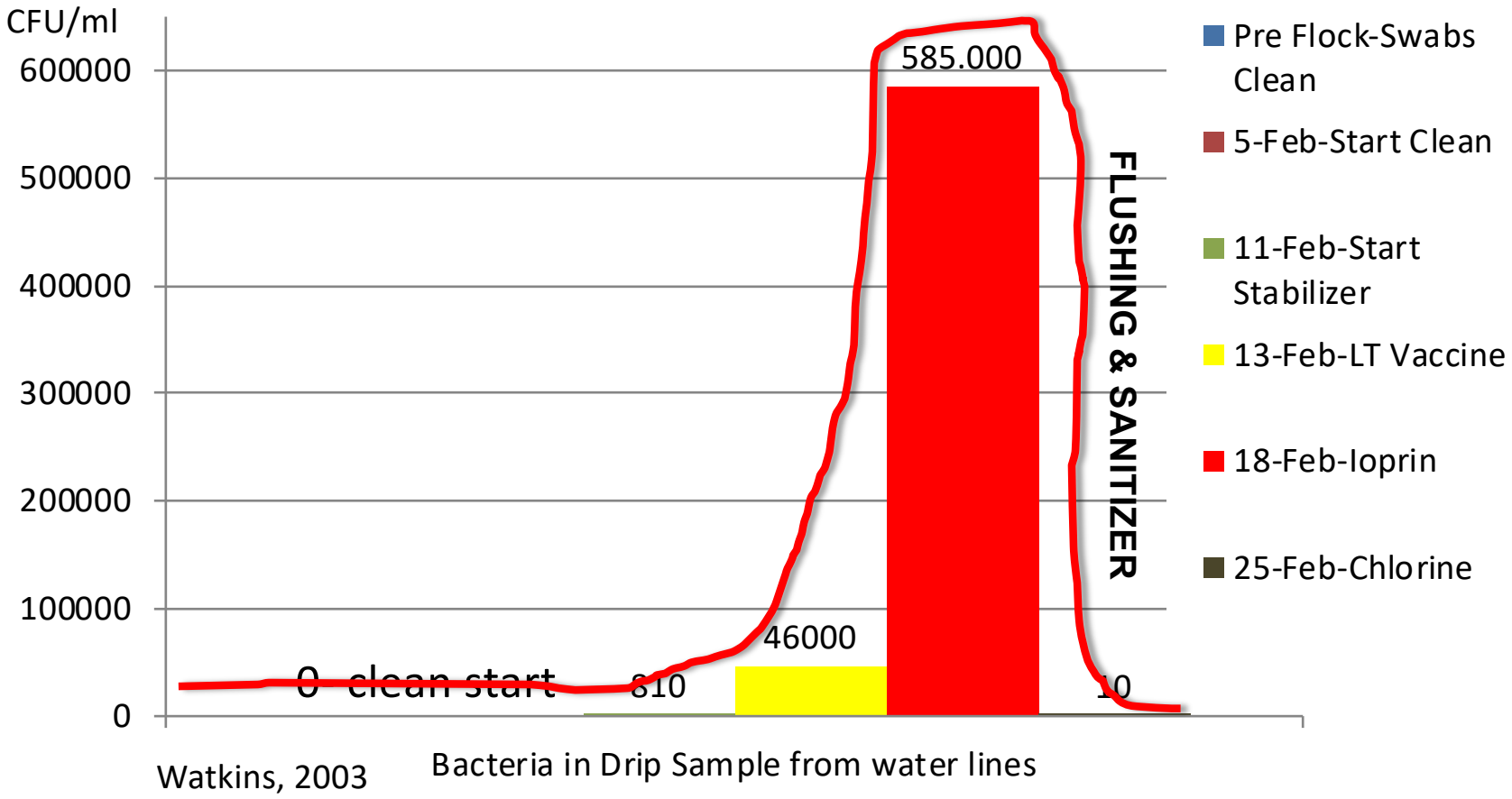
What happens to water quality when the sanitizer is shut off or barn is empty?

Microorganisms



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Chlorine

- Chlorine great sanitizer but not perfect
- Affected by:
  - pH, best pH is 4.0 to 7.0
  - Low concentration bacteria will live
  - Water temperature, >18.9 C loses effectiveness
  - Turbidity (dirty water)
  - Short exposure time, will not work
  - Age/ storage conditions of bleach

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What Form is Your Chlorine?

- Hypochlorus acid is 80-300 times more effective as a sanitizer than chloric ion
- Free chlorine not considered effective unless it is 85 % Hypochlorus acid (<7 pH)
- Goal: 2-4 ppm of free Chlorine

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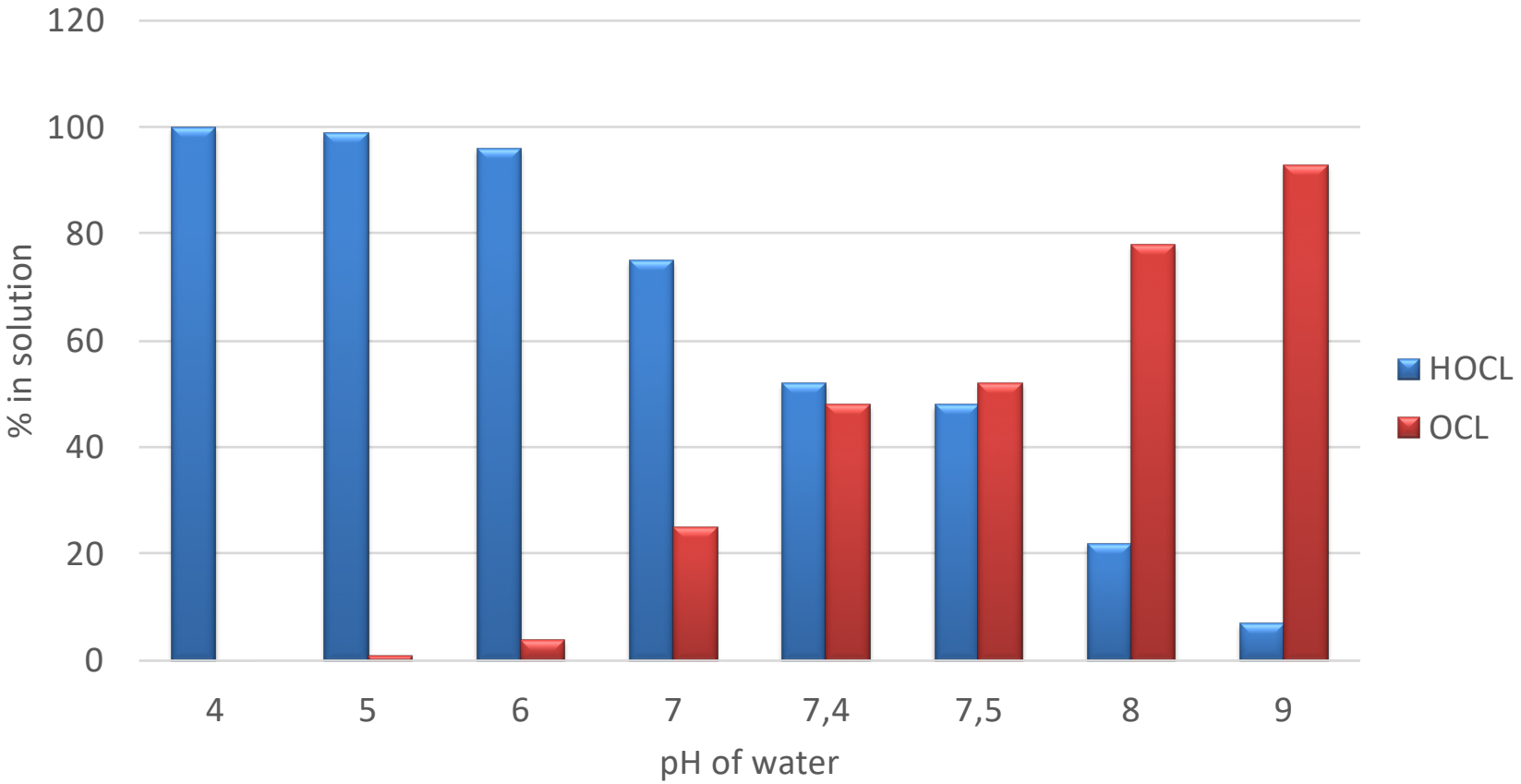
How pH Affects Chlorine
Ratio of Hypochlorous Acid to Chloric Ion



Microorganisms

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Always monitor water intake

- Daily check the presence of water.
- Water meters are a must in every poultry house.
- Best is to have a water meter per each water line.
- Record the daily water consumption.
- Record the Water : Feed ratio.
- Follow the guide & manufacturer space recommendations (birds/nipple).

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Flow Rate

Supply

- Periodically measure the flow rate (cc/min)
- Adjust it depending on flock age, BW, temperature, ventilation, among others.
- Keep an eye on ball height.
- Pay attention to the litter/manure belt condition (wet or not).
- The flow rate **MUST FOLLOW the** manufacturer recommendation.
- Keep in mind: Water Usage = Consumption + Spillage.

Always check the litter conditions!

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Check list

Have the profile of you water

- ☐ Minerals
- ☐ pH
- ☐ Micoorganism

- ☐ **Create procedures to optimize your water**

Daily:

- ☐ Check/adjust line height and levelness
- ☐ Check/adjust regulator pressure
- ☐ Check that incomin/outgoing pressure is steady
- ☐ Check water presence in water lines (end)
- ☐ Check drinker supply hoses
- ☐ Monitor water consumption

Weekly:

- ☐ Backflush water filters
- ☐ High pressure flush water lines
- ☐ Remove dust from site tubes
- ☐ Monitor the sanitizer concentration
- ☐ Monitor the water quality (fast test: pH, total hardness, etc)
- ☐ Check the water tanks

Monthly:

- ☐ Check flow rates (every 2-3 weeks during rearing)
- ☐ Samples for bacteriology

Quarterly:

- ☐ Clean and disinfect the whole system
- ☐ Check presence of bacteria

Yearly:

- ☐ Check water quality (complete analysis)

- Flush water lines after the application of any products through the water system

Valco, water line maintenance

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Conclusion

- Delivering good quality water is a must.
- Need to know all the water parameters.
- We need to have a water quality control program.
- Always monitor daily water intake.
- Always flush the water lines after the application of any product in the water.

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INTERACT WITH US!

Make use of our multiple-choice poll tool and pick what you think is correct.

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Thank you! Questions?