1

What is so important about water?

- Functions of water
  - Transportation of nutrients
  - Chemical processes/reactions
  - Body temperature regulation
  - Lubrication for joints and organs
  - Elimination of body wastes

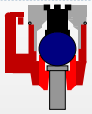
2

What is so important about water?

- Water quality
  - Vaccine efficacy
  - Equipment performance
  - Bird performance

3

Equipment Issues



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Equipment issues

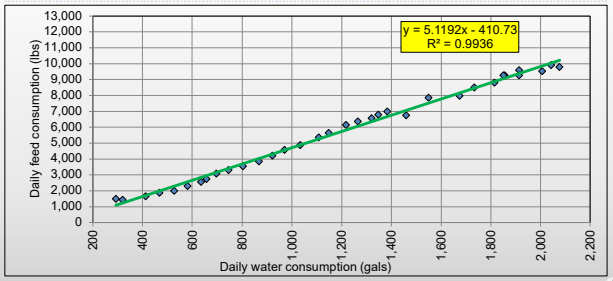
5

Water Quality Performance issues

- Increased feed conversion
- Reduced body weights
- Increased condemnation and mortality
- Food safety concerns
- Lessen effectiveness of medication and vaccines
- Increased equipment maintenance/cost
- Reduced equipment life
- Poor egg production
- High embryonic mortality
- Poor hatchability
- Reduced water consumption

6

Feed Consumed can be Calculated from Water



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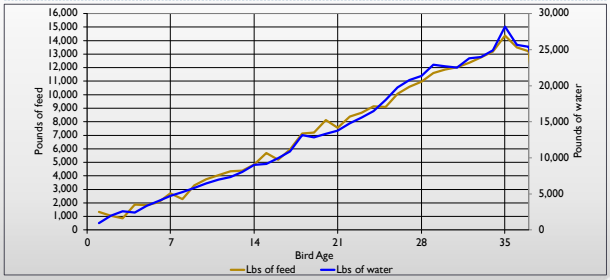
Feed consumption follows water consumption…



8

Before considering anything…

- Have water analyzed
  - pH
  - Minerals
    - Ca, Fe, Mg, Mn, SO_4, Cl, K, P, Nitrates, Na
  - Hardness
  - Bacteria
    - Coliforms
    - Total
  - Mold

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Poultry Drinking Water Quality

Contaminant, Characteristic or Mineral	Maximum Acceptable Levels
Bacteria	
Total Heterotrophic Bacteria	100 CFU/100 ml
Coliform Bacteria	50 CFU/100 ml
pH	6.0-6.8
Hardness	110
Calcium	500 ppm
Chloride	250 ppm
Copper	0.6 ppm
Iron*	0.3 ppm
Magnesium	125 ppm
Manganese**	0.05 ppm
Nitrate***	25 ppm
Phosphorus	0.1 ppm
Potassium	500 ppm
Sodium	50 ppm
Sulfate	250 ppm

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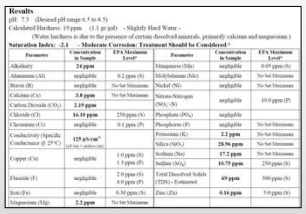
Test water annually

- What should be tested?
  - Water from drinker
  - Water from well
- Water test should include:
  - Minerals
  - Impurities
  - Bacteria
- Refer to poultry water standards
  - Slide 5 of this file



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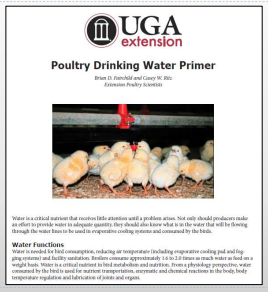
Poultry drinking water bulletin

Poultry Drinking Water Primer
Extension Bulletin UGA
https://secure.caes.uga.edu/extension/publications/files/pdf/B%201301_4.PDF



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Why treat water?

- Bird health/promote growth
- Prevent drinker failure
  - Prevent water deprivation
  - Extend equipment life
  - Reduce water line leakage
  - Maintain better litter conditions
- Reduce laborious tasks
  - Filter changing and maintenance
  - Drinker line maintenance

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Drinker performance

- Cleaned drinker
- Reduced leakage

14

Moved from Open Drinker Systems

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Enclosed Drinker Systems

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Drinker system

- Provide birds unlimited access to water
  - Should provide clean water
- Minimize water leakage
- Improved feed conversion

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Poultry Drinking Water Quality

Contaminant, Characteristic or Mineral	Maximum Acceptable Levels
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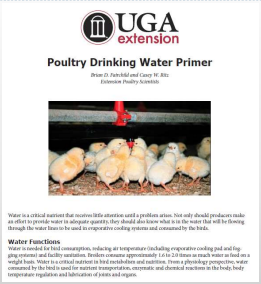
Poultry drinking water bulletin


UGA extension

Poultry Drinking Water Primer

Brian D. Fairchild and Casey W. Ritz
Extension Poultry Scientists

Water is a critical nutrient that receives little attention until a problem arises. Not only should producers make an effort to provide water in adequate quantity, they should also know what is in the water that will be flowing through the water lines to be used in evaporative cooling systems and consumed by the birds.

Water Functions

Water is needed for bird consumption, reducing air temperature (including evaporative cooling pad and fog -ging systems) and facility sanitation. Broilers consume approximately 1.6 to 2.0 times as much water as feed on a weight basis. Water is a critical nutrient in bird metabolism and nutrition. From a physiology perspective, water consumed by the bird is used for nutrient transportation, enzymatic and chemical reactions in the body, body temperature regulation and lubrication of joints and organs.

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Water Supply

- Make sure well is adequate (water volume)
- Proper water pipe size
  - Bird numbers
  - Evaporative cooling system requirements
- Conduct water test
  - Mineral
  - Impurities
  - Bacteria
- Minimize restrictions
- Properly sized filters for water volume

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Why Treat Water?

- Bird health/promote growth

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Water Quality Performance issues

- Increased feed conversion
- Reduced body weights
- Increased condemn & mortality
- Food safety concerns
- Medication & vaccine less effective
- Equipment maintenance/cost increase
- Reduced equipment life
- Poor egg production
- High embryonic mortality
- Poor hatchability
- Reduced water consumption

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Why Treat Water?

- Bird health/promote growth
- Prevent drinker failure
  - Prevent water deprivation
  - Extend equipment life
  - Reduce water line leakage
  - Maintain better litter conditions
- Reduce laborious tasks
  - Filter changing and maintenance
  - Drinker line maintenance

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Prevent drinker contamination

24

Filter – remove particulates before water enters drinker line

Sediment problem

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Fe and Mn removal

- Maximum acceptable levels
  - Fe - 0.3 ppm
  - Mn -0.05 ppm
- Test farm values
  - Fe - 3.3 ppm
  - Mn - 0.1 ppm

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Water treatment

Negative ion exchange system

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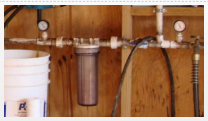
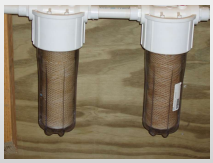
Water Line Management

- Manage drinker line height
- Manage drinker line water pressure
- Flush and sanitize regularly
- Change filters regularly





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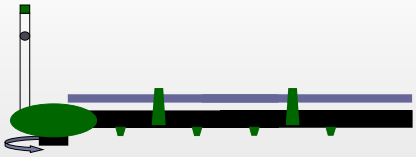
In between flocks



- Reduce water pressure to starting point after birds are removed from the house
- Prolong the life of the regulator and diaphragm.

29

Water pressure adjustment

30

Drinker System Tasks

- Clean drinker lines
- Keep drinker lines level

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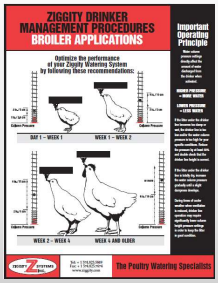
Maintain proper line height and water pressure for bird age



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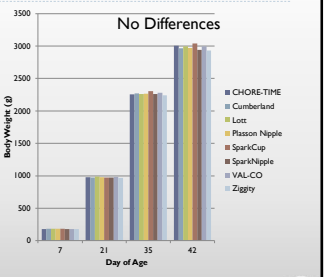
Drinker performed similarly when guidelines followed

- 7 Nipple Drinker Systems Evaluated
  - Choretime Relia-Flow
  - Cumberland
  - Plasson
  - Roxell SparkCup
  - Roxell SparkNipple
  - Valco
  - Ziggity Max3



Cornelson et al., 2005

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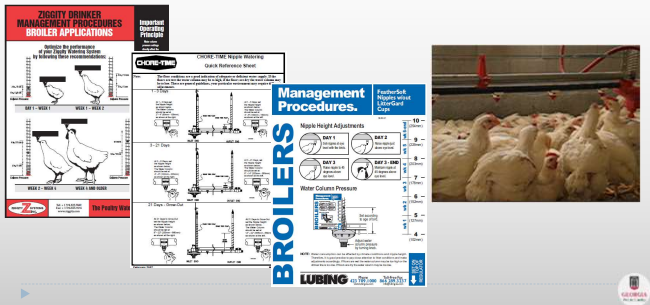
Follow the drinker manufacturer guidelines



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Drinker water treatment & supplements

- Drinker line cleaners
- Water treatments
  - Minerals, pH, etc.
  - Sanitation
- Bird performance supplements
  - Aid maintaining good intestinal health
  - Reduce Salmonella
  - Minimize stress

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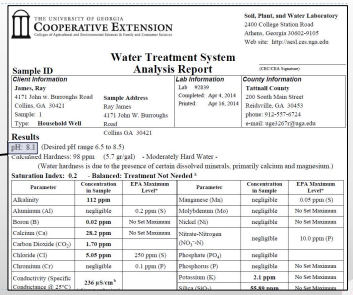
Water quality testing

- Conduct water test routinely
- Watch water pH

Results

pH: 8.1 (Desired pH range 6.5 to 8.5)



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Water pH is something you can measure

- $60 – $200
  - You get what you pay for
  - Want readings to stabilize quickly
- Need to check calibration routinely
- Pay attention to storage conditions

$65

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Pay attention to storage instructions

- Most pH meters require a storage solution
- Usually moisten a sponge in the cap

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Broiler performance and water acidification

- Two trials
  - Sodium Bisulfate was used to acidify water/lower pH
- Trial 1
  - 1,200 broilers in 24 pens
  - 3 pens per treatment
- Trial 2
  - 2,000 broilers in 40 pens
  - 5 pens per treatment
- Drinker system management same for all water pH treatments

Table 1. Water Treatments

Treatment Label	Water pH	pH Frequency
Control	(8.3)	Continuous
6C	6	Continuous
5C	5	Continuous
4C	4	Continuous
3C	3	Continuous
5I	5	Intermittent
4I	4	Intermittent
3I	3	Intermittent

1. Intermittent pH program—First 7 days, 48 hours before and after feed changes, 72 hours prior to end of trial

Watkins et al, 2005

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Drinker water pH impact on water consumption

- No differences between treatments on water consumption

Table 4. Impact Of Drinking Water pH On Male Broiler Average Water Usage—per Gram of Gain

Treatment	Day 7 (ml:g)	Day 21 (ml:g)	Day 35 (ml:g)	Day 42 (ml:g)
Control	1.054	2.187	4.111	5.261
6 Continuous	1.099	2.217	4.022	5.234
5C	0.977	2.249	4.073	5.327
4C	1.103	2.252	4.102	5.307
3C	1.163	2.313	4.114	5.315
5 Intermittent	1.328	2.317	4.151	5.307
4I	1.078	2.211	3.942	5.029
3I	1.118	2.265	4.087	5.185
SEM	.150	.06	.08	.09
P Value	.8117	.6563	.6490	.2760

1. The weight of all dead birds was used to calculate milliliters of average water usage per gram of gain

Watkins et al, 2005

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Drinker water pH impact on broiler weight

- No differences between treatments on body weight

Table 2. Impact Of Drinking Water pH On Male Broiler Average Weights

Treatment	Day 7 (lbs.)	Day 21 (lbs.)	Day 35 (lbs.)	Day 42 (lbs.)
Control	.359	1.958	4.79	5.85
6 Continuous	.355	1.954	4.79	5.77
5C	.355	1.956	4.77	5.92
4C	.361	1.986	4.75	5.90
3C	.350	1.986	4.80	5.95
5 Intermittent	.346	1.938	4.83	5.90
4I	.350	1.965	4.83	5.89
3I	.355	1.990	4.87	5.97
SEM	.008	.04	.08	.09
P Value	.9678	.9455	.8951	.6428

Watkins et al, 2005

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Drinker water pH impact on feed conversion

- Better FCR
- Continuous 4 and 5 pH water
- Intermittent 3 and 4 pH water

Table 3. Impact Of Drinking Water pH On Male Broiler Adjusted[1] Feed Conversions

Treatment	Day 7 (lb.:lb.)	Day 21 (lb.:lb.)	Day 35 (lb.:lb.)	Day 42 (lb.:lb.)
Control	.884	1.257	1.473	1.667abc
6 Continuous	.903	1.245	1.482	1.682ab
5C	.930	1.235	1.481	1.643bc
4C	.889	1.242	1.468	1.651abc
3C	.895	1.228	1.498	1.684a
5 Intermittent	.953	1.237	1.470	1.649bc
4I	.916	1.233	1.466	1.633c
3I	.895	1.225	1.469	1.642c
SEM	.029	.001	.013	.013
P Value	.6874	.4794	.7044	.0504

[1] Weight of all dead birds is used to determine the feed conversion

Watkins et al, 2005

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Drinker water pH impact on crop and gizzard

- Lower water pH reduced crop pH
- No differences due to pH on gizzard

Table 5. Impact Of Drinking Water pH On Crop And Gizzard pH

Drinking Water pH	Crop pH	Gizzard pH
3	4.33c	3.62
4	4.34c	3.72
5	4.62bc	3.70
6	4.96b	3.95
8	5.57a	4.16
SEM	.13	.152
P value	.0001	.1159

Watkins et al, 2005

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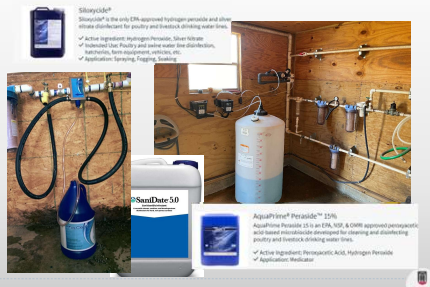
Sanitation

- Chlorine
- Chlorine gas
- Chlorine dioxide
- Hydrogen Peroxide (stabilized)



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Poultry drinking water supplements

- Copper Sulfate

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Poultry drinking water supplements

- Copper Sulfate
- Electrolytes

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Electrolytes

- Copper Sulfate
- Electrolytes
  - Sodium (Na)
  - Potassium (K)
  - Calcium (Ca)
  - Magnesium (Mg)
  - Chlorine (Cl)
  - Bicarbonate (HCO_3)
  - Sulfate (SO_4)

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Poultry drinking water supplements

- Copper Sulfate
- Electrolytes.
- Organic acids

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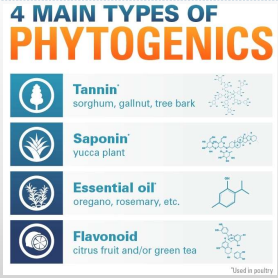
Poultry drinking water supplements

- Copper Sulfate
- Electrolytes
- Organic acids
- Phytogenic/botanicals



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Poultry drinking water supplements

- Copper Sulfate
- Electrolytes
- Organic acids
- Phytogenic/botanicals
- Probiotics

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Poultry drinking water supplements

- Copper Sulfate
- Electrolytes
- Organic acids
- Phytogenic/botanicals
- Probiotics
- Vitamins

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Poultry drinking water products

- Acidifiers
  - Citric acid
  - Acetic acid
  - PWT – sodium bi-sulfate
  - Acid based products
    - Sulfuric Acid
- Sanitation
  - Chlorine gas
  - Chlorine dioxide
  - Iodine
  - Hydrogen peroxide
    - Stablized
- Supplements
  - Botanicals
  - Copper sulfate
  - Electrolytes
  - Organic acids
  - Probiotics

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Summary

- Test the water
- Follow dosage instructions
- If using products with organisms be sure to suspend water sanitation treatments
- Sanitize the drinker line after using supplement products
- At least flush the lines after running products through the drinker system

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