

Water Disinfection - Add Unheated Water to Boiling Water

Day 1 Testing

Test dates: 8-9 September 2019

Location: Tampa, FL USA

Elevation: About 30 feet above sea level

Ambient air temperature: 26 - 27°C

Test procedure:

1. Boil 1000 ml water on an induction cooktop.
2. Turn off power.
3. Add unheated water.
4. Record temperature for 15 minutes at 1-minute intervals with no lid.

Boiling temp: 99.5°C

	Test 1 1000 ml Boiling 500 ml 26°C	Test 2 1000 ml Boiling 1000 ml 28°C	Test 3 1000 ml Boiling 500 ml 3.6°C	Test 4 1000 ml Boiling 1000 ml 6.5°C
Time	Temp (°C)	Temp (°C)	Temp (°C)	Temp (°C)
0*				
1	74.1	64.1	67.9	53.8
2	72.9	63.5	67.0	53.6
3	71.8	62.7	66.1	53.3
4	70.4	62.2	65.4	53.0
5	69.4	61.6	64.6	52.7
6	68.2	60.9	63.8	52.3
7	66.9	60.3	63.0	52.1
8	65.9	59.8	62.2	51.7
9	64.9	59.2	61.5	51.4
10	64.1	58.8	60.7	51.1
11	63.2	58.1	60.0	50.8
12	62.3	57.7	59.3	50.6

13	61.5	57.1	58.5	50.3
14	60.8	56.7	58.0	50.0
15	59.9	56.1	57.4	49.8

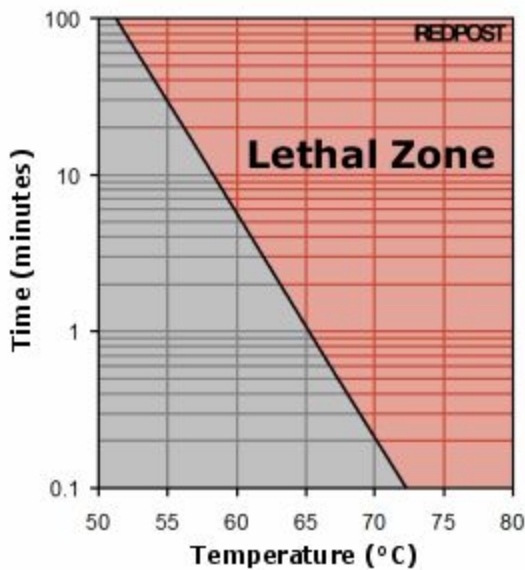
* The temperature when the unheated water was added to the boiling water could not be determined accurately because the thermometer was adjusting.

Setup

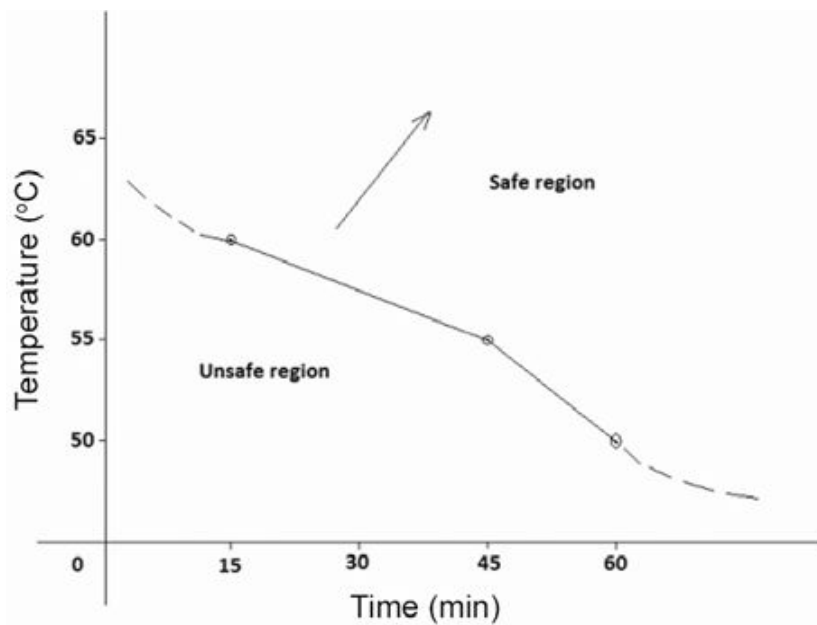


Discussion

Boiling is a common mark for disinfecting water because it is easy to observe. But, disinfection occurs at a much lower temperature. [Flash pasteurization](#) (disinfection) occurs at 72°C. At 60°C, pasteurization occurs in 4-15 minutes. Here are two charts:



<https://www.redpostltd.com/support/science>



https://www.researchgate.net/publication/286542951_Simple_filtration_and_low-temperature_sterilization_of_drinking_water

Conclusions from Day 1 Testing

Test 1. Adding one part unheated water to two parts boiling water should flash pasteurize the water. The three parts water can cool naturally for 15 minutes to give greater certainty that it has pasteurized.

Test 2. Adding one part unheated water to one part boiling water may pasteurize the water with the water being 55-65°C for 15 minutes. See [Ciochetti, et al., \(1984\)](#). More testing is needed.

Test 3. Adding one part very cold water added to two parts boiling water should pasteurize the cold water. This method should work in very cold environments.

People will usually disinfect more than 2000 ml of water providing greater heat retention than in these tests but may result in temperature stratification. Lids will also aid in heat retention.

Day 2 Testing

Test dates: 18 September 2019

Location: Tampa, FL USA

Elevation: About 30 feet above sea level

Ambient air temperature: 26 - 27°C

Test procedure:

5. Boil 3L water on an induction cooktop.
6. Turn off power.
7. Add 3L unheated water.
8. Record temperature for 15 minutes at 1-minute intervals with no lid.

# Rocks	0	Bricks	4	5	0
Time to boil	11:4	13:15	11:30	11:45	11:30
Time	°C	°C	°C	°C	°C
1	64,1	64.1	66.3	65.8	65.7
2	63.3	63.9	65.9	65.6	65.3
3	62,9	63.9	65.7	65.4	64.9
4	62.5	63.8	65.5	65.1	64.5
5	62.1	63.5	65.3	64.8	64.1
6	61.8	63.4	64.9	64.6	63.9

7	61.4	63.1	64.6	64.5	63.6
8	61.1	62.9	64.3	64.4	63.2
9	60.8	62.8	63.9	64.0	62.7
10	60.6	62.6	63.7	63.7	62.3
11	60.2	62.2	63.3	63.5	62.1
12	59.8	61.9	62.9	63.3	61.8
13	59.0	61.7	62.6	63.0	61.5
14	58.4	61.4	62.3	62.8	61.1
15	57.8	61.0	62.0	62.5	60.8
15-3	5.1	2.9	3.7	2.9	4.1

Kevin McLean
 Sun24
 info@sun24.solar
 +1 (813) 505-3340