



Chlorine as a Sanitizer

Chlorine is both an inexpensive and effective disinfectant if it is used properly. Improper use of chlorine could lead to incomplete sanitization or contamination of produce with excess chlorine.

This guidance document and episode will walk you through the safe and effective use of chlorine as a disinfectant. In addition, attaining and maintaining appropriate concentrations for food use will be discussed. As with other aspects of food safety, the pertinent record keeping requirements will also be covered. The chlorine referred to in this guidance document is common household bleach, free of fragrances or thickeners and possessing an EPA registration number on the label.

It must be noted that chlorine bleach is not the only sanitizing agent on the market, but it is by far the least expensive and most widely accessible. The particular concentrations for using other sanitizing agents are different and will not be addressed in this guidance document. The principles of sanitizing produce, monitoring sanitizer concentrations and documenting these concentrations remain the same, however.

To understand the reasons for monitoring, it is important to explain a bit about chlorine's chemistry. Chlorine bleach is essentially chlorine gas dissolved in a

Recommended Chlorine Concentrations for Sanitizing Fresh Produce

Type of Produce	Recommended PPM of Chlorine	Bleach per gallon of water ¹
Berries (blackberries, blueberries, raspberries, strawberries, etc.)	No Washing	N/A
Apples, pears, squash, cucumbers	65 ppm	1 tsp per gallon
Leafy greens, peaches, peppers, tomatoes, asparagus, broccoli, carrots	130 ppm	2 tsp per gallon
Melons, root crops	400 ppm ²	2 tbsp. per gallon

¹Based on using common household bleach without fragrances or thickeners and base concentration of 5.25% Sodium Hypochlorite.

²Sanitizing wash should be followed by a potable water rinse.

Table excerpted with permission from *Farm to School Program: Tips tools & guidelines for food distribution and food safety*. Oklahoma Department of Agriculture, Food & Forestry



liquid. Gases dissolved in liquids dissipate out of them based on many factors, including temperature, pH and particulate matter.

As with all dissolved gases, higher temperatures liberate more gases. On the one hand, this makes a warmer sanitizer more effective in the short term at disinfecting. In the longer term, however, the sanitizer loses its concentration of the sanitizing agent and requires more frequent monitoring to ensure effectiveness. For this reason, when sanitizing produce, consider water temperature when determining testing frequency.

The pH level of water can also influence the availability of free chlorine. Municipal water sources often increase the pH to inhibit Calcium development in water pipes. As is, this water, though potable, may not be suitable for sanitizing. Well water may also have similar properties in areas where a high amount of calcareous soil exists. In these cases you may wish to adjust water pH.

If you have ever dropped a sugar cube in soda, you have seen the effects of adding particulate matter to a liquid with dissolved gases. In the same way, excessive amounts of dirt can substantially reduce the amount of free chlorine in your sanitizer solution. That's why it is important to sanitize produce that is relatively free of field soil. In the event that this is impossible, you must account for this in the level of testing the concentration of free chlorine.

No matter how you manage the temperature, pH or amount of particulates in the sanitizer, you will need to monitor the available free chlorine in the sanitizer at least daily and adjust as necessary to maintain an optimum sanitizer level.

You can inexpensively monitor free chlorine using chlorine test strips, available at your local restaurant supply. Test strips usually measure a range of free chlorine in parts per million, so make sure you obtain test strips in the appropriate range based on what you are sanitizing. Consult the table on the front of this guidance document for what the optimal free chlorine is. Once you have tested the sanitizer, be sure to record the results on a testing log sheet.