Total Chlorine Testing

Pitfalls And Remedies

Presented By

What Is It & Why Is It In Our Water?

Chlorine (e.g., bleach) is a disinfectant; chloramine is a form of chlorine that stays active longer

Cities add chlorine and chloramines to their water distribution systems to protect our drinking water from bacterial growth

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Why An Accurate Test Is Important: Patient Consequences

The blood of hemodialysis patients is exposed to a LOT of water

24 – 50 gallons each treatment

Patient injury or death can happen when water used to make dialysate contains even a low level of total chlorine

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Why An Accurate Test Is Important: Dialysis Facility Consequences

- Condition-level deficiencies result if:
  - You do not follow the test directions EXACTLY
  - You do not properly document the test for total chlorine
  - You use expired testing strips
  - You use a strip or reagent that is not sensitive to the required levels
- At an initial survey, Condition-level deficiencies = failed survey
- At any survey, Condition-level deficiencies = a repeat visit

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Total Chlorine Testing

- By using the cut-off of the maximum allowable level for chloramine (<0.1 ppm)
  - ❑ One test checks for both chlorine AND chloramine
    - ❑ **You protect patients from both**
- Total chlorine test methods:
  - ❑ Dip-and-read test strips
  - ❑ "DPD" based kits (tablets or powders-rarely used now)
  - ❑ On-line monitoring
- Accurate results depend on following the directions EXACTLY

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Location

Test Sensitivity

Sample

Timing

Documentation

Pitfalls Of Total Chlorine Testing

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Pitfall: Location

Where should the sample be taken?

- Routine samples should be taken from a port AFTER the first carbon filter

What if that sample is >0.1?

- If that sample shows a level >0.1 mg/L, sample from a port after the second carbon filter

Remedy: Label collection ports and follow facility policy

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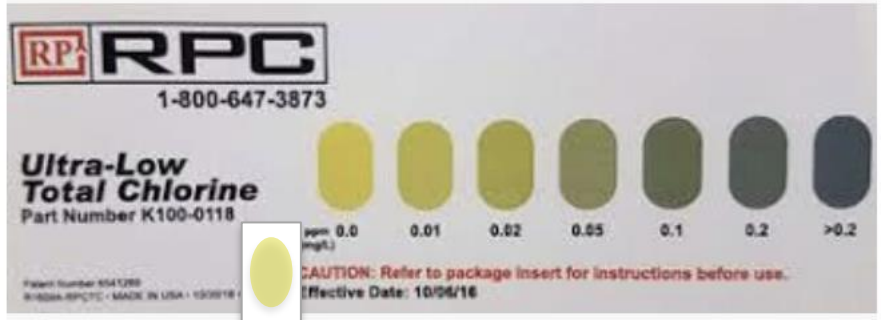
Pitfall: Test Sensitivity



- Total chlorine maximum "safe" level is less than or equal to 0.1 mg/L
- Test used must measure levels LOWER than 0.1 mg/L
- Zero ≠ zero:
  - Tests only measure to "less than" the lowest number on the color comparison chart
    - Example: if color chart shows 0.5 and then 0, the test only measures to "less than 0.5"
  - No test measures to "zero"
- Warning: tests for residual chlorine usually measure only to 0.5mg/L

Remedy: Do not store residual test strips in total chlorine testing area

Use only methods that test to less than 0.1 mg/L

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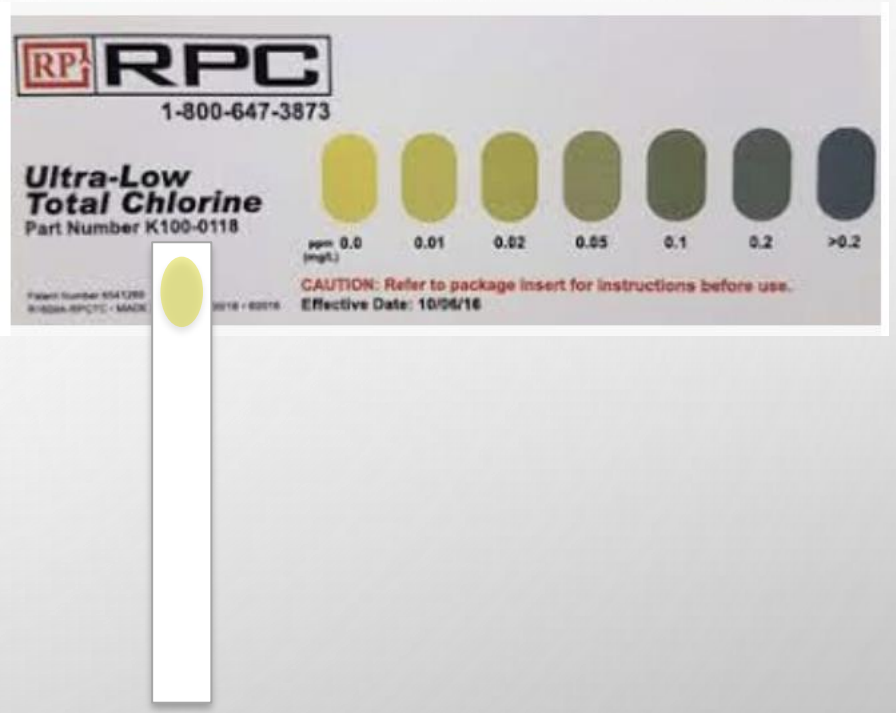
Pitfall: Test Sensitivity

Expiration date:

- Testing materials (test strips, powders, tablets) out-of-date



Remedy: Always check packaging for expiration date

- Discard expired strips
- Alert management to reorder before need is critical

Pitfall: Sample

Size

Size matters: 100 ml does not equal 80 or 110

Rinse

Rinse the container with water from the sampling port prior to collecting the test sample, not tap water or RO product water

- Follow facility policy or manufacturer's guidance for number of rinses

Remedy

Collect the correct sample amount

- Follow the test manufacturer's guidance exactly

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Pitfall: Timing

Testing frequency:

- At the start of each treatment day prior to first patient treatment

- Prior to each shift or every 4 hours if there are no set patient shifts

Remedy: follow facility policy for test frequency

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Pitfall: Timing

Test water that has spent the normal time in the carbon filter

Removal of total chlorine by carbon requires 10 minutes

When the RO is not running, water remains in carbon tank longer

Testing a water sample that was in the carbon tank longer = falsely lower value, potential for patient harm

Remedy: Ensure RO has been running at least 15 minutes prior to collecting sample

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Pitfall: Timing

When performing the test:

- USE A TIMING DEVICE (watch with second hand or clock or timer)
- Each step has a specific time requirement
  - ❑ Test is only accurate if time requirements are met
- Meet each time requirement EXACTLY
  - ❑ Examples:
    - ❑ Expose strip to sample for 60 seconds
    - ❑ Wait 20 seconds before reading

Remedy: Invest in a clock with a second hand or timer for the water room

Educate all who do testing to the importance of exact timing

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Online Total Chlorine Monitoring

- Monitoring is continuous, so no particular testing times are required
- Manufacturer requires a manual test of total chlorine before the first patient treatment each day to verify the accuracy of the on-line system
- Facility policy may require documentation of the monitor values

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Timing

Comparing the test to the color chart

- Must use a **white** background
- Must be done immediately after test completed
  - Color can change when reading is delayed
- If second person verification is required, second person should be present when the test is performed
  - Take sample and testing equipment to the treatment floor if necessary
- Test must <u>always</u> be compared to the color chart

Remedy: Keep color chart handy

Educate all who do testing to use color chart **promptly**

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Pitfall: Documentation

- Don't document the test until it is completed
- Be sure to document accurately (correct: <0.1, not correct: >0.1 or 1.0)
- Careful in documenting time and date

Remedy: Educate all who do testing to the need for careful documentation

Audit: Both practice and documentation

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Avoiding Pitfalls

"There is a right way, staff know the right way, and staff perform the task the right way."

- Facility policy should:
  - ✓ Follow the manufacturer's guidance
  - ✓ Provide clear step-by-step direction
- Staff should be trained on the "whys" of each step in total chlorine testing
- Competency testing is required for each staff member assigned the task
- Audits of practice provide opportunity to identify and correct any issues
- It's okay to use the posted procedure for reference: may help with nervousness

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Supervision

- The registered nurse in charge needs to know the basics of water treatment and ensure that assigned staff members are accurately performing the tests and recording the results
- The Medical Director and Nurse Manager must ensure all staff assigned water treatment duties are qualified by training and have current documentation of competency

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Summary

- Safe water for treatment is critical to quality care and safety for every dialysis patient

- Staff members who understand the importance of accurate total chlorine testing will keep patients safe and clinics survey ready

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