

The Most Commonly Misused Test Strips in Dialysis

Many reagent test strips use a color indicator which will react to a variety of different analytes. One example is the strips for peroxide and chlorine testing, both of which use reduction/oxidation (redox) indicator. As a consequence, many of these strips are improperly used to test for chemicals not intended for the specific application of the strip. The following are some of the most commonly misused test strips in renal dialysis community.

Hemastix®

Hemastix is a reagent strip for detection of blood in urine. It is manufactured by Bayer Diagnostics in Elkhart, Indiana. There are other urinary blood test strips by other manufacturers under different trade names.

Hemastix essentially is a peroxide test strip. Its active ingredients include a peroxide substrate and a redox indicator. In the presence of blood, the blood component hemoglobin, causes the peroxide to react with the indicator and turn the strip blue. Since peroxide inherently could react with the indicator without hemoglobin, the strip is deliberately formulated to reduce the strip sensitivity for peroxide to prevent premature greening of the strip. As a consequence, the strip is also less sensitive to other oxidants, such as chlorine. When the strip is used for chlorine testing, its detection sensitivity is about 5 ppm. Which means that when the strip is tested negative, the rinse water may still contain as much as 5 ppm of chlorine, which is 10 times above the recommended maximum allowable level of 0.5 ppm by the Association for the Advancement of Medical Instrumentation (AAMI).

WaterCheck RC, *WaterCheck CP* and *WaterCheck 2* reagent strips from IBT will detect chlorine of less than 0.5 ppm down to 0.1 ppm or less. They are specially developed for use in dialysis settings.

Potassium Iodide Strip

Starch iodide strip is another example of the most commonly cross used reagent strips for oxidants. The strip is widely used for detection of peroxide or chlorine/bleach.

The strip contains potassium iodide as an active

ingredient. In the presence of an oxidant such as peroxide or chlorine, iodide is converted to iodine which then binds to starch molecules in the strip and forms a blue colored complex. The color intensity of the blue starch complex varies widely, depending on the source and the type of starch used in the strip formulation. Molecule for molecule, it is much less intense than other more complex redox indicators. The detection sensitivity of the strip for peroxide or chlorine is poor. They are primarily used only as potency test strips for bleach sanitizing solutions in food and other chemical industries.

When used for residual chlorine testing, the sensitivity of the starch/iodide paper is about 7 ppm which again is more than 10 times over the AAMI standard of 0.5 ppm or less.

Although the strip is used for testing of bleach potency in sanitizing solutions, it is not suitable for use as potency test for bleach disinfection solution. For disinfection, the chlorine level of the bleach solution is much higher than that in a sanitizing solution. In a bleach disinfection solution, the chlorine levels range from 500 to 5000 ppm, while in a sanitizing solution, the chlorine levels are usually around 100 to 300 ppm. At 100 ppm, the starch iodide paper will turn to dark blue/black and lose the capability to distinguish chlorine levels of 100 and 500 ppm, let alone 5000 ppm. When used as a potency test for the presence of bleach in the disinfection solution, the starch-iodide paper can not sufficiently assure a minimum of 500 ppm chlorine in the disinfection solution.

WaterCheck RC and *WaterCheck CP* offers a wide range of chlorine detection. The strips are capable of detecting chlorine levels of 500 ppm or higher and can be used as a potency test for the presence of chlorine disinfection solution.

AquaCheck 5

AquaCheck 5 is a monitoring test strip, primarily, for swimming pool water. It contains 5 reagent pads in one strip, including tests for free and total chlorine, pH, hardness and alkalinity. The free and total chlorine pads are potency tests to assure certain minimum level of free chlorine in the water. Since both tests are potency tests, they do not have sufficient sensitivity to detect chlorine at 0.1 ppm levels. Nor is it possible to calculate and assure a concentration of 0.1 ppm or less of chloramine from the free and total chlorine as required in the dialysis applications.

Use of Residual Test as a Potency Test

One other common misuse of the strip is to use a residual test strip for monitoring of high level disinfectant potency. Most residual reagent strips have a narrow sensitivity range, for example, at 5 ppm chlorine. The strip is not capable of discerning chlorine concentrations above that level. For disinfection, the chlorine concentrations are in the range of 500 to 5000 ppm. Testing merely for presence of chlorine provides no indication as to the potency and usefulness of the disinfecting solution.

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