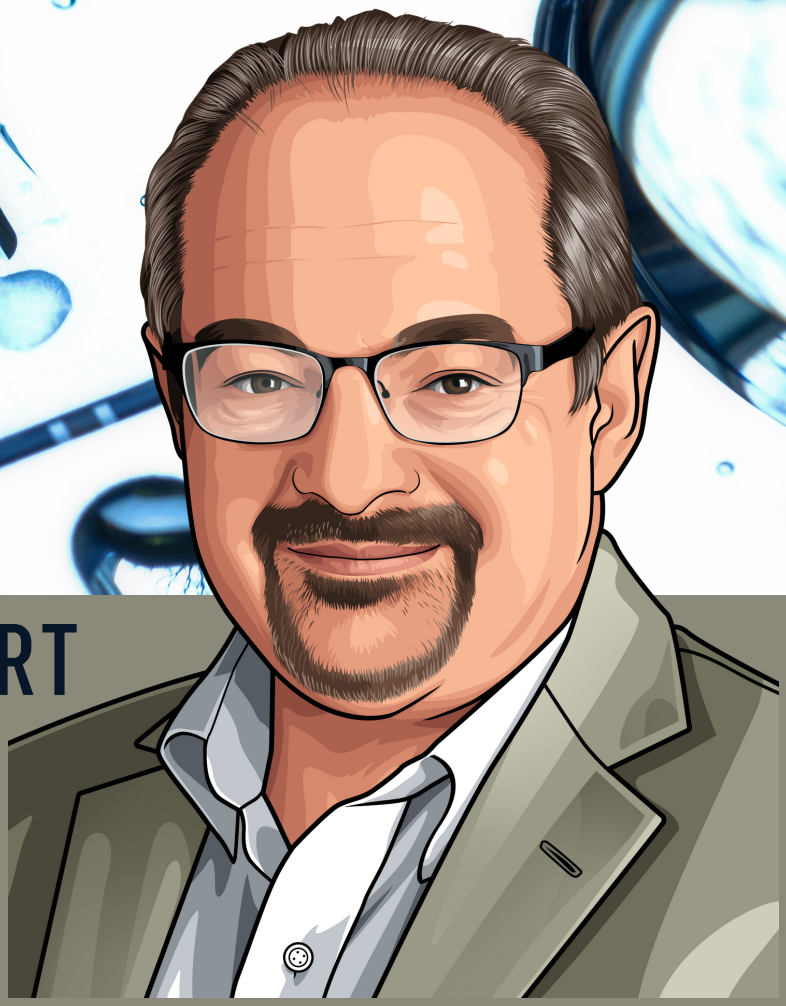
METALS

LIMITS AND EFFECTS ON PROCESSING



WATER QUALITY EXPERT

BEYOND CLEAN

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Beyond Clean Water Quality Expert:

METALS: LIMITS AND EFFECTS ON PROCESSING

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Most surgical instruments are primarily made of metal. So, if you have some metal dissolved in the water, that shouldn't be a problem, right? Uh, no. The metals in the instruments are generally carefully chosen for their application and finished and passivated for long life (generally). Adding metals to the surface of these materials can cause corrosion.

What's passivation? It means that the surface of the metal has been made relatively inert to the environment in which it is used. Stainless steel is "stainless" (no, it isn't, but it's better than most steel) because it has been "pickled" in acid to cause the surface to be a stable, inert compound of the component metals in it, typically, carbon, chromium, and nickel in 300-grade stainless steel. Aluminum is self-passivating since aluminum oxide makes a hard, inert surface layer. Where does the oxygen come from? You're breathing it. Copper is similar to aluminum as concerns self-passivation.

So what happens if you get some metal ions on a passive surface? You get corrosion. How? The metal that is deposited breaks the order of the passivation layer of the metal in the instruments leading to rust spots or stress-corrosion cracking. Which metals do this? Well, steel is mostly iron, so iron can be a problem. For this reason, iron is limited in AAMI TIR34:2014 to 0.1 mg/l (or ppm, same thing). Iron ions that deposit on a steel surface will rust and the rust will spread. Copper can also interact with the surfaces of instruments, and it has the same allowed limit as iron. Manganese is also a potential bad actor against stainless steel. Same limit, 0.1 ppm.

If these elements are found in water that surgical instruments are processed in, they can and will find imperfections in the passivation layer and deposit there, acting as nuclei for corrosion. Once started, it will spread. Scary, no? Well I am writing this just before Halloween... Your water should be tested for these elements, which is easily done using test strips. If the levels are above the stated 0.1 ppm, you need to get a water specialist to assist you. See you next month!

Have more water quality questions? Contact Jonathan at: jwilder@qprgllc.com

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Dr. Wilder joined MDT Corporation in 1990 as Staff R&D Scientist, tasked with executing process and product development in sterilization, disinfection and cleaning of reusable medical devices. He started H & W Technology in 1997 and allied with SMP Laboratories from Tübingen, Germany to form Quality Processing Resource Group (QPRG) in 2016. QPRG provides clients with operational, regulatory, and technical consulting in the area of sterile processing. Its services include accreditation readiness audits, technical deep dives into the issues causing wet loads and staining, and 510(k) filing support for manufacturers. He has a Ph.D. in physical chemistry from NYU and an MBA from Rochester Institute of Technology. He is a New Yorker by birth but escaped in 1986 to a postdoctoral fellowship at the Max Planck Institute for Surface Physics, the Fritz Haber Institute, in West Berlin, Germany. He is currently happily living near his children in Philadelphia, PA.

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