**PAESTA Podcast Series – You Asked, We Answered!**

**Why did the water in the Rio Olympics turn green?**

Rio Olympics Green Water Incident

Hello my name is Laura Delgadillo, I am a student at Penn State Brandywine and today I’d like to answer the question: Why did the water in the Olympic pools in Rio this past summer turned green? The issue started because [1] a local pool maintenance worker applied hydrogen peroxide to the pool when it already had chlorine. Hydrogen peroxide is good for cleaning pools but not when it is combined with chlorine. It was a chemical misbalance. [2] Hydrogen peroxide was dropped into the pools by the contractor and hydrogen peroxide undoes what chlorine is supposed to do which is kill germs and keep the water clean. Nonetheless, since the water had to be clean for synchronized swimmers to be able to see each other under water, for water polo players, and for divers, the solution was to drain both pools off of all their water and refill them with clean water from the practice pools in time for these events to be able to happen.

Now after the public saw and heard what was happening in Rio, there were people who argued that the pools’ dirty water was due to the fact that all water in Rio is unclean. [3] The problem of contaminated waters during the Rio Olympics was not only a problem in the swimming pools but in the sewage of the city, and country as a whole, and the outlets for all the water waste of the city, which are the rivers in Rio. The fact that the waste water goes to the rivers of Rio means the outdoor swimmers and rowers were at risk of contracting diseases from these waters. The waste from the poor favelas in Rio often does not get picked up by the government and it ends up in the rivers. If the government of a country cannot keep the rivers of its cities clean, then it would be easy for swimming pool managers at the Rio Olympics to neglect the treatment of the swimming pools and not apply the proper amount of chemicals into the competition pools. After I did a little more research however, I found an opposing viewpoint on a Forbes article about how the chemical misbalance everyone had been talking about had nothing to do with the water turning green. [4] The hydrogen peroxide and chlorine combination had nothing to do with the water turning green. The actual cause of it was copper(II) sulfate, a blue crystal that is used in tiny quantities to control the growth of green algae in large public pools and in municipal water supplies. It was added to the pool water; it dissolves quickly and it is to prevent algae from growing. It is toxic to algae, fish and other aquatic life; it can also be toxic to humans in large amounts. Another chemical reaction, which is the copper(II) sulfate dissolved in water that has to do with a poisonous stinky gas, which could be smelled from the pool water. This is how that chemical reaction works; the copper ions combine with four chlorine ions in the water, creating a copper(II) tetrachloro complex, which is green, and if it’s present in high enough concentrations, it turns the water green. The sulfate ions are reduced to hydrogen sulfide, a poisonous stinky gas, which is the source of the rotten egg smell associated with raw sewage smell people claimed was in the air. If the aquatic center for the Rio Olympics had a smell of raw sewage, or to vulgarly describe it: a smell of farts, then the opposing viewpoint seems to be the answer to the question we asked ourselves in the beginning.

These two reasons seemed like they both were the right answer, in one hand there are managers and pool supervisors saying that chemistry is not an exact science and it could have happened to anyone and the chemical misbalance of hydrogen peroxide being mixed in with chlorine was the reason for the green water. In the other hand there is a viewpoint in a Forbes article that talks about another chemical misbalance but that has to do with copper sulfate. Both seem to be human error that could have been avoided by having better prepared facilities such as The Cube in China which was used during the 2008 Beijing Olympics. [5] developed an ozone technology that made it easier to keep the swimming pools clean. The challenge ProMinent faced was to ensure pure water quality as required by the Olympic Committee for all six event pools. They programmed a logic controller, display panel for monitoring with an operator control panel. This allowed the pool waters to be monitored and get treated as needed.

Better preparing for such events would have prevented this incident from happening. Even though it was not harmless, it was a very odd thing to watch on television. This issue raised many questions about the effectiveness of pool managers to keep Olympic pools clean during such important events and I think it will help countries in the future better prepare to host the Olympics.

(*This audio file was recorded by Laura Delgadillo on November 14, 2016)*

**Works Cited**

[1] 15, C. N. A., 2016, & Pm, 12:58. (n.d.). This is why the Olympics pools turned green. Retrieved September 8, 2016

<http://www.cbsnews.com/news/this-is-why-the-olympics-pools-turned-green/>

[2] Alice Park. (n.d.). We Now Know Why Two Rio Olympics Pools Turned Green | TIME. Retrieved September 9, 2016

<http://time.com/4451484/why-rio-olympic-pools-turned-green-hydrogen-peroxide/>

[3] CBC News. (n.d.). “This is a shame!” Filthy waters raise ire ahead of Rio Olympics - World - CBC News. Retrieved September 30, 2016

<http://www.cbc.ca/news/world/rio-olympics-sewage-1.3704804>

[4] GrrlScientist. (n.d.). Why Are Rio’s Olympic Pools Green And Smelly? Ryan Lochte’s Hair Holds The Answer. Retrieved September 20, 2016

<http://www.forbes.com/sites/grrlscientist/2016/08/15/chemistry-its-why-the-rio2016-pool-water-is-green/#21268b7811f9>

[5] Mary Anne Simpson. (n.d.). It’s The Water: Beijing Olympic Swimmer Provided State-of-Art ProMinent Ozone Technology. Retrieved September 30, 2016

<http://phys.org/news/2008-08-beijing-olympic-swimmer-state-of-art-prominent.html>