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Managing and Developing Sport

INFORMATION

An outbreak of pseudomonas folliculitis associated with a swimming pool

There has been an outbreak of pseudomonas folliculitis associated with a swimming pool in a town in East Yorkshire. The outbreak began after the weekend of 9-10 February 2002, with a number of children presenting to their general practitioner (GP) with a rash. The rash was first thought to be 'friction burns' caused by contact with an inflatable structure that had been in use in the swimming pool. The practice nurse had noted that with many of the boys the rash was on the front of the body and with the girls it was in the groin area that had been in contact with the inflatable.

What is pseudomonas folliculitis?
Pseudomonas folliculitis is an inflammation of the hair follicles caused by infection with the bacterium *pseudomonas aeruginosa*. It has been reported in persons using hot tubs, spa pools, saunas, swimming pools, waterslides and physiotherapy pools.

Who gets pseudomonas folliculitis?
Any person exposed to water contaminated with *P. aeurginosa* can get pseudomonas folliculitis.

Where is *P. aeruginosa* found?
P. aeruginosa thrives in warm and moist areas and is commonly found in soil, sinks and drains, shower-floors, carpeting and even tap water.

What are the symptoms of pseudomonas folliculitis?
Pseudomonas folliculitis first appears as itchy bumps and develops into dark red tender nodules and/or small pus-filled pimples. The eruptions typically involve the trunk and upper parts of the arms and legs. The rash can be extensive and may affect all areas of the body except the palms of the hands and soles of the feet. The rash may be accompanied by headache, nausea, vomiting, abdominal cramps, sore throat, rhinitis, sore eyes, and fever.

Pseudomonas folliculitis rash

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Pseudomonas folliculitis rash

The rash may be more severe under areas covered by a swimsuit where the material holds the contaminated water in contact with the skin for a longer period of time.

How soon after exposures do symptoms of pseudomonas folliculitis appear?
The incubation period for pseudomonas folliculitis is usually 48 hours (range 8 hours to 5 days) after exposure to contaminated water.

How can Pseudomonas folliculitis be diagnosed?
Pseudomonas aeruginosa can often be cultured from pus-filled pimples on the skin.

What is the treatment for pseudomonas folliculitis?
The rash associated with this infection will usually go away on its own and treatment may not be needed. “Anti-itch” medications may be used to control the itching. Treatment may be required if the rash is severe and medical opinion should be sought.

Why are spa pools and hot tubs favourable for *P. aeruginosa*?

- Warmer water temperatures enhance the growth of *P. aeruginosa*.
- Warmer water temperatures of spa pools and hot tubs promote the expansion of the pores of the hair follicles allowing entrance to bacteria.
- The physical impact of jets of contaminated water hitting the skin.
- Organic matter commonly found on human skin provide nutrients for *P. aeruginosa* to grow and multiply.
- Turbulence in the water interferes with the maintenance of disinfectant levels, especially in whirlpools made of wood.

How can pseudomonas folliculitis be prevented?
Proper maintenance and control of the pH and disinfectant levels will prevent the growth of pseudomonas folliculitis.

Pseudomonas not found in Yorkshire Pool
In the pool highlighted in this guidance note, the operator was notified on 15 February 2002 and by 25 February 2002, 20 affected patients had been identified, seven of whom had skin swabs positive for *P. aeruginosa*. Examination of the pool water showed no *P. aeruginosa*, coliforms, or *Escherichia coli* per 100ml, a satisfactory colony count, and adequate chlorine levels. The pool was closed and hyper-chlorinated.

Inflatable found to be the source of infection
The investigation focused on an inflatable water play structure which repeatedly tested positive for *P. aeruginosa*, even after disinfection with a benzalconium chloride disinfectant. The inflatable is made of a flexible plastic material with a stitched construction, and is stored at the poolside. It is inflated from a pump through a flexible plastic hose and the stitched seams generate bubbles. Children come into close contact with the surface of the inflatable during its use. Examination of the deflated inflatable showed pools of water can collect on the plastic surface. Some of these had a visible biofilm and were slimy to the touch. The inside of the inflatable remains wet and there appears to be no mechanism for drying or disinfecting the inside.

There was an outbreak control team meeting, followed by a site visit, on Friday 22 February and it was agreed that the pool could be re-opened. It was also agreed that the inflatable should not be used again until the procedures for its disinfection were established.

Later findings
Since the earlier investigation further sampling of the equipment for the presence of pseudomonas was undertaken and cultures sent to the Central Public Health Laboratory for typing. This showed that the biofilms which harbour pseudomonas were inside the constant blow inflatable. The consequences of this are that children are exposed to pseudomonas when they are in close contact with the seams of the inflatable where the air, during use, is emitted.

This latter finding makes treatment of the inflatable to ensure pseudomonas is removed a particular problem.

Further research necessary
The Public Health Laboratory Service are now to carry out further research, targeting pools in the London area to show the extent or frequency of this problem. They will look at inflatable equipment used in pools to show if the problem is more general or if this incident is an isolated occurrence. They will also attempt to determine if the type of material used is significant. We know for example that pseudomonas can feed off certain forms of plasticisers used in the construction of this type of equipment and it may be that use of anti-bactierial materials may inhibit or prevent this from happening.

Action to take now
Until all the research is done, it is too soon to be categoric about effective action. However there are some good housekeeping rules that can be employed.

1. **Make sure the disinfection** required in the pool at the time when the inflatables or other equipment is used **is effective**. Preventing the incidence of Pseudomonas in pool water lowers the risk of it contaminating inflatables and other equipment. Pseudomonas in suspension in water is very vulnerable to free chlorine. In biofilms they are much more resistant.

   So in a pool with good hydraulics, turnover and effective pre swim hygiene this should be possible at 0.5 to 1.00 mg/l.

   In a pool that is not so good, with mixing problems, poor turnover or heavily loaded with poor pre-swim hygiene, you may need to target up to 1.5 to 2.0 mg/l.

   In both cases to ensure the effeciveness of disinfection pH should ideally be in the 7.2 to 7.4 range (see *Swimming Pool Water* from Pool Water Treatment Advisory Group).

2. **Don't store any equipment wet**, dry it as far as practicable prior to storing. With a large inflatable **follow manufacturers instructions** or ideally hang it up so that it can drip dry and the wetness evaporate.

3. **If it looks dirty**, with a scum line or other signs of ineffective hygiene then **clean it**. Use a hypochlorite and water solution up to 10mg/l applied by hand (using appropriate PPE) to ensure any biofilms are removed. Where there has been a problem identified with pseudomonas then it may be safer to clean inflatables with hypochlorite solution before each use as a biofilm does not have to be visible to be present in high numbers to cause problems and the risks are high in a pool environment and on this sort of material.

4. Give smaller equipment a weekly soak in a 10mg/l solution.

If specifying new equipment look for materials of construction that incorporate an anti-bacterial finish.

Conclusion
This incident should be put in context. There have been very, very few examples of rashes induced from pseudomonas colonising inflatables or similar equipment. So check the regime and ensure your hygiene practises are up to a good, current standard.

We are working with the PHLS and the manufacturers on this issue and through the co-operation of these and the pools used by the PHLS for further research would hope to satisfactorily resolve this problem.

We will notify all members of any further research findings and guidance as soon as this is available to us.

If it happens to you
If there are any other episodes of skin rash associated with swimming pool use, particularly where flexible plastic inflatables are involved, please contact Gordon Nichols from the Environmental Surveillance Unit (ESU) at CDSC Colindale, email: gnichols@phls.org.uk and Stewart Mawer from Hull Public Health Laboratory, email: hulsmawe@north.phls.nhs.uk.

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The PWTAG publication 'Swimming Pool Water' is available from ISRM for £35 (plus P&P). Call 01509 226474.