GEOTHERMAL HOT SPRINGS SANITATION PRACTICES

A PATH WAY TO A STANDARD?

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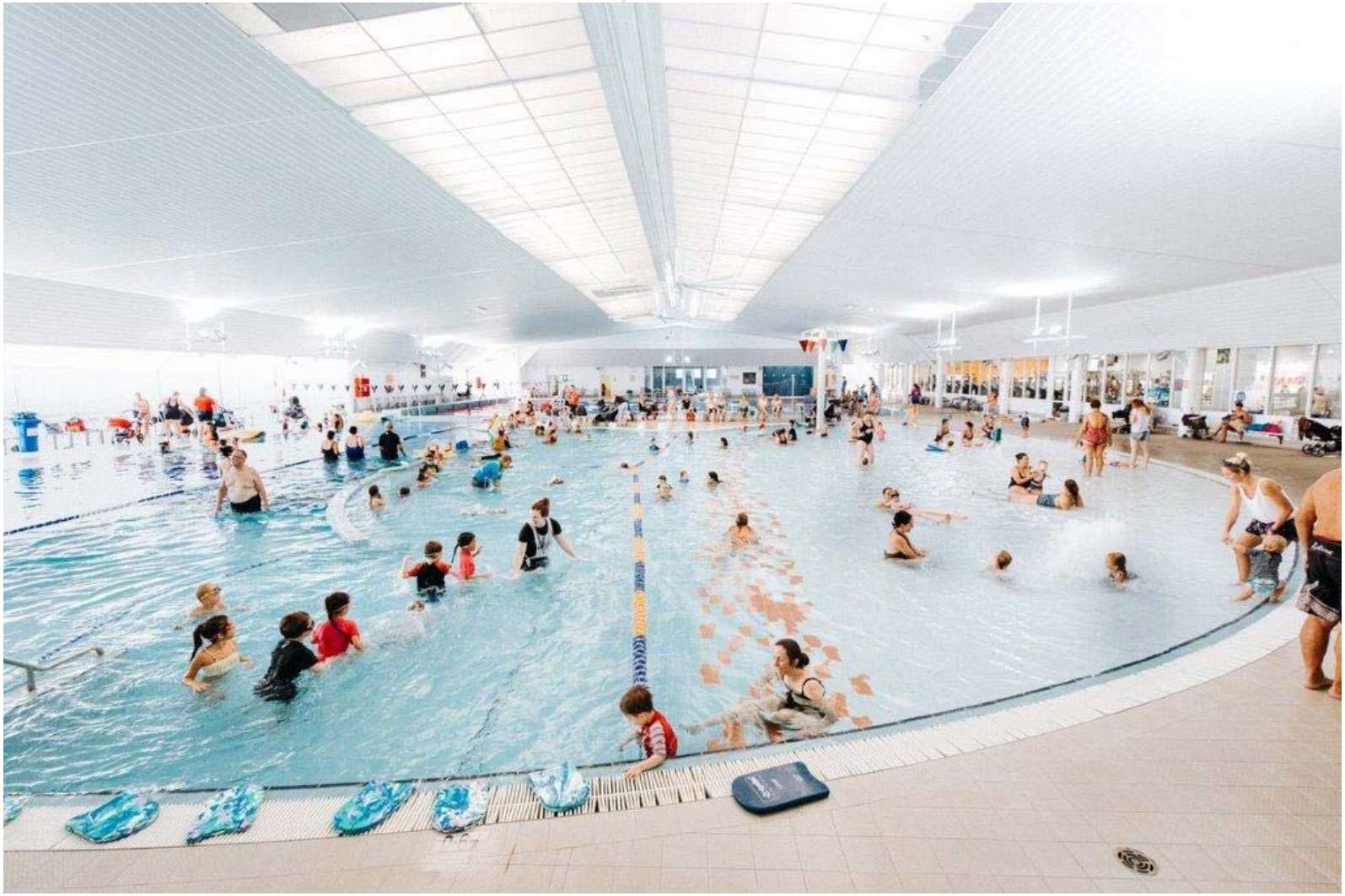

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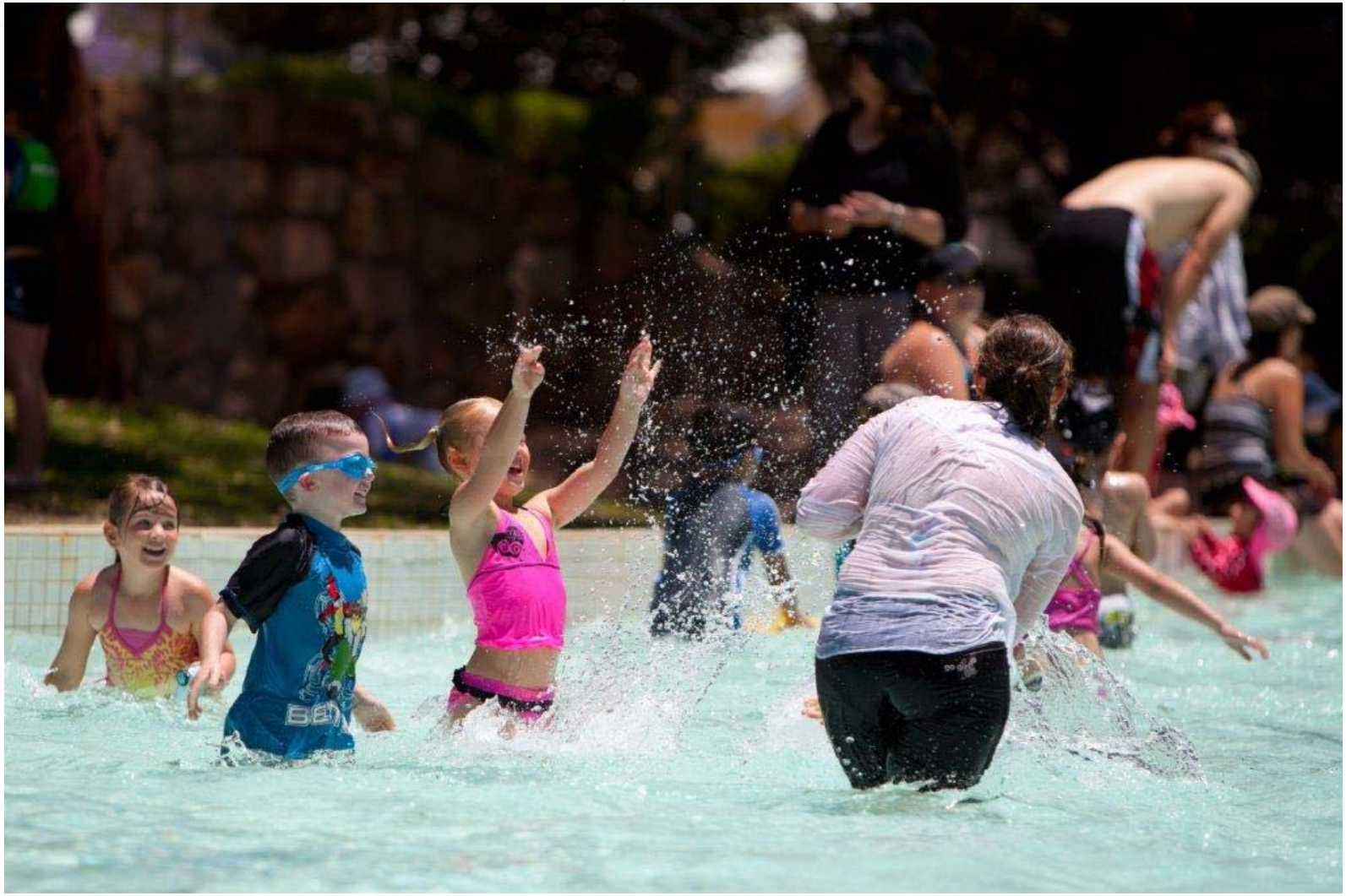

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A 2009 survey by the Water Quality and Health Council (WQHC) in the United States revealed that:

17% of bathers urinate in swimming pools.

83% of bathers do not shower before swimming.

63% are unaware of illnesses associated with swallowing, breathing or having contact with contaminated pool water.

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CONVENTIONAL AQUATICS STANDARDS

- **Assumes that water will be recirculated (assuring high organic loading)**
- Focuses on a process, rather than a health result
  - Filtration,
  - Circulation rates
  - Disinfectant use
  - Other chemical parameters
- Specifies maximum occupancy rates in keeping with the above
- Very little emphasis on the disinfection byproducts, thus allowing (from combination of organics and halogens)
  - Chloramines/Bromamines
  - Tri-Halomethanes
- Usually not effective against cryptosporidium

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CONVENTIONAL AQUATICS MICROBIOLOGY PARAMETERS

E. Coli	< 1 cfu / 100 ml
Pseudomonas Aerginosa	< 1 cfu / 100 ml
Thermophylic Naeglaria	zero
Legionella pneumophila	< 1 cfu / ml

NATURAL RECREATION WATER BODY PARAMETERS

Enterococci (indicator)	40-200 cfu/100 ml (Australian Standard)

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THERMAL HOT SPRINGS BEST PRACTICE?

- **Differences:**
  - **Health benefits of the water itself**
  - **Preferences not to manipulate the water chemically**
  - **The approach of flushing contaminants from the pool, rather than intervening with chemicals**

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THERMAL HOT SPRINGS BEST PRACTICE?

- **PRINCIPLES**
  - **Sterile incoming water?**
  - **Pool loading criteria?**
  - **Flushing rates?**
  - **Cleaning practices?**
  - **Monitoring practices?**

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ISSUES FOR A THS STANDARD / THS BEST PRACTICE

- Know your source water; Take measures to ensure it is sterile
- Design for dilution of contaminants
- Design for through-flow short residency time (plug flow ideal)
- Design for draindown & cleaning
- Design for drying of the entire system
- Design for through-flow short residency time (plug flow ideal)
- Is a no / low oxidant regime desirable or even possible
- Patron management (instantaneous and daily limitations, showering, child restrictions?, no submersion?, advice on restrictions after illness?)
- Water quality management & monitoring / Validation of water quality
- Management of potential external contamination routes

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THE SEARCH FOR A STANDARD

- New Zealand example
- British Columbia Example
- Victoria Example
- Italy?
- ?
- ?

- Limited information for practical application in most of these
- A duty of care would override all other considerations

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GOALS:

1. COMPILE A LIBRARY OF STANDARDS WHICH REFERENCE SPECIFIC THERMAL HOT SPRINGS DESIGN AND OPERATION

2. COMPILE EVIDENCE OF ACCEPTABLE ALTERNATIVES TO CONVENTIONAL AQUATICS WATER TREATMENT PROCESSES

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Thank You

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