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SAFER PUBLIC POOL WATER

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Conference review

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Understanding healthy water

Alan Lewis reports on exciting research developments at the World Aquatic Health Conference, held in October at Colorado Springs.

Associate Professor
Judy LaKind PhD



There is something about a relatively small city of less than half a million set in a very rural environment that breeds a feeling of comfort, courtesy, sociability and above all, hospitality.

Colorado Springs is a city where even the deer can feel at home munching the grass on the verges or feeding off the carefully tended front gardens. The resident dogs bark at them while keeping a respectful distance.

The character of this city is somewhat unique – the setting provides plenty of opportunity for physical and healthy outdoor activity from rock climbing and white water rafting to

trout fishing, mountain bike riding and hiking through the beautiful terrain.

There are also many interesting attractions within easy distance such as the 20km cog rail ascent to the nearby Pike's Peak (4300m above sea level – half the height of Everest!), the Garden of the Gods, the Cave of the Winds and the carefully preserved red Manitou cliff-dwellings which are somewhat reminiscent of the famous Petra site in Jordan.

Despite all these undoubted attractions, the place of most interest in Colorado Springs during October was the World Aquatic Health Conference (WAHC).

This was a carefully prepared and well orchestrated conference with 289 registrations from seven countries and 44 US states. Twelve months of planning by the National Swimming Pool Foundation (NSPF) CEO Tom Lachocki and his team had been painstakingly invested in its successful implementation.

The presenters of the seminars were world class academics and professionals and their material was totally absorbing and of vital import.

An original commissioned and juried art exhibition was also held, depicting themes of swimming pools and/or aquatic health, adding an artistic lustre to the conference.

Rounding all this out were the inspiring keynote speakers: Chuck Wielgus and Byron Embry who, at the opening and closing of the conference, delivered impressive and moving oratories reinforcing the worth of the industry.

Of further interest was a lunchtime speaker Jeff Wiltse, Associate Professor of History at the University of Montana, who gave an overview of his book "Contested Waters" which in essence is a Social History of Swimming Pools in America. Amongst other things, this introspective look at the role of the swimming pools in the USA finds many parallels in the social history of Australian communities. In particular, the relationship between the white and black peoples of both countries, in the way they have dealt and still deal, with the interracial conflict.

Wiltse called upon members of the industry to be receptive to broader social and cultural trends, to be sensitive to how aquatics helps people move throughout their lives, including how they are able to get around better as they age, or continue to participate in sports.

This WAHC 2010 was distinguished by a wide range of more than 40 topical seminars in six main streams.

Available space on these pages only allows a rough outline of the more important and exciting of the presentations. However, readers can discover more at the National Swimming Pool Foundation website (www.nspf.org).



Healthy Pools and Healthy People?

This well-known authority presented a wonderfully balanced toxicological assessment of the risks associated with swimming in indoor heated swimming pools.

The Centre for Disease Control (CDC) in the US has found that 1 in 8 pools may pose an infection risk. One wonders what this figure would look like today in Australia (if we had a CDC to study this). Given that we are entirely devoid of current research in this area – how can we know?

LaKind also points out that



Friends across the Pacific, your correspondent with Tom Lachocki

The centrepiece seminar was Disinfection By-Products (DBPs), a crucial topic which has attracted the attention of serious researchers in pool, spa and potable water around the world.

With international research effort in this stream, concern is escalating as more and more DBPs are identified and the suspicion deepens as to the detrimental health effects on children, elite swimmers, operating staff and swim teachers. No wonder this stream was very well attended.

The DBF seminar

The Disinfection By-Products seminar was presented by Judy S LaKind, President of LaKind Associates, Associate Professor in both University of Maryland School of Medicine and Adjunct Associate Professor of Penn State College of Medicine (she also has skills in environmental science; risk management; assessment of health risks; and much more...)

Her presentation was entitled The Good, the Bad, and the Volatile: Can We Have Both

budget and time restraints curtail the depth of the research and minimal measurements – so much so, that at times serious omissions in analyses can lead to misleading conclusions.

Nevertheless, we continue to confound the public with the message that, on the one hand swimming is a healthy activity; while on the other, disinfection is vital to public health. The crux of this presentation was that, although it may take many years before scientists will reach a comprehensive understanding of all the potential dangers from DBPs through inhalation, ingestion, and dermal absorption, there is much we can do to minimise detrimental effects on bathers.

These include:

- Public acceptance of the need to reduce bather contamination by taking a pre-immersion short shower;
- Public education of the need to refrain from swimming while ill; to report faecal accidents to operators; and an awareness

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and avoidance of swimming in contaminated water;

- Ensuring adequate but effective disinfection in public pools liable to suffer diaper leakage or from diarrheal contamination;
- Providing adequate bathroom breaks for children, adults and swim teams in training;
- Mitigating the development of undesirable DBPs by reducing their precursors where known;
- Encouraging better design of disinfection regimes and their management;
- Promoting and conducting longitudinal studies on the effects of chloramines; THMs and N-Nitrosamines on swimmers – particularly in regard to asthma, and bladder and liver cancer.

Of course, at a conference organised by the NSPF (which actively encourages and financially supports such research) these messages are very likely to resonate and eventually stand a good chance of implementation. The same cannot be said for Australia, where no serious effort is made to raise funds for research from the aquatics industry. This is despite the fact that the industry should be most interested in knowing how to relate to the evidence that DBPs are indeed a problem with potential liability implications.

Cutting trihalomethane and chloramines

Ole Gronborg, PhD, gave a seminar titled Reducing Trihalomethane and Chloramines in Swimming Pools.

His credentials are comprehensive and impressive: an MSc in Environmental Engineering (Aalborg University, Denmark); full-time lecturer in Process and Waste Water Treatment in Aquaculture; Project Head

in Innovation and New Water Treatment Technology, and Director of Skjolstrup and Gronborg Aps, Ultraaqua and more.

His presentation differed from common and accepted ways of tackling various problems. Appropriately enough, his ideas have been supported by the Danish Government and applied now in five Danish public indoor pools. His systems reduce chlorine demand by 50 per cent, backwash water by 90 per cent (compared to sand filters) and energy consumption by 50 per cent.

The Danes are justifiably considered one of the countries that have successfully invested money and resources into minimising waste of water, chemicals and energy. There is much to learn from them and from Gronborg in particular.

Danish research has shown that human skin cells shed by swimmers range from 10 micron to 30 micron. When caught in a sand filter they are reduced by the oxidants resulting in unwanted chlorinated DBPs. To minimise these, Gronborg has relied upon:

- The Danes – like their German neighbours – insisting that every bather showers before entering a pool or spa, and this requirement is followed religiously by all swimming pool patrons;
- A drum filter (manufactured in Sweden by Hydrotech) which backwashes a few times every hour for a few seconds only. This is done with sprays which wash the collected particles from the inside of the drum to waste. The drum filter has no media but its unique membrane (micro-screen) removes all particles down to 10 micron as do most good sand filters. This technology works by gravity only – there is no pressurised filter vessel. The filter therefore, ceases to be

a “chloramine factory” – with the filtered water returning to the balance tank by gravitation minus 90 per cent of the skin cells and other undissolved solids;

- The inorganic chloramines are then treated with medium density UV, while a side loop takes out any finer undissolved suspended solids (<10 micron) using ultrafine filtration membranes (common in potables water treatments);
- This meticulous process does not end there. By means of an ingenious configuration of the pool gutters – any trichloramine or trihalomethane gases which develop at the surface of the pool are sucked across the wet-edge drains and removed from the hall air space;
- Furthermore, where there might have been some residual trichloramines still dissolved in the pool water and about to become gaseous, there is yet another simple and inexpensive process used to encourage the transformation of liquid NCl_3 to gas, which is then also extracted together with the drawn-off surface air. This is accomplished with a “THM and trichloramine splash stripper” which consists of a specially designed drum where water splashes gravitationally over vanes while air (including the trichloramine and THM gases), is blown back up the drum and disposed of safely to the external atmosphere;
- Gronborg claims that these processes cost no more than other far less effective pool circulation and disinfection processes – but do save in running costs (energy and chemical) as well as water;
- The pH range for this process is 6.8-7.2, thereby making the most of the chlorine that is injected and reducing the overall cost of chemical markedly. Furthermore, the return spigots in the pool ensure that the water flows upwards evenly from the floor and into the wet edge gutters surrounding the pools. Horizontal spigots are positioned at a depth of 1.2 metres wherever the pool exceeds that depth. The majority of the spigots are spaced across the floor to ensure that there are no “dead” areas in the circulation of the pool.

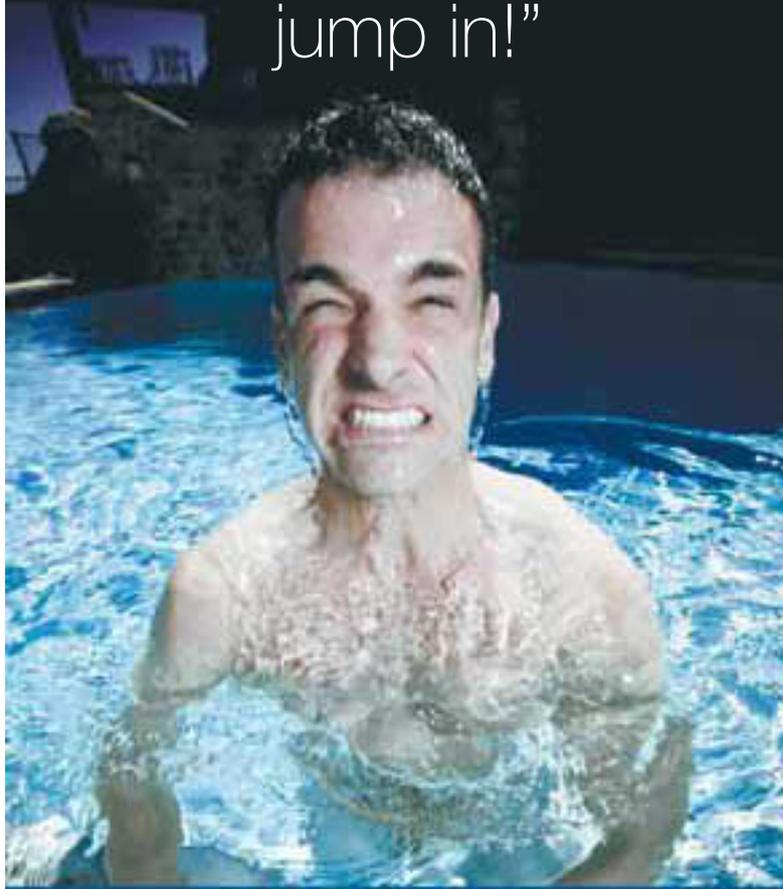
The sum total of this comprehensive design leads to what must be the highest standard of any in the world today and one which deserves the most serious study, admiration and emulation. In Australia we have many aquatic centres which, in spite of expensive designs, have not achieved anything like the efficiency and disinfection levels that these clever Danish measures have managed with



Associate Professor Ole Gronborg PhD



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jump in!”



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Professor Ernest (Chip) R. Blatchley III PhD

an invaluable tool in the research of chlorinated swimming pool water.

Blatchley’s detailed exploration of the air quality in chlorinated indoor pool halls dovetails well with the work of Gronborg. Indeed his work also answers some of La-Kind’s appeals with regard to further in-depth analysis of how and under which conditions asthma and other respiratory problems, eye irritations or the development of bladder cancer might be exacerbated.

He too studied ways and means of extracting the

trichloramine (and THM) gases from the air above the water surface and avoiding stagnant zones in the hall space. Much emphasis is placed on removal of the air immediately above the surface where competitive swimmers must take air into their lungs. Clearly it is the swimmers themselves who hasten the transformation of trichloramine from liquid to gas, as their strokes splash and promote that liquid-gas transfer.

It is important to note that Prof Blatchley has proven in this part of his research that the traditional method of breakpoint superchlorination or “shock” treatment in public pools is counter-productive in that it is ineffective for the oxidation of the ever present urea which is the common precursor of trichloramines, and the dominant source of organic chloramines (nitrogen leading to trihalomethanes). This is true, even though it does oxidise the inorganic chloramines. To be effective, public pool water treatment needs to reduce the precursors of the undesirable DBPs.

less expenditure. We can safely say that Judy Lakind’s dreams may have come true with these forward thinking measures.

Air quality in chlorinated indoor pools

Ernest R Blatchley III, PhD, of Purdue University gave a seminar titled Factors Affecting Air Quality in Chlorinated Indoor Pool Facilities.

“Chip” Blatchley is not new to the world aquatic health scene. Since 1988 he has been involved in research and teaching, related to physio/chemical processes of environmental engineering. His group has focused on ultraviolet photolysis and/or halogens. His special contribution to this area of research has been the development and application of the Membrane Introduction Mass Spectrometer (MIMS) which is best known for the readiness with which it can differentiate between the mono-, di- and tri-chloramines, as well as identifying various THMs of significance. This has proven

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Byron T Embry, closing keynote speaker

In summary

Since it is impossible here to do justice to all of the other streams in this conference, I shall discuss some of the more outstanding features of this rich and informative meeting of minds in future articles.

In the Health Benefit Seminar there was much to learn from experts dealing with methodologies for helping people suffering from many stressful common physical and mental health problems, and the social benefits of keeping people healthy and able to function better in their daily pursuits.

My impression is that in Australia we place too little emphasis on this area of aquatic activity, in spite of the well proven benefits expounded by US scientists and practitioners whose research and achievements in this area are impressive indeed.

The New Technologies in Industry stream dealt with some vital issues – notably the “Impact of Ozone as a Secondary Disinfection System in Public Pools” by Beth Hamil; “The Use and State of the Art UV” by Jon MacClean and Ron George; “Emerging Energy Standards, Regulations and Incentives” by Michael Orr; a fascinating presentation by Dr David Knighton dealing with the enlistment of sphagnum moss in purification of pools and spas; and several others worthy of renewed scrutiny as the knowledge and applications move forward – such as the presentation by Dale Polk:

ment principles; and rescue statistics for water park environments.

The Recreational Water Illnesses Prevention seminar drew much attention due to the fact that the CDC, after years of discussion and preparation, were finally able to present a Model Aquatic Health Code (MAHC) – now posted on the web for all to comment on.

This new code is aimed at unifying the recommended practices of circulation and filtration; disinfection and water quality; ventilation and indoor air quality; operator training; and an analysis of the lessons learned from events involving recreational water illness prevention by Michelle Hlavsa, CDC; James Amburgey, University of North Carolina-Charlotte and others.

Finally, various aspects of future facilities and regulations were presented by an elite selection of leading personalities who have figured prominently over many decades in the US aquatic industry in one way or another – as builders, designers, consultants, inventors, researchers, microbiologists and regulators in the ever burgeoning US industry. These leaders continue to dedicate their efforts and knowledge to the ongoing improvements and advances in the world aquatic industry.

It is now time for the Australian aquatic industry to step back into this arena and contribute at least on a proportional scale with the impressive vitality of the US involvement in the advancement of world knowledge and practice in the aquatic recreational field.

Learn more at www.nspf.org (seminars are available on line for a small charge).

“Large Composite Technology Makes Parabolic Solar Water Heating a Green Reality”.

The Risk Management seminars included further examination of oxidiser classifications, tests and criteria; codes and enforcement practices in the transport, storage and handling of pool chemicals; saving lives with new field practices linked to risk manage-



Chuck Wielgus, Executive Director of USA Swimming and opening keynote speaker