

I told YOU we should have gotten a new pool guy

## Why the DOG Died

And other pool water problems, and how to fix them

### Pool Water Problems

Another Perfect Pool 26861 Trabuco Rd., Suite E-74, Mission Viejo, CA, 92691 www.AnotherPerfectPool.com

## Algae

One-celled plant

Source water

Wind-borne

Algae itself is not harmful or unhealthy

- It is unsightly
- And does harbor bacteria
- It is an indication that the pool water is NOT 'Clean'

## Algae

Rapid reproduction

ONE ALGAE SPORE CAN BECOME 1024 ( $2^{10}$ ) IN 20 MINUTES OR 1,073,741,824 ( $2^{30}$ ) IN ONE HOUR

## Algae

Thousands of different kinds – The pool industry tends to group them into three categories:

**Green** Most easily controlled

**Black** Areas of poor circulation, Low/no chlorine, high pH

**Yellow** Everywhere – difficult to control

## Conditions for Algae

Light & temperature

Nutrients - Food

- Carbon
- Oxygen
- Hydrogen
- Nitrogen
- Phosphorous

## Prevention of Algae

We cannot do much about the light and temperature

But we can -- control the nutrients

- Insist on showers
- Water dilution
- Phosphates

### Algaecides

- **Quaternary Ammonium Compounds (Quats)**
  - Very common
  - Foaming
- **Polymeric (Poly Quats)**
  - Non-foaming
  - Cationic (positive charge)
  - Also removes dirt (like a clarifier)
    - Reduces effectiveness

### Algaecides

- **Metallic**
  - Copper
    - Not so effective on Black Algae
    - Can and will stain
  - Silver
    - Effective on all types
    - Black staining

### Algaecides

#### Chlorine Enhancers - Helpers

- Disodium salt of ammonium sulfate (Yellow Out®)
- Sodium bromide (Yellow Treat®)
- Sodium tetraborate (Proteam Supreme®)
- Lanthanum Chloride (PR-10,000®) (phosphate removers)

### Colored Water

#### Oxidized Metals

Source of minerals such as

- Fill water
- Lawn and landscaping chemicals
- Algaecides
- Corrosion due to poor pool water chemistry



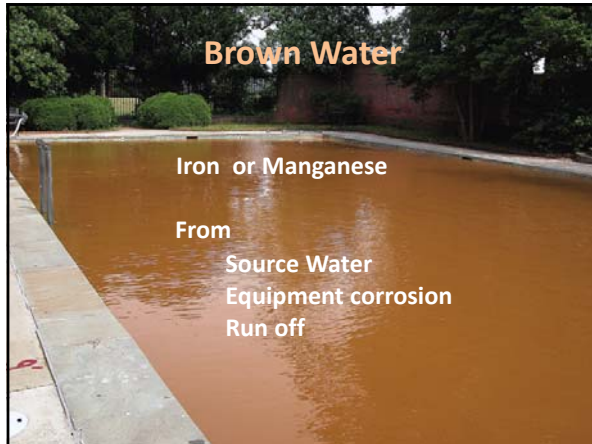
### Copper

#### Source

- Poor water balance
- Heater elements
- Pump impeller
- Water feature spill-over

#### Control / Removal

- Sequestering or chelating
- Drain - refill



### Other Staining

**Tough Ones**

- Nails, Hair pins, Iron Shavings
- Metal / Iron in fertilizer
- Re-Bar

**Easier Ones**

- Leaves, Acorns, ...

These will usually bleach out

### Combined Chlorine (CC)

Known as Chloramines

- Free Available Chlorine (FAC) reacting with
  - Ammonia (inorganic)
  - Organic nitrogen (organic)
- Too Much bather load – Too little chlorine

### Chloramines

$NHCl_2$  and  $NCl_3$

- Irritating
  - Eyes
  - Mucous membranes
- Chlorine odor
- Unhealthy

### Testing for Chloramines

Cannot test for them directly

CC Combined chlorine	=	TC Total chlorine	–	FC Free chlorine
Result		Step 2		Step 1

### Removing Inorganic Chloramines

**Breakpoint Chlorination**

Raising the FAC in the pool to **TEN TIMES** the amount of Combined Chlorine

## Organic Chloramines

**This is the problem**  
Disinfection-by-Products (DBPs)

Very difficult -- to impossible to remove

Very unhealthy – and actually dangerous to have in the pool  
They **WILL** make you sick – and can be lethal

Trihalomethanes (THMs)

- Chloroform
- Bromodichloromethane
- Dibromochloromethane
- -----

## Organic Chloramines

How do we know we have them?

Relationship Between TDS and Organic Contaminants/Conductance

## Organic Chloramines

So what do you do?

Prevention is the key –  
Do not let them develop in the first place

Keep chlorine levels up – at break point

Use / Install an oxidizer

- Potassium Monopersulfate
- Ozonator
- UV system
- Get on an enzyme routine  
(a catalyst – react and degrade organic contaminants)

## Water Chemistry Guidelines

### The Contaminants

Contaminant	Min.	Ideal	Max.	Pool Type
Combined Chlorine (ppm)	0	0	0.2	Pools, Waterparks
	0	0	0.5	Spas
Heavy Metals	None	None	None	All Types
Visible Algae	None	None	None	All Types
Bacteria	None	None	Local Code	All Types



Summary	
Organic and Inorganic Chloramines <prevention and="" pre="" reduction)<=""> </prevention>	
<b>Replace the Water</b>	<b>Reduce both  Organic and Inorganic</b>
<b>Break Point Chlorination</b>	<b>Prevent both but  Reduce only Inorganic</b>
<b>Ultraviolet (UV)</b> <small>(under research)</small>	<b>Prevent both but  Reduce only Inorganic</b>
<b>Ozone</b>	<b>Prevent and reduce Both</b>
<b>Potassium Monopersulfate</b>	<b>Prevent and reduce Both</b>
<b>Enzymes</b>	<b>Prevent and reduce Both</b>