

# The anti-aging effects of high pH water.

## University of Texas

### Effect of electrolytic water intake on lifespan of autoimmune disease prone mice.

Recent studies on electrolyzed water indicate that anode or acidic water is most effective as disinfectants; whereas, reduced or alkaline water processed through cathode is used as safe drinking water. The present drinking water study was undertaken in two strains of autoimmune disease prone mice to establish the spontaneous disease process and longevity. Weanling MRL/lpr and NZBxNZW [B/W] F1 female mice were provided daily with (1) tap water [pH ~7.5, oxygen reduction potential (ORP)~600+] (2) electrolyzed water with pH of ~9.0 and ORP ~400- and (3) hyper-reduced water with pH~10.0 and ORP~600-. Mice were provided H<sub>2</sub>O and chow diet ad libitum and weekly body weights and spontaneous deaths were recorded. The mean survival data recorded as days for MRL/lpr mice [25 mice/group] is as follows: (1) tap water 235±25, (2) reduced water 287±40 and (3) hyper-reduced water 346±45 days [ $<0.05$ ]. In the case of B/W mice [25 mice/group], (1) tap water 269±16, (2) reduced water 298±19 and (3) hyper-reduced 302±18 days. A significantly decreased ( $<0.05$ ) serum lipid peroxides were observed in mice fed hyper-reduced H<sub>2</sub>O. Also, the source of water did not alter lymphocyte subsets or their response to mitogens. In summary, hyper-reduced water with pH~10.0 appears to inhibit autoimmune disease of MRL/lpr mice whereas only a modest increased lifespan was noted for B/W mice. The increased lifespan by electrolyzed H<sub>2</sub>O appears to be related to the changes in free radicals and antioxidant enzyme levels. [Supported in part by Zanix Co. and Mr. Waterman Co., Tokyo, Japan].

#### Water Electrolytic Reactions:

|  | Properties |
|--|------------|
|--|------------|

#### Characteristics

##### Cathode Water



20 ~ 30% increase of alkaline minerals in relation to the raw water.

water is alkaline

high permeability

high solubility

high heat and electrical conductivity

##### Anode Water



20 ~ 30% increase of chlorine ions in relation to the raw water.

water is acid

has a bleaching effect

has a disinfectant effect

has an astringent effect

#### Experimental Design

| Mice: | MRL/lpr |
|-------|---------|
|-------|---------|

|               |   |
|---------------|---|
|               | NZB x NZW F1  |
| Water:        | Tap water (pH 7.5)<br>Reduced water (pH 9.0)<br>Hyper-reduced water (pH 10.0) |
| Measurements: | Survival<br>Immune parameters<br>Hydrogen peroxides                           |

#### Daily Analysis of Drinking H<sub>2</sub>O Given to Mice

|           | pH   | ORP (mV) | O <sub>2</sub> content (%) | Saturation Ratio (%) | Dissolved O <sub>2</sub> (mg/dl) | Temp (°C) |
|-----------|------|----------|----------------------------|----------------------|----------------------------------|-----------|
| Tap-Water | 7.5  | 600+     | 18 %                       | 80 %                 | 6.5                              | 25.0      |
| R-Water   | 9.0  | 400-     | 25 %                       | 90 %                 | 7.5                              | 26.0      |
| HR-Water  | 10.0 | 500-     | 25 %                       | 90 %                 | 7.5                              | 26.5      |

#### Drinking Water on Lymphocyte Subsets

| Mice         | Treatment | CD4+      | CD8+     | Ig+      |
|--------------|-----------|-----------|----------|----------|
| B/W          | Tap-Water | 29±1.7    | 12.7±2.7 | 53.5±4.8 |
|              | R-Water   | 30.8±2.4  | 13.4±2.9 | 53.0±4.6 |
|              | HR-Water  | 32.2±3.9  | 14.4±3.9 | 50.7±6.5 |
| MRL/lpr      | Tap-Water | 23.5±0.8  | 13.7±1.1 | 32.7±3.2 |
|              | R-Water   | 27.9±1.4* | 16.6±1.5 | 29.0±3.0 |
| *( $<0.05$ ) | HR-Water  | 30.7±3.7* | 17.2±3.1 | 29.4±2.9 |

#### Effect of H<sub>2</sub>O on DNA Synthesis (CPM) in Spleen Cells of B/W Mice

|           | Control (Media) | Anti-CD3 (T cell) | LPS (B cell) |
|-----------|-----------------|-------------------|--------------|
| Tap-Water | 13359±685       | 25647±5602        | 112752±2576  |
| R-Water   | 17005±1061      | 26368±6571        | 109859±3572  |
| HR-Water  | 14431±2519      | 32566±5939        | 117219±5092  |

#### Analysis of Blood Serum from Tap and Reduced Water Fed Animals

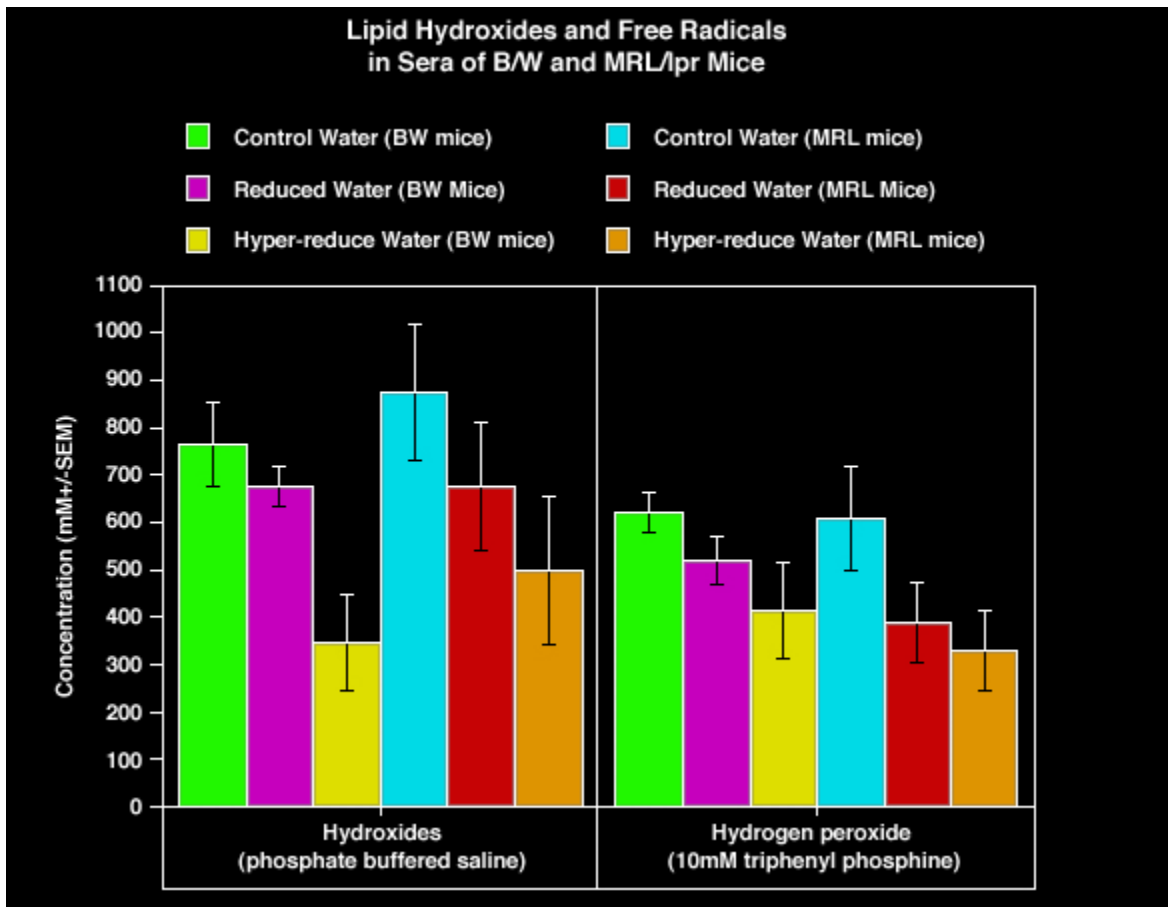
Serum Lipid Peroxides: Serum lipid peroxides were determined as described by Yagi using 20 ul serum. Fluorometric measurement was carried out using a Perkin -Elmer fluorescence spectrophotometer. 1,1,3,3, tetraethoxypropane was used as the standard.

Antioxidant Enzymes: Superoxide dismutase (SOD) activity was measured by the inhibition of cytochrome -c reduction mediated via superoxide anions generated by xanthin -xanthin oxidase and monitored at 550 nm. One unit of SOD is defined as the amount of enzyme required to inhibit the rate of cytochrome -c reduction by 50%.

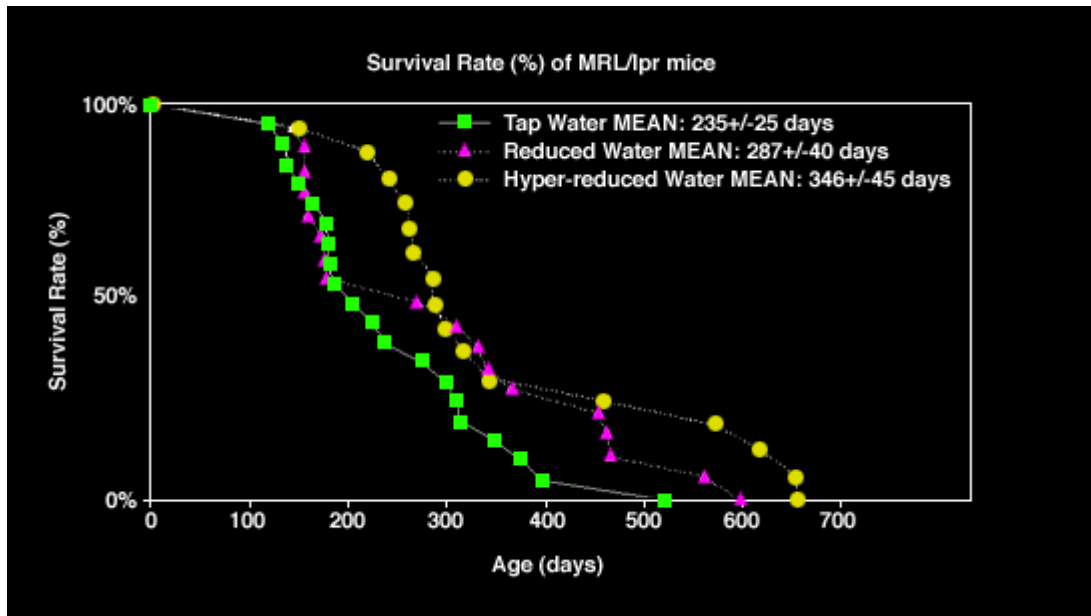
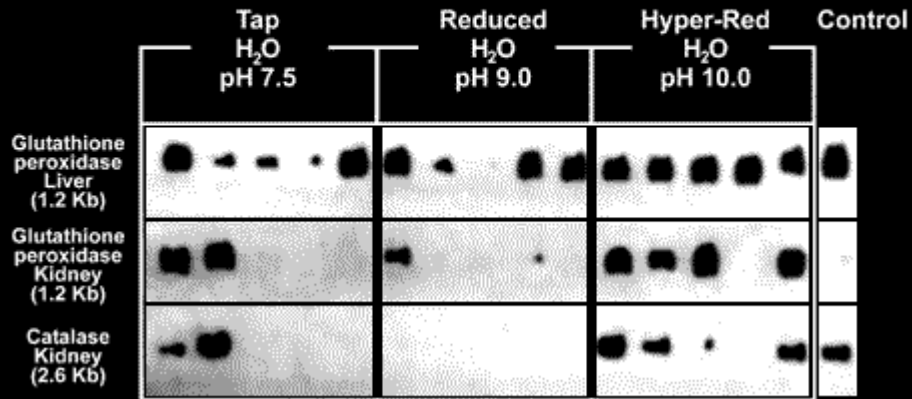
**Effect of Diet and H<sub>2</sub>O Intake on Lipid Peroxides and SOD Activity in the Serum of B/W Mice**

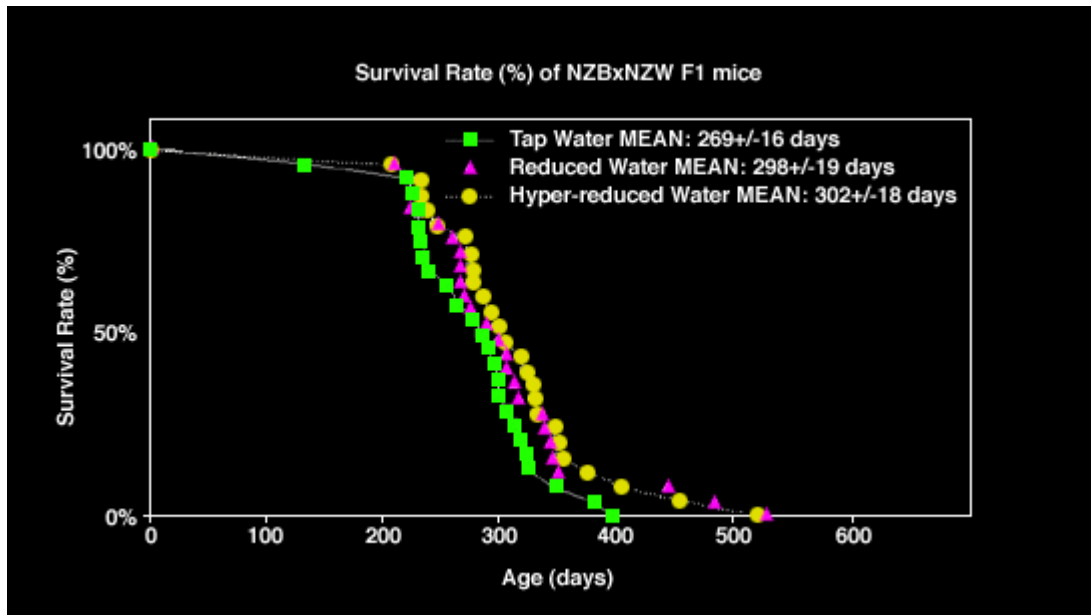
|                                  | 10% Corn Oil       | 10% Corn Oil       | 10% Fish Oil       | 10% Fish Oil       |
|----------------------------------|--------------------|--------------------|--------------------|--------------------|
| <b>Serum Analysis</b>            | Tap Water (pH 7.5) | HR-Water (pH 10.0) | Tap-Water (pH 7.5) | HR-Water (pH 10.0) |
| <b>MDA (nMole/ml)</b>            | 76±0.003           | 7.7±0.3            | 11.7±0.2           | 12.1±0.6           |
| <b>SOD Activity (U/ml serum)</b> | 28.6±2.8           | 46.5±6.1           | 86.0±3.2           | 83.6±4.8*          |

**Lipid Hydroxides and Free Radicals in Sera of B/W and MRL/pr Mice**



## Effect of Reduced Water on Antioxidant mRNA in B/W Mice





**Summary:**

1. Life long intake of both reduced (pH 9.0) and hyper-reduced (pH 10.0) water caused no harm to mice compared to tap water.
2. Survival is increased significantly by hyper-reduced water in one strain (MRL/lpr).
3. Slight increased life span in the other strain (NZBxNZW F1)
4. Reduced and hyper-reduced water appears to increase T cell numbers, and decrease B cells.
5. Both reduced and hyper-reduced water appears to increase antioxidant mRNA levels.
6. New clinical and animal studies are needed to confirm above results