

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

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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 H₂O 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 H₂O. 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 H₂O 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 H ₂ O -- --> H ⁺ + OH ⁻ 2H ⁺ ----> 2e ⁻ ----> H ⁺	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 H ₂ O ----> H ⁺ + OH ⁻ 4OH ⁻ -- 4e ⁻ -- > 2H ₂ O + O ₂	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) Reduced water (pH 9.0) Hyper-reduced water (pH 10.0)
Measurements:	Survival Immune parameters Hydrogen peroxides

Daily Analysis of Drinking H2O Given to Mice

	pH	ORP (mV)	O2 content(%)	Saturation Ratio(%)	Dissolved O2(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 H2O 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.

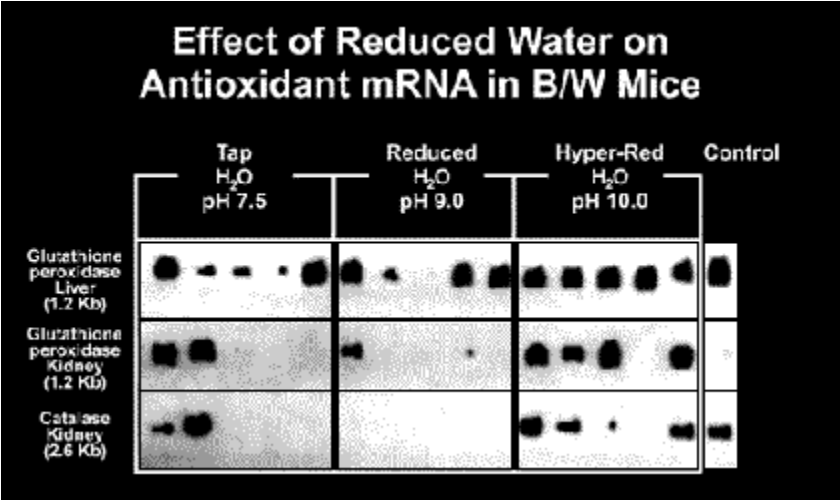
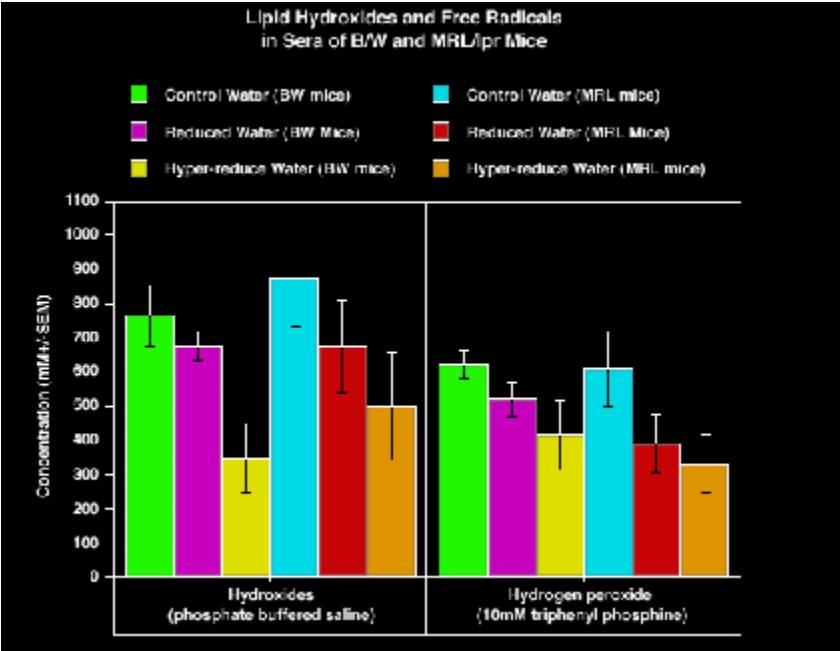
Antioxidant Enzymes: Superoxide dismutase (SOD) activity was measured by the inhibition of cytochrome-c reduction mediated via superoxide anions generated by xanthin-xanthin oxidase and monitored at 550 nm. One unit of SOD is defined as the amount of enzyme required to inhibit the rate of cytochrome-c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

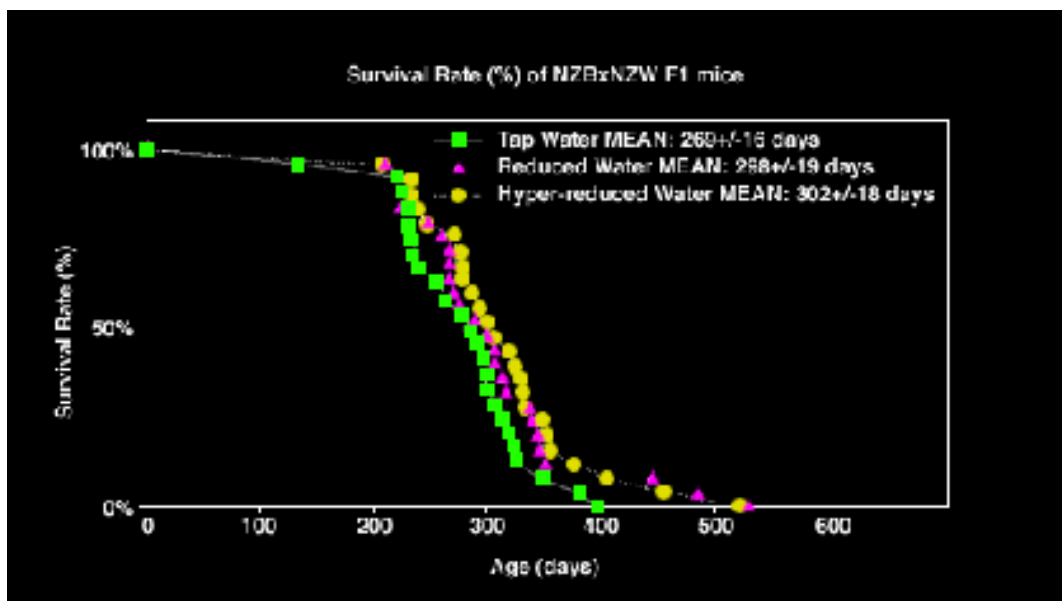
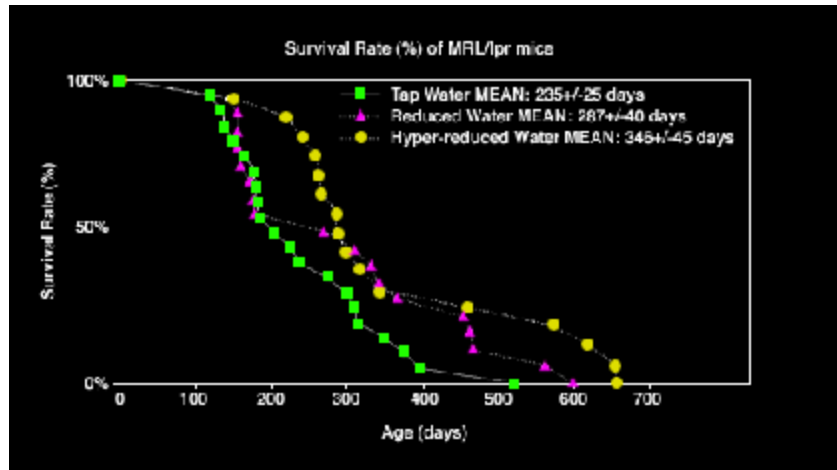
Effect of Diet and H2O Intake on Lipid Peroxides and SOD Activity in the Serum of B/W Mice

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

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.
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