

Functional

Electrolytic

Water

for improved

milk production

in Dairy Cattle

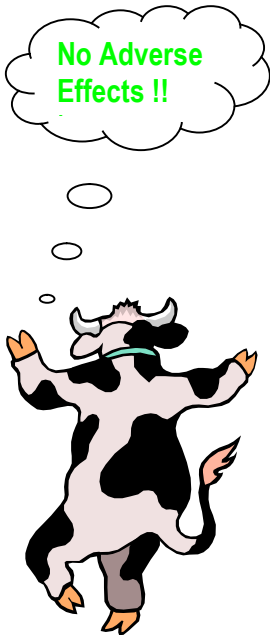
and for developing

a healthy herd



Innovative Designs and Technology usa  
ADVANCED SOLUTIONS THROUGH APPLIED ELECTROCHEMISTRY

# Summary of Functional Electrolytic Water Advantages FOR DAIRY CATTLE



- 18~28% increase in milk production
- Improvement in quality of milk
- Elimination of strong feces and urine odors
- Healthier skin condition
- Minimized injury to udder and healthier coloring
- Decrease in diarrhea cases
- Strengthening of legs with stronger knees
- Increased and consistent appetite
- Reduction to mineral supplements
- Extension to the productive life span
- Improved fertility rate
- Reduction to breeding disorders
- Reduction to still births in new-born calves
- Well digested food
- Quicker maturity rates for new-born calves
- Improved liver conditions, reduction to liver cystoma
- Elimination of mastitis
- Reduction to overall sicknesses and disease
- Reduction to cud rejection
- Lesser veterinary visits
- Consistent milk production even in hot summer months
- Recovery period after giving birth improved noticeably
- Stabilized pH factor in the first stomach
- Reduced swelling in legs
- Increase in number of bowel movements
- Increase to milk fat content
- Increase in number of rumination
- Prevention from osteomalacia





## FOREWORD:

**Just like humans, dairy cattle consume water.**

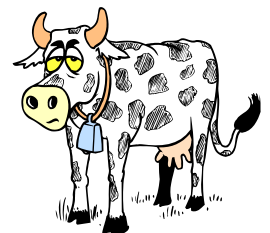
Unlike humans, dairy cattle consume an average of 30-40 gallons of water per day. Water is a critical component!

It is thought that water is the most important nutrient for dairy cattle.

**Like humans, dairy cattle require wellness.**

Generally, but unfortunately, the common perception about water is that “water is water”. However, water that is consumed by humans is generally “treated” with a process in which certain elements from water are removed to ensure its safety, cleanliness or palatability. Water provided to dairy cattle is seldom “treated”.

We would like to relate the experiences with a unique water that is processed through a proprietary, ion separation process which instills functional properties into water to make it **a healthy drinking water.**



# GENERAL DISCUSSION ON cattle water:

THE FOLLOWING EXCERPTS HAVE BEEN OBTAINED FROM *Water Technology*, April 2001 ISSUE.

Water is the most important nutrient for dairy cattle, and the more that is known about cattle needs, the more likely the proper treatment equipment will be applied.

Cattle require large amounts of water everyday. They meet this requirement in primarily two different ways: drinking, or free water intake (FWI), and ingestion of water contained in feed. The sum of the FWI and the water ingested in feed is the total water intake (TWI). These concepts can be important because the FWI—the amount of water requiring treatment—will vary from situation to situation, depending on other factors.

In one study (Holter and Urban, 1992) where milk production was 73-77 pounds per day, FWI was 5.94 pounds per pound of milk produced, or 52-55 gallons per day (gpd). TWI was 6.6 ponds per pound of milk produced.

With lower milk production (Dahlborn et al., 1998) of 57 pounds per day, FWI was 6.2 pounds per pound of milk produced, or 42 gpd. TWI was 8.3 pounds per pound of milk produced.

For a more precise calculation of FWI, the following formula can be used:

$$\text{FWI in kilograms per day (kg/d)} = 15.99 + [1.58 \times \text{kg/d dry matter intake (DMI)}] + 0.90 \times \text{kg/d milk} + 0.05 \times \text{grams per day sodium intake} + 1.20 \times \text{minimum temperature Celsius (Murphy et al., 1983)}$$

In seven other studies an average of 83 percent of the total water consumed by lactating cows was by drinking. However, another factor affecting the FWI is the percent of dry matter in the diet. As the percent of dry matter in the diet decreases, the FWI also decreases (Holter and Urban, 1992). This is exemplified by a cattle-grazing pasture wherein only 38 percent of the TWI is from drinking (Stockdale and King, 1983).

A dry (not producing milk at the present time) cow's free water intake can be calculated by the formula:

$$\text{FWI (kg/d)} = -10.34 + [.2296 \times \text{DM}^*] + 22212 \times \text{kg/d DMI} + 0.03944 \times \text{CP}^{**}$$

\*\*Dry matter % of diet \*\*Crude protein % of diet (Holter and Urban, 1992)

Other sources report that the above formula will yield a FWI for a dry cow of approximately 10-20 gpd.

[Temperature appears to have only a slight effect on milk production.](#)

In some studies cooler water caused a lowering of body temperature, but did not affect production. Given a choice of water temperature, cows prefer to drink water of moderate temperature (62-68 degrees Fahrenheit) rather than hot or cold water (Anderson, 1987; Lanham et al., 1986; Wilks et al., 1990)



## IMPORTANCE OF water quality:

**Water quality is an important concern in the production and health of dairy cattle.** There are four criteria that should be considered in assessing water quality for livestock:

<b>Organoleptic properties:</b>	odor and taste
<b>Physiochemical properties:</b>	total dissolved solids [TDS]
<b>Toxic compounds:</b>	heavy metals, toxic minerals, hydrocarbons
<b>Excess minerals or compounds:</b>	nitrates, sodium, sulfates

Research is sparse in this area of water contaminants and their effect on health and production. However, some common water problems do relate and can be treated.

**Research in Arizona** (Ray, 1986; Wegner and Schuh, 1986) studied the effects of saline water on feedlot steers and lactating dairy cows. Milk production was not different for animals drinking high saline water [4000 milligrams per liter (mg/l TDS)] than for cows drinking their regular water of 1,300 mg/L TDS during cool months, but was significantly lower during the summer months. But, cows offered the salty water drank more water per day (36 vs 32 gpd) over a 12-month period than cows drinking normal water.

**An Israeli study** (Solomon et al., 1995) with Holstein cows producing milk at over 66 pounds per day showed that cows consuming desalinated water produced 4.84 more pounds of milk per day than cows consuming salty water. Similar results were observed by Challis et al. (1997) under hot desert conditions. They reduced the TDS of the water from about 4,400 to 440 mg/L and obtained a greater than 20 percent increase in milk production, water intake and feed intake.

However, Bahman et al. (1993) offered cows natural water that contained 3,574 mg/L TDS and desalinated water at 449 mg/L and observed no differences in milk production.

## WATER HARDNESS not a factor:

Hardness had no effect on production or FWI (Graf and Holdaway, 1952; Bloser and Soni, 1957).

## OTHER FACTORS:

**The pH levels for dairy cattle water have not been established.**

No information was found in the scientific literature regarding the effects of pH on water intake, animal health, animal production or the microbial environment in the rumen.

**The effect of coliform bacteria in water on health of cattle is unknown.** However, it is recommended that an analysis be made for total coliforms. Results from this assay should be less than the most probable number (MPN). An MPN of 1 through 8 is unsatisfactory; an MPN of 9 or greater is unsafe. A fecal coliform test also is often performed.

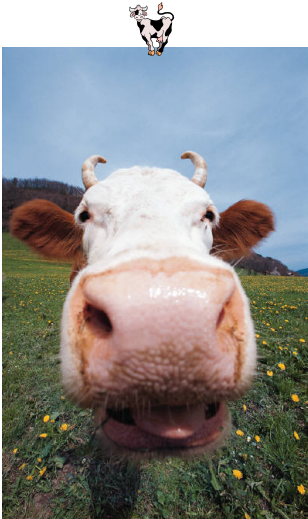
**There is no scientific study on the effects of chlorine** on the production or the drinking habits of dairy cattle. Anecdotal reports are wide ranging, from positive to negative. Informal reporting from



universities that have dairy science programs, including one which has cattle that drink chlorinated city water, seem to suggest the following: Dairy cattle do not benefit from chlorinated water, but if the water must be chlorinated for other reasons, then the chlorine residual should be kept in the same range as it is for humans—less than 0.5 mg/L.

## GENERAL DISCUSSION ON functional electrolytic water:

### Water is essential to life.



Although water is a simple molecule, consisting of only hydrogen and oxygen, it plays numerous roles as a solvent, and in electrolysis ion separation, polymerization, oxidation, reduction, resolution, and so on.

Any change in the properties of water or any addition to water therefore influences living things.

Fortunately, modern technology has enabled us artificially to change the properties of water or to give it functions—such water is called functional water.

There are numerous examples of water solutions in which something is dissolved, and many of these are used for improving health. The most widely used functional water is made by electrolytic ion separation.

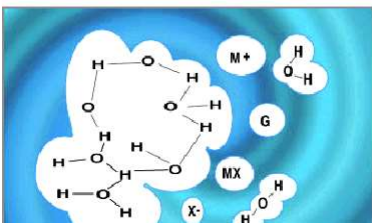
Electrolytic ion separation produces both acid and basic (alkaline) solutions. An electrolyzed basic (alkaline) solution has a reducing potential which leads to a reduction of the activity of free radicals in the body and may contribute to the prevention and or improvements to various diseases. An electrolyzed acid solution, which has a high oxidation reduction potential and high concentrations of dissolved chloride and oxygen, has a mild bactericidal function and is used in various types of infection control.

Functional electrolytic water has many known benefits to wellness. These unique characteristics and properties can be described as follows:

**After water is processed through electrolytic ion separation, the following changes have taken place to the original water:**

- Water with smaller clusters of water molecules.
- Water with a basic(alkaline) mineral concentration and a water with an acidic mineral concentration.
- Water that is reduced (basic/alkaline) which allows for electrons to be donated.
- Water that is oxidizing (acidic) which allows for electrons to be scavenged.
- Water that is higher in IP (energy level).

**Functional electrolytic water that possess these unique properties bring about the following improvements to water:**



- a. Water with smaller clusters, an alkaline concentration and highly energized has an improved ability to hydrate, permeate and dissolve matter.
- b. Water with an alkaline concentration delivers the health-beneficial alkaline minerals such as calcium, magnesium, manganese, sodium, iron and potassium. This same water is void of acidic properties.
- c. Water that is reduced has the ability to donate electrons which in turn allow the excess free radicals to obtain its missing electron from this supply of electrons without the need to deprive a healthy cell of its valuable, health-sustaining electron.

**Functional electrolytic water, based upon these functional properties instilled into the original water, assists in the following areas of wellness:**

- a. Improved hydration.
- b. Palatable taste to the drinking water and thereby making water desirable.
- c. Alkaline mineral concentrated.
- d. Acid buffering.
- e. Improved ability to remove acidic buildup.
- f. Electron donating.
- g. Higher energy level of water creates a disassociating reaction at a cellular level which triggers the immune system to strengthen its antioxidant properties.
- h. Improved ability to cleanse and balance the gastro-intestinal system.

## EMPIRICAL DATA obtained with functional electrolytic water provided to dairy cattle:

With the introduction of electrolytic ion separation to water treatment in Japan, electrolytic alkaline-concentrated water was introduced into the dairy farms. Based upon the positive health benefits that were learned through human consumption, this form of water was provided to dairy cattle in lieu of normal tap water.

In general, the following measurable conditions were noted:

- a. Increase in milk production by 18~28%.
- b. Notable improvement in the quality of milk.
- c. Elimination of strong feces and urine odors.
- d. Healthier skin condition.
- e. Minimized injury to the udder.
- f. Decrease in diarrhea cases.
- g. Strengthening of the legs.
- h. Increased appetite.
- i. Able to reduce mineral supplements normally added to the feed.



- j. Based upon the cow's improved health condition coupled with the stronger legs, an extension to the productive life span of the dairy cattle occurs.
- k. Improved the fertility rate and reduced still births in new-born calves.

As observations were made by veterinarians providing the above-outlined benefits, the following opinions were also provided:

- a. Despite the fact that no new supplements were added to their diet, a noticeable increase in appetite was noted with the same observations made of older dairy cattle.
- b. Consumed food was well digested.
- c. A beautiful sheen was observed on the cattle's hair.
- d. Higher fertility and pregnancy rates were observed.
- e. Maturity rates quickened for new-born calves.
- f. Dramatic increase to milk production volumes.
- g. Improved liver conditions.
- h. Minimizing of overall sicknesses which ultimately improved health conditions.
- i. No adverse conditions were noted with the consumption of functional electrolytic water. Fewer visits made by veterinarians to the point that a normal staff of 3 veterinarians were reduced to 1 resident veterinarian.



The following empirical data has been acquired from individual dairy farmers attesting to the noted benefits attained by their dairy cattle consuming functional electrolytic water:

1. Dairy Farm: KR
  - a. The milk output had increased from 7,000 kg to 8,900 kg, an increase of 27%.
  - b. The overall health condition of the herd had improved dramatically. Functional electrolytic water introduced a "preventive" approach in lieu of a reactive approach.
2. Dairy Farm: SR
  - a. There was a noticeable improvement in the quality of the milk produced.
  - b. Despite the high temperature during the Summer months, the milk output had increased dramatically. During prior Summer months, milk output had declined during Summer conditions.

3. Dairy Farm: SuR
 

Note: Unlike other dairy farms, this farmer had discontinued the use of functional electrolytic water to measure the effects of returning to normal tap water. The following effects were noted after the transition from functional electrolytic water to tap water.

  - a. The strong odors associated with cow excrements had returned after a period of time when the foul odor had been eliminated through the consumption of functional electrolytic water.
  - b. The sheen that was once present on the cows had disappeared and the hair had returned to a lackluster condition.
  - c. The frequency of diarrhea had increased.
  - d. Weakness was noticed in the cows legs as opposed to the strengthening of the cows legs during the use of functional electrolytic water.

4. Dairy Farm: TR
  - a. The sickness rate was considerably reduced.



5. Dairy Farm: HR
  - a. The coloring of the udder became extremely healthy.



- b. Due to the consumption of functional electrolytic water and its natural healing abilities, the amount of injury to the udder had diminished.
  - c. The milk output has increased by 800 kg per cow. (Note: since there was no “before and after” numbers provided, the percentage of increase could not be determined.)
6. Dairy Farm: KaR
- a. The results that were attained were excellent in every manner. Milk production was considerably higher, the sickness rate down, problems associated with diarrhea were minimized, the foul odor from the excrement was gone, the cow’s appetite was up, the sheen on the cow’s hair was considerably higher and the overall quality of the milk was up.
7. Dairy Farm: TaR
- a. The farmer was having a very difficult time getting their cows to drink tap water. With the introduction of functional electrolytic water, this concern was eliminated. The cows had taken a liking to the functional electrolytic water and had started to drink it on a consistent manner.
8. Dairy Farm: KuR
- a. The consumption of the functional electrolytic water has stabilized the appetites of the cows. The cows have developed a steady and strong appetite.
9. Dairy Farm: MR
- a. The rate of diarrhea has decreased considerably.
  - b. The cows had developed an increased and consistent appetite.
  - c. The farmer was able to reduce the amount of mineral supplements that were being added to the diet on account of the functional electrolytic water.
10. Dairy Farm: NR
- a. Due to the increase in calcium intake the legs were strengthened on the cow resulting in a longer life span for the cow as a milk producer.
  - b. .It became apparent that water was the most important element in the cow’s diet and overall health condition.
  - c. The effects of the fortified minerals, through functional electrolytic water were positive and conclusive.
11. Dairy Farm: NoR
- a. The dramatically improved health condition, stamina levels and the improved strength in the legs of the cows have added longevity to the cows. This has reduced the frequency of having to procure new dairy cows.
  - b. The appetite level of a cow giving birth generally declined after its pregnancy. This condition was overcome by the use of functional electrolytic water which rejuvenated their appetite immediately after delivery.
12. Dairy Farm: YR
- a. The overall skin condition of each cow had improved dramatically.
  - b. The foul odors associated with excrements and urine were eliminated with the consumption of functional electrolytic water.
  - c. The farm was able to reduce the amount of mineral supplements that were being added to the diet on account of the functional electrolytic water.
  - d. The newly-born calves have experienced no diarrhea.
13. Dairy Farm: KoiR
- a. The recovery period for cows giving birth had improved noticeably with the consumption of functional electrolytic water.



- b. The cows have experienced increased appetite.
  - c. Despite the higher temperature during the Summer months, the milk output had increased dramatically.
  - d. The consumption of functional electrolytic water had stabilized the pH factor for each cow.
14. Dairy Farm: Hon-MBBR
- a. There was a remarkable improvement in the quality of milk.
  - b. The cows increased their water intake which resulted in increased milk production.
  - c. The cows experienced reduced diarrhea conditions.
  - d. There was a remarkable improvement in the hair and skin texture of every cow.
15. Dairy Farm: AR
- a. Due to the consumption of functional electrolytic water and the improved immunity levels, there were lesser injuries to the cow's udder during the milking process.
  - b. The milk output had increased from a range of 282 to 360 tons or a 28% increase.
  - c. It was a financially and economically-prudent decision to use functional water.
16. Dairy Farm: RF
- a. The milk output had increased from a range of 7,000~7,300 kg to a higher output of 9,000 kg or a 28% increase.
  - b. Due to the unstable water condition, the farm had gone to functional electrolytic water.
17. Dairy Farm: NKD Association
- a. The use of functional electrolytic water has considerably reduced the number of sick cows and dramatically improved the health condition.
  - b. The farm has not measured all the positive effects brought about by the functional electrolytic water but on the other hand have not experienced any negative effects.
  - c. One noticeable difference was their improved digestion.
18. Dairy Farm: OR
- a. The use of functional electrolytic water has produced healthier cows. There were no changes to the diet or the environment but the cows became healthier.
  - b. The farm has increased their monthly sales by \$20,000.00 through increased milk output. (Note: There were no other comparative numbers provided to determine the actual increase in productivity levels.)
19. Dairy Farm: AikR
- a. The odors that are normally present in the urine and excrements were dramatically reduced.
  - b. The birthrate was considerably increased by the increase in fertility rate and the minimizing of stillborn calves.
  - c. There was a dramatic increase in milk production.
  - d. This farm is utilized as a model ranch in the use of functional electrolytic water.
20. Dairy Farm: MinR
- a. Experienced 100% fertility and birth rates through artificial insemination.
21. Dairy Farm: UR
- a. The fortified calcium through the functional electrolytic water has strengthened the legs of the cows.
  - b. Due to the dramatically-improved health conditions, the quality of the milk has improved.



- c. In the long run, the use of functional electrolytic water is a totally-economical approach to the dairy cattle industry.
22. Dairy Farm: YamR
- The quality and quantity of the milk has improved considerably.
  - Considerably minimized the sickness rate of each cow.
  - Minimized diarrhea conditions.
  - An overall improvement was noted in every aspect of the dairy cattle equating to better economic conditions.
23. Dairy Farm: YamaR
- The milk output had increased from 317 tons to 393 tons or an increase of 24.0%
  - The cow became fertile within one month of giving birth.
  - There was a substantial reduction to the number of veterinary visits.
  - There was a noticeable increase in their appetites.
24. Dairy Farm: SaR
- The milk output had increased from 8,614 kg to 10,177 kg or an increase of 17.8%
25. Dairy Farm: FuR
- There was a substantial reduction to the number of veterinary visits.
  - Reduced the swelling rate of the cow's legs.
  - Reduced the rate of external wounds caused by suction cups.



In conjunction to the above-outlined findings were the following comments that were made from a separate group of farmers and veterinarians.

- Appetite is promoted with the use of functional electrolytic water. The dairy cattle became less selective of the food they consumed.
- Increase in the number of bowel movements. The dairy cattle excretes a very healthy and well-digested stool.
- A high luster is seen on the animal's fur along with distinctive coloring.
- Increase in the number of rumination.
- Enhancement to the reproductive function. The achievement of a higher pregnancy ratio and the reduction to breeding disorders are attained.
- Functional electrolytic water works effectively as a growth promoting agent for calves after weaning.
- Increases the milk production of dairy cattle.
- Improves liver functions.
- Ability to increase the appetite levels of older cows and also in attaining complete digestion.
- Effective for the treatment and prevention of osteomalacia.
- There are no negative side effects primarily due to the fact that the water is orally taken and only absorbed by the animal in proper amounts with the excess being excreted.

The following summary narratives have been provided by individual farmers and veterinarians utilizing functional electrolytic water as the water for consumption for dairy cattle.

- Department of Agriculture at University S.

We conducted an experiment by providing functional electrolytic water to dairy cattle on a consistent basis and compared their health, amount of milk production and its impact on calcium concentration in the blood with those dairy cattle provided with ordinary tap water.

We recorded a substantial increase in the amount of milk produced from the group that was provided the functional electrolytic water. We also recorded no negative side effects or disorders.

## 2. District Agricultural Cooperative Association at City H.

I have often received questions concerning functional electrolytic water from people who have visited my Livestock Clinic. As part of my response, from a biological and biotechnological point of view, functional electrolytic water has all of the positive properties that promotes health in dairy cattle without any perceived negative side effects.

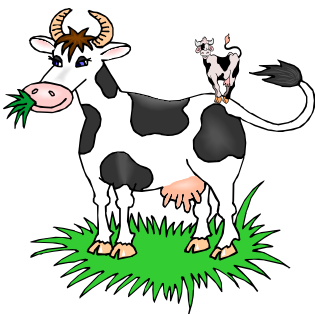
One key reason for utilizing functional electrolytic water is to gain improvements to the acidic pH of gastric juice in the first stomach of cows. The provision of functional electrolytic water on a daily basis maintains a high level of healthy bacterial activities and diseases such as rumen acidosis and a loss of appetite can be prevented. The water also improves digestion of the food and in achieving high level of feeding efficiencies. In addition, the dairy cattle's constitution itself has been enhanced and their body fluids—blood, lymphocytes, intracellular liquid—is directed to more of a neutral or alkaline pH.

As a result of the above improvements, functions of the internal organs are improved resulting in higher productivity and resistance against diseases. Through this, decreased number of disorders and an increase in milk production levels is attained. I have endorsed the use of functional electrolytic water for dairy cattle on account of these benefits that have been recorded.

## 3. Veterinarians belonging to the District Cooperative Associated at City H.

We have experimented with functional electrolytic water and have recorded the following effects from this water:

- a. Clearly achieved a reduction in pH in the first stomach of dairy cattle.
- b. Prevented and reduced the chance of liver cystoma caused by rumen acidosis which is classified as an "occupational disease" of the bullocks.
- c. Promoted protein synthesis while weight gain was seen in the bullocks as recorded by the increase of TP (transprotonase) and albumin.



In addition to these benefits the veterinarians have defined functional electrolytic water in relation to dairy cattle consumption in the following manner:

Functional electrolytic water is a byproduct of the process of electrolysis ion separation in which elements found in water are separated into effective nutrients (metal elements) and ineffective or harmful elements (non-metal elements). This process turns effective composite nutrients into a single form of pure nutrient to make it work directly for rejuvenation of cells. At the same time, due to the hydroxide ions (OH<sup>-</sup>), neutralization effects are stronger creating normal structure of organisms.

In addition to this, functional electrolytic water shows extraordinary osmotic pressure and a very effective absorbability. In other words, functional electrolytic water's osmotic pressure is proportional to the solute's concentration. Also, the metal elements that are electrically treated bring extraordinary pressure that the effective nutrients such as Calcium, Magnesium, Iron and Potassium are absorbed quickly and effortlessly. These alkaline minerals are closely related to each of the characteristics and

functions of vital cells, primarily, the osmotic pressure of water, permeability, agility, astringency, secretion, excretion and general metabolism. These characteristics allow water to play the role of a controller to maintain a balance of pH between acidity and alkalinity in the body fluids.

Generally, the following characteristics describe the two functional electrolytic waters produced through the process of electrolysis ion separation:

a. **Characteristics of alkaline water.**



1. Mellowing effect which make elements softer.
2. Solvency which allows for effective extraction to occur.
3. Heat conductivity which allows for heat to be transmitted rapidly.
4. Functions to maintain neutralization of materials.

b. **Characteristics of acidic water.**

1. Astringency which make elements constrict and contract.
2. Cleaning ability.
3. Represses the promulgation of molds and miscellaneous bacteria
4. Heat conductivity which allows for heat to be transmitted rapidly.

4. **Owner of Ranch K.**

I have been surprised by the clearly apparent differences that have been recorded in the amount of milk produced when compared between dairy cattle provided with functional electrolytic water and with those that have not been provided with this water. The increase that was recorded showed a near-2 ton increase from 7,000 kg to 8,900 kg. It is thought that this increase was primarily achieved through health wellness that was brought about with the use of functional electrolytic water. Reproductive disorders and various other disease conditions were improved upon.

During this process we did not change the diets nor the way in which we had managed the dairy cattle's well being. However, through our experiences that we have gained with the functional electrolytic water, it has become apparent to us that the manner in which preventive steps to disease has been the key factor.

I surely did not expect these types of benefits to be achieved by the use of this type of water.

5. **Owner of Ranch S.**

I have been made aware of functional electrolytic water from a neighboring farm. I had started utilizing this water and clearly noted the difference to the quality of the milk being produced from my dairy cattle. I had not made any changes to their diets. In my previous productions, I have never attained 4.25% fat content in the milk.



Along with this improvement, I have recorded feed efficiency and improved health conditions. Currently the amount of somatic cells range from 60,000 to 70,000. Through these changes, I have become to realize the importance in the type of water that is provided to dairy cattle.

The veterinarians and associate farmers that we work with have also concluded that the effects derived from the use of functional electrolytic water is highly satisfactory.

6. **Owner of Ranch Su.**

We wanted to study the effects of discontinuing the use of functional electrolytic water.

After we stopped utilizing this water, the odor of the animal pens got worse and the color and sheen of the cattle's fur had turned dull. The color of the udder had returned to that of an unhealthy coloring.

We are able to determine the health of the cow by looking at its fur and udder. By noticing these noticeable changes, we understood the positive effects that functional electrolytic water had for dairy cattle. Prior to the use of functional electrolytic water, there was an inconsistent appetite experienced by the cattle along with diarrhea, weak knees and postpartum anorexia. These negative traits were considerably improved upon with the functional electrolytic water.

Through these stark changes that were recorded with the discontinuance of functional electrolytic water, we have become to understand the benefits of this water.

7. [Owner of Ranch H-MBB.](#)

Upon switching from well water to electrolyzed well water we noticed an immediate improvement to the taste of the water. This became one reason why the cattle consumed more water which partially explained the reason for the increase in milk production.

Various disease and diarrhea conditions were minimized while the pink color of the udder did not fade even after the milking period had ended. The overall body condition of the cattle was excellent and they retained a consistent level in their appetites.

I am proud to be the recipient of the Number 1 milk producer award for our city while producing 12,000 kg of milk, as recorded officially by the milk inspector.

8. [Owner of Ranch F.](#)

Since we had installed the functional electrolytic water processing system we have seen its distinctive effects. Dairy cattle suffering from weak knees and leg disorders have minimized thereby requiring fewer visits from the veterinarians. Soon after providing the functional electrolytic water, the udder turned light red, the mastitis disappeared and the somatic cells increased.

The milk production increased by 120 tons. On account of the food nutrients, previous swelling was present in the legs; however, after switching to this water the swelling has subsided. Odors that had been present in the pen has subsided. I have drawn a conclusion from my positive experiences with the water that this is the single-most beneficial change that ranch management can make for economic and animal wellness reasons.

9. [Owner of Ranch K.](#)

The use of functional electrolytic water has brought about more benefits than we had ever anticipated. The number of mastitis cases had decreased while the somatic cells and udder conditions had improved immensely. Even during the hot summer months, the cows had maintained their strength. The milk production levels remain consistent.

10. [Owner of Ranch U.](#)

We had started utilizing the functional electrolytic water due to the many cases of reproductive disorders we had been experiencing. It has been 18 months since we started with this water and the reproductive problems that we had been experiencing have been eliminated. The milk production level has increased by 130 tons. Although this gain includes results gained from extra breeding efforts, 800 kg of this gain is directly attributed to the use of functional electrolytic water. We have also recorded a reduction to disease that the cows were susceptible to.

11. [Owner of Ranch M.](#)

To date, we have tried different combinations of feed that have been recommended to us; however, the most noticeable benefits have been recorded through the use of functional electrolytic water.

We now recognize that our investment on the new equipment and piping has not created a financial burden to our finances due to the benefits that have been derived from it. One of the first benefits that we noticed was the fact that the cows were consuming more water and that the odor that was present in the pens was eliminated. Especially noticeable was the excellent improvement in the calf's build. Along with this the cow's appetites have improved with an increase in the milk production levels. The value of somatic cells is currently ranging around 120,000.

These overall benefits have convinced us of the economic benefits that will follow.

#### 12. [Owner of Ranch Sh.](#)

In previous times, in order to produce more milk, we had to reluctantly force the cow to eat more. This action caused repeated mastitis and ungular gangrene to occur. The fat ratio was low at 3.6%.

Since we started using functional electrolytic water, the fat ratio increased above 4.0%. Disease conditions have also decreased.



In addition to the experiences reported thus far, the following narratives have been provided by a U.K. consulting group who has recently started testing functional electrolytic water with dairy cattle.

#### 1. [Experiences noted with a dairy unit located in Cheshire, England.](#)

The farm is milking 150 Friesian/Holstein cows. The milk yield is low at an average yield of 6,500 liters per year. The farmer has worked hard to maintain yields but it has been very difficult with a number of set backs experienced.

A program of soil fertility improvements has made significant achievements in the quality of grass and silage; however, only small improvements to milk yield has occurred.

The animals have shown symptoms of Acidosis while being restless, rejecting acid cud balls, with high urine pH and poor utilization of dry matter.

After providing Functional Electrolytic Water, the following changes were noted.

On day one, the first noticeable effect was with the animals liking the functional electrolytic water. This point was verified with 2 troughs that were set up. One trough holding the functional electrolytic water while the second trough had normal tap water. Once the animal was introduced to the first trough with the functional water, they would only drink from this trough.



By day 7, the urine pH had dropped to a satisfactory level of 7.0 while the amount of cud rejection was noticeably reduced. The animals were ruminating and were more placid.

Within 3 weeks, milk yields have gone up by 12%, the cud rejection at zero while the animals were quiet, happily resting and ruminating.

2. [The U.K. Consulting Group also visited with several sites in Japan to learn about the use of functional electrolytic water and dairy cattle.](#)
  - a. [Visit to an Agricultural High School and College for a conference and walk-through with the Head of Dairy and Beef Department.](#)

The Institute is located 250 km North of Tokyo, Japan.

The Institute provides students with detailed training in all aspects of beef and dairy cow production. Although small, students are involved in all areas of work, with classes and practical applications.

The beef production uses top progeny from the favored Japanese black known as Wagyu. The farm has a high reputation for producing top quality animals and many of its bulls are worth over 1 billion yen (\$763,359.00).

The milking cows are Holstein & Friesian that have been fed functional electrolytic water for the past 7 years. The cows are fed 25~30 kg (55~66 lbs) per day of a high energy ration with Ammonium-treated rice straw and high quality haylage imported from Canada.

Milk production is high, with a herd average of 12,000 liters (3,158 gallons) per year. Milk is sold to the milk cooperative at 83 yen ( \$.64) per kg or \$.29 per pound.

According to the Director, his trials and studies of functional electrolytic water confirmed the benefits mentioned elsewhere in this booklet with milk yields and herd health directly benefiting from the supply of this water.

The cows are not kept according to UK or U.S. standards and are tethered or confined to one building. Manure is taken for composting and the animals lay on a bed of wood shavings. On my visit the cows were comfortable, clean and appeared to be in good health with 75% of them chewing the cud.

The functional electrolytic water was produced from a series 700 unit providing water at a pH 9 and the acidic water at a pH 2.7. The acidic water is being used for cleaning and disinfecting as well as being applied to plants for disease control.



Due to the very low calcium in the source water, calcium is added as calcium chloride. The functional electrolytic water is then pumped to overhead containers and fed to the animals via shut off valves.

When discussing the problem of acidosis, the Director was well aware of this problem and knows that balancing the rumen's pH with functional electrolytic water is an essential tool for reducing this malady. The Director admits that he would not be able to maintain the yield and health of these animals without the benefit of the functional electrolytic water unit. In conjunction to the benefits of alkalinity, the Director appreciates the benefits of the antioxidant effects of functional electrolytic water on the animals.

The Director has worked with many dairy farmers in the district where functional electrolytic water has regularly improved milk yields by 25~30% and has been in use for over 20 years.

b. [Visit to a private farm situated 3.5 hours South East of Osaka, Japan.](#)

The son of the farmer had spent 3 years in Washington State on dairy farms and is familiar with U.S. and European milk production methods. He confirmed that the functional electrolytic water is an integral part of very high milk yield production methods in Japan.



The farm has 200 milking cows—Holstein/Friesian plus followers and young stock making a total of 350 animals on farm. Heifers are kept for replacement and bull calves sold at a rate of 1 per month.

The accommodations for the cows were dry and comfortable and they were confined to the open yards where air is circulated by the use of fans. Water is provided to an overhead container and then pumped to the cows some 150 meters away.

(It appeared that this set up was not ideal in that the electrolysis system could have been installed in or near to the herringbone parlor with a simple gravity supply system.). The functional electrolytic water is produced from 2 separate systems working independently. Calcium chloride is added to the water to compensate for low calcium and to improve pH, which is an alkaline pH of 9 and an acidic pH of 2.7. The acidic water is used for cleaning and disinfecting.

Functional electrolytic water has been used for 2 years and milk yields have increased 20% as a direct result of feeding the cows this water. Cow health has improved and lactations are 5 low to 9 high. Cows are fed a high concentrate diet with ad-lib hay, brought in from the United States and Australia. Yields before introducing functional electrolytic water to the cows were 25 kg per day per cow = 9,125 kg per year. Yields after the introduction of functional electrolytic water is 30 kg per day per cow=10,950 kg per year.

Milk is sold to the Milk Cooperative at 90 yen (\$.69) per kg.

This means that the increased profit to this farm is approximately \$140,000.00 per year.

The only operational problem that was noted by the farmer was the high level of calcium that was being processed through the electrolysis device. The potential problem that is created by this condition is that high levels of calcium coat membrane surfaces reducing the systems ability to maintain a 9.0 pH water. Also, the high levels of calcium creates a condition in which calcium sticks to the inner walls of piping causing a restriction to water flows. This problem is currently being resolved with cleaning processes that are conducted on the systems.

In addition to the material originating from Japan and the UK, the following excerpt is taken from the scientific work of the Russian, City Veterinary Center in St. Petersburg.

Beginning with the mid-1980's, in the Leningrad, Novgorod and Pakov Regions they began to use electrochemically activated (ECA) solutions when making silage. The cattle-breeding farm (Rassvet) in the Leningrad Region annually stores up 30 thousand tons of silage with the application of the ECA-solution.



The scientific and economic and balance tests conducted by the (Rasvet) specialists together with the researchers of the Feeding Department at the Leningrad Agricultural Institute have shown high feeding value of the silage preserved with the ECA solution. As compared with the ordinary silage, the preserved one has the sugar content higher by 62.5%, starch—by 81.1%, carotene—by 12%. The preserved silage significantly differs in the proportion of organic acids too. It has no butyric acid, while the share of lactic acid is 73%, and acetic acid—27%. In ordinary silage the share of lactic acid is 55%, acetic acid—24% and butyric acid—21%. According to the content of amino acids, the preserved silage also favorably differs from the ordinary one as regards the content in the protein of threonine, praline, glycine, alanine, valine, methionine, leucine, tyrosine and phenylalanine.

The scientific and economic experiment on 130 bull calves with a weight of 250-300 kg has shown that during the test there were not observance of any signs of deviations from the norm in the general condition and behavior of the animals, while the growth of their weight was 4.71% higher than in the control group.

The growth of the weight of the bull calves in the test group was conditioned by higher digestion and assimilation of nutrients in their organisms. Thus, dry substances were better digested by the animals in the test group by 2.57%, cellulose—by 24.19%, and BEV—by 1.3%.

Beginning with the second month of the experiment, calves in the test group have shown the increase of carotene in the blood by 18.83%, while at the end of the third month the increase constituted 25.24% as compared to the control group. This can be explained by two factors; preserved silage has 12% more carotene and 9% less nitrates which slow down the assimilation of carotene and transform it into vitamin A in the small intestine.

The obtained results of studies and their practical approbation have proved the high efficiency of ECA-solutions as preservatives when making silage.

3. In a limited but controlled format, a study was conducted in Colorado to determine if one benefit of functional electrolytic water—increased milk production—could be verified in the United States.

Background:



Anecdotal reports from Japan over the last several years have indicated that the use of functional electrolytic water as the sole water source for dairies resulted in an increase of milk production (15~25%), healthier coats, stronger joints, healthier udders (less occurrence of mastitis), reduction in odors caused by urine and feces, higher birth rates for the herd, and overall health of the herd.

Functional electrolytic water has shown positive health aspects when utilized on humans in terms of digestion, absorption of nutrients and minerals and cleansing of toxins. Functional electrolytic water

possesses a modified cluster structure, which has unique hydration capabilities such as the ability to alter the hydration of ions, macromolecules and biological tissues. According to research projects at Stanford University and the Universities of California, Irvine and Santa Barbara, a structured water can be produced from bulk water after treatment with electromagnetic fields, or through the electrolysis of purified water and the addition of simple saline or an electrolyte formulation. The consumption of structured water has been reported to have rather surprising effects for both human and animal consumption. These studies have been largely carried out in Japan and Europe.

### Hypothesis:

Cows consuming functional electrolytic water will show an increase of milk production over that of a control group using standard available water supplies. An increase in production of 3% or more is expected.

### Objective:

Measure the overall effects of functional electrolytic water on dairy cow milk production over a period of time.

Observe and note during this trial, the impact of functional electrolytic water on dairy smell, herd health and ease of conversion to an alternate water source.

Determine cost effectiveness of the use of functional electrolytic water in dairy production.

Provide repeatable data for use and comparison in further larger scale trials both for the testing dairy and other commercial and scientific parties.

### Testing Method:

The trial will take place at Dairy A in Colorado. Two pens of dairy cattle connected to the same milking barn were selected for this trial. 50 cows from each pen (paired) will be utilized in this trial. Pen #55 (treatment) contains approximately 70 cows and has a single unshared water supply. Areas of this pen and the cow density will be adequate to conduct this study.

Pen #56 (control containing approximately 100 cows) that will use a shared water supply with other non test pens. Area of this pen and cow density will be adequate for this study.

Pen #55 will be supplied with functional electrolytic water through two electrolysis devices contained in a heated facility located in the center of the pen. Two additional devices will be provided as backup.

Both pens have limited access to non-treated water for a short period of time while entering and leaving the milking barn. The testing dairy reports that this would not be significant since cows pass this water quickly on their way in due to the urgency of being milked and when leaving the urgency provided by feeding operation immediately after milking.



Fifty cows will be selected from each pen prior to the post treatment period and marked with chalk and by a device on their ear tag and given a number. Their ear tag will be recorded for a unique identifier for record keeping.

Trial data collection will occur for a period of 60 days during which the standard data will be collected three times a week and recorded.

Post-trial data collection will occur for a period of 10 days following the trial, during which standard data will be collected twice a week and recorded.

#### Test Results Achieved:

15% increase to milk production.

Water, a critical yet least-understood component of functionality, Innovative Designs and Technology usa utilizes this promising medium as its core catalyst.

Taking nature's water, separating the properties that are in its makeup through electrical polarization and redefining its parameters, functional waters with an array of applications are created.

Today, as more and more environmental research and development is undertaken,

Innovative Designs and Technology usa has been assertively contributing to this development, offering an array of functional water-based processes to positively effect a change towards environment, agricultural, anti-microbial and wellness concerns.

Innovaative Designs and Technology usa presents a natural, highly-efficacious medium for environmental preservation, human safety, social responsibility and cost containment.