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## Supplement to *The Art of Getting Well* **Boron and Arthritis**

Sources are given in references.

Authors of contributions/quotations are alphabetically arranged; major author, if any, is underlined.

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AKA The Arthritis Trust of America ®

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*Rex E. Newnham, Ph.D., D.O., N.D.*

### *Part 1 of 2 Parts*

In 1986 The Rheumatoid Disease Foundation received information on Boron and Arthritis from Rex E. Newnham, Ph.D., D.O., N.D. of Leeds, England.

Dr. Newnham demonstrated demographic evidence for the usefulness of Boron in treating or preventing Rheumatoid Arthritis and Osteoarthritis. His article follows:

"In countries where there are minimum amounts of available boron in the soil there is much more arthritis. In most developed countries there are about 20% of people with some musculo-skeletal disease, which is generally arthritis. In places where there is more than usual boron in the soil there is much less arthritis.

"Jamaica and Mauritius have more than usual arthritis, and there is very little available boron in their soils. Most or all of the food and other crops show severe boron deficiency in these soils. Soil or plant analyses in these countries support the visual signs of deficiency.

"Fiji is another tropical sugar producing country, and there the Indians have much more arthritis than the Fijians. The Indians eat mostly rice which is a monocotyledon plant, and these require much less boron than do the dicotyledons. The Fijians eat mostly starchy root vegetables, which are dicotyledons. Actual figures were not available.

"There is an area in Northern Thailand where there is a considerable boron deficiency, and Professor Jack Loneragan of Murdoch University is supervising work that will rehabilitate this soil. It has also been established from Thais who live in the USA that there is considerable arthritis in these parts of the country, but there has so far been no cooperation with the university or the Health Department in Bangkok. No visit is planned unless there can be some cooperation.

"Dr. Bridges-Webb recently completed a survey in southern Australia which showed that about 20% of the population suffered from a musculo-skeletal disease, and this is typical of the people in the other Western cultures<sup>1</sup>.

"Israel is an advanced country that has less than 0.5% arthritis, according to a survey conducted by Professor Bentwich<sup>12</sup>. It is interesting to note that there are no known shortages of boron in their soils. The soils of the Jordan Valley even have excess boron, so much so that in places only the very tolerant date palm will grow.

"At Carnarvon in Western Australia there was 0.35 ppm of boron in the water supply. This was reduced to 0.2 ppm a few years ago because there was some toxicity to legume crops. In this tropical environment the transpiration rate is high so that all minerals are soon concentrated in the plant. A survey was conducted there in 1981 which revealed that there was only 1% arthritis in that community. It was even found that some people went there from 1000 miles away so as to enjoy the good climate and get rid of their arthritis. It was the good water more than the climate that was the important factor in their health. Similarly in New Zealand there is a place called Ngawha, where spa pools contain 300 ppm of boron. This is a well known curative pool for arthritics<sup>2</sup>.

"Over 60 years ago Dr. Herbert, the government balneologist, or specialist on spa water treatment, recommended certain pools as beneficial for arthritis. All of these had a high boron content, but he did not know what the reasons for their curative properties were<sup>3</sup>. It is now being shown that it is the high boron content of the water. People used to bathe in these waters and they also drank some of the water.

"Professor O.L. Meyers recently supervised a survey in South Africa that showed how the Xhosa tribal people had 2% Rheumatoid Arthritis in their native state, but when the same people went to the big cities, they soon developed the prevalence for arthritis as was shown by the rest of the city population<sup>4</sup>. This is assumed to be about 20%. An experiment was devised to give the reason for these rather startling figures.

"In 1985 efforts were made to collect samples of mealies or maize or corn from the native gardens and from commercial farms.

"It took until 1986 to collect all the required samples. The Xhosa people live in Transkei, and one cannot just go there and get cobs of mealies. A pharmacist from Uitenhage tried and failed to get any on his first effort. Later he did get some, from some sort of stall. A Xhosa man from Durban who goes home to Transkei every month got some samples grown from truly native gardens. These were analysed by Professor Verbeek in the Department of Chemistry, University of Natal in Pietermaritzburg, (Republic of South Africa)<sup>5</sup>.

"See Table I. Analysis of Mealies From Various Sources. Of the four samples shown in Table I and collected in Transkei, the first two came from land that had never had chemicals added, it was truly a native garden. Information about the last two from Transkei is being obtained. Transkei is the traditional home for the Xhosa tribe.

"This table supports the hypothesis that was made four years ago in Aberdeen in which the boron intake of national groups was

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estimated on the grounds of observation of deficiency symptoms of foodstuff and on what analysis had been done. This is shown in the following table<sup>6</sup>: "See Table II, Daily Boron Levels in Food, by National Groups From this table it is seen that 5-6 mg of boron each day is sufficient to maintain good health without arthritis. In 1967 Ploquin published an article 'Boron in Foodstuffs'<sup>5</sup> and he shows how the boron content of some common foods will vary from 1 to 150 ppm, depending on the variety and the soil, but especially the fertilizer treatment of the soil. Some of the old crushed rock fertilizers had sufficient boron, but the newer synthetic types contain none. Crops will remove from 30 to 300 g of boron per hectare. Grains remove the least while fruit trees and Cruciferae remove the most. Most commercial crops are grown with fertilizer, and this means the minimum of boron, but those grown on gardens that have never had fertilizer, but to which all wastes are returned, have the most. The South African work shows this very well.

"Ploquin did produce the following table III. Three additional columns have been added which will give nearer to the actual quantity consumed by the average person in America, England or Australia, New Zealand or South Africa in 1986<sup>5</sup>. See Table III, Ideal Amounts of Foodstuffs Consumed per Week

"The revised daily intake of boron is below 2 mg as is consumed by some people in the English speaking countries. Most ingest only 1-2 mg daily. There are large numbers of people who eat what is often called junk foods, with well over the average for sugar, hamburger type meat meals, fried meat and eggs. Most of their calories come from sugar and fat with no fruit or vegetables. As fruit accounts for 65% of the revised boron intake, and fresh fruit and vegetables for 72% of Ploquin's figure, people who eat this junk food will ingest less than 2 mg boron daily, probably less than 1 mg.

"Ploquin does show that those who drink half a litre of wine each day will take in much more boron, but that is more of a European habit, and those who eat much fast food or take away foods and junk foods will have much less.

"In 1979 there was a report of Dr. Rex E. Newnham claiming that 'Boron Beats Arthritis'<sup>8</sup>. It was the first paper linking boron with arthritis and much work has been done since then. It is very interesting that boron compounds in concentrations as low as 0.0005M will inhibit bacteriophages and protozoa, this was reported by Zittle in 1951<sup>9</sup>. Other microorganisms are destroyed by higher concentration. This [may] give a reason for the success of boron supplements in alleviating rheumatoid arthritis. Nielsen has shown that boron seems to be able to effect calcium and magnesium metabolism in the rat<sup>10</sup>. This agrees with Loughman's work in which he showed that boron acted as a membrane catalyst to allow other ions to pass into the cell<sup>11</sup>. On this basis boron will allow ATP (adenosine tri-phosphate) to enter cells of worn-out cartilage or collagen, so as to give energy for cell division, and thus to repair tissues, and so to overcome the effect of arthritis.

"There is increasing evidence that boron is an essential trace element for both man and animal. It does influence calcium and magnesium metabolism, and this is possibly through the parathyroid gland<sup>10</sup>. It does alleviate and seems to cure arthritis either by acting [against whatever organism may cause Rheumatoid Diseases] and/or as a membrane catalyst that permits repair of damaged cartilage and collagen.

"It has been shown by Professor Jeffries, an orthopaedic surgeon at Otago Hospital, New Zealand, that patients who had been

taking the boron supplement had harder bones than the normal arthritic patient. This supports the work of Nielsen that boron does influence calcium metabolism. We must get more evidence on this and then it will probably be shown that lack of boron is one of the main causes of osteoporosis.

Dr. Newnham's hypothesis is making headway via physicians and vitamin research organizations. His Osteo-trace™, B-Alive, or Bone Salts tablets have also helped the elderly, in Still's Disease, Juvenile Arthritis, and Lupus, especially in its severe form of Systemic Lupus Erythematosus. Infants do require a reduced dose of 1/4 to 1/2 tablet twice daily. [Newnham can be reached at Cracoe House Cottage, Cracoe, Shipton, North Yorkshire, England BD23 6LB: Ed.]

Other products, such as Vitamin Research Products of Mountain View, California, also recommend and sell Boron and also Biotech, P.O. Box 1992, Fayetteville, AR 72702.

It is interesting and helpful to compare Jeff E. Young's, (M.S.) article with Newnham's. I quote from Vitamin Research Products' nutritional newsletter, Volume 3, Number 5, August 1988:

#### **"BORON**

#### **"Boron — Becoming Recognized as an Essential Mineral**

#### *Part 2 of 2 Parts*

"We have heard of the importance of micro-essential minerals such as manganese, molybdenum, selenium, and vanadium. We know that calcium is required for sound bones. Now research shows that boron may play a key role in the retention of calcium. But, what is boron? The latest study conducted by the U.S. Department of Agriculture indicated that within 8 days of supplementing 3 mg. of boron, a test group of postmenopausal women lost 40 percent less calcium, one-third less magnesium, and slightly less phosphorus through their urine. These are the minerals which make up our bones.

"Each day the women took a 3 mg. boron supplement in the form of sodium borate. They retained an average of 52 mg. more calcium which is equal to a gram of calcium every 20 days. The body contains roughly 1100 grams of calcium, so over a period of several years, that's a significant savings in calcium.

"The absorption of calcium into our body is a very complicated process. It requires sex hormones, especially estrogen. This is the reason why menopausal women, whose ovaries are no longer producing estrogen, have a hard time absorbing calcium. Even though many are taking a calcium supplement, most of the supplemental calcium is wasted through urination. Currently, estrogen replacement is the only proven treatment for Osteoporosis, the brittle bone disease that affects millions." [See *Chelation Therapy*<sup>13</sup> as well as *Prevention and Treatment of Osteoporosis*<sup>14</sup>; also note that, according to Gus Prosch, Jr, M.D., calcium should always be taken with an equal amount of magnesium, and both should be in a form that is bio-available: *Proper Nutrition for Rheumatoid Arthritis*.]

"After the exciting discovery of calcium retention by a small boron supplement, a question arises. How can boron make such a dramatic difference? The answer is found in the blood serum of the experimental subjects. Researchers have discovered that the blood level of the most active form of estrogen — 17-beta estradiol — DOUBLES to the level found in women on estrogen replacement therapy; that's a fifty percent increase over the pre-study levels! Also, the blood levels of testosterone — a male hormone and precursor of estradiol — MORE than doubled.

"The researchers suspect that the body needs boron to synthesize estrogen, vitamin D, and other steroid hormones. It may also protect these hormones against rapid breakdown. Another

### Analysis of Mealies From Various Sources

Origin of Sample	%P	%Mg	%K	parts per million							
				Fe	Al	B	Na	Zn	Ca	Mn	
Transkei-native	1.33	0.54	1.32	70	46	5.0	51	99	96	17	According to <b>Rex E. Newnham,</b> Ph.D., D.O., N.D.  <b>Legend:</b> P = Phosphorus Mg = Magnesium K = Potassium Fe = Iron Al = Aluminum B = Boron Na = Sodium Zn = Zinc Ca = Calcium Mn = Manganese
Transkei-native	1.32	0.53	1.33	76	61	4.5	53	87	208	29	
Seed from Harry Thomas, Durban	0.30	0.12	0.30	30	9	3.1	150	21	56	7	
Popcorn seed, Mistri's	0.34	0.15	0.29	44	16	1.25	115	29	67	12	
Organic Farm, E. Transvaal	0.32	0.12	0.33	26	4	1.25	41	18	52	5	
Transkei, 1	0.29	0.14	0.32	39	10	1.10	128	22	45	6	
Alpheus 2	0.23	0.094	0.28	26	4	0.95	97	22	23	4	
Crushed Maize, Seel Special	0.21	0.080	0.25	20	5	0.60	34	14	42	5	
Maize Meal, Induna Special	0.17	0.069	0.19	17	4	0.50	104	13	27	4	
Maize Meal, White, Diamond, Enriched	0.23	0.087	0.29	16	3	0.55	32	14	25	3	
Maize Flour, Mistri's	0.24	0.095	0.28	17	2	0.75	21	15	25	4	
Maize Meal, Nyala Super, Enriched	0.13	0.051	0.16	8	3	0.40	106	9	20	2	

*These values are based on the dry sample, after drying at 110° c.*

**Table I**

### Daily Boron Levels in Food, by National Groups

Country & Criteria	Estimated Daily Intake	% Having Arthritis	Remarks	
<b>Jamaica</b> Old soil analysis & personal inspection of crops	<1mg	70%	Grossly insufficient Every crop had deficiencies	According to <b>Rex E. Newnham,</b> Ph.D., D.O., N.D.  <b>Legend</b> mg = milligram
<b>Mauritius</b> Analysis of sugar cane leaf. Inspection of crops	<1mg	50%	Grossly insufficient Most crops had deficiencies	
<b>U.S.A., England, New Zealand, Australia</b> Analysis of school meals Arthritis surveys	1-2mg	20%	Insufficient boron, most older people have arthritis	
<b>South africa</b> Xhosa tribe in Transkei Xhosa and others in the big cities	3-5mg	3-4% 20%	Based on Meyer Similar to U.S.A.	
<b>Fiji</b> Indians have much Arthritis Fijians, little Arthritis	1-1.5mg 3-5mg	20-30%	These eat much rice These eat root vegetables	
<b>Carnarvon, West Australia</b> Govt. Research Station Personal survey	6-10mg	1%	Due to high boron in water supply. Adequate	
<b>Israel</b> Information from Volcani Institute & a survey	5-8mg	1%	Adequate	
<b>Ngawha, New Zealand</b> Information from the town Council	> 10mg	none	Few people live here but arthritics go there to get rid of arthritis	

**Table II**

### Ideal Amounts of Foodstuffs Consumed per Week

Commodity	Amount		Average Boron mg/Kg		Total Boron mg		
	1967	1986	1967	1986	1967	1986	
Milk	2.5L	2.5L	0.2	0.2	0.5	0.5	According to <b>Rex E. Newnham,</b> Ph.D., D.O., N.D.  Legend: mg/Kg = milligrams per kilogram L = Liters
Cheese	0.35K	0.35K	1.0	1.0	0.35	0.35	
Meat	0.7Kg	0.7Kg	0.5	0.5	0.35	0.35	
Fish	0.2Kg	0.05Kg	2.0	2.0	0.40	0.10 (1)	
Eggs	0.14Kg	0.14Kg	0.014	0.014	0.002	0.002	
Butter	0.1Kg	0.1Kg	0.01	0.01	0.001	0.001	
Edible Fats	0.1Kg	0.1Kg	0.01	0.01	0.001	0.001	
Oil	0.1Kg	0.1Kg	0.02	0.02	0.002	0.002	
Bread	2.8Kg	1.4Kg	1.0	1.0	2.8	1.4	
Rice, Pastry	0.25Kg	0.25Kg	4.0	2.0	1.0	0.5 (2)	
Potatoes	2.0Kg	2.0Kg	1.5	0.75	3.0	1.5 (3)	
Dry Vegetable	0.2Kg	0.2Kg	10	2.0	2.0	0.4 (4)	
Dry Fruits	0.05Kg	0.01Kg	10	2.0	0.5	0.1 (4)	
Sugar	0.28Kg	1.1Kg	0	0	0	0 (5)	
Jams	0.15Kg	0.15Kg	15	5	2.25	0.75 (6)	
Chocolate	0.07Kg	0.07Kg	0.1	0.1	0.007	0.007	
Fresh Vegies	2.0Kg	2.0Kg	10	2	20	4.0 (7)	
Fresh Fruits	1.0Kg	0.50Kg	16	8	16	4.0	
<b>Totals</b>					<b>49.163</b>	<b>13.963</b>	

(1) Few people, except those who live near the coast eat fish more than once in 2 or 3 weeks. The fish diet is halved.

(2) Rice is now invariably white rice, and this is very low in all trace elements. Fisher quotes cereals as having 0.6-2.3 ppm boron, so Ploquin's figure is halved.

(3) Most people discard the potato skin which has more mineral than all the rest. Even if they are cooked in their skins, most people discard the cooking water, and this has 90% of the minerals of the potato.

(4) Few people eat any dried fruit or vegetables, possibly a few sultanas in a cake. Ploquin's figures are cut to 20%.

(5) Present average sugar consumption is 130 pounds or 54 Kg per year, or 1.1 Kg per week. Some people, especially teenagers, will eat 3 times this amount, but some do not eat any. The average is taken for this table.

(6) In the 1980's most commercial jams contain very little fruit and much filler, often a gelatine type of compound. There is just enough fruit for a few raspberry seeds (more often tomato seeds) to be seen and some colour. The boron content is reduced.

(7) Most people boil their vegetables with added salt, and then the cooking water is discarded, this discards 90% of the mineral content of those vegetables.

(8) Many people eat no fresh fruit, and others only sometimes. As more fertilizer is used by the grower the boron content is also less.

(9) The 1967 figures are from Ploquin<sup>5</sup> and the 1986 figures are more suited to U.S. conditions in 1986.

**Table III**

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study further substantiated this theory. A group of chickens were fed with a low vitamin D diet which normally would have stunted their bone growth. However, this phenomenon has been halted by the boron supplement, and the chickens are growing normally.

"Osteoporosis affects as many as 15 to 20 million older Americans predominately women. Each year Osteoporosis contributes to about 1.3 million fractures (primarily in the hip, spine and wrist) in people 45 years old and over. This costs an estimated \$3.8 billion annually [paid] to the medical industry.

"Calcium supplement sales are at an all-time high as women try to prevent bone loss. Unfortunately, only a certain type of bone, the cortical bones (the outer, harder layer of bone), are being strengthened from the added calcium intake. But the trabecular bone loss (the spongy bone in the spine and distal forearm where Osteoporosis frequently occurs) is not affected by calcium supplementation. Dr. Mark Hegsted, professor of Nutrition at Harvard University, stated that 'Osteoporosis looks like a dietary problem, not a calcium problem.' You need magnesium, boron, phosphorus, silicon etc., as much as calcium for maintaining the healthy state of all your bones.

"To make certain that boron can prevent or stop Osteoporosis, long term studies by monitoring bone mass while supplementing 3 mg. of boron per day will provide conclusive evidence to prove the worthiness of this supplement. At this time, we are making a very educated assumption that calcium and magnesium preserved by boron will end up saving our bones.

"Fruits and vegetables are rich in boron, especially apples, pears, nuts, leafy vegetables and legumes. The tables listed below show the boron content in some foods. As you can see, the average boron intake can vary greatly in individuals depending on their daily diet. Some have only 0.2 mg. per day, while vegetarians may consume up to 20 mg. of boron per day. Based on animal experiments, it seems reasonable that the human requirement for boron will be found to be near 1 to 2 mg. per day." [Dr. Newnham says: "Yet at this figure 90-100% of people develop arthritis if they live long enough." 5-6 mg, he feels, is nearer to optimum: Ed.]

"Since boron is rich in fruits and vegetables, the finding also indicates that vegetarians should have a much lower occurrence of osteoporosis. On the contrary, Eskimos, who eat almost no fruits and vegetables, have a very high incidence of bone demineralization, even during their youth. Excessive phosphorus, which is found in meat, also causes deterioration of bone (but that's another story)." [Consider the impact on health of carbonated drinks with their high and, for some, continuous intake of phosphorus: Ed.]

**"Table I  
Average Boron Content in Different  
Food Groups**

<u>Food Group</u>	<u>Boron</u> (ug/g dry weight)
Cereals	0.6-2.3ug
Meat	0.1-0.3ug
Fish	0.1-0.9ug
Dairy Products	0.1-1.5ug
Vegetable foods (fresh)	1.1-41ug
Vegetable foods (canned)	0.4-2.0ug
Fruit	0.8-3.8ug
Other	2.6ug"

[Dr. Newnham says that Young has provided these figures as average boron contents of certain food groups; and that "it would be much more meaningful if the maximum and minimum figures were also given. We should aim to get quality in our food, rather than a large quantity of mediocre food. Processed foods, freezing, canning do reduce the mineral contents. Even home cooking will reduce the

mineral content if the cooking water is discarded."]

**"Table II  
Boron Content in a Serving  
(mg. Boron per 100 ml).  
(3-1/3 fluid ounces or 0.42 cup)  
or 100 gr. (3-2/3 ounces, dry weight)**

Apple sauce, bottled	0.279mg
Grape Juice, bottled	0.202mg
Apple Juice, bottled	0.188mg
Peaches, canned	0.187mg
Broccoli, frozen flower	0.185mg
Broccoli, frozen stalks	0.089mg
Cherries, frozen	0.147mg
Pears, canned	0.122mg
Carrots, canned	0.075mg
Green beans, frozen	0.046mg
Orange juice, frozen	0.041mg
Lettuce, iceberg	0.039mg
Noodles, egg	0.037mg
Cornflakes, fortified	0.031mg
Bread, white enriched	0.020mg
Ice cream, vanilla	0.019mg
Potatoes, canned	0.017mg
Chicken breast, ground	0.005mg
Coffee, freeze dried	0.005mg
Rice, Minute	0.003mg
Milk, 2% fat	0.002mg
Beef, ground round *	Not detectable
Cheese, cheddar or cream*	Not detectable
Eggs, frozen	Not detectable
Sugar, granulated	Not detectable

\* [These vary from Table I and so supports the need for maximum and minimum values alongside average figures: Ed.]

[Dr. Newnham says, "There are 5 drinks and 20 foods in the above list. Normal people do not eat this much in a day and the total boron intake is [about] 1.7 mg. The only fresh and unprocessed food is the lettuce. When the frozen foods are thawed in the manner done by most people, much of the mineral content is lost."]

**Table 3  
Food With Highest Level of  
Boron (In ug/g Fresh Weight)**

Soy meal	28ug
Prune	27ug
Raisin	25ug
Almond	23ug
Rosehips	19ug
Peanut	18ug
Hazel nut	16ug
Date	9.2ug
Honey	7.2ug
Wines	8.5ug
Raisin	25ug

"Nature normally supplies boron in boric acid complex with sugar, polysaccharides, adenosine 5-phosphate, pyridoxine, riboflavin, dehydroascorbic acid and pyridine nucleotides.

"Postmenopausal women, aged 48 to 82 were equilibrated with a low boron diet for 119 days. When they were given 3 mg of boron as a supplement, their calcium excretion through urine decreased, and estradiol (estrogen) and testosterone in their blood serum increased significantly.

Furthermore, the responses were not temporary: The beneficial result of boron supplementation seems to last for as long as

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the boron supplements are given.

"When the diet of the subjects contained adequate magnesium, the effects of boron became less significant. The reason is not yet fully understood.

"Even though there currently are no definitive answers for the total role of boron, the scientists who discovered the boron/calcium/estradiol connection suggest that boron may be crucial for the addition of the hydroxyl (OH) group onto the hormones and vitamin D. The presence of hydroxyl groups make a big difference in their hormonal characteristics. The differences between testosterone and estradiol (estrogen) are mainly determined by a single hydroxyl group.

"Actually, vitamin D behaves more as a hormone, rather than as a vitamin. The vitamin D which we get from food or from dietary supplementation is not fully activated. It requires a conversion in the liver, and also another conversion in the kidney in order to become fully active. This fully active vitamin D is called 1 alpha, 25 dihydro-cholecalciferol. People with a poor liver and/or kidney function are at a higher risk of getting Osteoporosis. As the name of the active vitamin D implies, dihydro means two hydroxyl groups contained in each vitamin D molecule. They make a big difference when it comes to biological activity.

"In excess, boron is harmful to plants, livestock and humans. Boron inhibits many enzymatic activities with harmful effects. These enzymes include zanthine oxidase, alcohol dehydrogenase, alkaline phosphatase, catechol oxidase, polyphenol oxidase, tyrosinase, peroxidase, IAA oxidase, phosphoglucose isomerase, phosphoglucomutase and phosphorylase (which inhibits starch synthesis). Enzymes are the machinery of metabolism. When one or more enzymes are hindered by toxic substances, the result can be fatal.

"How much boron is toxic? We have discussed the estimation of boron requirement, which is about 2mg per day (0.000017 ounces). Researchers found the lowest reported lethal dose of boric acid is about 45 gr. (1.6 ounce) for an adult and 2 gr. (0.07 ounces) for an infant." [This ends Young's paper. Dr. Newnham shows that 6mg per day of boron (.000213 ounces) is necessary for good health: Ed.]

#### **Additional Information**

Since Dr. Newnham's paper was sent to our physicians in 1986, there has been considerably more research performed on the effects of boron in various forms of arthritis.

Gus J. Prosch, Jr., M.D., until his retirement one of our referral physicians, was recently asked to review an article by Dr. Newnham entitled "Boron and Arthritis: Is There a Connection?" I have abstracted some of Prosch's comments in review of this article:

"Dr. Newnham's findings and research, if eventually conclusively proven, will serve to explain and possibly verify with further research, certain unexplained observations I have made in my own private practice when treating numerous patients with Rheumatoid Arthritis, Osteoarthritis and Osteoporosis.

"In treating arthritic and osteoporotic patients, I consistently observe better results when I supplement the diet of these patients with either Calcium Orotate or Calcium Aspartate along with Norwegian Cod Liver Oil — which I feel is the best source of natural Vitamin D<sub>3</sub>. The D<sub>3</sub> more efficiently helps regulate the excessive excretion of calcium than the more commonly used synthetic vitamin D<sub>2</sub>. I've noticed that using Calcium Carbonate or other forms of calcium do not give the same consistent results as in the orotate or aspartate forms. Dr. Hans Neiper claims the orotate and aspartate forms of calcium carry the mineral directly into the cells to be utilized more efficiently. I have often wondered

why the more common forms of calcium do not perform as well as the orotates and aspartates.

"Dr. Newnham states that the parathyroid gland contains more boron than any other tissue in humans. Boron enhances parathormone activity which is the prime organ controlling bone mineralization. Dr. Newnham's research makes me now consider that if arthritic patients are deficient in boron, there is a strong possibility that the parathyroid bone mineralization effects are not functioning efficiently. By supplementing these patients with boron, could the patients be given regular forms of calcium such as calcium carbonate and would they receive the same benefits as by using the orotates and aspartates?

"Dr. Newnham's article also stimulated my imagination concerning the possible imbalance of certain anabolic hormones in arthritics as well as the known deficiencies in osteoporosis patients such as 17- beta estradiol and testosterone. I have previously noted further improvement in treating many arthritic patients and in nearly all osteoporosis patients when I supplement these patients with small amounts of these anabolic hormones. Dr. Newnham further documents a previous study by Nielsen and Hunt which proved that a boron supplemented diet with post-menopausal osteoporosis patients markedly reduced their urinary excretion of calcium and magnesium as well as greatly elevated the serum concentrations of 17-beta estradiol and of testosterone. The increase in the serum concentration of these anabolic hormones may eventually prove, with further research, to be the reason many arthritic patients respond in a more positive manner to any therapy when they are given the hormones. It is obvious why osteoporosis patients respond better when given these hormones.

"Dr. Newnham's article confirmed other observations I have noted in treating arthritic patients. For the past five years I have been a dedicated proponent of [*The Rheumatoid Disease Foundation* treatment program]. Provided I adequately supplement the patient's diet with various nutritional supplements, I have experienced an eighty percent remission rate in these patients . . . . I have noticed that approximately sixty-five percent of Rheumatoid Arthritis patients and twenty-five to thirty percent of osteoarthritic patients undergo the Herxheimer reaction when treated with [*The Rheumatoid Disease Foundation* medications and *The Proper Nutrition for Rheumatoid Arthritis*]. (See *The Herxheimer Effect*<sup>15</sup>)

"Dr. Newnham has in his research verified the fact that arthritic patients undergoing treatment with Boron supplementation often experienced the Herxheimer reaction and the reaction is always a good prognostic sign." [In Dr. Newnham's article], considerable evidence presented is strictly demographic in nature and this type of evidence [is not conclusive]. As I read the article a second time, the demographic studies took on an entirely different importance to me and I found the accumulated information extremely interesting. All in all, I feel that Dr. Newnham did a remarkable job in collating and presenting this information . . .

"[Dr Newnham's] article has some deficiencies and inadequacies but the merit and reasoning of the article far outweighs the negative points. It is definitely not an illogical hypothesis and the theory presented certainly does not conflict with present day thinking and especially from a nutritional standpoint. . . I believe the article will motivate further research from the published findings."

Rex Newnham, D.O., Ph.D., N.D.<sup>16</sup>, states: "As we use more and more superphosphate on our food crops the availability of soil boron is decreased. It is estimated that most people in western

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societies ingest less than 2mg boron daily. This is based on the analysis of school meals in the U.S.A.<sup>17</sup>, but analyses earlier in this century put the figure at 8mg<sup>18</sup>.

"The prevalence of arthritis seems to follow inversely the availability of boron in the soil. Jamaica has least boron and 70% with arthritis.

"Mauritius has very little and has much arthritis. Northern Thailand is very short of boron and has much arthritis but no figures are available. In Fiji the Indians have much more arthritis than do the Fijians, and the reason is that Indians eat mostly rice while Fijians eat mostly starchy root vegetables. Monocotyledons have much lesser need for boron than do the dicotyledons.

#### **"The Theory Behind Boron Metabolism**

"Based on work done at Oxford in the Agriculture Faculty<sup>19</sup> it is believed that at the cellular level mineral metabolism is similar with both plants and man. If this can be relied on, then boron is a membrane catalyst which allows various ions to pass through the cell membrane, particularly phosphates to support synthesis of ATP. This will give energy for efficient repair. It is obvious that in Osteoarthritis the cartilage is worn out, if it is because it lacks the necessary energy for cell division, it explains the action of boron. Then in Rheumatoid Arthritis there is an autoimmune reaction for no known reason. It is suggested that the reason is that certain collagen fibres are overage and cannot repair themselves, due to lack of energy-rich compounds within the cells."

In an article entitled "Prevention is Better Than Cure The Sad Story of Arthritis and Osteoporosis" by Rex E. Newnham, Ph.D., D.O., N.D., Newnham has said, "It has been said that if we grow old enough then we will all get arthritis. Old enough is generally in the fifties or sixties, but some survive to the eighties or nineties without any arthritis. In recent years, especially in some countries there are growing numbers of young children who develop juvenile arthritis or Still's disease; and some of these are even too young to walk. Just recently a case was brought to my attention of a young girl aged 9 months, but she was crying much and was evidently in pain, then it was noticed that some of her joints were swollen and red. This was juvenile arthritis and we were able to cure her in 2 weeks using mineral nutrients. The orthodox method would have been to give her pain killing drugs, in fact these are used for all arthritis.

"In America there are Poison Control Centres where every case of poisoning is reported, and it is seen that analgesics or pain killing drugs are responsible for many deaths each year. The latest figures show that these have died from taking analgesics in recent years as shown in brackets: 22 in 1983, 52 in 1984, 87 in 1985, 82 in 1986, 93 in 1987, 118 in 1988, 126 in 1989, a total of 580 in 8 years and the numbers seem to be increasing as time goes on. There is not much hope for arthritics here.

"The latest of these analgesics are called NSAIDS or Non-Specific Anti-Inflammatory Drugs [also Non-steroidal Anti-Inflammatory Drugs] but they will induce stomach bleeding and ulcers. The Food and Drug Administration admits that these drugs cause 200,000 cases of gastric bleeding each year and many of these have to be hospitalised. Probably 2,000 of these die each year and these drugs are mainly used for rheumatoid arthritis. We badly need some good preventive for this disease.

"All our chronic diseases seem to be increasing and this is a bad effect of modern medical methods. Acute diseases can generally be relieved, or at least the severe symptoms are covered up, but there is evidence that sometimes when the cause is not corrected the trouble goes deeper only to be manifested later in some other chronic disease. This is well seen when people have a number of dental fillings, but then the metals in their mouth set up an electrical discharge and the people complain of allergies, pains that are

difficult to diagnose, digestive problems, multiple sclerosis, myalgic encephalitis, even heart problems have all improved when these toxic metals were properly removed from teeth. Yet most people accept these fillings as normal.

"There is osteoporosis which is another bone disease in which calcium is constantly lost, it attacks women after menopause and men after age 70. One can see old men and women who are hunched and stooping for very age. This is due to collapse of vertebrae. It is generally associated with much pain and inability to do necessary tasks. The bones are weaker and will break more easily, especially at the places where there is more tension, such as the hips and the wrist. This means that there are many old ladies filling hospital beds for 3 or 4 months at a time while their hips heal and they are taught to walk again.

"Thirty years ago it was discovered that arthritis was associated with a dietary deficiency of the mineral boron. This mineral is present in all good soils, in fact plants will not grow without it. Some parts of the world have more boron than others and less arthritics too. The land of Israel has more boron than is usual in the waters of the Jordan river and the underground water, which is used for irrigation, has 0.2 parts per million boron. Israeli people have about 10 mg a day of boron in their diet and in that whole land, according to professor Bentwich of the Kaplan Hospital and Hebrew University, who did a survey that showed there was only 0.35% of the people with rheumatoid arthritis; and he estimated that a similar number had osteo arthritis a total of 0.7%

"In Britain, U.S.A., Australia, New Zealand and South Africa people have from 1 to 2 mg boron a day in their diet on the average, yet there is 20% of the population with arthritis. There are isolated areas in some of these countries where there is more than average boron in soil or water, such as at Carnarvon in Western Australia where only 1% of the people have arthritis, and Ngawah in New Zealand where nobody has arthritis but people go there to enjoy the spas that are rich in boron.

"In the last 15 years something over 500,000 people have used a boron food supplement tablet so as to get rid of their arthritis. They take 3 tablets a day while they have arthritis and in about 1 to 3 months they can get rid of all the pain, swelling and stiffness. Those who have rheumatoid arthritis generally experience an early aggravation when there is more pain. This is called an Herxheimer reaction and is a good thing as it shows the remedy is working, but they must persevere and in another 2 or 3 weeks all the pain and swelling and stiffness has gone. Then they revert to one tablet a day for a maintenance dose so that they can avoid any more arthritis.

"The American Human Nutrition Research Center has shown that a similar boron supplement will reduce the daily loss of calcium by nearly 50% and this would mean that victims of osteoporosis would live longer and be free of pain and discomfort. This is partly brought about by raising the levels of sex hormones present in the blood. Some of the women in the American trial were using HRT or Hormone Replacement therapy, and the blood levels of these hormones was the same as that of those who were using the boron supplement. HRT has the disadvantage that there can be a higher risk of breast or endometrial cancer. The boron treatment has no such risk as the hormones are made by the body and there is no synthetic material introduced to the body.

"In the mid 1980s a double blind hospital trial was conducted in Melbourne that showed these boron tablets were very efficacious and quite safe. The authorities were looking for ways to stop the use of a boron supplement and did many pathological tests which all proved the complete safety of this supplement. Since then there have been many other boron tablets on the market, and some use different compounds of boron which have never been proven, so it is best to

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use those brands that have been proven in such a way.

"The reason for the lack of boron in some soils is largely that they have had too much soluble fertilizer applied in recent years, and this in turn inhibits the uptake of the trace minerals such as boron. Farmers have to use methods that will ensure a quick return so they use these fertilizers, but the real quality of the produce suffers. The country where this is seen at its worst is Jamaica, where sugar has been grown for 200 years and the growers started using soluble chemical fertilizer in 1872. The soils are quite worn out and so are the people; 70% of them have arthritis and even the dogs in Kingston are limping. Most British and American soils have three times as much available boron in the soil as is found in Jamaica.

"Fruits and vegetables are the common foods which are rich in boron; honey is also a good source. But these foods should be organically grown. A good apple can have 20 mg boron, but an ordinary apple grown with fertilizer can have as little as 1 mg boron, or maybe less. The same applies to certain other fruits.

"So it seems that the taking of boron should be the first thing to do to prevent or cure this disease."

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Apparently also boron stimulates in a positive way, hormonal factors for both men and women, resulting in healthy bones.

Aging factors, of course, are also involved in Osteoarthritis, and for that reason various treatments aimed at improving metabolism and the general ability to repair oneself, are obviously in order.

Vitamin Research Products, (1-800-VRP-24HR: toll free number) sells a new Boron Formula which contains Boron (from boric acid) 3 mg; Calcium 60 mg (from Calcium Ascorbate and Calcium Citrate); Magnesium 30 mg (from magnesium oxide); and Vitamin C (from calcium ascorbate) of 90 mg.

Gus Prosch, Jr., M.D. orders for his patients Boron Citrate from Bio-Tech (1-800-345-1199 toll free telephone; in Arkansas 1-501-443-9148).

Patients who wish to order Osteo-Trace™, a vitamin mineral supplement developed by Dr. Rex Newnham, and the Arthritis and Rheumatism Natural Therapy Association of England, may do so through the address of Rex Newnham Cracoe House Cottage, Cracoe, Skipton, North Yorkshire, England BD23 6LB. Dr. Newnham says that these supplements are the culmination of 15 years of research and manufacture of boron tablets. Any doctor or patient or health food wholesale or retail agency may order through this source.

Dells Heathology, P.O. Box 281, Wisconsin Dells, WI 53965 sells Bone Salts containing 3 mg. Boron and Magnesium as carbonate, with vitamins B<sub>3</sub>, B<sub>6</sub> and Calcium Pantothenate, Zinc and Silica. All these do help certain forms of Arthritis and have been well tested, according to Dr. Newnham.

[Osteo-Trace has two main suppliers in the USA: Dr. Don Brenn, 1535 N. Limestone St., Springfield, OH 45503; Lawrence Mumme, 1321 Meridian Avenue, S. Pasadena, CA 91030. Other physicians and supplement suppliers also handle this product. Dr. Newnham's booklet, *Away With Arthritis*, can be ordered through this foundation for \$10 donation. Please wait six weeks for your order.)

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##### Boron in Medicine — Update

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(Formerly published in *The Journal of the Rheumatoid Disease Foundation, Volume 1, Number 2*)

**History.** Boron as the sodium salt has been used by man for over 2500 years as a flux for welding gold and as an embalming agent by the Egyptians. As supplies became easier to get, namely from Italy, boric acid and borax became increasingly used as a mild antiseptic, especially for eyes and burns.

For the last 200 years, boric acid has often been used as a food preservative, but this use has been recently stopped because it tended to disguise food that was unfit for use as being in a reasonable

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condition for use. People must have ingested considerable quantities without any ill effect during this period. Much has been used as a simple home remedy for stings and burns, and as a powder to prevent rash.<sup>1</sup>

**Antipathogenic Action.** Boric acid and borax in a 2-3% solution will prevent the growth of most bacteria and will kill many fungi. A 1.5% solution has some stimulating effect on phagocytosis *in vitro*, but at 2% this ceases.<sup>6</sup>

**Biochemistry.**<sup>10</sup> Borates are active complexing agents for diol groups particularly in secchorides, and in some of the B-vitamins and ascorbate and can inhibit certain enzyme reactions. They can reverse gel formation.

**Pharmacology.** These substances are readily absorbed by damaged skin and by mucous membranes. 50% of borate is eliminated via the kidneys in the first 12 hours, and 90% of the remainder is gone within a week, in all but extreme doses.<sup>7</sup>

Borates are slightly astringent and will tend to allay the pain of burns and wounds. If the dry powder is introduced to the nose, it can bring on sneezing and lacrimation.<sup>6</sup>

**Toxicology.** These substances are not dangerously toxic, but large doses can be dangerous. The LD-50 for borax is 5.33 g/Kg for guinea pigs, and 2-3 g/Kg for Swiss mice. But for boric acid, it is greater than 4.1 g/Kg for mice.<sup>9</sup>

Rats and dogs were fed a diet containing 52.5, 117, 350, 525, and 1750 ppm boron as borate and as boric acid for up to 38 weeks. In this period, reproductive studies were possible. Only the highest level was there any toxicity with congestion of the kidneys, liver, small gonads, thickened pancreas, and a swollen brain. Even at 525 ppm, there was no adverse effect. Rats ingesting 350 ppm boron for 2 years showed no histologic changes at necropsy.<sup>9</sup>

Some workers have shown that 3 g boric acid or 5 g borax have no effect on the adult human, while others have reported symptoms at 1-2 g per day.<sup>2</sup> No one is likely to take too much in their food even if they do use a supplement that has only a few mg per tablet. Greater absorption is likely to come from a mouthwash or if a borate is applied to damaged skin.

Extensive laboratory studies on both man and animal have not shown the exact role of boron in their metabolism. Patients have been given 10 g/day for extended periods and were still excreting boron after 7 weeks. The LD-50 for the dog is 1 g/Kg and these dogs developed a violet red skin color with persistent vomiting, diarrhea, and meningismus. Acute intoxication can include hypothermia, depression, and ataxia.<sup>5</sup>

With daily doses of 100 mg/Kg, it takes 18 days for the dog to reach a plateau in boron excretion.<sup>5</sup>

The literature from 1848 to 1948 contains data of 86 cases of borax-boric acid toxicity and 42 of these died. Some were given doses of over 100g, yet many had no real confirmation of the cause of death. One 2 day old infant died and this was blamed on the mother who cleansed her nipples with a boric acid solution. A proper autopsy and analysis should have been used to prove the cause of death. Many of the deaths were due to absorption of borax/boric acid through damaged skin. Granulating skin will readily absorb these substances and so will mucous membranes.<sup>5</sup>

The acute toxic dose for an adult is from 20 to 60g in a single dose, but infants have died with 5g, yet others lived after being given 9g boric acid. There is a great individual variation with these substances. A 50% plasma — Ringer's solution IV is the best antidote and will increase the LD-50 for mice by 250%.

**The Position in Australia.** In 1981 or soon after, the various states scheduled boron compounds in any concentration, and this is an extreme case of bureaucracy because an apple can contain over 10mg of elemental boron. Many fruits and vegetables contain over

50 ppm boron and when these are grown on a really good soil, they will have up to 160 ppm boron. Should these foods be scheduled?

Yet at the same time, a mouth-wash containing 68% borate was acceptable for OTC (Over The Counter) sales. A good mouth-wash with this substance would put many mg of boron into the blood. To become dangerous, the solution would have to be held in the mouth for many hours. Strong solutions or the powder when introduced into other body cavities have proved fatal. That legislation was introduced because a product called Bor-ex containing 5% boron was having remarkable results with both rheumatoid and osteoarthritis. Without advertising, the sales of this product went from zero to 10,000 bottles a month in 5 years. No unwanted side-effects were noticed during these 5 years.

A properly organized trial of Bor-ex is being carried out in one of the country's bigger hospitals. This started 3 years ago, but very regrettably is still not completed.

Carnarvon has 0.2 ppm boron in the water supply and people do go there from 1000 miles away in the Southwest to enjoy the good climate and get relief from their arthritis. It is really the good water and not the good climate that helps them. Yet some people in Carnarvon never drink local water. A survey was conducted there in 1981 that brought these facts to light.

**The Position in the Rest of the World.** West Germany stopped the use of boron compounds in medicine three years ago on the assumption that there were other drugs that would do everything that boron would do and that they would do it better.

In many other countries, a boron supplement is being used as a food supplement, and no claims are made, but satisfied users soon tell other people who need it. Over 250,000 people have used this supplement, and it corrects between 80 and 90% of all arthritis. No untoward side effects have been noted, but there are some useful side-effects, such as would be noticed if boron were the limiting factor in a person's well-being. Cardiopathies have been corrected, vision has been improved, psoriasis has been much improved, balance has been corrected. Arthritis in horses, cattle, dogs, deer, and goats have all been corrected.

As we use more and more superphosphate on our food crops, the availability of soil boron is decreased. It is estimated that most people in western societies ingest about 2 mg boron daily. This is based on the analysis of school meals in the U.S.A.,<sup>3</sup> but analyses earlier in this century put the figure at 8 mg.<sup>9</sup>

The prevalence of arthritis seems to follow inversely the availability of boron in the soil. Jamaica has the least boron and 70% with arthritis. Mauritius has very little and has arthritis. Northern Thailand is very short of boron and much arthritis, but no figures are available. In Fiji, the Indians have much more arthritis than do the Fijians, and the reason is that Indians eat mostly rice while Fijians eat mostly starch root vegetables. Monocotyledons have a much less need for boron than do the dicotyledons.

**The Theory Behind Boron Metabolism.** Based on work done at Oxford in the Agriculture Faculty<sup>4</sup> it is believed that at the cellular level mineral metabolism is similar with both plants and man. If this can be relied on, then boron is a membrane catalyst which allows various ions to pass through the cell membrane, particularly phosphates to support synthesis of ATP. This will give energy for efficient repair. It is obvious that in osteoarthritis the cartilage is worn out, if it is because it lacks the necessary energy for cell division, it explains the action of boron. Then in rheumatoid arthritis, there is an autoimmune reaction for no known reason. It is suggested that the reason is that certain collagen fibers are overage and cannot repair themselves, due to lack of energy-rich

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compounds within the cells.

**Other Boron Compounds.** Boranes are hydrides of boron and are very toxic. They are used as solid rocket fuels and can be used to prevent bacterial decontamination of diesel fuel.

Boron analogues of many of the amino acids have been made and tested in North Carolina. The original research was to find carcinostatic compounds of boron, but some of these are also anti-arthritic, anti-inflammatory, anti-tumor and anti-hyperlipidemic in their action on test animals. The amino carboxyboranes are relatively non-toxic, but the cyano boranes are very toxic. More will be heard about these compounds.<sup>7</sup>

Some of the analogues of amino-acids have an LD-50 of 1800mg/Kg so they do not present any problems.

**The Future of Boron.** When the aforementioned trial is completed, it is likely that many people will require the boron supplement so as to relieve their arthritis and the health departments [Australian] over-reaction will have to be reversed. Farmers will also have to look more to quality instead of quantity, and will have to add trace elements to their soil so as to give good quality crops.

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