A study on the mineral depletion of the foods available to us as a nation over the period 1940 to 1991.

The data used as the basis for this study was published in 5 Editions, initially under the auspices of the Medical Research Council and later the Ministry of Agriculture Fisheries and Foods and the Royal Society of Chemistry: Authors R.A. McCance and E.M. Widdowson.

Foreword

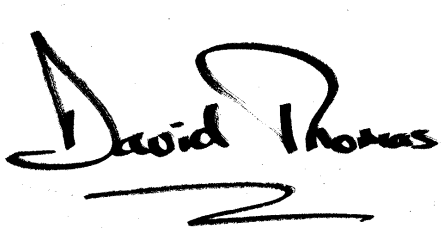
At the outset I must admit that this report was not written for entirely altruistic motives. For the past 20 years I have been professionally involved in dealing with various health related complaints for which members of the public have consulted me. The vitalistic methods I incorporate into my treatment plan are principally bio-mechanical - i.e. Chiropractic, Osteopathic and massage techniques, and/or bio-chemical - i.e. dietary guidance, food intolerance testing and supplement advice. Needless to say both overlap and lack of appropriate bio-mechanical or bio-chemical balance can affect an individual's physical as well as their mental and emotional well being. One inherent difficulty is that different people may respond symptomatically in a different way to the same underlying cause.

In my opinion one of the most prevalent causative factors in the etiology of illness in general is lack of appropriate nutrition. In terms of quantity of food eaten, the vast majority of people in the UK have one of the best diets in the world. We eat plenty of fats, carbohydrates and proteins and yet many people are malnourished. Why should this be?

Most nutritionists suggest that it is the quality of our present day foods which is lacking when compared to those same foods in the past. Vital nutrients are missing - these nutrients are invariably trace minerals that are known to have a beneficial effect on our health. This situation creates a stress within our metabolism as our bodies strive to maintain the homeostatic balance that allows us to adjust, compensate and adapt to our ever changing environment. When this cannot be achieved the body has to signal that a problem exists by giving 'us' a symptom. We are made up of the stuff of the earth, consequently it is not surprising that lack of appropriate minerals can create a variety of very evident modern day symptoms - see Appendix 1. Whilst toxic overload of modern day trace metal pollutants can also cause many recognizable 'modern' symptoms – see Appendix 2. We currently have a lot of information - most of which originates from the USA - which indicates that the mineral content of foods has deteriorated over the past 50-60 years[(1)].

A factor which enthused me to undertake this study related to a lecture tour of the UK in 1999 of American Herbalist, Paul Bergner. He had conducted some research on the depletion of minerals in the American diets, which he published in his book - "The Healing Power of Minerals"(1). I decided that in order to make British people become more aware about the worrying conclusions of his research, I would conduct a similar study to ascertain if any such data existed on the mineral depletion, over time, of foods available to the British public.

The report that follows, then, is the result of that research. The results are worrying



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Introduction

The source of the information used to compile this report is data published by the Medical Research Council (1940)[2,3,4] and M.A.F.F.[5,6] . These books provide statistics on the chemical composition of foods available to us as a nation between the period 1940 to 1991. Part of the analysis includes the mineral content - in mg per 100gm portion of that food. The analysis provided information on the amounts of Calcium, Magnesium, Potassium, Phosphorous, Iron, Copper and Sodium . It was found that only certain foods within the categories of Vegetables, Fruits and cuts of Meat could be readily traced over this 51 year period. The result of comparing data available in 1940 with that in 1991 demonstrates that in every sub group of foods investigated there has been a substantial loss in their mineral content.

Background

In 1926 Dr. R. A. McCance undertook- with a grant from the Medical Research Council - to analyse raw and cooked fruits and vegetables for their total 'available carbohydrate'. So began a programme of analysis which resulted, in 1940, with the publication of the Medical Research Council's, Special Report No: 235, entitled "The Chemical Composition of Foods". This report represented the culmination of a comprehensive research programme on the chemical composition of foods available to the British public. 1 ounce and 100 grams of different Vegetables, Fruits, Cereals, Meats, Seafoods, Beverages, Beers, Sugars, Preserves, Sweetmeats, Condiments, and Dairy Products were analysed for their organic and mineral content as well as portions of traditional British food recipes including Cakes, Pastries and Puddings.

This, then, was the first determined effort by a number of dedicated Doctors and Food Scientists headed by McCance and Widdowson to establish definitives by which to quantitatively compare and contrast individual dietary intakes. This 1st Edition was subsequently updated by the Medical Research Council in 1946 and 1960 as new foods became available, analytical procedures improved and new information regarding constituents of food (e.g. vitamins/amino acids etc.) were considered as being needed. Over the next 30 years the need to continually update information resulted in the 4th and 5th Editions which were published in 1978 and 1991 respectively under the title of 'The Composition of Foods', this time under the auspices of the Ministry of Agriculture Fisheries and Food in conjunction with the Royal Society of Chemistry.

On comparing and contrasting the 1940 figures with the 1991 figures quite a number of variables exist; enough in some instances such as cereals, to make comparisons meaningless. Equally there is a wealth of data available which provides very real insights to the change in food values over the 51 years between 1940 and 1991. The 1940 data often incorporates work published in 1929, 1933 and 1936, similarly the 5th Edition published in 1991 contains data that originates in 1987. For consistency I have used the published dates.

The Food Analysis

In the first Edition the foods were analysed for:-

- Water Content
- Total Nitrogen
- Protein
- Fat
- Available Carbohydrate
- Mineral Content
- Acid-Base Balance

In the context of this report only the mineral analysis was of interest and considered. The minerals assayed for were Sodium (Na), Potassium (K), Magnesium (Mg), Calcium (Ca), Phosphorous (P), Iron (Fe), Copper (Cu), Nitrogen (N) and Chlorine (Cl). The amounts were recorded in milligrams per 100 gm of the food. Details such as a description of the food, where it was sourced, how many samples were used, its preparation (whole/with peel/top leaves etc) and its condition - raw or cooked (and if so how and for how long) - was often recorded for each item of food. In this way like could be compared to like with regards to the variety of food and the cooking time. With foods where both raw and cooked values were given the raw value was the one selected.

In later Editions information on the dietary fibre, energy values and the vitamin content of foods was incorporated; the nitrogen content was dropped and a more complete breakdown of the amino acid composition was given. Zinc analysis was conducted in the 1978 Edition and Selenium, Iodine and Manganese in the 1991 Edition. Obviously the analytical procedures changed over the years between 1940 and 1991. However, to quote the Forword of the 5th Edition "Those methods (of 40 years ago) were no less accurate than the modern automated ones, but they took a much longer time".

Presentation of information

Vegetables

The vegetables selected represent those that were described by the authors as being of the same variety e.g. runner beans (raw) in 1940 with runner beans (raw) in 1991. Many of the vegetables on original lists were not subsequently analysed i.e. artichokes, butter beans, celeriac, endive etc. Whilst others such as peppers, yam, plantain, okra, garlic, fennel etc. were only analysed in later years.

Of the original 28 raw vegetables and 44 cooked vegetables detailed in the 1st Edition, 27 vegetables (together with mushroom) were able to be traced through to the 5th Edition. In order to make the summary of results easier to read these vegetables were grouped in order of their dominant characteristic ie: bulb, root etc and the results presented in Table 1. The individual values are presented in Appendix 4. In addition to the individual percentage change in the minerals Na, K, Mg, Ca, P, Fe and Cu the change in the ratios

between Ca:P, Na:K, Mg:Ca, and Fe:Cu were also calculated. Where the vegetable has been boiled it is usually in distilled water, normally with no salt. It is interesting to note the change between 1940 and 1991 in what was considered an appropriate time to cook a vegetable i.e. for broccoli in 1991 it was 15 minutes in 1940 it was 45 minutes! When comparing the results of the analysis it is pertinent to bear this in mind.

In the 1960 and 1975 Editions Zinc was assayed for the first time: where this value has been given it has been included in the table at the appropriate date. Also within the 3rd and 4th Editions certain 'new' vegetables were analysed: where these could be traced through to the 5th Edition their values have been recorded on Table 2 and their individual analyses have been included in Appendix 5.

Fruits

In a similar manner to the vegetables 17 fruits were 'followed through' from the 1940 to 1991 Editions and changes in their individual mineral content recorded and presented in a summary sheet - see Table 3.

Meats

With regards to comparing Meat, Poultry and Game (1940) with Meat and Meat products (1991) there were, suprisingly, only 10 items that were readily comparable. This situation was created to quote from Edition 5, "The conformation of farm animals had altered and methods of butchering had changed since the 1930's".
The results obtained are presented in Table 4.

Discussion of results

Vegetables

With most vegetables when they are harvested it is usually the whole plant that is taken. An exception would be the 'Pod and Seeds' and 'Fruit' groups where there is the possibility of the rest of the plant being ploughed back into the soil. Consequently, vegetables are probably the best indicators of change relating to the mineral depletion of soils. If the soils become depleted in minerals, the minerals are simply not there to become incorporated within the plant structure which ultimately effects the plant's 'health' and consequently the farmer's profitability when harvesting the crop.

Obviously this situation has been known to farmers since the land was first cultivated and hence the tradition in primitive cultures to move on after 10 years growing at one site, or to regularly replenish the nutrients with fertilizers, or to leave the fields to 'fallow'. It was discovered early in the 1900's that Nitrogen, Phosphorous and Potassium were the main minerals required for plant growth. These minerals together with adequate water, light and carbon-dioxide seemingly allowed for optimum growth. Consequently since

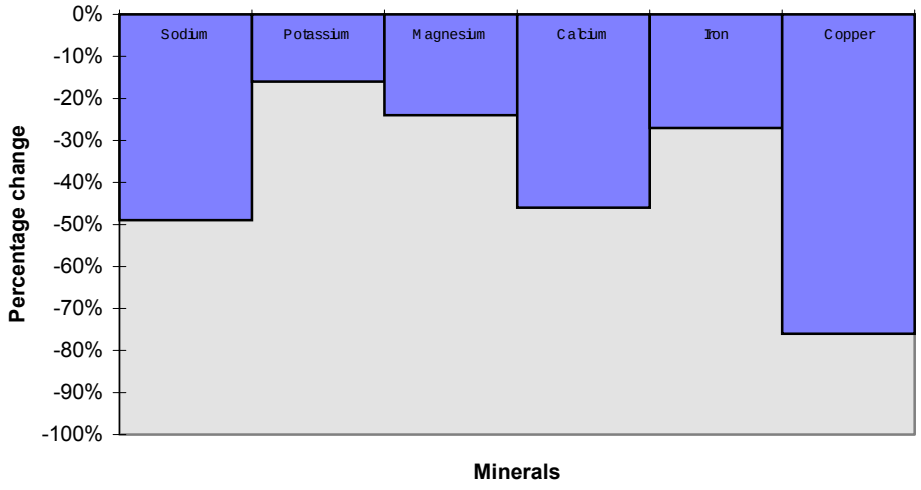
the 1920's NPK fertilizers have been routinely added to agricultural soils in the UK. Calcium - in the form of lime - and Iron are also sometimes added to fertilizers.

The base figures used in the tables presented must, therefore, not be considered as a 'true, unadulterated' representation of the mineral content of any specific vegetable. In this regard it is interesting to note that in their introduction to the vegetable section of the 5th Edition the authors state "Any differences arising from the method of cultivation, for example 'organic' methods, appear to be small and inconsistent". Also in their introduction of the 5th Edition pg. 1, the authors acknowledge that "the nutritional value of many of the more traditional foods has changed. This can happen when there are new varieties or sources of supply for the raw materials with new farming practices which can effect the nutritional value of both plant and animal products". Despite these remarks however, the summary Tables 1 and 2 provide evidence of an alarming change over 51 years. These data illustrate that there has been a severe depletion in the mineral content of the vegetables available to us as a nation.

During this time there has been an average

Loss of **49**% of their Sodium content
Loss of **16**% of their Potassium content
Loss of **24**% of their Magnesium content
Loss of **46**% of their Calcium content
Loss of **27**% of their Iron content
and a massive **76% loss** of their Copper content

Mineral Changes in Vegetables Since 1940



Perhaps not too surprisingly given the regular use of NPK fertilizer, the only exception is Phosphorous, which shows a 9% rise. These losses include the analytical results of vegetables which were boiled at least twice as long in 1940 as in 1991 - with the probable

ensuing greater loss of mineral content. The individual analysis tables provide insights as to the ranges of highs and lows within these figures.

The greatest individual mineral losses (mg per 100 gm sample).

Sodium - Runner Beans 6.5 to trace (nearly 100% loss)

Potassium - Spinach (boiled) 490 to 230 (less 53%)
- Potatoes 568 to 360 (less 36%)

Phosphorous - Spinach (boiled) 93 to 28 (less 70%)
- Potatoes 0.15 to 0.08 (less 47%)

Magnesium - Carrots 12 to 3 (less 75%)

Calcium - Broccoli (boiled) 160 to 40 (less 75%)
- Spring Onion 135 to 35 (less 74%)

Iron - Spinach (boiled) 4 to 1.6 (less 60%)
- Swede 0.35 to 0.1 (less 71%)

Copper - Spinach (boiled) 0.26 to 0.01 (less 96%)
- Watercress 0.14 to 0.01 (less 93%)

Greatest Increases in Mineral content (mg per 100gm sample).

Sodium - Peas 0.5 to 1.0 (could have been rounded up)

Potassium - Broccoli 103 to 170 (plus 46%)
- Onion 137 to 160 (plus 30%)

Phosphorous - Swede 19 to 40 (plus 110%)

Magnesium - Cauliflower (boiled) 6.6 to 12 (plus 82%)

Calcium - Peas 15.1 to 21 (plus 40%)

Iron - Runner Beans 0.8 to 1.2 (plus 50%)

Copper - there were no increases in any vegetables analysed: the least loss was potatoes 0.15 to 0.08 (less 47%)

Perhaps two of the most concerning results relate to two regularly used vegetables in the British diet, 'Old' Potatoes and 'Old' Carrots. During the 51 year period Carrots lost 75% of their Magnesium , 48% of their Calcium, 46% of their Iron and 75% of their Copper, whilst our traditional 'spud' lost 30% of its Magnesium, 35% of its Calcium, 45% of its Iron and 47% of its Copper and you would need to have eaten 10 tomatoes in 1991 to have obtained the same copper intake as one tomato would have given you in 1940.

In addition to the overall mineral depletion changes recorded, there has also taken place significant changes in the ratios of the minerals to one another. Given that there are known critical ratios of certain minerals within our physiology (Ca:P, Na:K, Mg:Ca, Fe:Cu) the changes in these ratios were calculated for each individual vegetable. An overall summary is given below:-

	1940	1991
Ca:P	1 : 2	1 : 1
Na:K	1 : 10	1 : 17
Mg:Ca	1 : 4.8	1 : 3.4
Fe:Cu	1 : 10	1 : 30

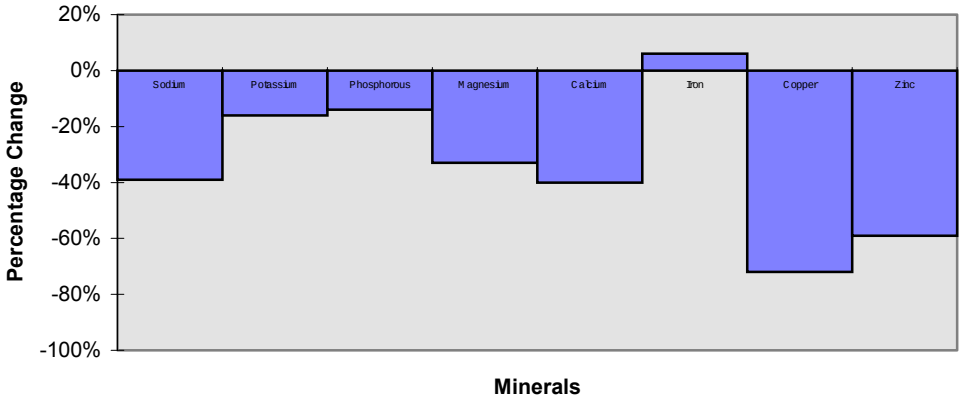
The figures, therefore, represent a significant change in the ratios between the minerals which in turn could well have a significant influence on our bio-chemistry.

Vegetables (1978-1991)

Unfortunately only 7 vegetables could be traced over this 13 year period - see Table 2 and Appendix 5. The results are again disconcerting, during this time there has been an average:-

Loss of 39% of their Sodium content
Loss of 16% of their Potassium content
Loss of 14% of their Phosphorous content
Loss of 33% of their Magnesium content
Loss of 40% of their Calcium content
Increase 6% of their Iron content
Loss of 72% of their Copper content
Loss of 59% of their Zinc content

Mineral Changes in Vegetables Between 1978 - 1991



Again very disturbing results, the seemingly anomalous result of iron is due to the significant increase in the beetroot analysis (from 0.37mg to 1.2mg) which has skewed the overall result and may have been related to the addition of Iron sometimes used in fertilizers.

The worrying concern regarding trace mineral availability is again the significant loss in Copper (72%) and Zinc (59%) this time over a 13 year period. In the 5th Edition Manganese, Selenium and Iodine have been included in the list of minerals assayed for. If the foregoing depletion of Copper and Zinc are considered typical for trace minerals it is quite likely that all other trace minerals have been significantly depleted: consequently the 1991 'official' values for Mn, Se and I must be considered in this light. Trace minerals play a huge role in human physiology to help maintain homeostasis. The significant loss of these essential trace minerals within the vegetables available to us again highlights the need to supplement with a well balanced, naturally derived product.
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Fruit

The analytical results of 17 fruits traced through from 1940 to 1991 given in Table 3
A summary is given below:

Loss of 29% of their Sodium
Loss of 19% of their Potassium
Loss of 2% of their Phosphorous
Loss of 16% of their Magnesium
Loss of 16% of their Calcium
Loss of 24% of their Iron
Loss of 20% of their Copper
Loss of 27% of their Zinc

Unlike a vegetable, when a fruit is harvested the whole plant is not taken. Consequently the changes evident are not so startling. Nevertheless, there are significant overall losses in mineral content. Also when individual fruits are considered, you would have needed to eat 3 apples or oranges in 1991 to supply the same Iron content as in 1940. It is also pertinent to note that the 10 fruits assayed for Zinc in 1978 show an overall 27% loss in their 1991 values. As Blackcurrants, Olives and Tangerines have exactly the same values in 1991 as given in 1940 – they have probably not been reassayed.

Meats

10 items of meat were able to be compared, the results are given on Table 4. As with some of the fruits some analyses given in the 5th Edition are exactly the same as given in the 1st: these include Pork Loin (grilled), Rabbit, Veal Fillet, Venison (roasted), Tripe (dressed), Sheep's Tongue, Ox Tongue, Grouse, Goose; Partridge, Pheasant and Pigeon. A summary of the mineral losses is given below, there has been an average:-

Loss of 30% of their Sodium
Loss of 16% of their Potassium
Loss of 28% of their Phosphorous
Loss of 10% of their Magnesium
Loss of 41% of their Calcium
Loss of 54% of their Iron
Loss of 24% of their Copper

Again there is a significant loss in all minerals assayed for, which could reflect the fact that these animals are fed on produce that itself is minerally depleted - including one another! The alarming 41% loss in Calcium could be a spurious reading due to the difficulty of extracting all bone from the flesh in the original analysis but the 54% loss of Iron cannot be so readily explained. Copper in meats and meat products was not routinely assayed for in 1940 hence the lack of data - see Table 4.

Cereals

Within this category of foods it proved very difficult to compare like with like. Also since 1984 Iron, Calcium and Thiamin have been added, by law, to all white and most brown flours. As with items in Fruit and Meat, Cornflour, Sage and Topioca all have the same 1991 values as given in 1940.

Dairy

In a similar manner it is difficult to compare like with like. The only reasonable comparisons are milk (fresh/whole) and cheddar cheese. Comparisons of these are shown opposite.

Milk			
	1940	**1991**	**change**
Na	50	55	**Plus 10%**
K	160	140	**less 12.5%**
P	95	92	**Less 3%**
Mg	14	11	**Less 21%**
Ca	120	115	**Less 4%**
Fe	0.08	0.05	**Less 38%**
Cu	0.02	Tr	

Cheddar Cheese			
	1940	**1991**	**change**
Na			
K	116	77	**Less 34%**
P	545	490	**Less 10%**
Mg	46.9	25	**Less 47%**
Ca	810	720	**Less 11%**
Fe	0.57	0.3	**Less 47%**
Cu	0.03	0.03	**Same**

Fish and Seafood

These creatures may be considered wild - consequently time related comparisons would be inappropriate. It is interesting to note, however, that two relatively modern 'farmed' fish- salmon and trout - in the 1991 5th Edition have the same mineral content values as given in the 1940 1st Edition.

Conclusion.

On comparing all the lists of foods in the 1st Edition with those in the 5th Edition of the Composition of Foods, it can be seen that the dietary habits of the people in the UK have changed dramatically. Since the publication of the 4th Edition in 1978 there has been a dramatic rise in the popularity of refined processed foods - 'fast' foods - which are often high in saturated fats, sugars, colourings, preservatives and flavourings. These foods have, over the past 30 years become the 'norm'. Consequently we now have a generation who considers this situation as normal and their children grow up regarding 'fast' foods and drinks as an appropriate diet.

The 'raw materials' from which these foods have been manufactured are themselves often contaminated by herbicides, fungicides, pesticides, antibiotics and hormones. As this report has demonstrated there has also been a significant deterioration in the mineral content of those foods - vegetables, fruit, meat - that may be considered the foundation of a 'good diet'. Is it being really radical to suggest there is a link between this circumstance and the rise in chronic disease conditions?

Minerals are what we are made of, to quote the Bible "ashes to ashes, dust to dust". We are all an amalgam of the 'stuff' of the earth and a quality often understood as 'life force'. It is improbable that we can function at our optimum on a physical, mental and emotional level if the foods we have available to us are deficient in vital minerals and trace elements.

Physiologically it would be very difficult to underestimate the importance of minerals and trace elements. They often act as the catalyst for all the other nutrients the body uses to develop and maintain good health. The deterioration in the mineral content of the 64 foods that could be traced over the 51 year period between 1940 and 1991 is alarming - a summary is given on Table 5.

The significant loss in the macro-minerals Na, K, Ca, Mg is cause for real concern, but the 76% loss in Copper is very worrying, not only because of the nutrient value of Copper in its own right but this substantial reduction could reflect the probability that most of the other trace elements - Si, Co, Ni, V, Mo, Se, I, Mn, Bo, Ch etc - have also been significantly depleted. This probability is supported by the 57% percentage reduction found in Zinc in vegetables during the 13 years between 1978 and 1991.

The beneficial and often essential roles played by trace elements is gradually being recognised - See Table on next page.

Some Beneficial Trace Elements By Year of Recognition *

Iron	17th Century	Molybdenum	1953	Silicon	1972
Iodine	19th Century	Selenium	1957	Nickel	1974
Copper	1928	Chromium	1959	Arsenic	1975
Manganese	1931	Tin	1970	Cadmium	1977
Zinc	1934	Vanadium	1971	Lead	1977
Cobalt	1935	Fluorine	1971	Boron	1990

Why wait until some future date when it is determined that Rubidium, Germanium, etc. are of vital significance in our physiology? The results of this study indicate that as a nation we could be described as being overfed but malnourished, there is a need to recognise that trace minerals are deficient in our foods, that an appropriate prophylactic supplement should be taken and that there needs to be changes in national policy to ensure the quality of food available to us as a nation is of the highest standard.

REFERENCES

(1) Bergner, Paul 1997 "*The Healing Power of Minerals*" Published by PRIMA HEALTH

(2) McCance and Widdowson 1940 1st Edition "*The Chemical Composition of Foods*" published by Medical Research Council: Special Report Series No: 235

(3) McCance and Widdowson 1946 2nd Edition "*The Chemical Composition of Foods*" Published by Medical Research Council: Special Report Series No: 235

(4) McCance and Widdowson 1960 3rd Edition "*The Composition of Foods*" Published by Medical Research Council: Special Report Series No: 297

(5) McCance and Widdowson 1976 4th Edition "*The Composition of Foods*" Published by RSC/MAFF

(6) McCance and Widdowson 1991 5th Edition "*The Composition of Foods*" Published by RSC/MAFF

* Source - The Healing Power of Minerals, Paul Bergner 1997
Benefits demonstrated in animals, but not necessarily humans

APPENDIXES

Appendix 1 - Mineral V's Symptom

Appendix 2 - Symptoms V's Toxicity

Appendix 3 - Blank

Appendix 4 - 27 Individual Vegetables 1940 to 1991

Appendix 5 -7 Individual Vegetables 1960 or 1978 to 1991

Table 1.

Summary of changes in the Mineral Content of 27 Vegetables between1940 and 1991

Year of Analysis	Mineral	Brassicas	'Bulb' Veg	'Fruit' Veg	'Leaf'	'Pods'	'Shoot' Veg	'Root' Veg	1936 Total	1987 Total	Change over 51 yrs.
1940	Sodium	67.8	29.6	18.5	205.1	7	144.3	287.7	760		
1991	(Na)	21	16	14	191	1	61	83		387	Less 49%
1940	Potassium	922	641	976	1967	618	460	2098	7682		
1991	(K)	1030	570	730	940	550	490	2180		6490	Less 16%
1940	Phosphorous	194.4	81.1	76.9	240.7	130	52.6	239.5	1015.2		
1991	(P)	240	91	108	137	164	48	314		1102	plus 9%
1940	Magnesium	55.8	31	37.8	113.2	53.2	22.2	105.1	418.3		
1991	(Mg)	54	18	36	67	53	11	81		320	Less 24%
1940	Calcium	349.3	226.7	85.5	908.8	48.1	70.6	299.4	1988.4		
1991	(Ca)	204	84	64	393	54	62	220		1081	Less 46%
1940	Iron	4.53	3.54	1.51	10.89	2.68	1.3	5.18	29.63		
1991	(Fe)	4	2.9	1.5	5.5	4	0.8	3		21.7	Less 27%
1940	Copper	0.41	0.3	0.35	0.67	0.32	0.25	0.72	3.02		
1991	(Cu)	0.11	0.13	0.05	0.09	0.07	0.06	0.21		0.72	Less 76%
Each analysis figure represents a cummulative figure obtained from individual tables - see Appendix 1								Ratio Changes			
These statistics have been calculated by comparing and contrasting data first published in 1940 by McCance								Ca:P	1:2	1:1	
and Widdowson - 'Chemical Composition of Food', which was commissioned by the Medical Research								Na:K	1:10	1:17	
Council - with that data published by the same authors in 1991 - The Composition of Food, which was								Mg:Ca	1:4.8	1:3.4	
commissioned by the Royal Society of Chemistry and the Ministry of Agriculture Fisheries and Food.								Cu:Fe	1:10	1:30	

Table 2.

Summary of changes in the Mineral Content of 7 Vegetables between 1978 and 1991

Year of Analysis	Mineral	Beetroot	Broccoli	Leek	Marrow	New Potatoes (Boiled)	Pepper / Green	Sweetcorn	Totals	Change
1978	Sodium	84	12	8.8	1	41	2	1	149.8	
1991	(Na)	66	8	2	1	9	4	1	91	less 39%
1978	Potassium	303	340	314	210	330	210	280	1987	
1991	(K)	380	370	260	140	250	120	140	1660	Less 16%
1978	Phosphorous	32	67	43.2	20	33	25	120	340.2	
1991	(P)	51	87	44	17	28	19	48	294	Less 14%
1978	Magnesium	15	18	10.3	12	20	11	45	131.3	
1991	(Mg)	11	22	3	10	12	10	20	88	Less 33%
1978	Calcium	24.9	100	62.7	17	5	9	4	222.6	
1991	(Ca)	20	56	24	18	5	8	2	133	Less 40%
1978	Iron	0.37	1.5	1.12	0.2	0.4	0.4	0.9	4.89	
1991	(Fe)	1.2	1.7	1.1	0.2	0.3	0.4	0.3	5.2	Plus 6%
1978	Copper	0.07	0.07	0.1	0.03	0.15	0.07	0.15	0.64	
1991	(Cu)	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.18	Less 72 %
1978	Zinc	0.4	0.6	-	0.2	0.3	0.2	1	2.7	
1991	(Zn)	0.4	0.6	0.2	0.2	0.1	0.1	0.2	1.1	Less 59%
							Ratio Changes			
Each individual numerical amount refers to mg per 100gm.							Ca:P	1: 1.5	1: 2.2	
These statistics have been calculated by comparing and contrasting data first published in 1940 by McCance							Na:K	1: 13	1: 18	
and Widdowson - 'Chemical Composition of Food' which was commissioned by the Medical Research							Mg:Ca	1: 1.7	1: 1.5	
present in the 3rd and 4th editions of the Composition of Foods with that in the 1991 5th edition.							Cu:Fe	1 : 7.6	1: 29	

Table 3.

Summary of changes in the Mineral Content of 17 Fruits between 1940 and 1991

Year of Analysis	Mineral	Apple	Apricot	Avocado	Balckberry	Cherry	Damson	Lemon	Melon	Nectarine	Orange	Passion Fruit	Peach	Pineapple	Raspberry	Rhubarb	Strawberry	Bannana	Totals	Change
1940	Sodium	2	<1	16	3.7	2.8	2.2	6	13.5	9.1	2.9	28.4	2.7	1.6	2.5	2.2	1.5	1.2	98.3	
1991	(Na)	3	2	6	2	1	2	5	8	1	5	19	1	2	3	3	6	1	70	Less 29%
1940	Potassium	120	320	396	208	275	290	163	319	268	197	348	259	247	224	425	161	348	4568	
1991	(K)	120	270	450	160	210	260	150	210	170	150	200	160	160	170	290	160	400	3690	Less 19%
1940	Phosphorous	8.5	21.3	30.8	23.8	16.8	16.4	20.7	30.4	23.9	23.7	54.2	18.5	7.8	28.7	21	23	28.1	397.6	
1991	(P)	11	20	39	31	21	14	18	13	22	21	64	22	10	31	17	24	28	406	plus 2%
1940	Magnesium	4.3	12.3	29.4	29.5	9.6	11	11.6	20.1	12.6	12.9	38.6	7.9	16.9	21.6	13.6	11.7	41.9	305.5	
1991	(Mg)	5	11	25	23	10	10	12	11	10	10	29	9	16	19	13	10	34	257	less 16%
1940	Calcium	3.5	17.2	15.3	63.3	15.9	23.5	107	19.1	3.9	41.3	15.6	4.8	12.2	40.7	103	22	6.8	515.1	
1991	(Ca)	4	15	11	41	13	22	85	20	7	47	11	7	18	25	93	10	6	435	less 16%
1940	Iron	0.29	0.37	0.53	0.85	0.38	0.41	0.35	0.81	0.46	0.33	1.12	0.38	0.42	1.21	0.4	0.71	0.41	9.43	
1991	(Fe)	0.1	0.5	0.4	0.7	0.2	0.4	0.5	0.3	0.4	0.1	1.3	0.4	0.2	0.7	0.3	0.4	0.3	7.2	Less 24%
1940	Copper	0.07	0.12	0.21	0.12	0.07	0.08	0.26	0.04	0.06	0.07	0.12	0.05	0.08	0.21	0.13	0.13	0.16	1.98	
1991	(Cu)	0.2	0.06	0.19	0.11	0.07	0.07	0.26	Tr	0.06	0.05	-	0.06	0.11	0.1	0.07	0.07	0.1	1.58	Less 20%
1978	Zinc	0.1	0.1	-	-	0.1	-	0.1	0.1	0.1	0.2	-	0.1	0.1	-	-	0.1		1.1	
1991	(Zn)	Tr	0.1	0.4	0.2	0.1	-	0.1	Tr	0.1	0.1	0.8	0.1	0.1	0.3	0.1	0.1		2.6	Less 27%

Each individual figure represents mg per 100gm.

Ratio Changes		
Ca:P	1 : 1.4	1 : 1.7
Na:K	1 : 43	1 : 48
Mg:Ca	1 : 1.9	1 : 1.9
Cu:Fe	1 : 5	1 : 4.6

These statistics have been calculated by comparing and contrasting data first published in 1940 by McCance and Widdowson - 'Chemical Composition of Food', which was commissioned by the Medical Research Council - with that data published by the same authors in 1991 - The Composition of Food, which was commissioned by the Royal Society of Chemistry and the Ministry of Agriculture Fisheries and Food.

Table 4.

Summary of changes in the Mineral Content of 10 samples of Meat between 1940 and 1991

Year of Analysis	Mineral	Beef / Topside (Roast)	Beef / Sirloin (Roast)	Beef / Steak (Fried)	Chicken Meat)Boiled)	Chicken Meat (Roast)	Duck (Roast)	Pork Leg (Roast)	Bacon / Back (Fried)	Bacon / Streaky (Fried)	Turkey (Roast)	Totals	Change
1940	Sodium	76	62	80	98	80	195	66			130	787	
1991	(Na)	49	54	54	82	81	96	79			57	552	Less 30%
1940	Potassium	370	290	371	381	355	319	308	517	462	367	3740	
1991	(K)	370	300	360	300	310	270	350	300	290	310	3160	Less 16%
1940	Phosphorous	286	237	257	270	271	231	363	229	238	320	2702	
1991	(P)	210	170	220	190	210	200	200	170	160	220	1950	less 28%
1940	Magnesium	28.1	19.9	24.8	26.4	23	23.9	22.6	25.7	25.1	28.2	247.7	
1991	(Mg)	24	19	24	25	24	20	22	20	19	27	224	Less 10%
1940	Calcium	6.2	5.8	5.2	10.7	14.5	19	5.2	11.5	52.3	38.3	168.7	
1991	(Ca)	6	10	7	11	9	13	10	13	12	9	100	Less 41%
1940	Iron	4.7	4.6	6	2.1	2.6	5.8	1.7	2.8	3.2	3.8	37.3	
1991	(Fe)	2.8	1.9	3.2	1.2	0.8	2.7	1.3	1.3	1.2	0.9	17.3	Less 54%
1940	Copper	0.25	0.17									0.42	
1991	(Cu)	0.14	0.18		0.2	0.12	0.31	0.29	0.12	0.12		0.32	Less 24%

Each individual figure represents mg per 100 gm

These statistics have been calculated by comparing and contrasting data first published in 1940 by McCance and Widdowson - 'Chemical Composition of Food', which was commissioned by the Medical Research Council - with that data published by the same authors in 1991 - The Composition of Food, which was commissioned by the Royal Society of Chemistry and the Ministry of Agriculture Fisheries and Food.

Table 5.

Summary of Changes in the Mineral Content of
Vegetables, Fruit and Meat between 1940 and 1991

Year of Analysis	Mineral	Vegetables (27 Varieties)	Fruit (17 Varieties)	Meat (10 Cuts)
1940	Sodium			
1991	(Na)	Less 49%	Less 29%	Less 30%
1940	Potassium			
1991	(K)	Less 16%	Less 19%	Less 16%
1940	Phosphorous			
1991	(P)	Plus 9%	Plus 2%	Less 28%
1940	Magnesium			
1991	(Mg)	Less 24%	Less 16%	Less 10%
1940	Calcium			
1991	(Ca)	Less 46%	Less 16%	Less 41%
1940	Iron			
1991	(Fe)	Less 27%	Less 24%	Less 54%
1940	Copper			
1991	(Cu)	Less 76%	Less 20%	Less 24%

These statistics have been calculated by comparing and contrasting data first published in 1940 by McCance and Widdowson - 'Chemical Composition of Food', which was commissioned by the Medical Research Council - with that data published by the same authors in 1991 - The Composition of Food, which was commissioned by the Royal Society of Chemistry and the Ministry of Agriculture Fisheries and Food.

Signs and Symptoms of Deficiencies of calcium, magnesium, zinc, iron and Copper.

acne	zinc
agitation	calcium, magnesium
alopecia	zinc, copper
anemia	iron, magnesium, copper
anorexia	iron, magnesium, zinc
anxiety	calcium, magnesium
apathy	zinc
brittle nails	calcium, iron, zinc
cognitive impairment	calcium, potassium
cold hands and feet	magnesium
cold, sensitivity to	iron
constipation	iron
delusions	calcium
depression	calcium, iron, magnesium, zinc, copper
diarrhea	zinc, copper
disorientation	magnesium
dizziness	iron
eczema	zinc, calcium
edema	magnesium
empysema	copper
fatigue	iron, magnesium, zinc, copper
hallucinations	magnesium
headache	iron
hyperactivity	calcium, iron, magnesium, zinc
hypercholesterolemia	zinc, copper
hypertension	calcium, magnesium
hypotension	magnesium
immunodepression	iron, magnesium, zinc
impotence	zinc
infections	copper
infertility (male)	zinc
insomnia	calcium, iron, magnesium
irritability	calcium, iron, magnesium
kidney stones	magnesium
legs, restless	calcium, magnesium
lethargy	zinc
leukopenia	copper
memory, poor	zinc
mental confusion	iron, magnesium
muscle cramps	calcium, magnesium
muscle pain	magnesium
muscle spasm	calcium
muscle tension	calcium
muscle tremor	magnesium
muscle weakness	magnesium
myocardinal degeneration	copper
nausea	magnesium
nervousness	calcium, magnesium
neutropenia	copper
numbness of limbs	calcium
osteoporosis	calcium, magnesium, copper
palpitations	calcium, iron
paranoia	zinc
parasthesia	calcium, magnesium
periodontal disease	calcium
startle reflex	magnesium
tooth decay	calcium
vertigo	magnesium
wound healing, slow	zinc

* Melvyn R. Werbach, M.D. *"Nutritional Influences on Illness"*
1993 - Second Edition, Published By Third Line Press

Appendix 2.

Symptoms associated with toxicity of Aluminium,Cadium, Lead and Mercury

alopecia	cadmium
anemia	aluminium, cadmium, mercury, lead
anorexia	cadmium, mercury, lead
anosmia	cadmium
anxiety	lead
atoxia	aluminium, mercury
colic	aluminium
colitis	mercury
concentration impairment	lead
confusion	lead
constipation	lead
dementa	aluminium
depression	lead, mercury
dizzyness	lead, mercury
drowsiness	lead, mercury
dyspnea	aluminium
emotional instability	mercury
emphysema	cadmium
eophagitis	aluminium
erethism	mercury
fatigue	cadmium, mercury, lead
gastroenteritis	aluminium
headaches	lead, mercury
hearing impairment	mercury
hepatic dysfunction	aluminium, cadmium
hypertension	cadmium, mercury, lead
in coordination	lead, mercury
indigestion	lead
insomnia	mercury
irritability	lead, mercury
joint soreness	cadmium
kidney dysfunction	mercury
memory impairment	lead, mercury
metallic taste	mercury
nephocalcinosis	cadmium
nephritis	aluminium
numbness	mercury
osteoporosis	cadmium
pain in bones	lead
pain in muscle	aluminium, cadmium, lead
paresthesios	mercury
psychosis	aluminium, mercury
restlesness	lead
skin-dry and scaly	cadmium
stomatitis	lead
teeth - yellow	cadmium
tremours	lead, mercury
weakness	aluminium, lead

* Melvyn R. Werbach, M.D. *"Nutritional Influences on Illness"*
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Appendix 3.

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Appendix 4.

Individual analysis of vegetables that could be traced from 1940 to 1991 listed alphabetically with groups of similar characteristics - for summary see Table 1. Each numerical figure refers to the mg amount of mineral per 100gm of vegetable analysed.

Brassicas

Broccoli (boiled) 1940 for 45 mins: 1991 for 15 mins
Brussel Sprouts (boiled) 1940 for 30 mins: 1991 for 15 mins
Cabbage 1940 (red): 1991 (average)
Cauliflower (boiled) 1940 for 30 mins: 1991 for 13 mins
Spring Greens (boiled) 1940 for 30 mins: 1991 for 12 mins

Brocolli (boiled)				
	1940	**1978**	**1991**	**change**
Na	6.8			
K	103		170	**plus 46%**
P	54		57	**plus 6%**
Mg	13.5		13	**less 4%**
Ca	160		40	**less 75%**
Fe	1.52		1	**less 34%**
Cu	0.1		0.02	**less 80%**
Zn			0.4	
Na : K				
Mg : Ca	I : 12		I : 3	
Cu : Fe	I : 15		I : 50	

Brussel Sprouts				
	1940	**1960**	**1991**	**change**
Na	7.7		2	**less 74%**
K	247		310	**Plus 26%**
P	44.8		61	**Plus 36%**
Mg	10.6		13	**Plus 23%**
Ca	27.1		20	**Less 26%**
Fe	0.63		0.5	**Less 21%**
Cu	0.08		0.03	**Less 63%**
Zn		0.4	0.3	**Less 25%**
Na : K	1: 32		1: 155	
Mg : Ca	1: 27		1: 1.5	
Cu : Fe	1: 79		1: 17	

Cabbage				
	1940	**1978**	**1991**	**change**
Na	31.6		5	**less 84%**
K	302		270	**less 11%**
P	32.1		41	**plus 28%**
Mg	16.5		8	**less 52%**
Ca	53.2		52	**less 2%**
Fe	0.57		0.7	**plus 23%**
Cu	0.09		0.02	**less 78%**
Zn				
Na : K	1: 9.6		1: 54	
Mg : Ca	1: 3.2		1: 6.5	
Cu : Fe	1: 6.3		1: 35	

Cauliflower (boiled)				
	1940	**1978**	**1991**	**change**
Na	11.4		4	**less 65%**
K	152		120	**less 21%**
P	33		52	**plus 57%**
Mg	6.6		12	**Plus 82%**
Ca	23		17	**less 26%**
Fe	0.48		0.4	**less 20%**
Cu	0.06		0.02	**less 67%**
Zn				
Na : K	1: 13		1: 30	
Mg : Ca	1: 3.5		1: 1.4	
Cu : Fe	1: 8		1: 20	

Spring Greens (boiled)				
	1960	**1978**	**1991**	**change**
Na	10.3		10	**less 21%**
K	118		160	**less 24%**
P	30.5		29	**plus 59%**
Mg	8.6		8	**less 27%**
Ca	86		75	**less 25%**
Fe	1.33		1.4	**Plus 5%**
Cu	0.08		0.02	**less 71%**
Zn				
Na : K	1: 11		1: 16	
Mg : Ca	1: 10		1: 9.3	
Cu : Fe	1: 17		1: 70	

Individual analysis of vegetables that could be traced from 1940 to 1991 listed alphabetically with groups of similar characteristics - for summary see Table 1. Each numerical figure refers to the mg amount of mineral per 100gm of vegetable analysed.

'Bulb' vegetables

Leeks (boiled) 1940 for 30 mins : 1991 for 22 mins.
Spring Onion 1940 bulb only : 1991 bulb plus top.

Leeks				
	1940		**1991**	**change**
Na	8.8		2	**less 78%**
K	314		260	**less 17%**
P	43.2		44	**plus 2%**
Mg	10.3		3	**less 71%**
Ca	62.7		24	**less 61%**
Fe	1.12		1.1	**less 1%**
Cu	0.1		0.02	**less 80%**
Zn			0.2	
Na : K	I : 36		I : 130	
Mg : Ca	I : 6		I : 8	
Cu : Fe	I : 11		I : 55	

Onion				
	1940	**1978**	**1991**	**change**
Na	10.2		3	**less 40%**
K	137		160	**plus 30%**
P	30		30	**plus 7%**
Mg	7.6		4	**plus 3%**
Ca	31.2		25	**less 25%**
Fe	0.3		0.3	**same**
Cu	0.08		0.05	**less 50%**
Zn		0.1	0.2	**plus 100%**
Na : K	I ; 13		I : 53	
Mg : Ca	I : 4.1		I : 6	
Cu : Fe	I : 3.7		I : 6	

Spring Onion				
	1940		**1991**	**change**
Na	13		7	**less 46%**
K	226		260	**plus 15%**
P	23.6		29	**plus 23%**
Mg	10.9		12	**plus 10%**
Ca	135		35	**less 74%**
Fe	1.24		1.9	**plus 53%**
Cu	0.13		0.06	**less 54%**
Zn			0.4	
Na : K	I : 17		I : 37	
Mg : Ca	I : 12		I : 2.9	
Cu : Fe	I : 9.5		I : 32	

'Fruit' Vegetables

Aubergine, Cucumber, Pumpkin and Tomatoes.

Aubergine				
	1940	**1978**	**1991**	**change**
Na	2.5		2	**less 20%**
K	238		210	**less12%**
P	12.1		16	**plus 32%**
Mg	9.5		11	**plus 16%**
Ca	10.4		10	**less 4%**
Fe	0.39		0.3	**less 23%**
Cu	0.08		0.01	**less 87%**
Zn			0.2	
Na : K	I : 95		I : 105	
Mg : Ca	I : 1.1		I : 0.9	
Cu : Fe	I : 4.9		I : 30	

Cucumber				
	1940	**1978**	**1991**	**change**
Na	13		3	**less 77%**
K	141		140	**same**
P	24.1		49	**plus 103%**
Mg	9.1		8	**less 12%**
Ca	22.8		18	**less 12%**
Fe	0.3		0.3	**same**
Cu	0.09		0.01	**less 89%**
Zn				
Na : K	1: 11		1: 47	
Mg : Ca	1: 2.5		1: 2.3	
Cu : Fe	1: 3.3		1: 30	

Pumpkin				
	1936	**1978**	**1987**	**change**
Na	1.3		Tr	**less 99%**
K	309		130	**less 58%**
P	19.4		19	**less 2%**
Mg	8.2		10	**plus 22%**
Ca	39		29	**less 26%**
Fe	0.39		0.4	**plus 3%**
Cu	0.08		0.02	**less 75%**
Zn		-	0.2	
Na : K	1:238		1: 0	
Mg : Ca	1: 4.8		1: 2.9	
Cu : Fe	1: 4.9		1: 20	

Tomatoes				
	1936	**1978**	**1987**	**change**
Na	3		9	**plus 200%**
K	288		250	**less 13%**
P	21.3		24	**less 13%**
Mg	11		7	**less 36%**
Ca	13.3		7	**less 47%**
Fe	0.43		0.5	**plus 16%**
Cu	0.1		0.01	**less 90%**
Zn		0.2	0.1	**less 100%**
Na : K	I : 96		I : 28	
Mg : Ca	I : 1.2		I : I	
Cu : Fe	I : 4.3		I : 50	

'Leaf' Vegetables

Spinach(boiled) 1940 15 mins : 1991 12 mins.

Lettuce				
	1936	**1978**	**1987**	**change**
Na	3.1	9	3	**less 3%**
K	208	240	220	**plus 6%**
P	30.2	27	28	**less 7%**
Mg	9.7	8	6	**less 38%**
Ca	25.9	23	28	**plus 8%**
Fe	0.73	0.9	0.7	**less 4%**
Cu	0.15	0.03	0.01	**less 93%**
Zn		0.02	0.2	
Na : K	I : 67		I : 73	
Mg : Ca	I : 2.7		I : 4.7	
Cu : Fe	I : 4.9		I : 70	

Mustard & Cress				
	1960	**1978**	**1987**	**change**
Na	19		19	**same**
K	337		260	**less 23%**
P	65.5		29	**less 56%**
Mg	27.3		12	**less 56%**
Ca	65.9		35	**less 47%**
Fe	4.54		1	**less 78%**
Cu	0.12		0.06	**less 50%**
Zn		-	0.3	
Na : K	1: 18		1: 14	
Mg : Ca	1: 2.4		1: 2.9	
Cu : Fe	1: 38		1: 17	

Spinach (Boiled)				
	1936	**1978**	**1987**	**change**
Na	123		120	**same**
K	490		230	**less 53%**
P	93		28	**less 70%**
Mg	59.2		34	**less 43%**
Ca	595		160	**less 73%**
Fe	4		1.6	**less 60%**
Cu	0.26		0.01	**less 96%**
Zn		0.4	0.5	**plus 20%**
Na : K	I : 4		I : 2	
Mg : Ca	I : 10		I : 5	
Cu : Fe	I : 15		I : 160	

Watercress				
	1936	**1978**	**1986**	**change**
Na	60		49	**less 18%**
K	314		230	**less 27%**
P	52		52	**same**
Mg	17		15	**less 12%**
Ca	222		170	**less 23%**
Fe	1.62		2.2	**plus 36%**
Cu	0.14		0.01	**less 93%**
Zn				
Na : K	1: 5.2		1: 4.7	
Mg : Ca	1: 13		1: 11	
Cu : Fe	1: 12		1: 220	

Pods and Seeds

Peas and Runner Beans.

Peas				
	1940	**1978**	**1991**	**change**
Na	0.5		1	**plus 100%**
K	342		330	**less 3.5%**
P	104		130	**plus 40%**
Mg	30.2		34	**plus 7%**
Ca	15.1		21	**plus 40%**
Fe	1.88		2.8	**plus 49%**
Cu	0.23		0.05	**less 78%**
Zn		0.7	1.1	**plus 57%**
Na : K	I : 7		I : 3	
Mg : Ca	I : 0.5		I : 0.6	
Cu : Fe	I : 8		I : 56	

Runner Beans				
Bean	**1940**	**1978**	**1991**	**change**
Na	6.5	2	Tr	**less 100%**
K	276	280	220	**less 20%**
P	26	47	34	**plus 31%**
Mg	23	27	19	**less 17%**
Ca	33	27	33	**same**
Fe	0.8	0.8	1.2	**plus 50%**
Cu	0.09	0.07	0.02	**less 78%**
Zn		0.4	0.2	**less 50%**
Na : K	I :42		>1000	
Mg : Ca	I : I.2		I : 1.74	
Cu : Fe	I : 9		I : 60	

'Shoot' Vegetables

Celery and Chicory.

Celery				
	1940	**1978**	**1991**	**change**
Na	137		60	**less 56%**
K	278		320	**plus 15%**
P	31.7		21	**less 29%**
Mg	9.6		5	**less 48%**
Ca	52.2		41	**less 21%**
Fe	0.61		0.4	**less 34%**
Cu	0.11		0.01	**less 90%**
Zn		0.1	0.1	**same**
Na : K	I : 2		I : 5.3	
Mg : Ca	I : 5.4		I : 8.2	
Cu : Fe	I : 5.5		I : 40	

Chicory				
	1940	**1978**	**1991**	**change**
Na	7.3		1	**less 86%**
K	182		170	**less 7%**
P	20.9		27	**plus 29%**
Mg	12.6		6	**less 52%**
Ca	18.4		21	**plus 14%**
Fe	0.69		0.4	**less 42%**
Cu	0.14		0.05	**less 64%**
Zn		0.2	0.2	**same**
Na : K	I : 25		I : 170	
Mg : Ca	I : 1.5		I : 3.5	
Cu : Fe	I : 4.9		I : 8	

'Root' Vegetables

Beetroot (boiled) 1940 for 2 hours : 1991 in salted water for 45 mins.
Carrot (old), Parsnip, Potatoes (old), Radish, Swede and Turnip.

Beetroot				
	1940	**1978**	**1991**	**change**
Na	64		110	**Plus 72%**
K	350		510	**Plus 46%**
P	35.6		87	**Plus144%**
Mg	16.9		16	**Less 6%**
Ca	30		29	**Less 3%**
Fe	0.7		0.8	**Plus 14%**
Cu	0.14		0.03	**Less 79%**
Zn		0.4	0.5	**Plus 25%**
Na : K	1 : 5.5		1 : 4.6	
Mg : Ca	1 : 1.8		1 : 1.8	
Cu : Fe	1 : 5		1 : 27	

Carrots (old)				
	1940	**1978**	**1991**	**change**
Na	95		25	**less 74%**
K	224		170	**less 24%**
P	21		15	**less 33%**
Mg	12		3	**less 75%**
Ca	48		25	**less 48%**
Fe	0.56		0.3	**less 46%**
Cu	0.08		0.02	**less 75%**
Zn		0.4	0.4	**same**
Na : K	I : 2.4		I : 6.8	
Mg : Ca	I : 4		I : 8.3	
Cu : Fe	I : 7		I : 15	

Appendix 5.

Individual analysis of vegetables introduced either in 1960 or 1978 that could be traced through to 1991. For a summary of results see Table 2.

Beetroot (Raw)				
	1960	1978	1991	change
Na	84		66	less 21%
K	303		380	less 24%
P	32		51	plus 59%
Mg	15		11	less 27%
Ca	24.9		20	less 25%
Fe	0.37		1.2	plus 224%
Cu	0.07		0.02	less 71%
Zn		0.4	0.4	same
Na : K	I : 3.6		I : 5.8	
Mg : Ca	I : 1.7		I : 1.8	
Cu : Fe	I : 5.3		I : 60	

Brocolli (boiled)				
	1940	1978	1991	change
Na		12	8	Less 50%
K		340	370	Plus 9%
P		67	87	Plus 30%
Mg		18	22	Plus 22%
Ca		100	56	Less 44%
Fe		1.5	1.7	Plus 13%
Cu		0.07	0.02	Less 71%
Zn		0.6	0.6	same
Na : K		1 : 28	1 : 46	
Mg : Ca		1 : 5.6	1 : 2.5	
Cu : Fe		1 : 8.6	1 : 85	

Leeks				
	1960		1991	change
Na	8.8		2	less 78%
K	314		260	less 17%
P	43.2		44	plus 2%
Mg	10.3		3	less 71%
Ca	62.7		24	less 61%
Fe	1.12		1.1	less 1%
Cu	0.1		0.02	less 80%
Zn		-	0.2	
Na : K	I : 36		I : 130	
Mg : Ca	I : 6		I : 8	
Cu : Fe	I : 11		I : 55	

Marrow				
	1978		1991	change
Na	1		1	same
K	210		140	Less 33%
P	20		17	Less 10%
Mg	12		10	Less 17%
Ca	17		18	Plus 6%
Fe	0.2		0.2	same
Cu	0.03		0.02	Less 33%
Zn	0.2		0.2	same
Na : K	1 :210		1 : 140	
Mg : Ca	1 : 1.4		1 : 1.8	
Cu : Fe	1 : 6.7		1 : 10	

New Potatoes (boiled)				
	1978		1991	change
Na	41		9	Less 78%
K	330		250	Less 24%
P	33		28	Less 15%
Mg	20		12	Less 40%
Ca	5		5	same
Fe	0.4		0.3	Less 25%
Cu	0.15		0.06	Less 60%
Zn	0.3		0.1	Less 67%
Na : K	1: 8		1: 28	
Mg : Ca	1: 0.2		1: 0.4	
Cu : Fe	1: 2.7		1: 5	

Green Pepper				
	1978		1991	change
Na	2		4	Plus 100%
K	210		120	Less 43%
P	25		19	Less 24%
Mg	11		10	Less 9%
Ca	9		8	Less 11%
Fe	0.4		0.4	same
Cu	0.07		0.02	Less 87%
Zn	0.2		0.1	Less 50%
Na : K	1: 105		1: 30	
Mg : Ca	1: 0.8		1: 08	
Cu : Fe	1: 5.7		1: 20	

Sweetcorn				
		1978	1991	change
Na		1	1	same
K		280	140	less 50%
P		120	48	less 60%
Mg		45	20	less 56%
Ca		4	2	less 50%
Fe		0.9	0.3	less 67%
Cu		0.15	0.02	less 87%
Zn		1	0.2	less 80%
Na : K		I : 280	I : 140	
Mg : Ca		I : 0.1	I : 0.1	
Cu : Fe		I : 6	I : 10	

Attention, Behaviour and Minerals

by R.H. Anderson, Ph.D., L.C.S.W.

One of the greatest mysteries of our current medical community is why there are so many of our youth and adults without the ability to focus, concentrate and learn skills the "normal way". One need only read the newspaper to hear stories of special education facilities in schools incapable of dealing with the number of students that cannot function in a regular classroom because they cannot sit still, focus on the work, remember their assignments, etc. The cost of these children to society in education and as they grow into adults with many of the same problems prompted Associated Interventions and Counselling, Inc. of Ogden, Utah to explore further.

No one can say for certain why these problems exist in our society and in other industrialised societies at this time, but there are viable explanations. We do know that the foods we eat are no longer ripened to maturity on the plant but picked at immaturity for better handling and shipping. We also know that most foods are grown in chemically treated soils to enrich growth, weight and fight pests. Residual chemicals are part of the food we eat. We also know the basic eating habits and styles of industrialised nations reflect more additives and preservatives and less fresh, properly prepared diets. It was with this information that Associated Intervention and Counselling Inc. of Ogden, Utah sought to discover if the use of mineral supplements could help these children and adults do better and calm down to a level they could function and learn better.

As part of this exploration a study was set up using a test known as the T.O.V.A. (Test of Variable Attentiveness) to measure the impulsivity, hyperactivity, reaction time and variability (ability to stay with the task at hand). A scientifically significant number of participants (n=34) were found that showed signs of these traits in their testing. Participants used in this study demonstrated, on this scientifically validated test, that they possessed the traits of impulsivity, hyperactivity, poor reaction time or difficulty staying on task. They were administered 10 drops of concentrated minerals produced by Trace Minerals Research. These minerals were given to them orally in juice (approximately 8oz). Electron-microscopic studies have shown that such administration reaches the system within approximately forty-five minutes. Forty-five minutes after ingesting the minerals they were tested again using the T.O.V.A. The T.O.V.A. is fully validated to not be able to be learned and create the problem called test re-test problems. Therefore the results of the second test would clearly show if there was an effect by the administration of the minerals.

The results were astounding! In approximately eighty per cent of the cases there was a significant decrease in either impulsivity, hyperactivity, reaction time or variability. In several cases the original test had revealed the child or adult to show the measurements typical of a person with problems maintaining attention and forty-five minutes later they showed results of a person with typical and normal attention. No-one can say for sure exactly what the minerals did for the participants but the effect can not be denied. Whether the minerals have the ability to help the nerve impulses get to the proper parts of the brain and body better, restore communication and electrical balance in the body or serve another purpose, is not clear at this juncture. It

would appear that at a synaptic level of nerve endings there is a change in the mineral balance allowing for nerve impulses to cross over and meet with the correct receptor more often and with greater ease. In many people the nerve impulses appeared to move through non-conductive space whereas after the minerals the space became more conductive and the nerve impulses became more efficient. What is clear is that both the adults and the children assessed reduced their negative characteristics at significant measures due to the administration of a natural product instead of the use of potentially dangerous drugs.

Further investigation into this new information found that when used in doses of ten to twenty-five drops three times a day this calmness and better attention to detail could be maintained. The participants explained. "I listened better", "I didn't get into trouble today for the first time!", "Mum and Dad are not yelling as much. It sure is better at home". It was further discovered that when the drops were used in conjunction with products called Naturest and Stress-X, also manufactured by Trace Minerals Research, there was an immediate and dramatic increase in the ability to fall asleep at night, sleep soundly and peacefully, wake refreshed and calm. When the drops and Naturest or Stress-X were taken during the day there were reports of better work performance in both the adults and the adolescents, they reported a greater calmness, less anxiety, decreased stress and an increase in the ability to follow directions and complete tasks.

Scientifically it is not possible to tell exactly what happened with the administration of the minerals. It is only clear that something changed. There is a need to have further research to see if the electrical system of the body was modified and connected better after administration of the minerals such as in a synaptic change of electrical conductivity. There is a need to see if the minerals aiding the ability of the body to get the nutrients it needs increases the natural ability of the body to operate as designed. **There is also need to accept that the results clearly indicate that the administration of the minerals to people with trouble focusing, being impulsive, not listening as they should and not functioning as normal made a significant difference.** The reasons now need further exploration. Fortunately, unlike the use of medications, there is no need to be concerned about side effects or long term damage to the person when the minerals are used and further research proceeds.

It is important to note that the minerals did not and will not "cure". They are not designed to cure. The body has the capacity to cure itself in many cases if it has the materials it needs to do so. It would appear in this study that the body, once receiving natural ionic minerals, moves towards homeostasis or balance on its own. The organism cannot work without the correct balance of minerals and other necessary components and it would appear that in general our current society is not receiving them nutritionally. The addition of these minerals appear to be making up a deficiency and in so doing has the possibility, if used wisely, of being of far greater value to the new generation than we can imagine.

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