

Chapter 2

Mental health and mineral depletion

DR DAVID THOMAS DC



I was once told a story about a group of blind people who were asked to describe an elephant; each duly felt the part that they were closest to and gave a remarkably accurate description. This simple analogy illustrates the many different individual research topics there have been, and that are currently being examined, in the name of nutritional research. There is a danger of losing sight of the whole 'nutrition' picture. My specific contribution relates to the research work conducted on the historical loss of minerals in our foods (Thomas, 2003; Thomas, 2007). In this article we shall consider how this circumstance relates to the myth of the 'healthy, balanced diet' and the relevance of this link to physical and mental health.

Due to my geological background, my personal preference concerning guidance to patients regarding supplementing dietary regimes has always been towards minerals and trace elements. My initial use of mineral supplementation was using Blackmore's mineral celloid therapy, and I was later introduced to a liquid trace element product called Beres Drops Plus. This product was developed by a Hungarian Biochemist, Dr Beres, who, in the 1960s, was given the research task by the Hungarian government of ascertaining why there had been successive potato crop failures in a certain part of Hungary. Dr Beres' conclusions were what many gardeners could have told him – the health of the crop depended on the health of the soil. His research demonstrated that there were a number of what he considered to be essential trace elements missing in the soil. When these were replaced, healthy crops were grown.

As a result of these insights, Dr Beres turned his attention to human diseases using the same concept: that human disease conditions relate to specific or multiple trace element deficiencies. His contention was that eventually the body's ability to adapt, compensate and adjust to continued trace element deficiency is exceeded, and disease symptoms relating to the individual genetic make-up of the person concerned will manifest. He formulated the Beres Drops Plus, which contains 17 trace elements 'blended' together with organic carrier molecules. This product is now classified as a drug in Hungary, under the category of 'roborant'. It is used specifically as an adjunct in chemotherapy and radiotherapy to minimise the side effects of these therapies.

In 1999 I was introduced to American Herbalist Paul Bergner who had observed that the successful protocol he had used with his patients over a 20-year period – a wholefood diet together with appropriate herbal tinctures – had become less effective during the past 10 years. As the tinctures had not changed, he decided to research

Mental health and mineral depletion

the 'wholefood'. He discovered a dramatic decrease in many of the minerals and trace elements present in the vegetables, fruit and meats available to the American public at the time of his research, in comparison to 20 to 30 years previously (Bergner, 1997). A subsequent report by Halweil describes the loss of nutrient levels in the US food supply due to the pursuit of high yields (Halweil, 2007).

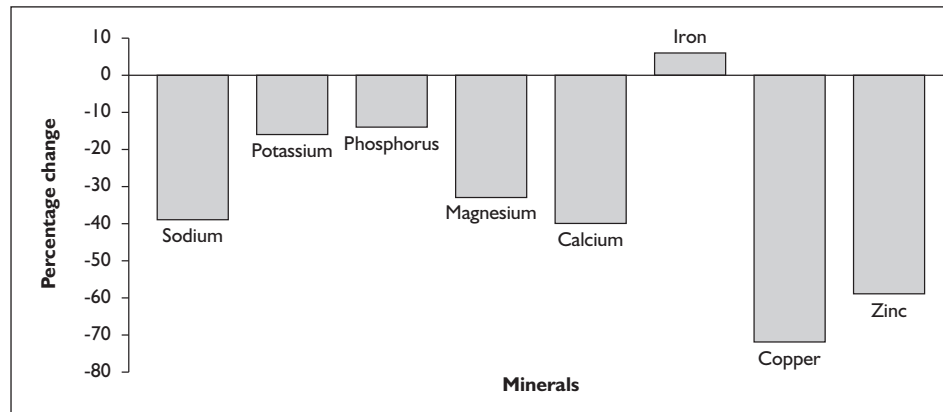
I decided to conduct similar research projects on the foods available to us in the UK. **Table 1** represents a weighted average summary of the mineral and trace element changes that have taken place for 72 foods. These can be traced through the six editions of McCance and Widdowson's *The Composition of Foods* (Food Standards Agency) between 1940 and 1991 for fruit and vegetables, and between 1940/1960 and 2002 for meat and meat products, cheeses and dairy products. For specifics regarding the foods within the categories mentioned and the details of individual losses, I would refer the reader to my original texts (Thomas, 2003; 2007). Collectively, there has been an average 19% loss in magnesium, a 29% loss in calcium, a 37% loss in iron and a really alarming 62% loss in copper – iron and copper being the only trace elements analysed in 1940.

TABLE 1: HISTORICAL ESSENTIAL MINERAL DEPLETION CHANGES IN FIVE CATEGORIES OF FOOD PRODUCTS

	1940–1991 Vegetables (n = 28)	1940–1991 Fruit (n = 17)	1940–2002 Meat (n = 14)	1940–2002 Cheeses (n = 9)	1940–2002 Dairy (n = 4)	Weighted average (n = 72)
Sodium	-49%	-29%	-24%	-9%	-47%	-34%
Potassium	-16%	-19%	-9%	-19%	-7%	-15%
Phosphorus	9%	2%	-21%	-8%	34%	1%
Magnesium	-24%	-16%	-15%	-26%	-1%	-19%
Calcium	-46%	-16%	-29%	-15%	4%	-29%
Iron	-27%	-24%	-50%	-53%	-83%	-37%
Copper	-76%	-20%	-55%	-91%	-97%	-62%

Table 2 shows the loss of minerals (including zinc) in seven vegetables that were analysed by McCance and Widdowson, subsequent to 1940, over the 13-year period 1978 to 1991. Unfortunately, only seven vegetables could be traced and the results are again disconcerting.

TABLE 2: MINERAL CHANGES IN VEGETABLES BETWEEN 1978 AND 1991



To try and put the significance of these findings into perspective, let's consider the approximate recommended daily allowances (RDAs) for magnesium (300 mg), zinc (10 mg) and chromium (100 mcg), remembering that in the view of many nutritionists, the RDAs are considered the absolute minimums before deficiency disease conditions begin to manifest. How much is this actually per day? Consider that just over half a teaspoon represents your magnesium quota; a 50th of a teaspoon is the requirement for zinc; while a 500th of a teaspoon is all that is required for chromium. In relationship to the amount of food we eat each day, these are minuscule amounts.

Magnesium-rich foods include: green leafy vegetables; meats; wholegrains; milk; nuts and seeds, such as sunflower and pumpkin.
Zinc-rich foods include: oysters; lamb; pecan nuts; peas; haddock; potatoes; egg-yolk; peanuts; sardines; tuna; lentils.
Chromium-rich foods include: organ meats; mushrooms; broccoli; oysters.

Although broccoli is rich in minerals, 100 g only contains 13 mg of magnesium (4.3% of RDA) and 0.4 mg of zinc (4% of RDA). In other words, you would have to eat 2.5 kg of broccoli per day to satisfy the RDA. It gets worse: the micronutrients in foods are present in many different forms and some are more readily assimilated than others. Iron from animal tissues (haem) has greater bioavailability than iron present in vegetables. So, although analytically certain foods may be rich in certain minerals (eg. iron in spinach), the amount assimilated is significantly less than is actually in the food. In addition, there are complex synergistic inter-relationships that exist between these various essential micronutrients. Too much zinc, for instance, will interfere with copper metabolism.

Finally, it is not just what you eat, it is also what your body is able to absorb from what you eat. If the gastrointestinal tract has been compromised, this will make an

Mental health and mineral depletion

optimum digestive process less likely. Another major culprit associated with poor absorption is mental and emotional stress. The biodiversity within the human race also plays an important role – because of inherent genetic-constitutional traits, the same deficiency will manifest itself in different ways in different individuals.

Magnesium and zinc both play vital neurological roles, and deficiency symptoms include: sensitivity to noise; nervousness; irritability; mental depression; confusion; twitching; trembling; apprehension; insomnia; muscle weakness; ADHD; anorexia nervosa; bulimia nervosa; amnesia; apathy; depression; irritability; lethargy; mental retardation; paranoia.

Chromium deficiency is associated with: depression; insulin resistance; mood swings.

These days it is very difficult to obtain a 'healthy, balanced diet'. Given this, and the fact that micronutrient deficiency can be an integral and fundamental component of all disease conditions, does it not make sense in a therapeutic situation to give people the choice of sound dietary guidance and appropriate supplementation (and observe how they progress), prior to dispensing pharmaceutical and psychopharmacological drugs? The very ingestion of the latter may not only further deplete body reserves of essential micronutrients, but detrimentally interfere with their bioavailability.

In my initial paper I listed some of the physical, mental and emotional conditions that are influenced by mineral and trace element deficiencies (Thomas, 2003). In my second paper I was able to reference 214 peer-reviewed research papers written between 1923 and 2003 that correlate specific mental illnesses with specific mineral and trace element deficiencies or imbalances (Thomas, 2007). **Table 3** represents a summary of these papers.

TABLE 3: MENTAL ILLNESSES CORRELATED WITH MINERAL AND TRACE ELEMENT DEFICIENCIES OR IMBALANCES

	Chromium	Copper	Iron	Iodine	Potassium	Magnesium	Molybdenum	Phosphorus	Selenium	Vanadium	Zinc
ADHD		X				X		X			X
Anxiety					X	X		X	X		
Aggression			X		X						X
Bipolar disorder			X	X	X	X	X			X	
Depression	X	X	X	X	X	X			X	X	X
PMS		X	X			X					X
Schizophrenia		X	X	X		X			X		

As individuals, and as a society as a whole, we are aware that eating is a fundamental requirement for life and that what we eat is relevant to our health. Awareness that food can affect health has been part of our national psyche from as long ago as the early 17th century, when it was realised that scurvy was caused by a lack of fresh fruit and vegetables. Yet, from an 'establishment' perspective, the essential role of micronutrients (eg. minerals, trace elements, vitamins, essential fatty acids, phytonutrients, digestive enzymes, probiotics) is cursory at best and usually ignored. The best guidance is to 'eat a healthy, balanced diet'. This is a very difficult directive when the presence of micronutrients is diminishing and the modern diet favours meals high in proteins, carbohydrates and saturated fats, colourings, flavourings and preservatives.

Warnings, research and relevant information have existed since the 1930s, written by many esteemed men and women working as pioneers in the fields of nutrition and health, including Sir Robert McCarrison (1936; 1937), Surgeon Captain TL Cleave RN (1977), Weston Price (1945), Linus Pauling (1970) and Trowell, Burkitt and Heaton (1986) among many others. Perhaps to emphasise the fundamental role that micronutrients play in our physical and psychological well-being (and their global relevance to health), in March 2006 the UN acknowledged a 'new' kind of malnutrition. Catherine Bertini (2006), Chairperson of the UN Standing Committee on Nutrition, said:

'The overweight are just as malnourished as the starving, and nutritional programs in poor countries need to target rising obesity alongside hunger.'

She also suggested that we need a new definition of malnutrition because food availability is not really the issue – the *quality* of food is the problem. A new type of malnutrition has been recognised that can be categorised as multiple micronutrient depletion and has been termed 'type B malnutrition'.

To re-emphasise this point, despite a huge amount of research evidence and past and current campaigning by many organisations – including The McCarrison Society, Foresight, the Alliance for Natural Health, Sustain and the Hyperactive Children's Support Group – very little heed is given to their research results or 'real life' experiences. Recently, Lauridsen *et al* (2006) found that rats fed on organic food were less fat, slept better and had stronger immune systems than rats fed on conventionally grown produce. Given the enormous knowledge base on the significance of good nutrition in relationship to good health, these findings are common sense. Is it worthwhile to continue to prove the obvious?

Examples of ongoing research needed in this field are currently being promoted by The Good Gardeners Association's *Moving Beyond Organic* project and the Tablehurst Farm initiative *Learning on the Land* (www.tablehurstandplawhatch.co.uk). The aim of *Moving Beyond Organic* is to develop research methods that link the well-being of the micro life of a soil to an increase in the food's nutritional qualities. Working in partnership, this experimental research work is being developed in a

Mental health and mineral depletion

garden called GREEN (Gardens for Research Experimental Education and Nutrition) (Good Gardeners Association, 2006). Using quantitative and qualitative methods, the flow of minerals, trace minerals and other nutrients, as well as the 'life force' from soil to plant are being tracked. The objective is to learn how these processes are affected by the method of cultivation used and the subsequent effect that this has on the soil food-web.

Preliminary findings suggest that to grow nutritious food, knowledge of soil biology is far more useful than soil chemistry. When plants are encouraged to form symbiotic relationships with beneficial soil microbes, it appears to increase the transfer of essential nutrients from soil to plant. To date, this research has produced potatoes and leeks with substantial increases in calcium, magnesium and iron that far exceed any of the data from 1940. As the methodology develops, more tests are being added (the latest being antioxidants), which again show variations depending on soil health. This research project should be applauded – and publicly funded.

The *Learning on the Land* initiative recognises the historical separation that has taken place between individuals (particularly children) and where their food originates. It seeks, by inviting school children to live within a working farm environment, to reassert the connection that arable and pastoral foods have on soil preparation, cultivation and production, and then the role that cooking and community sharing of the produce has on their social life.

As the many research references used indicate, the quality of the food and drink we consume does make a difference to our physical, mental and emotional health. The impact of the decline in micronutrients in modern foods compared with foods available 70 years ago is exacerbated by two further problems:

- a substantial proportion of the population consume few or no fresh vegetables at all
- 'modern' foods contain various other components that come as 'part of the package', namely residual herbicides, pesticides, fungicides and the ubiquitous additives of processed, convenience foods, eg. colourings, flavourings, preservatives (while some of these have been individually tested for short-term safety, no one knows what their interactions might be or their cumulative effects on the body over a lifetime).

The question then arises as to what is to be done about this potentially catastrophic state of affairs. During the Second World War the UK government required that, because diets might be inadequate due to rationing, all children should receive cod liver oil and orange juice. Sixty years on, despite the historical 'official' introduction of 'fortified foods' we find that we are in a situation where the nation, as a whole, is overfed but malnourished. Supplementation and fortification can certainly play a role and this is a subject for research and debate in its own right (Mejia, 1994; Fletcher *et al*, 2004).

REASONS FOR THE REDUCTION IN THE MINERAL CONTENT OF FOOD OVER TIME

- Favouring varieties of crops and animal breeds for their presentation rather than nutritional quality.
- Increased use of NPK fertilisers free of trace elements.
- Inevitable soil depletion of essential minerals through continuous crop growing, contributed to by the overuse of NPK fertilisers with consequent damage to endomycorrhizal fungi that help liberate essential minerals from the soil (Ward *et al*, 2001).
- Inherent soil deficiencies of essential minerals due to parent bedrock material, the amount of organic matter present, the ionic potential of differing trace elements, the degree of soil oxidation and soil pH (Thorvaldsson, 2005).
- Increased transport distances, storage times and storage methods for 'fresh' produce.

FACTORS CONTRIBUTING TO MINERAL DEPLETION IN THE POPULATION

- Increased lifestyle stresses: mental, physical and emotional.
- Increased use of stimulants: coffee, tea, tobacco, alcohol and recreational drugs.
- Increased use of medication.
- Dietary trends towards cheaper, more refined, quicker, convenience foods and drinks, which are high in proteins, saturated fats and refined carbohydrates but very low in micronutrients.
- Polluted air and water supplies.
- Sunlight deprivation and quality (due to ozone depletion).

The form that supplementation takes is vital, as if it is too 'crude', the supplement is likely to leave the body in exactly the manner it went in. Also, given that it is possible to upset the balance between specific minerals/trace elements, I would suggest that if daily supplementation is considered, it should be derived from a naturally-occurring sea/food source (chlorella, kelp, spirulina, sea water concentrates, cod liver oil, brewers yeast, fruit concentrates).

Supplementation may well prove to be a constructive short to medium-term solution but only if, at the same time, we actively encourage lifestyle changes from an early age. These should include:

- exercising
- healthier eating and drinking habits
- paying specific attention to advertising and the availability and presentation of junk food in schools, hospitals, penal institutions and public places.

Mental health and mineral depletion

There is a desperate need for the conventional farming and food and drink industries to become more aware of their role in this scenario and realise that they have an ever-growing responsibility to their customers to provide good-quality, nourishing, non-toxic products. More 'holistic' and local projects, such as those being developed by GREEN and *Learning on the Land* should be encouraged and publicly funded. Fortunately, there has been an interesting, relatively recent, positive development: a significant and growing trend towards nutritional awareness. This is demonstrated by the buying of locally grown and organic produce and a greater interest in food preparation, world cuisine and animal husbandry – a powerful force, and one that is likely to bring about significant changes in the food industry.

Already, this consumer-driven change has resulted in alterations in food labelling, as well as greater availability of organically and bio-dynamically grown foods. We have recently experienced a resistant, but gradual, decline in the addition of additives to foods in the food and drink industries, especially artificial colours and preservatives, sugar, salt and trans fats. In addition, the cooking of foods has been given far greater emphasis both through media attention nationally and via specific informative sites.

To return to my initial comments about the elephant: this article is not 'just' about the loss of micronutrients in our food over historical time and the proven relationship of micronutrients to physiological and psychological health, it is about becoming more aware of the importance and significance of those bountiful resources, which are ultimately the providers of our 'nourishment' – the land and the sea. In so doing, it should be possible to consciously re-assert our relationship with our environment and thereby appreciate the appropriate stewardship that is necessary to care correctly for them. A true respect of these resources and the fundamental role that nutrition plays in our lives would lead us – individually and collectively – to procure, prepare, cook, present and celebrate our food in a far more considered and conscious manner than is currently evident.

HOW TO MAXIMISE YOUR MINERALS*

- Optimise every link in the chain from soil to plate by raising healthy soils, finding the best ingredients and doing the minimum to them.
- The fresher, the better – so buy local and seasonal. Look for local farmers who use compost, crop rotation and minimal digging. If you want to guarantee the health of the soil, look for the Demeter certification (biodynamic symbol).
- Try and increase the number of times you shop per week. Explore farmers' markets, farm gate shops and organic box delivery schemes (supermarket produce is likely to have clocked up food miles, storage time and chemical storage tricks).
- Choose a variety of different foods to maximise nutrient intake.
- The more colourful the produce, the higher their mineral and antioxidant levels.
- Scrub fruit and vegetables rather than peeling them, as most of the nutrients hide just under the skin.
- Cook with minimum water, heat and time. Keep the vegetable water for soup, or drink it.
- Steam or stir fry rather than deep fry, grill, char or roast.
- Store fresh produce in cool, dark places. Freeze leftovers or extra portions as soon as possible.
- Avoid foods that have been refined, processed, tinned and packaged for convenience whenever possible.

* With thanks to Jane Lorimer; see: www.janelorimerforhealth.co.uk

References

- Bergner P (1997) *The Healing Power of Minerals*. Rocklin, CA: Prima Health.
- Bertini C (2006) *Report of the Standing Committee on Nutrition at its 33rd Session*. Hosted by the World Health Organization, at the Geneva International Conference Centre, Geneva, Switzerland 13–17 March 2006. Available at: www.unsystem.org/SCN/Publications/AnnualMeeting/SCN33/FINAL%20REPORT%2033rd%20SESSION.pdf [accessed 28/04/08].
- Cleve TL (1977) Over-consumption. Now the most dangerous cause of disease in Westernised countries. *Public Health: The Journal of the Society of Community Medicine* **91** (3) 127–123.
- Fletcher RJ, Bell IP and Lambert JP (2004) Public health aspects of food fortification: a question of balance. *Proceedings of the Nutritional Society* **63** (4) 605–614.
- Food Standards Agency (1940–2002) *McCance and Widdowson's The Composition of Foods* (various editions). London: Royal Society of Chemistry.
- Good Gardeners Association (2006) GREEN data from *The Good Gardeners Association News Journal* **159**; **160**; **161**; **162**.
- Halweil B (2007) *Still No Free Lunch: Nutrient levels in US food supply eroded by pursuit of high yields*. Critical issue report for The Organic Center. Available at: www.organic-center.org/reportfiles/Yield_Nutrient_Density_Final.pdf [accessed 28/04/08].

Mental health and mineral depletion

- Lauridsen C, Jørgensen H, Halekoh U, Porskjær Christensen L and Brandt K (2006) Organic diet enhanced the health of rats. Website: *Danish Research Centre for Organic Food and Farming*. Available at: www.darcof.dk/research/health.html [accessed 28/04/08].
- McCarrison R (1936) Nutrition in health and disease. *British Medical Journal* **2** 611–615.
- McCarrison R (1937) Nutritional needs in pregnancy. *British Medical Journal* **2** 256–257.
- Mejia LA (1994) Fortification of foods: historical development and current practices. *Food and Nutrition Bulletin* **15** (4) 278–281.
- Pauling L (1970) Evolution and the need for ascorbic acid. *Proceedings of the National Academy of Sciences* **67** (4).
- Price W (1945) *Nutrition and Physical Degeneration*. New Canaan, CT: Keats Publishing.
- Thomas DE (2003) A study of the mineral depletion of foods available to us as a nation over the period 1940 to 1991. *Nutrition and Health* **17** (2) 85–115.
- Thomas DE (2007) The mineral depletion of foods available to us as a nation over the period 1940 to 2002. *Nutrition and Health* **19** 21–55.
- Thorvaldsson G (2005) *Essential Trace Elements for Plants, Animals and Humans*. NJF Seminar 370 convened by Agricultural University of Iceland. Available at: [www.hvanneyri.is/landbunadur/wglbhi.nsf/Attachment/LBHI-rit-3/\\$file/LBHI-rit-3.pdf](http://www.hvanneyri.is/landbunadur/wglbhi.nsf/Attachment/LBHI-rit-3/$file/LBHI-rit-3.pdf) [accessed 28/04/08].
- Trowell N, Burkitt D and Heaton K (1986) *Dietary Fibre, Fibre-depleted Foods and Disease*. London: Academic Press.
- Ward N, Stead K and Reeves J (2001) Impact of endomycorrhizal fungi on plant trace element uptake and nutrition. *The Nutrition Practitioner* **3** (2) 30–31.