

## Research on CGF

In the 1950s Dr. Fujimake of the People's Scientific Research Center in Tokyo, separated a substance from a hot water extract of chlorella by electrophoresis. This hitherto unknown fraction of Chlorella was found to be rich in nucleic factors, and it promoted the healthy growth of human children as well as young animals.



Early experiments with young laboratory animals (rats, rabbits, pigs and chicks) showed that adding 5 to 10 percent of Chlorella to the regular feed brought dramatic increases in weight gain and size. These gains ranged from a low of 10 percent to a high of 47 percent compared to control groups.

Dr. Yoshio Yamagishi received permission from the authorities to try Chlorella on human volunteers. They were healthy ten year old students, 22 boys and 18 girls, studying at Okuno Primary School in Tokyo. Another group of the same age and composition served as controls.

The height and weight of all the children were recorded on a regular basis. At the end of the experiment in which the test group received two grams of Chlorella daily (except on Sundays) for 112 days, the average increase for boys taking Chlorella was inch in height and 2.3 pounds in weight. The boys in the control group grew 0.6 inches in height and gained 1.6 pounds in weight. The girls of both groups gained an average of 0.9 inches in height, but the girls who took Chlorella gained an average of 4.2 pounds, while the controls gained 2.7 pounds.

This capacity to promote growth in the young is apparently related to Chlorella ability to stimulate the healing process in the body and work against many disease stated probably due to its nucleic acid content more than anything else – since the same substances and process that accelerate growth in the young promote repair of damaged tissue in mature animals and humans.

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## RECENT RESEARCH STUDIES ON CHLORELLA GRWOTH FACTOR C.G.F

**The following speech was given by Sally Hesmondhalgh at the International Symposium, Nutrition Sante Mer . Which took place at Granville, Normandy on the 23rd September of 2003. It has been published in the proceedings of the conference by the organisers, the Institute de Phytonutrition of Deauville, France.**

Before starting an overview of recent research on Chlorella and its extract, CGF, allow me to introduce this green freshwater unicellular micro-algae, which has been in existence for 2, 5 billion years.

Chlorella is a food supplement. In Japan, it is used daily by 4 million people, to such an extent that the Japanese government has declared it a functional food of national interest. Why does this plant arouse such interest? Chlorella contains an almost complete range of vitamins (apart from vitamin D), all the main minerals, large amounts of iron and calcium that render it very useful to anaemic people, 19 amino acids and 60% of vegetable protein.

It contains 10 times more vitamin A than beef liver per gram, and 40 times more protein per gram than soya, rice and wheat. It contains more chlorophyll than any other plant (4 times more than Spirulina).

Besides its obvious nutritional qualities, Chlorella has been the subject of many medical studies, much more than any other food supplement. I have been able to find only around 40 studies about Spirulina, compared with 300 or more about Chlorella, and these studies were spread over forty years.

### **Chlorella – The history**

Let us now look at Chlorella its history. Chlorella was discovered in 1890 by a Dutch biologist, Beyerinck.<sup>1</sup> The natural wealth of the plant immediately excited scientific interest. During the First World War a German microbiology specialist, Hardener Linder, undertook an experiment, feeding German troops with Chlorella. The end of the war, and the fact that in its natural state Chlorella is mostly indigestible, led to unsatisfactory results in this first test.<sup>2</sup> During the Second World War Lindner carried out a second experiment, once again with little <sup>3</sup>success. Since the seventies, a technique which breaks open the cellular envelope has rendered Chlorella 80% digestible.

In 1948 the Stanford Research Institute in the USA demonstrated that it was possible to grow and harvest large quantities of Chlorella all year round. At this time the Americans were looking at Chlorella as a potential source of oxygen, protein and vitamins for astronauts during space trips.

During the same period, Japan was emerging from the war, destroyed by the atom bombs and ruined by the war. With the help of an American charity, the Rockefeller Foundation, and after a comparative study of 100 plants, Japan chose to develop Chlorella as a potential protein source

to feed its population. In 1957 a Chlorella research institute was set up in Japan to find the best means of exploiting the algae.

### **Used in drinks, biscuits and dried milk**

In these early years the Japanese used Chlorella in very varied foods: in drinks, biscuits, and in the dried milk powder that was given out in all Japanese schools and to National Defence troops. The use of Chlorella in drinks was inspired by the first medical studies on Chlorella, which had shown that Chlorella stimulated the growth of lactobacilli? People who regularly consumed foods containing Chlorella started reporting beneficial effects on their health.<sup>4</sup> These observations in turn lead to further medical experiments. Well aware that Chlorella stimulates wound healing, and that Chlorella is the plant that contains most chlorophyll, Japanese doctors tested Chlorella on patients suffering from gastric and duodenal ulcers. Chlorella yielded a success rate of 100% in healing gastric ulcers, and in the case of duodenal ulcers, 71%.<sup>5</sup> Further positive results were obtained when Chlorella was fed to patients suffering from refractory wounds. In one case of a wound open for more than a year, the skin began to reform over the wound after one month of algae supplementation.<sup>6</sup>

### **Fewer colds for Chlorella users**

In 1966 a study was carried out over three months on 1000 people on a ship belonging to the Japanese navy. Results showed that consuming two grams of Chlorella per day reduced the frequency of colds and flu by 37%.<sup>7</sup> The results of this study were later confirmed by a Bulgarian study carried out in 1983. A group of 463 calves was monitored during the year following birth. The calves were divided into 5 batches and treated by different methods against bovine broncho-pneumonia, including two veterinary vaccines. The most effective treatment was a combination of Chlorella and a hyper immune bovine serum, which protected 80% of the animals against the illness. But Chlorella used alone protected 72% of the batch, compared to 56-60% protected in the two batches treated with vaccines.<sup>8</sup> The same year (1966) as the study on the sailors, Japanese doctors started to give Chlorella to patients undergoing chemotherapy after surgical ablation of cancerous tumours. Experiments showed that the consumption of Chlorella stopped the white blood cell count from dropping as it often does during this type of treatment. <sup>9</sup> It is interesting to note that, as a result of these experiments, trials of Chlorella started in France. In 1976, Dr Vermeil and his team in Rennes carried out two experiments<sup>10</sup> to see if Chlorella could help cure cancers. I have never managed to find an account of these experiments, but according to a summary in an American book about Chlorella, Dr Vermeil injected the algae straight into tumours. The results, according to Dr Steenblock, were not clear enough to prove an anti-tumoral effect.

But before detailing these rather serious medical aspects, I would like to come back to less serious subjects. Chlorella given to nursing newborns in 1962 and 1963, Dr Takida made a substitute for artificial baby milk, in which Chlorella was used as protein, mixed with honey, flour, soya oil and Mackerel-Simmons salts. This mixture was given to newborn babies who had developed allergies to commercial baby milk. The results proved that this mixture could indeed replace commercial milk. Two of the newborn babies who suffered from eczema were

cured after a week of consuming the Chlorella milk. When fed with the commercial milk once again, the eczema reappeared immediately.

Obviously, before giving Chlorella to newborn babies, the Japanese scientists had carried out numerous experiments on animals. It became obvious from these experiments that Chlorella contains a substance unique to this plant, as it was found that children and young animals fed with Chlorella grew faster than control groups.

### **Animals consuming Chlorella grow faster**

For example, in an experiment with white rats, Dr Nakamura used a control group fed with 10% of casein and compared them with groups fed with 2%, 5% and 10% of Chlorella. After 100 days, for a value of 100 attributed to the control group, values of 108, 114 and 111 were noted for the groups fed with Chlorella.<sup>12</sup> In another experiment, 1% of Chlorella was added to the food given to mice. Even with this tiny amount, the mice in the Chlorella group grew at a faster rate than the mice in the control group.<sup>13</sup> Cellular regeneration

### **Tested on adult animals and humans, Chlorella accelerates cellular regeneration and stimulates cicatrization, as has already shown in the studies on ulcers and refractory wounds**

In a summary of these studies, which Dr Takechi wrote in 1967 for the Japan Health Journal, he says 'Chlorella contains an unknown vegetable hormone which produces effects different from those of gibberelline and kinetine. This hormone has a stimulating effect on the growth of the plumule of plants, situated above the cotyledons. Dr Takada, Dr Kuze and others report that it stimulates chlorophyll production. <sup>14</sup> The Japanese named this growth hormone . Chlorella Growth Factor., usually shortened to CGF. The CGF in Chlorella is extracted by making a concentrate of Chlorella, available in liquid or powder form. It takes 15 kg of Chlorella, heated in water, to obtain 1kg of CGF. The concentrate is obtained by skimming the heated liquid. The remains of the Chlorella are used as animal feed.

### **What are the effects produced by this CGF ?**

In 1962 a series of studies on CGF began. In one of these studies, newborn babies were given 5mg of CGF per day. At birth, these babies were on average smaller than those in the control group. During a five-year observation period, the CGF children. grew to become taller and better developed than those in the control group. Scientists also noted that the children consuming CGF had exceptionally healthy teeth, devoid of the slightest carry. Chlorella and CGF contain a natural antibiotic that scientists called Chlorellane, which can be found in a very concentrated form in CGF. Chlorella is very rich in DNA and RNA and in CGF these elements are about five times more concentrated than in the algae itself. At the beginning of the sixties, Professor Fujimaki of the People's Scientific Research Centre in Tokyo carried out experiments to better understand the composants in Chlorella. In the course of these experiments, he discovered CGF. Several experiments carried out on animals proved that CGF has extraordinary effects. Fujimaki noticed that when young rabbits, mice, rats and chicks were fed with CGF, an impressive acceleration of their growth occurred. Furthermore, these animals seemed to be less

vulnerable to illnesses. Their size and weight rose from 19 to 47% percent without any negative secondary effect.

### **CGF effects animal reproduction rates**

As soon as these animals reached sexual maturity, the reproduction rate rose as well. These results are without doubt due to the increased sexual activity of these animals in comparison with the control group. Researchers were able to confirm these results during the next ten years, in innumerable experiments carried out on all kinds of animals. <sup>15</sup> Chlorella used for heavy metal poisoning during the seventies scientists found yet another use for Chlorella. In 1978 rats were given Chlorella mixed with cadmium for 10 days. A control group was given cadmium with their usual food. The symptoms of poisoning that were obvious in the control group were totally absent in the group taking Chlorella. Later tests showed that once cadmium comes into contact with Chlorella, it cannot detach itself and passes through the rat's body without poisoning it.<sup>16</sup> At the time there had been many cases of humans poisoned by heavy metals. In 1975 Dr Himura gave 8 grams of Chlorella per day to patients suffering from cadmium poisoning. He observed that after Chlorella consumption for 12 days, there was a three-fold increase of cadmium elimination. <sup>17</sup> Twenty-four days later, the amount of cadmium found in the Patients' urine had been multiplied by seven compared to the amount eliminated without Chlorella.<sup>17</sup>

Following these experiments and many others of the same kind, Chlorella was used in Japan and later in the USA and Europe to speed up the detoxification process for people suffering from heavy metal poisoning. Today, Chlorella is part of the detoxification protocol recommended by some dentists to people having their mercury fillings extracted, in order to eliminate all traces of mercury in the body.

Other research has confirmed that Chlorella acts as a chelator in cases of PCB and chlordecone-based pesticide poisonings<sup>18</sup>. It is interesting to note that if one adds Chlorella to the water in sewage works; it can clean and purify dirty water.

Recent studies suggest that Chlorella can also cleanse the human body of other types of toxins. According to a Japanese study published in 1999, Chlorella can prevent dioxins in food from being absorbed by the body.

In the study, rats were fed with a rice oil containing dioxins. Half of the rats were given the poisoned oil with 10% of Chlorella. The amount of dioxins eliminated by the rats eating the Chlorella was 12 times greater than the amount eliminated by the control group. Another experiment showed that Chlorella absorbed after the poisoning was less effective, but nevertheless led to a higher elimination rate. <sup>20</sup> But let us go back to CGF, an extract with some interesting effects.

In an experiment carried out in 1980 in Japan, cancerous cells were implanted into mice. The mice were divided into three groups, a control group, a group fed with chlorella (split-nucleus Chlorella), and a group fed with glycoprotein-enriched Chlorella. Each Chlorella-fed group was divided into two, Chlorella given before the cancer implantation, and Chlorella given afterwards.

After 60 days, all the mice in the control group were dead. All the mice having been given the Chlorella after the cancer implantation were also dead, but in the group that had been given split-nucleus Chlorella before implantation, 8 out of 10 mice were still alive after 60 days. 21 After this experiment and many others, scientists became curious to see if Chlorella worked by stimulating the body's natural defences, the macrophage cells. In a study carried out by the Kanazawa Medical College in Japan in 1988, cells from mouse mammary cancer, leukemia cells, and Ehrlich tumours were implanted into mice. At the end of 20 days, all the mice in the control group had died, but 73% and 80% of the mice in the split-nucleus Chlorella and CGF groups were still alive after a period of 60 days. Once again, it was noted that Chlorella only protected the mice if it was administered beforehand.<sup>22</sup>

Very recent studies have confirmed that Chlorella prevents the white blood cell count from dropping owing to use of cancer treatment medicines. In 1996 a team of scientists in Fukoka, Japan, published a report showing that the subcutaneous administration of a glycoprotein prepared from a Chlorella vulgaris culture reduced the death rate of mice carrying tumours treated with 5-fluorouracil. <sup>23</sup> A Brazilian team has demonstrated the existence of a similar effect, in a study published in 1999. Mice were injected with a sublethal dose of *Listeria monocytogenes*. The administration of the chlorella extract CGF raised the level of activity of the macrophage cells in the experimental group. All the mice in the control group died, but 20% of one group and 52% of a second group of mice that had been given the CGF beforehand survived. <sup>24</sup> In the face of all these studies, it is clear that the consumption of Chlorella can be a useful help in the fight against cancer, because of the fact that Chlorella reinforces white blood cells and stimulates macrophage activity, and this remains true even during chemotherapy or radiotherapy treatment.

By saying this I do not wish to imply that Chlorella protects people against cancer, or that it has an anti-tumoral effect, merely that it helps the body to use its natural defences to fight the disease.

A study that clearly demonstrates the protective effect of Chlorella was carried out by the neuro-surgical department of the University Of Virginia Hospital on a group of twenty patients suffering from brain tumours.

The goal of the study was to determine if Chlorella consumption could raise the patient's resistance to respiratory diseases during the course of their treatment by chemo-and radio therapy. Up to 50% of people suffering from cancer die not because of their cancer, but because of banal . Opportunist diseases such as mild respiratory diseases which become lethal because the body is unable to resist them. The quantity of Chlorella consumed by these people was massive: they took 10 grams of Chlorella and 150ml of CGF in liquid form every day for two years.

The final report noted that all the patients had managed to maintain a normal number of white blood cells, even in the case of patients whose white blood cell count had fallen sharply before the beginning of the Chlorella treatment. That said, eating Chlorella did not prevent some of the patients dying of their cancer; at the end of the study, 9 patients were still alive and for 7 of them,

the tumour had not progressed. 25 On the other hand, another element contained in Chlorella represents a real hope against cancer: chlorophyll.

### **The many benefits of chlorophyll**

Modern-day doctors are no longer aware that chlorophyll has medicinal effects. But here is a quote I found in an encyclopaedia of medicinal plants in the pharmacology section of the University of Paris. This encyclopaedia was published in 1944. The long list of the medicinal effects of chlorophyll includes the following extract:

It is prescribed in all cases of anaemia due to haemorrhages, in the case of recent infections, and for people suffering from cancer, to combat the anaemia consecutive to the use of deep radiotherapy.

Indeed, if one takes care to proceed each session with a chlorophyll injection, one can without inconvenience administer strong X-ray doses without this resulting in the usual anaemia which enforces long waiting periods between sessions. 26 Almost 50 years after this quote, during the nineties, scientists all over the world carried out experiments proving that chlorophyll protects the body against cancerogenic substances. In these experiments, scientists attempted to cause cancer in animals by exposing them to known mutagenic substances. In every case, the administration of chlorophylline, a substance derived from chlorophyll, insured that the animals did not in fact develop the expected tumours.

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