

## **A DNA-technology-based cellular assay used to measure specific biological activity in a wheatgrass extract.**

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Since the 1930's wheatgrass and a number of other cereal grasses have been comprehensively researched and reported as therapeutically effective substances. For example, a number of animal studies have shown quite marked improvement in anaemia from grass-derived chlorophyll ingestion.<sup>1,2,3</sup> Other studies up to the present day have shown positive and promising results in the treatment of suppurating wounds<sup>4</sup>, burns<sup>5</sup>, hepatocellular carcinoma<sup>6</sup>, ulcerative colitis<sup>7</sup> and many other conditions. My own experiences in successfully treating numerous patients with a wheatgrass extract since 1995, strongly support many of the research findings.

In August, 2004, paediatric haematologist Dr. R. K. Marwaha and co-workers at the Advanced Pediatric Centre, Postgraduate Institute of Medical Education and Research, Chandigarh, India published an article in Indian Pediatrics entitled "Wheat grass juice reduces transfusion requirement in patients with thalassemia major: a pilot study." The study was performed between February 2000 and May 2003. Sixteen out of 38 (42%) blood transfusion dependent thalassaemics fulfilled the trial criteria for final analysis.

To summarise the findings during period of wheatgrass juice ingestion:

- all participants experienced lower blood transfusion requirements
- 50% had at least 25% reduction in transfusion requirements
- the mean interval between transfusions increased 29.5%
- overall, hemoglobin levels were not compromised by reduced transfusion volumes

Dr. Marwaha's conclusion was that "wheat grass juice has the potential to lower transfusion requirements in thalasseemics." He did not speculate on the "mechanism of action of wheat grass juice in transfusion dependent thalasseemics" being of the opinion that the concept of chlorophyll enhancing hemoglobin production (a popular and highly marketed view) "sounds too simplistic". I support this position and seriously doubt whether chlorophyll has any function in nature other than to drive photosynthesis.

The Cell & Gene Therapy Research Group at The Murdoch Children's Research Institute, Royal Children's Hospital, Melbourne is headed by noted thalassaemia researcher, Professor Panos Ioannou. His work in the research and development of artificial chromosomes has resulted in a significant contribution to the Human Genome Project.

In May, having read Dr. Marwaha's article, Prof. Ioannou sent me the following communication: "We have recently developed very specific assays for the induction of foetal haemoglobin, (*The assay is based on detecting production of HbF in human erythroleukaemia cells using a fluorescent protein gene that is used to replace the genes for HbF*) to facilitate the discovery of pharmacological agents that might be therapeutic

for thalassaemia. Given the reported effects of wheatgrass juice on thalassaemia, (*Dr. Marwaha's pilot study*) we would very much like to test (*your*)wheatgrass juice (*extract*) whether it can cause a significant increase in foetal haemoglobin."

As we know, foetal hemoglobin, (HbF) has a substantially higher oxygen tension than adult hemoglobin. It has been found that induction of HbF in thalassemia can significantly improve the patient's clinical condition, presumably by augmenting arterial oxygen concentration. Although intravenously administered drugs exist that can evoke this effect, e.g. hydroxyurea, they are expensive, lack specificity, are cytotoxic, and can suppress the bone marrow.

Professor Ioannou assayed the wheatgrass extract for fetal hemoglobin induction on three separate human cell clones and reported that over a 5 day period:  
"Our measurements suggest a 3-5 fold increase in the production of HbF by the wheat grass extract. This is a substantial increase and could certainly provide an explanation why some thalassaemia patients may derive significant benefit."

Of course, these in vitro results may or may not bear a relationship to what one might expect in vivo. However, given the quite significant reduction in transfusion requirements noted in some of Dr. Marwaha's trial participants (HbF was not measured), Professor Ioannou's findings may suggest this could have resulted from the induction of HbF by wheatgrass. Because chlorophyll is virtually eliminated during production of the wheatgrass extract, the question remains as to which biological active(s) in the extract were responsible for the in-vitro results.

It is hoped these two new findings of clinical improvement from ingestion of fresh wheatgrass juice and clear indications that the wheatgrass extract induces HbF in vitro may eventually translate to a better quality of life for thalasseemics – particularly in underdeveloped countries where technological and financial resources are scarce.

The cellular assay used by Prof. Ioannou has enabled measurement of a specific biological activity in a herbal extract with a precision and accuracy that is not possible using current assaying techniques. The level and speed of induction of HbF by the wheatgrass extract is, according to Prof. Ioannou, significantly greater than any of the various pharmaceutical "inducers" available. There is also a far higher degree of safety, economy and simplicity of administration. His cellular assay has revealed a promising, highly specific biological activity in wheatgrass that adds considerable credibility to the therapeutic value of this simple herb.

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