Elevated Xenobiotics, Lactate and Pyruvate in C.F.S. Patients

Robert Buist, Ph.D.[1]

Previously in this journal[1] I suggested the possibility that the muscle pain and weakness associated with Chronic Fatigue Syndrome may be the indirect result of ingested environmental chemicals causing shape changes in red blood cell membranes which resulted in poor oxygen supply to tissues and lactate accumulation.

Specific erydirocytic shape changes have been demonstrated in relapsing CFS patients by Dr. Tapen Mukherjee[2] using electron microscopy (Figure 1) but there is no direct evidence linking chemicals with these shape changes, nor have elevated intermediary metabolites been identified, though intracellular acidosis has been reported in CFS patients.[3 4]

In Australia indirect evidence for an association between chemicals and CFS comes from two different sources. Data collected from 250 questionnaires completed by CFS patients in Adelaide, South Australia, and Lismore, N.S.W., indicates a previous history of chemical exposure in 70-80% of respondents. Many describe in detail how the first onset of symptoms (or exacerbation of symptoms) appeared to be related to chemical exposure, including multiple drug usage and anaesthesia during surgery). The second source comes from a group of doctors in Sydney who have routinely analyzed the blood of 300 CFS patients for chemicals during the last 12 months. Collation of this data by Dr. Mark Donohoe (Sydney physician) has revealed elevated blood levels of many chemicals including DDT, DDE, hexa-chlorobenzene, dieldrin, toluene, xylenes, styrene, tetrachloroethylene, dichlorome-thane and isomers of PCB's. These substances are highly fat soluble, store readily in adipose tissue and would be expected to be mobilized during periods of weight loss, heavy exercise, deep tissue massage or saunas. In fact, CFS symptoms are frequently exacerbated at such times and may indeed result from the consequences of destructive free radical induced membrane changes affecting not only erthrocytes but also neurones, lymphocytes, mitochondria and a host of tissue-bound enzymes responsible for xenobiotic detoxification (e.g. P450 cytochromes).

Ignoring for the moment whether the membrane changes are chemically or vi-rally induced, Mukherjee's preliminary EM results indicate that 40-100% of the erythrocytes in symptomatic CFS patients are grossly deformed and can be identified as rigid stomatocytes and dimpled sphero-cytes (Figure IB). It is postulated that such changes would prevent these red cells from squeezing through fine capillaries, thus causing intracellular oxygen starvation in tissues which should result in an accumulation and leakage of non-oxidized end products of glycolysis due to reduced mitochondrial function.

Table 1.
Intermediary Metabolites of CFS Patients (venous blood)

	Lactate (mmol/1)	**Pyruvate** (micro mol/1)
J.S.	1.73	318.0
S.G.	4.91	390.0
R.B.	2.05	68.3
P.C.	1.91	358.0
PQ.	1.11	307.0
M.K.	1.34	358.0
Normal values	(0.55-1.15)	(41-67)

In order to test this hypothesis further Dr. Alan McLeay at Clinical Assays in Gladesville, Sydney, and I decided to measure both lactate and pyruvate levels in venous blood taken from six non-fasting

1. Editorial Office, International Clinical Nutrition Review, P.O. Box 370, Manly, New South Wales 2095, Australia.

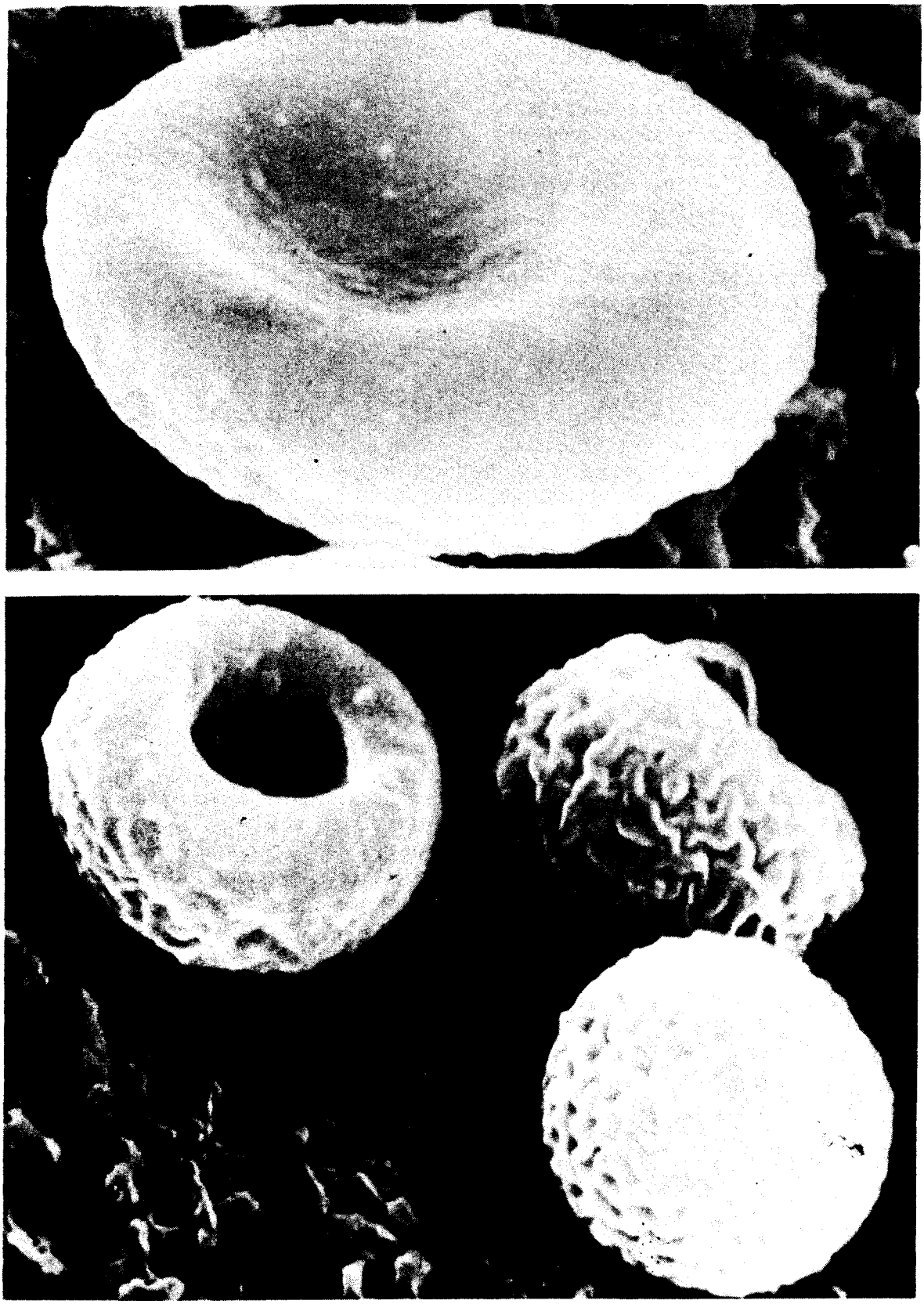

Figure 1.
Scanning electron microscopy showing: A. Erythrocyte with normal morphology and, B. Deformed erythrocytes including stomatocytes and dimpled spherocytes.

(photographs kindly supplied by Dr. Tapen Mukherjee)