Some aspects of glucose metabolism and related activities in sickle red cells (SS) have been investigated. The findings have been compared with those from the red cells of sickle cell trait (AS), and normal (AA) individuals.

The rate of glucose consumption, pyruvate and lactate production in red blood cells of normal, sickle cell trait, and sickle cell, diseased subjects were investigated. A time dependent measurement of glucose consumption was also made. $Na^+$, $K^+$ and cholesterol levels in the plasma of the three types of subjects were also estimated during incubation to see whether any metabolic abnormality existed in the SS and trait (AS) red cells as compared to the normal (AA) ones.

Osmotic fragility test for red cells were also done using freshly pooled blood and 24 hours incubated blood of AA, AS and SS individuals to see whether there was any change due to metabolic stress.
To see the effect of enhanced plasma glucose level on the number of circulating sickle cells, an in vivo study of CVSC count was done in the SS patients before and after intravenous glucose infusion.

The glucose consumption rate in the SS red cells was observed to be significantly higher (p<0.001) than the normal (AA) and sickle cell trait (AS) red cells. The rate of glucose consumption in AA, AS and SS red blood cells were found to be $0.301\pm0.01$, $0.296\pm0.02$, and $0.604\pm0.02$ mg/ml RBC/hour respectively.

The rate of pyruvate production in SS red cells was observed to be significantly higher (p<0.001) than the AA, AS red cells. The rate of pyruvate production in AA, AS and SS RBCs were $13.70\pm1.2$, $10.11\pm0.7$ and $23.52\pm0.9$ µg/ml RBC/hour respectively.

A significant increase (p<0.001) in the rate of lactate formation by SS red cells was also observed. The rates were $0.300\pm0.01$, $0.231\pm0.01$ and $0.500\pm0.02$ mg/ml RBC/hour in AA, AS and SS red cells respectively.

The time dependent glucose consumption rate was measured in red cells from AA and SS subjects. The rate of
glucose consumption in AA was 0.386±0.02, 0.352±0.01, 0.298±0.01, and 0.244±0.01 mg/ml RBC/hour after 1, 2, 4, and 6 hours of incubation respectively. Whereas those values for SS red cells were 0.716±0.03, 0.590±0.02, 0.480±0.02 and 0.362±0.01 mg/ml RBC/hour respectively. The rate of glucose consumption in SS red cells declined significantly after 2 to 4 hours of incubation as compared to the AA red cells.

The mean fasting plasma glucose values in AA, AS and SS samples were 90.7±3.4, 92.8±4.5, and 88.4±2.2 mg/dl respectively. After 6 hours of incubation the mean plasma glucose value in SS samples was significantly lower as compared to AA (p<0.001) and AS (p<0.01) mean values.

The plasma cholesterol values were significantly lower in SS samples, than the AA (p<0.01) and AS (p<0.05) mean values. The plasma cholesterol values showed an increase in AA, AS and SS samples after 6 and 24 hours of incubation.

The mean fasting plasma Na⁺ concentration in AA, AS and SS samples were 129.0±4.6, 130.1±3.0 and 127.5±3.3 mEq/litre respectively. Plasma Na⁺ concentration in all the cases showed a decrease after 6 and 24 hours of incubation.
The mean plasma K⁺ values were initially 4.0±0.1, 3.7±0.1 and 3.8±0.1 mEq/litre in AA, AS and SS samples respectively. However the mean plasma K⁺ values in SS samples showed a significant increase as compared to the AA (p<0.001) and AS (p<0.001) mean values after 6 and 24 hours of incubation.

The osmotic fragility curve of SS red cells showed a shift to the left as compared to AA and AS red cells. After 24 hours of incubation the osmotic fragility curve of SS red cells showed a further shift to the left as compared to its initial osmotic fragility curve.

The pre and post glucose infusion circulating venous sickle cell count (CVSC) percentages were 19.9±0.44 and 12.48±0.31 respectively. The post-infusion circulating venous sickle cell count was significantly lower (p<0.001) than the pre-infusion value.