G}lucose-6-phosphate dehydrogenase (G6PD) deficiency is an inherited disease with a high prevalence in Africa, southern Europe, the Middle East, South East Asia, and Oceania and in descendants of migrants from these areas. G6PD is involved in the production of NADPH, which maintains glutathione, and consequently other proteins, in the reduced state when erythrocytes are subjected to an oxidant stress. Reduced concentrations of G6PD render red blood cells susceptible to haemolysis under conditions that occur when oxidant drugs are administered, when fava beans are ingested (favism), or during infection.1

“Heterozygous females can also be affected in some circumstances, because of the existence of a population of deficient cells”

Because G6PD deficiency is an X linked disorder, the main clinical manifestations are seen in hemizygous males. In areas where G6PD deficiency is prevalent, homozygous females will also be affected in the same way as hemizygous males. However, heterozygous females can also be affected in some circumstances, because of the existence of a population of deficient cells. In some cases, because of extremely skewed lyonisation, the population of deficient cells is much larger, and the total red cell enzyme concentrations may be similar to those in hemizygous males, leading to haemolysis on exposure to oxidant drugs or fava beans.

The difficulties in diagnosing G6PD deficiency in hemizygous males with the A+ type of G6PD deficiency immediately after a haemolytic event is well recognised by most haematologists. This difficulty does not arise in males with the Mediterranean enzyme deficiency because reticuloocytes do not have high enzyme concentrations. The situation in females heterozygous for the deficiency is less clear, and an extensive search in textbooks and on Medline failed to find a reference to enzyme concentrations in red blood cells in this situation. Here, we report a female patient who was heterozygous for Mediterranean G6PD deficiency. She presented with favism and her enzyme concentrations were normal at presentation, causing a delay in making a definitive diagnosis.
Deficiency (10–60%). In addition, in the A
haemolytic anaemia in response to three types of trigger,
be further augmented by compensatory reticulocytosis
remaining cells. The increased enzyme concentration would
possibly lyse when exposed to an oxidant challenge, leaving behind cells with a normal enzyme content.

FAVISM RESULTS FROM THE PRESENCE IN FAVA BEANS OF TWO β GLYCOSIDES—VICINE AND CONVICINE— WHICH CONTAIN THE PYRIMIDINES DIVICINE AND ISOURAMIL. THESE PRODUCE FREE RADICALS DURING AUTO-OXIDATION, LEADING TO HAEMOLYSIS IN G6PD DEFICIENT SUBJECTS. THE BLOOD FILM SHOWS POLYCHROMASIA, ANISOCYTOSIS, POIKILOCYTOSIS, AND “BLISTER” CELLS—ALL FEATURES OF ACUTE OXIDANT INDUCED HAEMOLYSIS. G6PD DEFICIENT INDIVIDUALS DO NOT DEVELOP FAVISM EVERY TIME THEY CONSUME BROAD BEANS; THE REASONS FOR THIS ARE NOT CLEAR. HOWEVER, WHAT IS IMPORTANT IS THE QUALITY AND QUANTITY OF BROAD BEANS CONSUMED. IN OUR CASE, THE BEANS WERE CONSUMED IN LARGE AMOUNTS AND WERE LIGHTLY BOILED, AND THIS MAY HAVE A BEARING ON THE OCCURRENCE OF HAEMOLYSIS.

At presentation, the enzyme assay in our case gave a misleading result—within the normal range. Subsequent enzyme assays showed decreasing enzyme concentrations.

Haemolysis and favism have been described in female patients heterozygous for the Mediterranean type of G6PD deficiency. However, after an extensive Medline search, we found no reports in the English language literature of this phenomenon. Therefore, we think that our case is a reminder of the occurrence of favism in female patients with G6PD deficiency. The blood film shows polychromasia, anisocytosis, poikilocytosis, and “blister” cells—all features of acute oxidant induced haemolysis. G6PD deficient females do not develop favism every time they consume broad beans; the reasons for this are not clear. However, what is important is the quality and quantity of broad beans consumed. In our case, the beans were consumed in large amounts and were lightly boiled, and this may have a bearing on the occurrence of haemolysis.

The situation in female patients is more complex. It is well documented that female patients heterozygous for G6PD deficiency have two cell populations—one with a normal enzyme content and one deficient in enzyme—and this is used as the basis for a cytochemical test. Therefore, the cell population deficient in enzyme would probably lyse when exposed to an oxidant challenge, leaving behind a population of cells with a normal enzyme content. This in turn will lead to an increased average enzyme concentration in the remaining cells. The increased enzyme concentration would be further augmented by compensatory reticulocytosis because of the high concentration of enzyme in the reticulocytes of the red cell population with normal enzyme.

Most individuals who are G6PD deficient remain clinically asymptomatic. However, they are at risk of developing acute haemolytic anaemia in response to three types of trigger, namely: drugs, infections, and broad (fava) beans. In most cases the haemolytic attack is self-limiting. Depending on the number of red blood cells that have been destroyed, the haemoglobin concentration returns to normal in three to six weeks.
REFERENCES


