

# LETTER TO THE EDITOR

## What G6PD-deficient individuals should really avoid

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Glucose-6-phosphate dehydrogenase (G6PD) deficiency affects over 400 million people worldwide [1, 2]. Although most individuals are asymptomatic, it can lead to acute haemolytic anaemia with malaise, neonatal jaundice and haemoglobinuria in the presence of oxidative triggers. We recently conducted a systematic review that evaluated the herbs and dietary supplements that should be avoided by G6PD-deficient individuals [3]. In our study, we also noted that there was no synthesized evidence on the roles of food and chemicals these individuals. To address this gap, we conducted a systematic review up to June 2016 using five databases (PubMed, CINAHL Plus, AMED, CENTRAL and EMBASE) to identify foods and chemicals which are associated with harm in these individuals. We considered all study designs as long as they reported clinical outcomes along with indicators of haemolysis. The list of foods and chemicals identified were subsequently classified into one of the following categories: (i) should be avoided completely; (ii) caution should be exercised during use/consumption; or (iii) no evidence to contraindicate its use, based upon our initial classification [3].

Overall, we found that there was scant literature describing foods or chemicals which triggered haemolysis in G6PD-deficient individuals. Only 38 articles, describing 14 different types of food or chemical, were found (a full list of the articles retrieved can be obtained by contacting S.W.H.L.; Table 1). We noted that only the consumption of fava beans

or food cross-contaminated with fava beans [4], as well as the use of naphthalene and aniline dyes, were consistently associated with haemolysis. However, there was only one isolated case report describing haemolysis when G6PD-deficient individuals consumed: fenugreek, unripe peach or smoked synthetic cannabinoid, or consumed beans within the same genus as fava beans – namely, *Vicia sativa* (common vetch) and *Vicia faba* (broad bean). Reports of haemolysis have also been noted when G6PD-deficient individuals came into contact with flower pollen, the plant *Hoya carmosa*, silver sulfadiazine, aluminium phosphide and menthol products (including menthol powder and medicated plaster). Considering the scarcity of such reports, there is insufficient evidence to reach a clear conclusion regarding the risks of the substances mentioned in causing haemolysis in G6PD-deficient individuals in general. However, there have been several reports of haemolysis in G6PD-deficient individuals, linking the use of food coloured with the reddish-orange agent 1-phenylazo-2-naphthol-6-sulphonic acid, which is found in food colouring agent, Orange-RN [5, 6]. This food additive has subsequently been banned in many countries, which may account for the paucity of report on it in recent years. Nevertheless, we urge caution while consuming any food which contains a high concentration of this agent in view of the potential for haemolysis and toxicity [7].

In summary, we found only a limited number of publications describing foods or chemicals which are known to

## Table 1

List of foods and chemicals which should be avoided, cautioned against or can be safely consumed by glucose-6-phosphate dehydrogenase (G6PD)-deficient individuals

Foods/chemicals that should be avoided by G6PD-deficient individuals	Foods/chemicals for which caution should be exercised during consumption	Foods/chemicals for which there is no evidence to contraindicate their use
Fava beans Naphthalene Aniline dyes	Food colouring agent 1-phenylazo-2-naphthol-6-sulphonic acid	Pumpkin Unripe peaches <i>Vicia sativa</i> Fenugreek seeds Flower pollen Synthetic cannabinoids Silver sulfadiazine <i>Hoya carnosia</i> Menthol Aluminium phosphide <i>Vicia faba</i>

Foods/chemicals are classified as either: (i) should be avoided completely; (ii) caution should be exercised during use/consumption; or (iii) no evidence to contraindicate its use. These classifications are based upon the association with haemolysis as evidenced by case reports, and laboratory and clinical studies

increase the risk of haemolysis in G6PD-deficient individuals. Our review confirms the association between commonly implicated agents, such as fava beans, naphthalene and aniline dyes, and haemolysis in affected people, although the overall quality of the evidence is low. We hope that this report will increase the level of discussion and reporting on foods as well as chemicals, and their possible association with G6PD deficiency, given the paucity of publications on this topic over the past 30 years.

## Competing Interests

The authors have indicated they have no potential conflicts of interest to disclose.

## Contributors

S.W.H.L. conceived the study, developed and tested the data collection forms, conducted the analysis, drafted the initial manuscript and approved the final manuscript as submitted. N.M.L. and N.C. conducted the data analysis, reviewed and revised the manuscript and approved the final manuscript as submitted. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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