

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Traditional stiff maize porridge contains two types of enzyme resistant starch: physically enclosed starch (type 1) and retrograded amylose (type 2). Resistant starch is an important part of dietary fibre (Asp, 1996). A diet rich in starch and dietary fibre and low in fat is recommended for people who suffer from diabetes (ADSA, 1997). Traditional stiff maize porridge fits these criteria. It can be useful in the dietary management of diabetes, because of the low rate of starch digestion. The predicted GI value is low (44 with glucose reference) which is an indication that traditional stiff maize porridge will not cause a sudden, sharp rise in blood glucose concentration, but rather a small increase over a longer period.

The change in carbohydrate staple food from slowly digested maize porridge to rapidly digested bread when South African Black people urbanise could be a contributing factor to the higher prevalence of diabetes (situation similar to that of Australian Aborigines as discussed by Thorburn *et al.*, 1987). The change in staple food is, however, merely one of the diet and lifestyle factors that changes. It is recommended that the results of the Transition, Health and Urbanisation in South Africa (THUSA) study (currently being done by Prof. Vorster and co-workers at the Department of Nutrition, Potchefstroom University for Christian Higher Education) be used to compare the glycaemic load of the diets of rural and urban Africans in order to determine to which extent the change in carbohydrate staple affected the glycaemic load of the diet.

The higher rate of starch digestion in bread compared to stiff maize porridge is probably due to the more open structure of bread, which gives α -amylase a larger surface contact area with the starch molecules. The higher fat content of bread may reduce amylose retrogradation in bread to some extent, whereas the high amylose content of South African maize will cause slower starch digestion and the formation of more retrograded amylose (type 3 enzyme resistant starch) in maize porridge. The presence of physically enclosed starch granules in maize porridge and the fact that starch granules in maize

porridge are less distorted than starch granules in bread contributes to the lower rate of digestion of porridge compared to bread. Intrinsic ingredients of the cereal endosperm (e.g. gluten in wheat and β -glucans in oats) probably have an important effect on the digestibility of starch in cereal flour porridges.

The digestibility of maize porridge was affected more by the duration of cooking than by maize cultivar, the particle size of the maize meal or the type of cooking (hotplate or microwave). Decreasing the cooking time may cause less disruption of the starch granules and thereby decrease the susceptibility of the starch to enzymes. Increasing the cooking time, together with more stirring, probably increases the disruption of starch granules and solubilisation of starch molecules. This may lead to the formation of more retrograded starch during the cooling, which decreases digestibility.

Reducing the particle size of maize meal to maize flour does not affect starch digestibility, because the surface area of the porridge lumps after chewing may have a greater effect than the size of the individual endosperm grit particles. Also, the particle size difference between meal and flour is relatively small.

The increase in the starch digestibility of hotplate cooked porridge with increase in endosperm hardness cannot be explained in terms of differences in degree of gelatinisation, because virtually all the starch granules in maize porridge are gelatinised. The difference in particle size distribution between cultivars is also ruled out, because it was shown that particle size did not affect digestibility. The proximate composition of the maize meal from different cultivars was also very similar. It is possible that soft maize cultivar porridge contained more retrograded amylose, or that the differences in digestibility are caused by unidentified endosperm texture related properties.

Because the starch digestibility of microwave cooked porridge is similar to hotplate cooked porridge, it possible to prepare the porridge in a convenient way that can even suit the more affluent urban dweller's lifestyle without losing the advantages of slow starch digestibility. With microwave cooked porridge there is no correlation between

digestibility and endosperm hardness as is the case with hotplate cooked porridge. During microwave cooking the high rate of heat transfer may destroy the endosperm texture related properties.

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