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Mandatory Folic Acid Flour Fortification in the UK

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On September 20, 2021 the UK announced the introduction of mandatory folic acid fortification of non-wholemeal wheat flour in the prevention of neural tube defects (NTDs), including spina bifida and anencephaly. Wholemeal wheat flour is exempt because it contains naturally occurring folate[1].

Thirty years ago, the Medical Research Council conducted an RCT (randomised control trial) to determine the effectiveness of folic acid supplementation in the prevention of the recurrence of NTDs[2]. It found that the group who took daily folic acid reduced the NTD risk by 70%.

Making additions to flour is not a new concept. Since the second world war, flour has been fortified with calcium, iron, niacin and thiamine during milling.

There are 1,000 neural tube defect (NTD) cases in the UK annually. It is estimated that the folic acid fortification will prevent 20% of the cases, that is 200 NTDs per year.

Folate is a water-soluble B vitamin. It is found naturally as folate in many foods such as green leafy vegetables. Folic acid derives its name from the Latin word folium which means a leaf. It was first isolated from the spinach leaf in 1941.

Folic acid cannot be made or stored by the body. It must be provided from one's daily intake. Greater amounts of folic acid are required during pregnancy because the rapid rate of cellular and tissue growth of the fetus.

Many people do not achieve the recommended daily intake. It has been estimated that 90% of women aged 16 – 49 years have a folate status less than recommended to reduce the risk of an NTD. The folate status in the UK has deteriorated in recent years. The red blood cell concentration of individuals has decreased by 5% per year between 2008-2009 and 2016-2017.

NTDs occur in the first 4 weeks of the pregnancy. Only one fifth of women report taking folic acid supplements before pregnancy. It appears that attempts to increase folic acid levels through education has had a limited effect. The other important consideration is that over half of pregnancies are unplanned.

There are reports that the folic acid intakes of women in the reproductive age group has declined particularly in deprived areas.

The relationship between folic acid and NTD risk is in part due to its role in nucleotide synthesis. The rapidly dividing cells of the developing neural tube requires the synthesis of large amounts of nucleotides in order to facilitate DNA replication. In the absence of sufficient nucleotides, cellular replication slows down, and the neural folds are impeded[3].

Folic acid fortification of flour has been adopted in more than 60 countries including Australia, Canada, and the US. Many countries have added in the region of 150ug of folic acid per 100 g of flour. This provides 100 – 200 ug of folic acid per day[4]. Following its introduction, countries have reported falls in NTD rates, ranging from 16% to 58%. The countries with the highest background prevalence have witnessed greater declines.

New Zealand authorised folic acid fortification of flour in July 2021. During a public consultation process, the majority of participants were supportive of the mandatory approach.

Kehoe et al[5] have modelled the potential impact of adding folic acid to flour in Ireland. They estimate that it would reduce NTDs by 8% to 32%. The risk of masking anaemia associated with vitamin B12 deficiency in older adults would be negligible.

Daly et al[6] have previously shown that there is a log linear association between a woman's serum folate concentration and her risk of having an NTD pregnancy.

The prevalence of NTDs has not decreased in Europe, 0.91 per 1,000 births[7]. In comparison, in the US, NTD prevalence has decreased from 0.76 per 1,000 births to 0.56 per 1,000 births following mandatory folic acid fortification of flour. In Europe it had been hoped that the NTD prevalence would fall due to improvements in diet, and the taking of folic acid supplements prior to conception.

An update report[8] on folic acid and the prevention of NTDs was published in Ireland in 2016. It is a very comprehensive document that runs to 83 pages. Ireland is considered as having a high rate of NTDs. It is stated that the current rate is 0.93 per 1,000 births, and the lowest achievable rate is 0.6-0.7 per 1,000 births.

Fifty per cent of the indigenous Irish population has variations in the gene coding for the enzyme involved in folate metabolism – 5, 10-methylenetetrahydrofolate. This genetic variation may account for 1-in-4 NTD cases in Ireland.

The report describes 2 options. The first is mandatory fortification of flour with folic acid plus the advice that all women of child-bearing age should take an additional 400ug of folic acid daily. The second option is to continue with the current policy of advising daily 400ug folic acid advice for child-bearing women and the voluntary fortification of foods. The report recommends that the policies should be reviewed on a regular basis.

The UK decision to introduce mandatory fortification of flour is likely to re-open the folic acid debate.

References:

1. Haggarty P. UK introduces folic acid fortification of flour to prevent neural tube defects. Lancet 2021;398:1199-1201.
2. MRC vitamin research group. Prevention of neural tube defects. Lancet 1991;338:131-137.
3. Imbard A, Benoist JF, Bloom HJ. Neural tube defects, folic acid methylation. Int J Environ Res Public Health 2013;10(9):4352-4389.
4. Crider KS, Bailey LB, Berry RJ. Folic acid fortification, its history, effect, concerns, and future directions. Nutrients 2011;3(3):370-384.
5. Kehoe L, Walton J, Hopkins SM, McNulty BA, Nugent AP, Flynn A. Modelling the impact of mandatory folic acid fortification of bread or flour in Ireland on the risk of occurrence of NTD affected pregnancies in women of child bearing age and on the risk of masking vitamin B deficiency in older adults. Eur J Nut 2020;Sept 59(6):2631-2639.
6. Daly LF, Kirke PN, Molloy A, Weir DG, Scott JM. Folate levels and neural tube defects, implications for prevention. JAMA 1995;274:1698-702.
7. Morris JK, Addor MC, Ballardini E et al. Prevention of neural tube defects in Europe. A public health failure. Front Pediatr 2021 June.
8. Update report on folic acid and the prevention of birth defects in Ireland. Food Safety Authority of Ireland 2016.