

Our medical education is constantly being revised. Faculties around the world tirelessly critique and mould their curricula, with each syllabus revision promising greater empathy, empowerment, information literacy and clinical excellence in students. As these changes take place, we challenge faculties to recognize that our education extends beyond our classrooms and clinical teaching. The development of social networking, communication techniques, and student advocacy are a few of the many skills that are refined outside the standard curriculum. Student initiatives provide a valuable forum for the development of these characteristics in medical students.

NZMSJ is representative of the educational and professional benefits of student initiatives. As the executive of NZMSJ we have been privileged to be part of an exceptionally successful student initiative. From humble beginnings a mere three years ago we have become a recognized biannual journal. NZMSJ is becoming a valuable tool for students to gain experience publishing academic articles. This third edition represents our largest issue yet, and we are confident of continued growth in submission numbers. Alongside the growth of the journal, student authors have had the opportunity for detailed expert review of their work, and reviewers have been exposed to student articles as colleagues instead of markers. We believe that all of the students, staff and authors involved in the NZMSJ enjoy many of the learning outcomes curriculum designers strive for.

The diversity of articles in this edition is remarkable. We have published articles from authors as far away as Nepal and the USA, whilst ensuring that New Zealand students have also been well represented. Original research, interesting reviews and topical opinion pieces have ensured that this issue of the NZMSJ will make quite exceptional reading. Letters to the editor in response to any article are welcome.

We are also pleased to announce the winner and runner up for the NZMSJ writing prize advertised in our last edition. The academic editorial board and advisors were immensely impressed by the standard of submissions. We selected Shannon McCarthy's literature review of Folic Acid supplementation for first prize; an excellent example of clear, relevant, interesting writing for students. The Gale *et al.* group from Wellington received runner up for their research into the sick building syndrome at the Wellington School of Medicine. Brian Grainger's original research into ATP release in cochlear cells was commended as an impressive investigation of a complex topic.

We look forward to receiving further excellent submissions.

The NZMSJ Executive

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Folic acid supplementation as a preventative for defects of neural tube closure

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INTRODUCTION

Neural tube defects such as spina bifida and anencephaly are rare birth defects that affect around 0.8 per 1000 total births in New Zealand¹ and are due to failure of the neural tube to close during development. For the past 60 years it has been known that folic acid supplementation is effective in preventing neural tube defects by an unknown mechanism². Since 1993 the New Zealand Ministry of Health has recommended 0.8mg of folic acid per day for first time pregnancies and 5mg per day for high risk (previous NTD pregnancy) women to be taken four weeks prior to conception until the end of the twelfth week of pregnancy³. A woman needs to receive daily folic acid before she becomes pregnant otherwise it is too late. This review will examine various intervention studies which have provided strong evidence for the protective role of folic acid supplementation in preventing neural tube defects and the proposed scientific mechanisms of action.

BACKGROUND

Neural tube formation and closure occurs between days 22 and 28 of gestation in humans and involves paired neural folds being brought together at the dorsal midline and adhering to each other with a merging of cells.⁴ In mammals, closure is initiated at several places along the anterior-posterior axis until the neural tube forms a closed cylinder which is separated from the surface ectoderm⁴. Neural tube defects (NTDs) occur when various parts of the neural tube fail to close. Spina bifida refers to failed closure of the posterior neural tube. It varies in severity, and is characterised by neural tissue covered by meninges that extrude through the vertebral column⁵. Anencephaly is a lethal malformation that occurs when the anterior neuropore fails to close and the brain remains in contact with the amniotic fluid and degenerates.⁵ Epidemiological studies have suggested that environmental and genetic factors have a joint role in causing NTDs⁶. From such studies it has been determined that poor nutrition and folate deficiency in particular puts fetuses most at risk⁴. Folate, or Vitamin B₉, acts as a cofactor for enzymes essential in DNA and RNA synthesis and is also required in the transfer of methyl groups in the amino acid methylation cycle, an essential step in the recycling of homocysteine back to methionine⁵.

STUDIES

Several intervention studies have shown that taking folic acid supplements can reduce the occurrence and recurrence of neural tube defects



Shannon McCarthy is nearing the end of her second year as a medical student at the University of Otago. She recently graduated with a BSc in Anatomy and Structural Biology, and hopes to combine her keen interest in neuroscience with her medical career.

(NTDs). Smithells *et al.*⁷ found a significant 85 per cent reduction in the recurrence rate of NTDs in mothers given a multivitamin supplement containing 0.36mg folic acid during the periconceptional period (before conception to early pregnancy), compared with unsupplemented mothers. This trial was controversial however, due to the absence of a placebo controlled double blind approach⁸. In 1988, Mulinare *et al.*⁹ found that, as well as multivitamin use reducing the risk of NTDs, it also has a protective effect among women without prior NTD-affected pregnancies.

Milunsky *et al.*¹⁰ found a substantially reduced risk of NTDs among women who took standard doses of folic acid containing multivitamins during the first six weeks of pregnancy, and they estimated that folic acid supplements taken during the first six weeks of pregnancy would prevent the occurrence of NTDs by more than 50 per cent.

The most convincing evidence that folic acid supplementation aids in primary prevention of NTDs and recurrence of NTDs has been provided by three studies. In 1992, a randomised control trial performed by Czeizel and Dudas¹¹ found that the incidence of a first occurrence of NTDs was reduced among women who took folic acid supplements during the periconceptional period. A placebo controlled study by the MRC Vitamin Research Group (1991) assigned women with previous NTD-affected pregnancies to one of four groups: daily supplementation with 4mg folic acid, 4mg folic acid and other vitamins, other vitamins without folic acid, neither folic acid or vitamins¹². The trial found that high-dose folic acid supplementation (4.0mg) alone reduced NTD recurrences by 72 per cent and that the addition of other vitamins conferred no extra benefit in averting NTDs¹².

During 1993-1995, the Centre for Disease Control and Prevention in the USA and the People's Republic of China conducted a population based intervention study to the efficacy of periconceptional use of folic acid in preventing NTDs¹³. The study included almost 250,000 women