ELECTRONIC LETTER

Inositol and folate resistant neural tube defects

P Cavalli, A J Copp

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Folic acid supplementation is widely used to prevent neural tube defects (NTDs).[1 2] Yet not all cases of NTD appear to respond to folic acid. For instance, in the randomised controlled trial sponsored by the Medical Research Council,[1] six NTD recurrences were noted among 593 women (1%) who received full folic acid supplementation, compared with 21 recurrences among 602 unsupplemented pregnancies (3.5%). Hence, in this study, 28% of NTD cases failed to be prevented by folic acid. Currently, no alternative therapy is available for such "folic acid resistant" NTDs.

Studies in mice provide evidence for folate sensitive and folate resistant NTD types. NTDs in mice homozygous for mutations of the *Pax3*, *Cart1*, and *crooked tail* genes can be prevented by folic acid,[3–5] whereas NTDs in the *curly tail* mutant mouse are resistant to folic acid.[6] A potentially novel therapy for folate resistant NTD was suggested by our finding that treatment of pregnant females with *myo*-inositol, during early pregnancy, can prevent the majority of NTD cases in the *curly tail* mouse.[7] Dietary inositol also reduces the frequency of NTDs in a diabetic rat model.[8]

Here, we report the first use of periconceptional inositol in human pregnancy, in association with a history of folate resistant NTD. Two unrelated, healthy, Italian parents of European origin (mother aged 25, father aged 30) elected to terminate two consecutive pregnancies following ultrasound findings of myelomeningocele. These NTDs occurred despite administration of 4 mg folic acid daily, starting three months before conception. Amniotic fluid karyotype was normal (46,XY) in both NTD pregnancies. There were no known illnesses in either family, nor was there a history of medication or drug usage, *x* ray exposure, infectious disease, alcohol intake, or smoking during the first two pregnancies. The mother had a normal blood glucose concentration two hours after a standard glucose load both before and during each pregnancy. Following the second affected pregnancy, both parents were tested for the C677T mutation[9] in methylenetetrahydrofolate reductase (MTHFR), but only wild type alleles were found.

During extensive genetic counselling, the parents were informed that their previous affected pregnancies could be folate resistant and that a high recurrence risk of NTD (approximately 1 in 9 chance[10]) was to be expected in a third pregnancy. The preventive effect of inositol in mouse studies, and the absence of significant side effects of inositol therapy (up to 12 g/day) in psychiatric patients,[11] were discussed, as well as a possible adverse effect of inositol, in stimulating uterine contractions.[12] The parents took the personal decision to undergo combined inositol and folic acid treatment (500 mg inositol and 2.5 mg folic acid daily), starting three months before conception and continuing until 60 days of pregnancy. Tablets were prepared by an external chemist, using FU inositol (Farmacopea Ufficiale, 98.60% purity).

During the third pregnancy, maternal serum and amniotic fluid alpha-fetoprotein measurements were within the normal range at the 15th week of pregnancy, while ultrasound examinations at 15, 20, and 22 weeks showed normal fetal and placental growth parameters. The pregnancy progressed uneventfully, with no particular episodes of uterine contraction, and a healthy baby boy weighing 3900 g was delivered spontaneously at 40+3 weeks. Apgar scores were 8 at one minute and 10 at five minutes. Length and head circumference were at the 50th centile. Clinical evaluation after birth was normal, routine blood and urine tests were in the normal range, and neurological assessment, performed two weeks after birth, showed normal psychomotor development.

In conclusion, inositol has been taken during pregnancy without toxicity for mother or fetus, and with no anomalous uterine contractions. Given the strong preventive effect of inositol in mice, this normal pregnancy outcome, despite the high recurrence risk of NTD, indicates the need for further evaluation of inositol as an adjunct therapy to folic acid for preventing folate resistant NTD.

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Authors' affiliations

P Cavalli, Servizio di Genetica, Ospedale di Cremona, Via Concordia 1, 26100 Cremona, Italy
A J Copp, Institute of Child Health, University College London, London WC1N 1EH, UK

Correspondence to: Professor A Copp, Neural Development Unit, Institute of Child Health, 30 Guilford Street, London WC1N 1EH, UK; a.copp@ich.ucl.ac.uk

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