Bioavailability of the most predominant 5-MTHF in humans using the emerging LC-MS/MS technique

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I will focus on THREE things today

1. Research background
2. Research methodology
3. Results

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The public derives its folate not only from synthetic folic acid....
also from natural sources!

Literature to date suggests that the food folates are 10-98% bioavailable compared to folic acid (Tamura & Stokstad, 1973; Brouwer et al., 1999; Winkels et al., 2007)

Despite 35 years of investigation.....
Research Objective

• The bioavailability of dietary 5-methyl tetrahydrofolate (5-MTHF) in a whole day’s mixed diet (a form predominant in foods) relative to supplemental 5-methyl Tetrahydrofolate in the selected population

Research methodology
Facts about the project country

- Population not exposed to synthetic folic acid
- No data on processed (cooked) foods!

Study design
Study period: 3 Months

Screening for participants (n=200)

- Unwilling to participate (n=140)
- Willing to participate (n=60)

Subsequently:

- Subjects met the inclusion criteria (N=22)
- Excluded due to deficiency in folate/iron/B12 (n=38)

Supplementation group (n=11)
- 400 µg

High folate diet group (n=11)
- 400 µg
Dietary analysis and Planning

What is the daily intake of dietary folate in the selected population?

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Typical South Indian Diet

Breakfast (or Dinner)

Lunch
✓ A microbiological assay lab was set up in India in one month!

✓ 45 foods were prioritised based on a 24 hour dietary recall and FFQ, Standardised and analysed for total folate contents

Profiling the folate vitamers

External standards

Internal standards

Folic acid
THF
5-MTHF
10-FFA
5-Formyl THF
What did we measure?

• Serum folate (Chemiluminescence and LC-MS/MS)
• Red cell folate (Chemiluminescence and LC-MS/MS)
Results

Relative Bioavailability based on serum folate was 41%

Folate (5MTHF) rich diet group

Supplement group

Maximal bioavailability = 24%  Maximal bioavailability = 60%

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Relative Bioavailability based on RBC folate was 45.5%

<table>
<thead>
<tr>
<th>Study groups</th>
<th>Mean baseline RBC folate (ng/ml)</th>
<th>Mean W12 RBC folate (ng/ml)</th>
<th>Mean increase in RBC folate (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A (5-MT diet rich group)</td>
<td>362 ± 87</td>
<td>582 ± 140</td>
<td>220 ± 79</td>
</tr>
<tr>
<td>Group B (5-MT supplement group)</td>
<td>312 ± 98</td>
<td>728 ± 166</td>
<td>416 ± 103</td>
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</table>

# Statistically significant P=0.001

Conclusion

• Relative bioavailability based on serum folate was 41%
• Relative bioavailability based on RBC folate was 45.5%
Strengths of the study

• Long term study
• Population not exposed to synthetic folic acid
• Test diet representative of a mixed varied diet
• Test diet similar to traditional diet
• LC-MS/MS adds accuracy to the values generated for biomarkers and diets

Acknowledgement

Study Participants (India)

IPRS, School of Chemical Sciences and Engineering, BMSF

Dr. Sheela Ramachandran, PSG college (India)

Dr. Russ Pickford, UNSW
Thank you!

Questions???

"Dad—who put my lunch through the mail slot?"