MedNut Mail

The How, When, Where, Which and Why of pharmacotnutrition

B6 absorption requires an acid environment

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https://medicationsandnutrition.online

Commentary

A recent seminal study (DOI 10.1074/jbc.RA120.013610) found that ThTr1/2 (Thiamine Transporters 1/2) can transport both thiamine and pyridoxine from the brush border membranes of the small intestines into the epithelial cells. This study established 3 key findings, being -

- the first to identify an intestine-to-epithelium transporter for pyridoxine,
- that ThTr 1/2 are actually multi-specific transporters that can transport thiamine, pyridoxine and other structurally unrelated cationic compounds,
- the optimal pH for thiamine transport is near neutral pH (near 7), and for pyridoxine is acidic pH (about 5.5).

Pyridoxine requires an acidic environment for absorption and the small intestine has an acidic surface microclimate. Therefore, if an acid inhibitor is prescribed does it change absorption site acidity, and if so, is the change sufficient to negatively impact pyridoxine absorption by the ThTr1/2 transporters? And is overall B6 status negatively impacted? The research to answer these questions is seemingly yet to be conducted.

Therefore, should one include this in one's clinical practice, or how should we deal with this information? I suggest that since the evidence on the negative impact of acid inhibitors on nutrients is increasing, that it is also likely future research findings will confirm a negative impact on B6 status, therefore there are 2 options for responsibly including this in one's clinically practice -

- regularly (eg 3-monthly) monitor B6 status for an extended period (eg at least a year) for steadily decreasing B6 levels whilst an acid inhibitor is prescribed, and if B6 levels are decreasing then initiate a small intervention and continue to monitor regularly for a further extended period (preferred option);
- initiate a small B6 intervention (eg maximum dose no more than 10 x current recommended intake) and monitor B6 levels regularly for an extended period to ensure the levels are neither falling too low nor rising too high.

Both of these options mean the new information is being utilized and therefore likely to benefit the person in your care whilst there is reasonable monitoring to minimize any potential harm.

As the finding that B6 absorption requires an acidic environment is so recent what will you do when you see someone whose prescribed

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medications include an acid inhibitor - will you -

- request vitamin B6 status be clarified?
- recommend regular monitoring of pyridoxine status whilst an acid inhibitor is prescribed?
- recommend a small pyridoxine intervention and that it be administered at a different time from the prescribed acid inhibitors?

Conclusions

This study has identified yet another nutrient that is potentially negatively impacted by an acid inhibitor, however it is likely that years will pass before someone will conduct the research to formally clarify any level of impact. Ultimately there is a decision to be made about whether to use new research and how to apply it responsibly so that any potential harm is mitigated.

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Case study

Medical History with Nutritional Aspect

Amputation	☐	Constipation	☐	Dysphagia	☐	MND	☐
Anaemia	☐	CVA	☐	Enteral Feed	☐	MS	☐
Arthritis	☐	CVD	☐	Falls	☐	Osteoporosis	☐
Cancer	☐	Dementia	☐	Fracture	☐	PD	☐
CCF	☐	Dentures	☐	Frailty	☐	Pressure Area	☐
Chest Infection	☐	Depression	☐	Gout	☐	Renal	☐
COAD	☐	DM Type 1	☐	Hypertension	☐	Ulcer	☐
Confusion	☐	DM Type 2	☑	Incontinent	☑	UTI	☐

Food Allergies: fish, pork (requires halal)

Other: IDA

Biochemistry with Pharmaconutritional Consequences

Na:	141	mmol/l	Hb:		g/L	Albumin:	44	g/L	BSL:		mmol/l
K:	4.7	mmol/l	Lymph:			Total Protein:	73	g/L	HbA1C:		
Urea:	5.1	mmol/l	MCV:		mmol/l	B12:		pmol/L	INR:		
Creatinine:	0.096	mmol/l	Zn:		umol/l	Folate:		nmol/L	TSH:		mIU/L

Other: eGFR >60, Fe 18, TRF 2.6, satn 28%, ferritin 260, chol 5.4, Tg 2.9

Medications That May Adversely Affect Nutritional Status

Drug	Vits + Mins	bpp >90%	N/V	C/D	Wt	App	Tst	Thir	Sal	Drlg	d m	Dys	BSL
Donepezil		☑	NV	CD	↓	↓	☐				☑	☐	☐
GLUCOVANCE	() 08:00, 17:00) B12	☑	NV	D	↕	↑	☑				☐	☐	☑
		▩					▩				▩	▩	▩

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Comments – medication and nutrition impacts (direct and indirect) only

Recent relevant available biochemistry within acceptable ranges.

BSLs - refuses to have them tested therefore advisable to check HbAc and clarify overall glycaemic control.

Diabetes drugs

- glucovance has a duration of 18-24 hours.

Diabetes drugs coverage

- before breakfast BSLs - minimal, if any, coverage from previous morning's dose; covered by previous evening's dose;
- before evening meal BSLs - minimal, if any, coverage from previous evening's dose; covered by current morning's dose.

Glibenclamide component of glucovance reduces long-chain fatty acid oxidation by inhibiting carnitine palmitoyltransferase; metformin component is a substrate for OCTN1 (Carnitine/Organic Cation Transporter) which functions as a major carnitine transporter. Advisable to monitor carnitine status.

Metformin component of glucovance decreases B12 absorption - there is now a recommendation to monitor B12 status on a regular basis ie at least annually. Metformin's decrease on B12 status is not transitory, but is progressive ie the decrease persists and grows.

Bowels –

- no regular intervention prescribed

- no PRN interventions prescribed

- no Nurse Initiated interventions administered

Mr ABK is a charming Mediterranean man who indicated he was hungry and chose half a dozen sweet dry biscuits which he mostly ate - and shared some with his friends.

Given many of the thiamine transporters are negatively impacted by metformin and with a small contribution from donepezil, advisable to consider a small thiamine intervention administered at a different time from metformin and donepezil and monitor for effectiveness.

What else would you include?

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