Template

Entire dispensary

Review plan (10)

Back

Proton-pump Inhibitor Support

Template by Fullscript

Updated Jun 12th, 2024

Preview **Evidence**

Evidence rating

The following protocols were developed using only **a,b,c,d**-quality evidence

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Overview

Proton pump inhibitors (PPIs) are a class of medications commonly prescribed to reduce stomach acid production and treat conditions like gastroesophageal reflux disease (GERD) and peptic ulcers. While effective, their long-term use may be associated with different nutrient deficiencies. (Eusebi 2017)

The mechanism of PPIs primarily involves reduced stomach acid production. However, stomach acid is important for absorbing certain nutrients. Vitamin B12 absorption, for example, depends on sufficient gastric acid to separate the vitamin from food proteins. Similarly, stomach acid is needed for the optimal absorption of minerals like iron, zinc, and magnesium. Reductions in stomach acid can also affect vitamin C absorption, which is sensitive to changes in gastric pH. Consequently, prolonged use of PPIs may impair the body's ability to absorb these important nutrients, potentially leading to specific

deficiencies and related health concerns such as an increased risk of infection, kidney damage, and dementia. (Eusebi 2017)

Assessing nutrient levels before and throughout the course of PPI therapy, with subsequent tailored supplementation based on these findings, may benefit patients using PPI medications. (Eusebi 2017)

Vitamin C

Vitamin C

- **Maintenance: 90 mg per day (Office of Dietary Supplements n.d.)(U.S. Food & Drug Administration 2016)**
- **Correct deficiency: 200–500 mg per day of liposomal vitamin C (Davis 2016)**

- A one-month course of 40 mg per day of omeprazole reduced plasma vitamin C levels in both *Helicobacter pylori* positive and negative individuals independent of dietary intake, indicating decreased bioavailability of the vitamin due to increased gastric pH. (Henry 2005)
- When combined with dietary nitrate intake, omeprazole significantly decreased the gastric juice ascorbate/nitrite ratio, potentially increasing the risk of gastric cancer due to elevated levels of carcinogenic N-nitroso compounds. (Mowa 1999)

Vitamin B12

Vitamin B12

- **Maintenance: 2.4 mcg per day (U.S. Food & Drug Administration 2016)(Office of Dietary Supplements n.d.)**
- **Correct deficiency: 1,000–2,000 mcg per day of methylcobalamin (Wang 2018)**

- Two or more years' supply of PPIs was associated with a 65% increased risk for vitamin B12 deficiency compared to non-users. Doses more than 1.5 PPI pills per day were more strongly associated with vitamin B12 deficiency than were doses less than 0.75 pills per day. (Lam 2013)
- A 2021 cohort study examined 3,299 older adults. Participants taking higher PPI doses (≥30 mg per day) for more than six months had a significantly greater

prevalence (21%) of vitamin B12 deficiency. (Porter 2021)

- A retrospective cohort study reported a significant association between the chronic use of PPIs and the presence of anemia, showing a decrease in hematological values in PPI users. (Sarzynski 2011)

Iron

Iron

- **Maintenance: 18 mg per day of ferrous bisglycinate (U.S. Food & Drug Administration 2016)(Office of Dietary Supplements n.d.)**
- **Correct deficiency: 325–650 mg per day of ferrous bisglycinate (equivalent to 105–210 mg elemental iron) (Baird-Gunning 2016)**

- There was a significant association between PPI use and the development of iron deficiency anemia (IDA) in patients with celiac disease. (Hawkins 2023)
- PPIs directly impaired iron metabolism by increasing hepcidin levels, which inhibited iron absorption through the suppression of duodenal ferroportin. (Hamano 2020)
- In a retrospective cohort study, chronic use of PPIs was significantly associated with a decrease in hemoglobin and hematocrit levels, suggesting an increased risk of iron-deficiency anemia. (Sarzynski 2011)

Magnesium

Magnesium

- **Maintenance: 420 mg per day (U.S. Food & Drug Administration 2016)(Office of Dietary Supplements n.d.)**
- **Correct deficiency: 500–600 mg per day in divided doses (Agus 1999)**

Elevated doses of magnesium may induce loose stools, necessitating the adoption of the bowel tolerance method.

- Long-term PPI use was significantly associated with hypomagnesemia in hospitalized adult patients. (Kim 2015)
- A 2011 FDA report stated that prolonged use of prescription PPIs may lead to low serum magnesium levels, which can result in adverse events, such as muscle spasms,

irregular heartbeat, and seizures, and might necessitate the discontinuation of the drug in about one-quarter of the cases if magnesium supplementation alone does not resolve the issue. (FDA 2015)

- Hypomagnesemia was identified in 65 of 305 (21.3%) of participants taking PPIs for one year or longer, and the incidence increased as the age and duration of use increased. Patients using omeprazole had significantly lower magnesium levels than those using pantoprazole, rabeprazole, esomeprazole, and iansoprazole. (Yoldemir 2021)
- Long-term use of PPIs may cause severe hypomagnesemia, often accompanied by hypocalcemia and hypokalemia, which may lead to serious clinical issues such as arrhythmias. (Hoorn 2010)

Zinc

Zinc

- **Maintenance: 11 mg per day (U.S. Food & Drug Administration 2016)(Henderson 1995)**
- **Correct deficiency: 20–50 mg per day, depending on severity, for six months (Henderson 1995)**

- Long-term use of PPIs significantly reduced the absorption of supplemental zinc, leading to lower systemic zinc levels compared to healthy controls not using PPIs. (Farrell 2011)
- In an in-vitro and in-vivo study, the PPI drug pantoprazole suppressed the production of key immune-regulating cytokines IFN-γ and IL-2 in T cells by altering zinc distribution and downregulating the expression of Zip8 and transcription regulators pCREB and CREMα, suggesting that the use of pantoprazole may negatively affect the immune response. (Liu 2023)

References

1. Agus, Z. S. (1999). Hypomagnesemia. *Journal of the American Society of Nephrology*, *10*(7), 1616–1622. https://doi.org/10.1681/asn.v1071616
2. Baird-Gunning, J., & Bromley, J. (2016). Correcting iron deficiency. *Australian Prescriber*, *39*(6), 193–199. https://doi.org/10.18773/austprescr.2016.069

3. Davis, J. L., Paris, H. L., Beals, J. W., Binns, S. E., Giordano, G. R., Scalzo, R. L., Schweder, M. M., Blair, E., & Bell, C. (2016). Liposomal-encapsulated Ascorbic Acid: Influence on Vitamin C Bioavailability and Capacity to Protect against Ischemia–Reperfusion Injury. *Nutrition and Metabolic Insights*, *9*, NMI.S39764. https://doi.org/10.4137/nmi.s39764
4. Eusebi, L. H., Rabitti, S., Artesiani, M. L., Gelli, D., Montagnani, M., Zagari, R. M., & Bazzoli, F. (2017). Proton pump inhibitors: Risks of long-term use. *Journal of Gastroenterology and Hepatology*, *32*(7), 1295–1302. https://doi.org/10.1111/jgh.13737
5. Farrell, N. (2011). Proton pump inhibitors interfere with zinc absorption and zinc body stores. *Gastroenterology Research*. https://doi.org/10.4021/gr379w
6. Frequently asked questions for industry on Nutrition Facts Labeling requirements. (2016). In *U.S. Food & Drug Administration*. department of health and human services. https://s3.amazonaws.com/public-inspection.federalregister.gov/2016-11867.pdf
7. Hamano, H., Niimura, T., Horinouchi, Y., Zamami, Y., Takechi, K., Goda, M., Imanishi, M., Chuma, M., Izawa-Ishizawa, Y., Miyamoto, L., Fukushima, K., Fujino, H., Tsuchiya, K., Ishizawa, K., Tamaki, T., & Ikeda, Y. (2020). Proton pump inhibitors block iron absorption through direct regulation of hepcidin via the aryl hydrocarbon receptor-mediated pathway. *Toxicology Letters*, *318*, 86–91. https://doi.org/10.1016/j.toxlet.2019.10.016
8. Hawkins, S., Nighot, M., Dalessio, S., Zhu, J., Morris, N., & Clarke, K. (2023). Proton pump inhibitor use and iron deficiency anemia in celiac patients. *Digestive Diseases*, *42*(1), 25–30. https://doi.org/10.1159/000534800
9. Henderson, L. M., Brewer, G. J., Dressman, J. B., Swidan, S. Z., DuRoss, D. J., Adair, C. H., Barnett, J. L., & Berardi, R. R. (1995). Effect of intragastric pH on the absorption of oral zinc acetate and zinc oxide in young healthy volunteers. *JPEN, Journal of Parenteral and Enteral Nutrition/JPEN. Journal of Parenteral and Enteral Nutrition*, *19*(5), 393–397. https://doi.org/10.1177/0148607195019005393
10. Henry, E. B., Carswell, A., Wirz, A., Fyffe, V., & Mccoll, K. E. L. (2005). Proton pump inhibitors reduce the bioavailability of dietary vitamin C. *Alimentary Pharmacology & Therapeutics*, *22*(6), 539–545. https://doi.org/10.1111/j.1365-2036.2005.02568.x
11. Hoorn, E. J., Van Der Hoek, J., De Man, R. A., Kuipers, E. J., Bolwerk, C., & Zietse, R. (2010). A case series of Proton Pump Inhibitor–Induced Hypomagnesemia. *American Journal of Kidney Diseases*, *56*(1), 112–116. https://doi.org/10.1053/j.ajkd.2009.11.019
12. Kim, S., Lee, H., Park, C. H., Shim, C. N., Lee, H. J., Park, J. C., Shin, S. K., Lee, S. K., Lee, Y. C., Kim, H. Y., & Kang, D. R. (2015). Clinical predictors associated with Proton Pump Inhibitor–Induced Hypomagnesemia. *American Journal of Therapeutics*, *22*(1), 14–21. https://doi.org/10.1097/mjt.0b013e31829c4c71

13. Lam, J. R., Schneider, J. L., Zhao, W., & Corley, D. A. (2013). Proton pump inhibitor and histamine 2 receptor antagonist use and vitamin B12Deficiency. *JAMA*, *310*(22), 2435. https://doi.org/10.1001/jama.2013.280490
14. Liu, W., Jakobs, J., & Rink, L. (2023). Proton-Pump inhibitors suppress T cell response by shifting intracellular zinc distribution. *International Journal of Molecular Sciences*, *24*(2), 1191. https://doi.org/10.3390/ijms24021191
15. Mowat, C., Carswell, A., Wirz, A., & McColl, K. E. (1999). Omeprazole and dietary nitrate independently affect levels of vitamin C and nitrite in gastric juice. *Gastroenterology*, *116*(4), 813–822. https://doi.org/10.1016/s0016-5085(99)70064-8
16. *Office of Dietary Supplements – Iron*. (n.d.). https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/
17. *Office of Dietary Supplements – magnesium*. (n.d.). https://ods.od.nih.gov/factsheets/Magnesium-HealthProfessional/
18. *Office of Dietary Supplements – Vitamin B12*. (n.d.). https://ods.od.nih.gov/factsheets/VitaminB12-Consumer/
19. *Office of Dietary Supplements – Vitamin C*. (n.d.). https://ods.od.nih.gov/factsheets/VitaminC-Consumer/
20. *Office of Dietary Supplements – Zinc*. (n.d.). https://ods.od.nih.gov/factsheets/Zinc-HealthProfessional/
21. Porter, K. M., Hoey, L., Hughes, C. F., Ward, M., Clements, M., Strain, J., Cunningham, C., Casey, M. C., Tracey, F., O'Kane, M., Pentieva, K., McAnena, L., McCarroll, K., Laird, E., Molloy, A. M., & McNulty, H. (2021). Associations of atrophic gastritis and proton-pump inhibitor drug use with vitamin B-12 status, and the impact of fortified foods, in older adults. *the American Journal of Clinical Nutrition*, *114*(4), 1286–1294. https://doi.org/10.1093/ajcn/nqab193
22. Research, C. F. D. E. A. (2017, August 4). *FDA Drug Safety Communication: Low magnesium levels can be associated with long-term use of Proton Pump Inhibitor drugs (PPIs)*. U.S. Food And Drug Administration. https://www.fda.gov/drugs/drug-safety-and-availability/fda-drug-safety-communication-low-magnesium-levels-can-be-associated-long-term-use-proton-pump
23. Sarzynski, E., Puttarajappa, C., Xie, Y., Grover, M., & Laird-Fick, H. (2011). Association between proton pump inhibitor use and anemia: a retrospective cohort study. *Digestive Diseases and Sciences*, *56*(8), 2349–2353. https://doi.org/10.1007/s10620-011-1589-y
24. Wang, H., Li, L., Qin, L. L., Song, Y., Vidal-Alaball, J., & Liu, T. H. (2018). Oral vitamin B12versus intramuscular vitamin B12for vitamin B12deficiency. *Cochrane Library*, *2018*(3). https://doi.org/10.1002/14651858.cd004655.pub3

25. Yoldemir, Ş. A., Ozturk, G. Z., Akarsu, M., & Ozcan, M. (2021). Is there a correlation between hypomagnesemia linked to long-term proton pump inhibitor use and the active agent? *Wiener Klinische Wochenschrift*, *134*(3–4), 104–109. https://doi.org/10.1007/s00508-021-01834-x

Template

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†Claims based on traditional homeopathic practice, not accepted medical evidence. Not FDA evaluated.