

## 77. HOMOCYSTEINE

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**Q: “I had a blood clot in my leg (DVT) due to elevated homocysteine levels. My doctor wants me to go take a folic acid vitamin pill. I went to the drug store and was a little overwhelmed – they have so many different folic acid tablets. What dose should I be taking?”**

A: 2.5 mg of folic acid often successfully lowers elevated homocysteine levels. An even better result can be obtained by taking a combination of folic acid, vitamin B6 and vitamin B12. Tablets containing a combination of these exist, making it easy to take the appropriate doses.

### What is homocysteine?

Homocysteine is a chemical present in the blood. It is a breakdown product of the amino acid methionine, which we take in with our food. Homocysteine is normally excreted in the urine.

### Why do some people have elevated levels?

Some people have an inherited reason to have elevated homocysteine levels (for example a mutation in the MTHFR enzyme, called homozygous MTHFR mutation – see also [Q/A 51](#)); other people have a deficiency in vitamin B12 or folate that results in elevated homocysteine levels. Patients with renal failure often have elevated levels; and in yet in other patients we do not know why their levels are high.

Elevated homocysteine levels in the blood can be classified as follows:

- Less than 13  $\mu\text{mol/L}$  = Normal
- 13-30  $\mu\text{mol/L}$  = Slightly elevated
- 30-60  $\mu\text{mol/L}$  = Moderately elevated
- Greater than 60  $\mu\text{mol/L}$  = Severely elevated

What do elevated levels do?

Elevated levels of homocysteine have been shown to increase the risk for:

- Atherosclerosis (= hardening of the arteries), that may lead to heart attack and stroke;
- Blood clots in the legs and veins (venous thromboembolism, such as deep venous thrombosis [DVT] and pulmonary embolism [PE]).

It is not understood how elevated homocysteine leads to blood vessel damage or blood clots.

How can you lower homocysteine levels?

Folic acid, vitamin B6, and vitamin B12 are involved in breaking down homocysteine in the blood. Therefore, taking folic acid, B6, and B12 may help lower the homocysteine level. It is not know whether lowering elevated homocysteine levels really leads to a lowering of the risk of blood clots and hardening of the arteries. However, many physicians recommend that homocysteine levels be normalized, since folic acid, vitamin B6, and vitamin B12 appear to be safe treatments.

The following chart contains information about prescription medications that combine folic acid, B6, and B12 into one tablet that can be taken once a day. This is the easiest way to normalize elevated levels.

| Brand name      | Folic Acid | Vitamin B6 = pyridoxine | Vitamin B12 = cyanocobalamin | Approximate Monthly Cost | Generic available |
|-----------------|------------|-------------------------|------------------------------|--------------------------|-------------------|
| Foltx®          | 2.5 mg     | 25 mg                   | 1000 mcg                     | \$20.69                  | Yes               |
| Folbee*         | 2.5 mg     | 25 mg                   | 1000 mcg                     | \$12.49                  | -                 |
| Folgard® Rx 2.2 | 2.5 mg     | 25 mg                   | 1000 mcg                     | \$14.01                  | No                |

\*generic for Foltx®

Regular non-prescription multiple vitamins are typically not sufficient, since they contain much less folic acid, B6 and B12, such as, for example:

| Brand name        | Folic Acid | Vitamin B6 = pyridoxine | Vitamin B12 = cyanocobalamin | Approximate Monthly Cost | Generic available |
|-------------------|------------|-------------------------|------------------------------|--------------------------|-------------------|
| Centrum®          | 0.4 mg     | 2 mg                    | 6 mcg                        | \$ 2.40                  | Yes               |
| Theragran M®      | 0.4 mg     | 2 mg                    | 12 mcg                       | \$ 1.50                  | Yes               |
| Folgard®          | 0.8 mg     | 10 mg                   | 115 mcg                      | \$ 6.50                  | No                |
| B complex vitamin | 0.4 mg     | 100 mg                  | 100 mcg                      | \$ 4.80                  | Yes               |

Pharmacies sell non-prescription folic acid, B6 and B12 as separate vitamins. An acceptable alternative to the prescription combinations would be to take 3 separate tablets of folic acid, vitamin B6 and vitamin B12. While this is a little cumbersome, since one has to take several different tablets a day, it is the least expensive method.

| Ingredients per tablet |                   |                         |                              |                           |                          |
|------------------------|-------------------|-------------------------|------------------------------|---------------------------|--------------------------|
| Name                   | Folic Acid        | Vitamin B6 = pyridoxine | Vitamin B12 = cyanocobalamin | Number of tablets per day | Approximate Monthly Cost |
| vitamin B6             | -                 | 50 mg                   | -                            | 1                         | \$ 0.90                  |
| vitamin B12            | -                 | -                       | 1000 mcg                     | 1                         | \$ 1.50                  |
| folic acid             | 0.8 mg(= 800 mcg) | -                       | -                            | 3                         | \$ 1.65                  |
|                        |                   |                         | Total per month              |                           | \$ 6.25                  |

There are many tablet strengths. Be sure to read the label and find the correct strength.

#### Comment

This Q/A was prepared in collaboration with Dr. Caron Misita, pharmacist in the University of North Carolina Thrombophilia Program.