### Vitamin B3

Maintains proper methylation of genes that suppress tumor formation and growth.<sup>3,4,5,6</sup>

### Vitamin B6

Cofactor for the enzyme (serine hydroxyl methyl transferase) that transfers methyl units.<sup>7,8</sup>

### Vitamin B12

B12 is a key enzyme needed in the synthesis of S-adenosylmethionine (SAMe), the body's most important methyl donor. Methionine synthase, an enzyme that catalyzes the methylation cycle is B12 dependent. 9,10,11

### **Folate**

Methyl donor for many reactions in the body, including neurotransmitter synthesis and conversion of homocysteine to methionine; Precursor to SAMe; Required for proper DNA synthesis. 12,13,14

### Vitamin B2

Helps recycle folate into a usable methyl-donor form; Precursor to FAD (flavin adenine dinucleotide) which assists methylation reactions. 1,2,3

### **Choline**

A major source of methyl groups (methyl donor); Deficiency linked to DNA damage. 15,16,17

### **Zinc**

Deficiency can lower the ability to use methyl groups from methyl donors such as SAMe, thus causing global hypo-methylation of DNA.<sup>32,33,34</sup>

### **Serine**

Important methyl donor, especially in the case of folate deficiency. 18,19,20

# METHYLATION

### **Glutathione**

Deficiency impairs methylation reactions and hinders synthesis of the methyl donor SAMe.<sup>21,22</sup>

### Selenium

Inhibits a methylating enzyme (DNA methyltransferase) in cancer genes, effectively turning them off; Selenoproteins protect DNA and metabolize methionine.<sup>30,31</sup>

### **Magnesium**

Its role in the methylation of genes that affect glucose metabolism may explain the link between magnesium deficiency and diabetes.<sup>28,29</sup>

## Vitamin C

Deficiency alters methylation patterns in cancer cells; Also a cofactor for methylating enzymes.<sup>23,24</sup>

### Copper

Several key enzymes needed for methylation reactions are copper dependent. 25,26,27

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