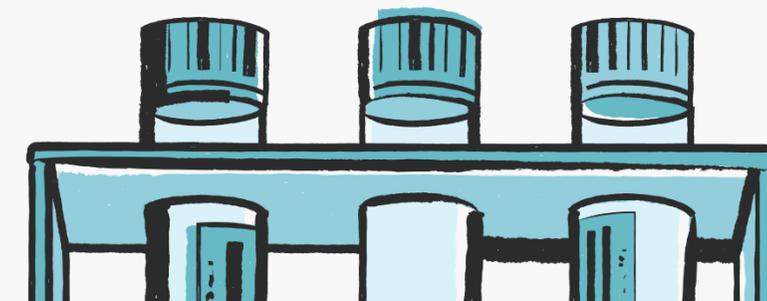
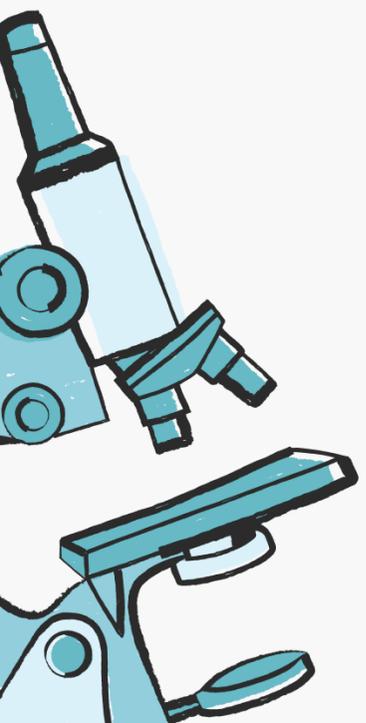
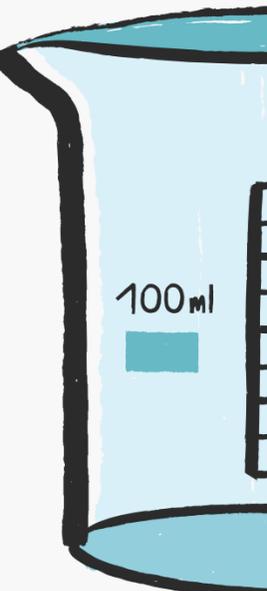




# VITAMINS – DEFINITION & CLASSIFICATION

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Medical Biochemistry



## **FOLIC ACID (VITAMIN B9)**

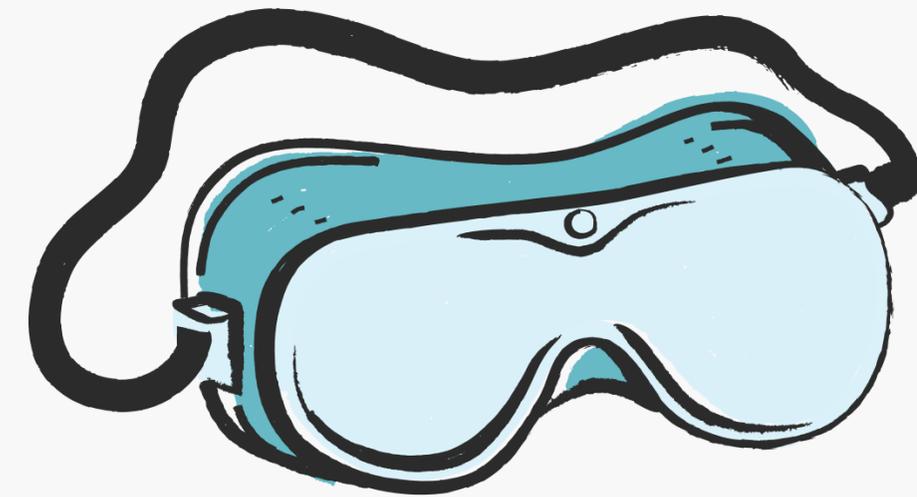
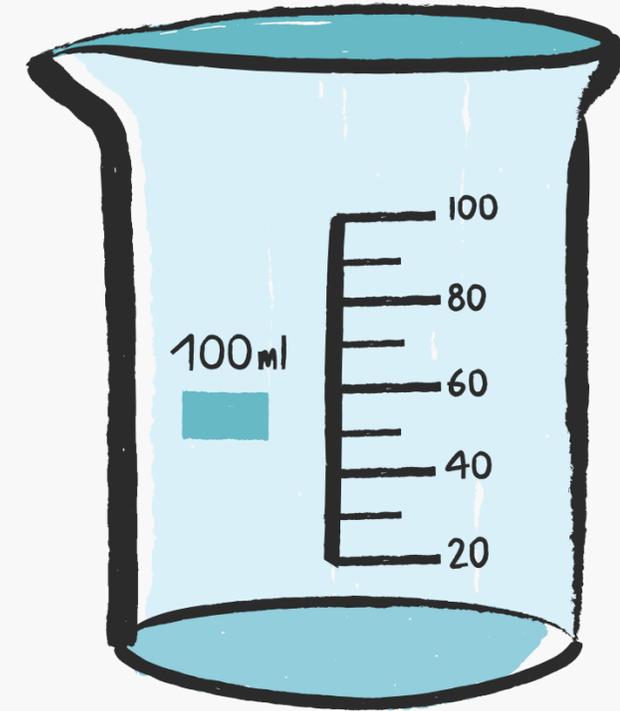
**Vitamin B9 describes many forms of naturally occurring folate. Folic acid is the synthetic form of folate that is used in supplements and in fortification of foods.**

**However, these two terms, folic acid and folate, are often used interchangeably. Folic acid plays a key role in one-carbon metabolism, and it is essential for the biosynthesis of several compounds.**

## **Function**

**Tetrahydrofolate (THF), the reduced, coenzyme form of folate, receives one-carbon fragments from donors such as serine, glycine**

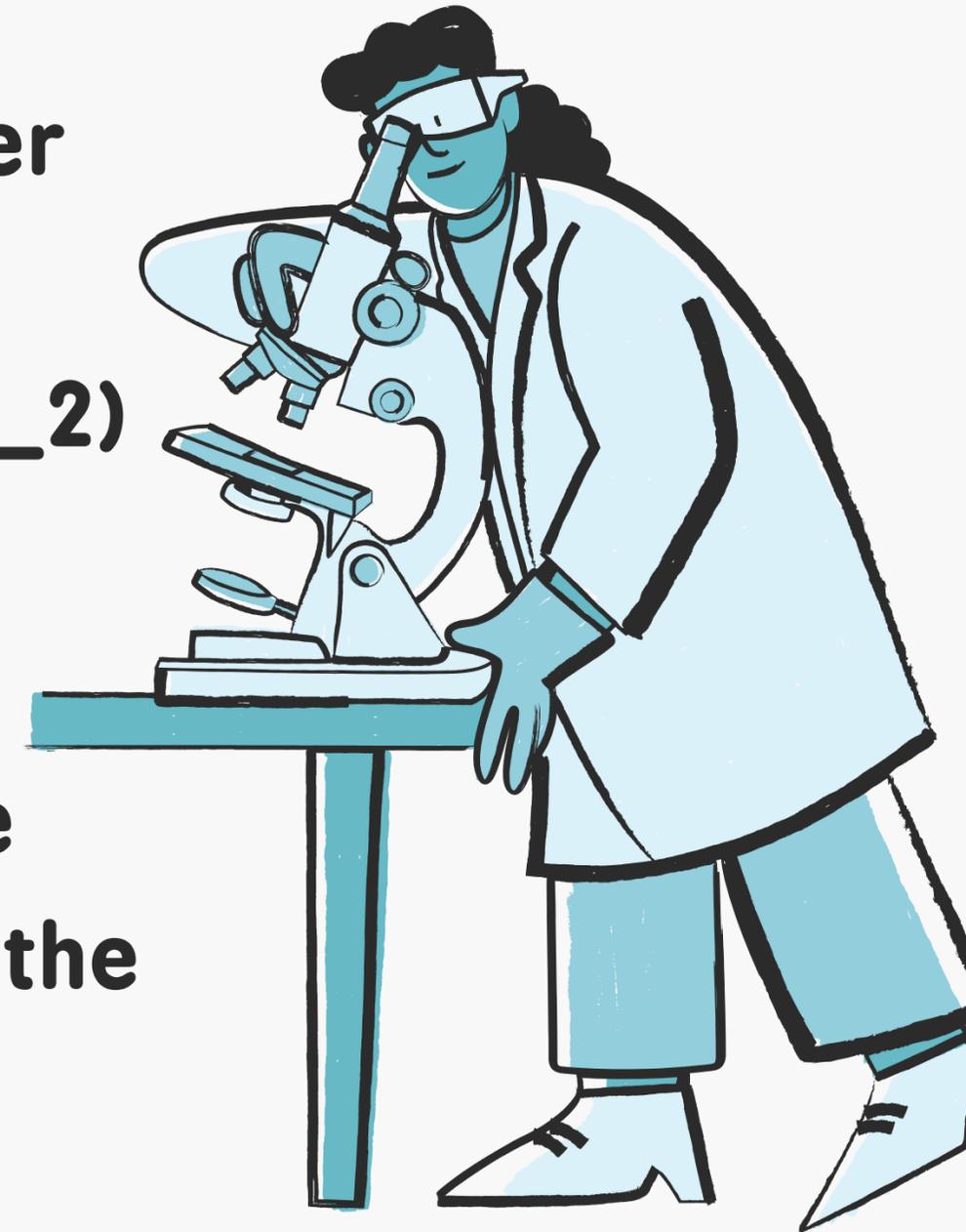
**and histidine and transfers them to intermediates in the synthesis of amino acids, purine nucleotides, and thymidine monophosphate (TMP), a pyrimidine nucleotide incorporated into DNA**



# Nutritional anemias

**Anemia is a condition in which the blood has a lower than normal concentration of hemoglobin, which results in a reduced ability to transport oxygen (O<sub>2</sub>)**  
**Nutritional anemias (i.e.)**

**those caused by inadequate intake of one or more essential nutrients) can be classified according to the size of the red blood cells (RBCs), or mean corpuscular volume (MCV), observed in the blood**



# Basic laboratory tools and their uses

01

**Microcytic anemia (MCV below normal), caused by lack of iron, is the most common form of nutritional anemia.**

02

**The second major category of nutritional anemia, macrocytic (MCV above normal), results from a deficiency in folic acid or vitamin B12.**

03

**Note: These macrocytic anemias are commonly called megaloblastic because a deficiency of either vitamin [or both] causes accumulation of large, immature RBC precursors, known as megaloblasts, in the bone marrow and the blood**

## **Folate and anemia**

**Inadequate serum levels of folate can be caused by increased demand (e.g., pregnancy and lactation), poor absorption caused by pathology of the small intestine  
alcoholism**

**or treatment with drugs (e.g., methotrexate) that are dihydrofolate reductase inhibitors**

**A folate-free diet can cause a deficiency within a few weeks**

**A primary result of folic acid deficiency is megaloblastic anemia  
caused by diminished synthesis of purine nucleotides and TMP**

**which leads to an inability of cells (including RBC precursors) to make DNA and,  
therefore, an inability to divide.**

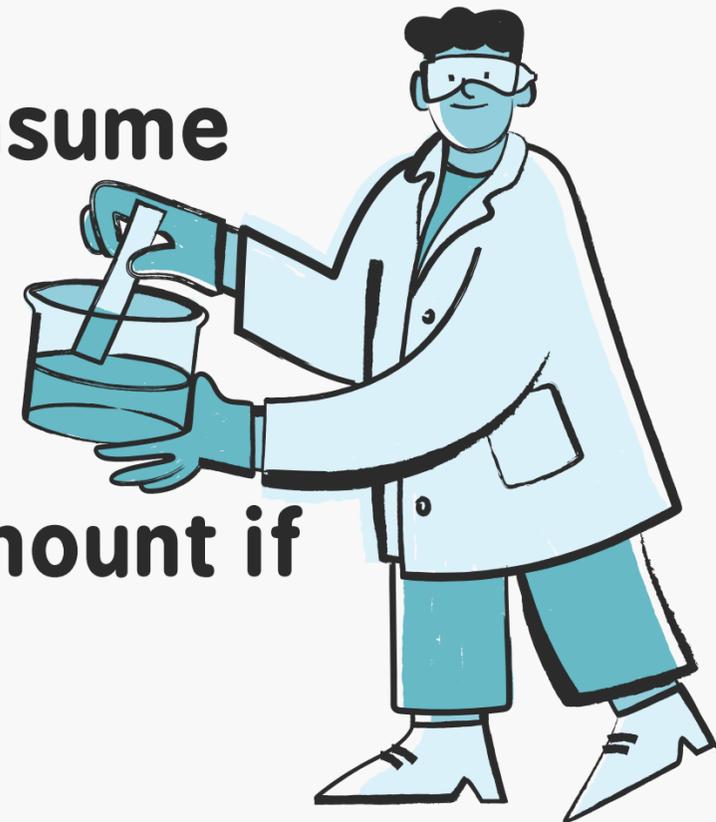
## **Folate and neural tube defects**

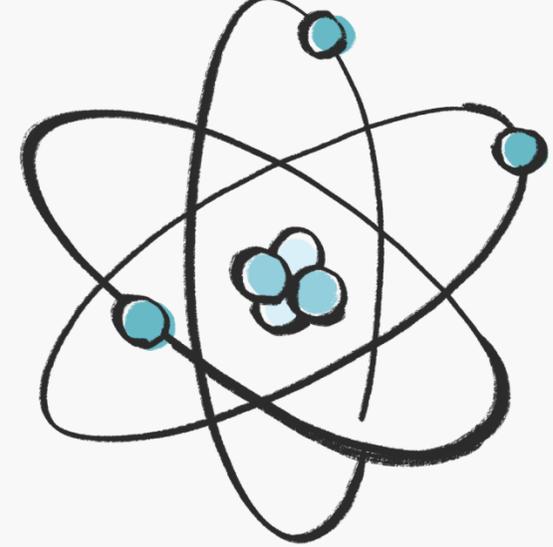
**Spina bifida and anencephaly, the most common neural tube defects (NTDs), affect ~3,000 pregnancies in the United States annually**

**Folic acid supplementation before conception and during the first trimester has been shown to significantly reduce NTD**

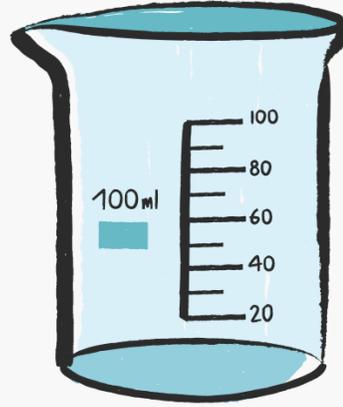
**Therefore, all women of childbearing age are advised to consume 0.4 mg/day (400  $\mu\text{g}$ /day) of folic acid to reduce the risk**

**of having a pregnancy affected by NTD and ten times that amount if a previous pregnancy was affected.**



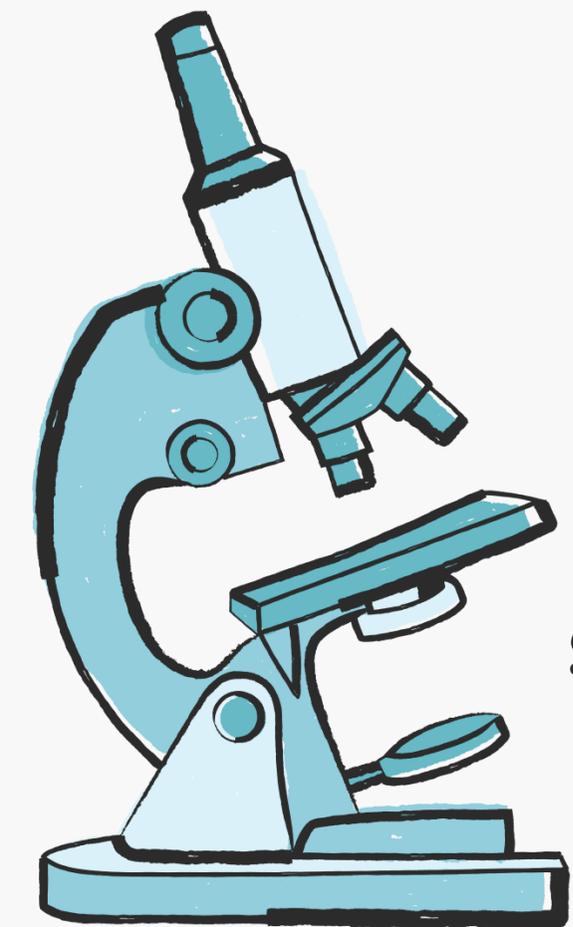


**Adequate folate nutrition must occur at the time of conception because critical folate-dependent development occurs in the first weeks of fetal life, at a time when many women are not yet aware of their pregnancy**



**In 1998, the U.S. Food and Drug Administration authorized the fortification of cereal grain products with folic acid and also recommended folate supplementation in the form of pills resulting**

**in a dietary supplementation of ~0.1 mg / day. This supplementation allows ~50% of all reproductive-aged women to receive 0.4 mg of folate from all sources.**



**THANK YOU FOR  
YOUR ATTENTION**

