



## Medallion Laboratories

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# FOLIC ACID (Folates)

## Technical Bulletin

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Folate is the generic name for a large group of chemically similar, water-soluble B-vitamins (pteroylpolyglutamates). Folic acid (pteroylmonoglutamic acid) is the stable, synthetic analog of this group of B-vitamins that is used most frequently for nutritional supplements. For nutritional labeling purposes, folate is expressed as folic acid. Folic acid does not occur naturally in food, but is found when diets are fortified or when naturally occurring folates are oxidized<sup>[1]</sup>. Naturally occurring folates in foods and feedstuffs are almost exclusively in reduced form as one carbon substituted polyglutamyl derivatives, with 5-methyltetrahydrofolate and 10-formyltetrahydrofolate being predominant<sup>[2]</sup>. Naturally occurring folates are usually present in trace amounts, hence the need for fortification of foods.

In their natural forms, or as dietary supplements, folates play an important role in preventing neural tube defects (NTD)<sup>[3]</sup> and occlusive vascular disease (OVD)<sup>[4]</sup>. Deficiencies of folates result in anemia, dermatologic lesions and poor growth in most species<sup>[2]</sup>. Other deficiency disorders such as cleft palate<sup>[5]</sup>, cervical, bronchial, colon and breast cancers<sup>[6-8]</sup>, Alzheimers disease<sup>[9]</sup>, and Down's syndrome<sup>[10]</sup> are thought to be influenced by folate.

### FOLATE CONTENTS OF SOME FOODS (NON-FORTIFIED)<sup>[2]</sup>

<b>FOOD</b>	<b>µg/100g</b>	<b>FOOD</b>	<b>µg/100g</b>
Milk	5-12	Barley	15
Cheese	20	Corn	35
Beef	5-18	Rice	15-25
Liver (beef & chicken)	140-1810	Wheat, whole	30-55
Apples	5	Wheat, bran	80
Bananas	30	Asparagus	70-175
Oranges	25	Beans	70

## ASSAY PRINCIPAL AND APPLICABILITY

(adapted from AACC 86-47)

This is a microbiological assay that employs the organism *Lactobacillus casei*, subsp. *rhamnosus* (ATCC no. 7469) to determine total folate in foods. The ground, homogenous sample is dissolved in a pH 7.8 phosphate buffer solution and autoclaved to break up particles, gelatinize starch, denature proteins to enhance enzymatic attack and destroy all strains of bacteria which might interfere with the test. Folate is extracted from the sample using a triple enzyme system. A protease and an amylase are used to digest the food matrix and aid in the release of folates. Chicken pancreas conjugase is used to hydrolyze pteroylpolyglutamates to pteroyldiglutamates, which, along with folic acid, can be utilized by the assay organism. The extract, diluted with a basal medium containing all required growth nutrients for the organism except folate, is inoculated with the organism and incubated for 22 hours at 37°C. The growth response of the organism (measured as turbidity at 600 nm) in the sample is compared quantitatively to that of known standard solutions of folic acid. This method is applicable to cereals, oils, beverages, vitamin concentrates and dairy products that contain added folate (folic acid) or other naturally occurring folates.

Detection Limit	5.0µg/100g (w/w)
Reporting Units	µg/100 g
Information required with sample	Estimate of folate level
Special Notes	Indicate if sample is a concentrate

## NUTRITION INFORMATION

### Recommended Daily Allowances

	<u>µg/day</u>
For labeling purposes:	400
Infants	65-80
Children	150-200
Pregnant Females	600
Lactating Females	500
Adult Females	300-400
Adult Males	300-400

## REFERENCES:

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- <sup>[7]</sup>T Kamei et al; Cancer **71**:2477-2483, 1993
- <sup>[8]</sup>ML Slattery et al; Cancer Epidemiol Biomarkers Prevention **8**:513-518, 1999
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- <sup>[10]</sup>SJ James et al; Am J Clin Nutr **70**:495-501, 1999

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