



Vitamin B6

Background

Vitamin B6 is a water-soluble and heat sensitive vitamin. Vitamin B6 performs a wide variety of functions in the body as a coenzyme in metabolism of protein, carbohydrates and lipids.

Vitamin B6 is a group of six related compounds, known as vitamers: pyridoxal, pyridoxine and pyridoxamine, and their 5'-phosphate forms (see table below). All these forms are present in food (EFSA, 2016). The main form found in human tissues is pyridoxal 5'-phosphate ([PLP](#)). Most PLP is stored in muscle, where it is bound to phosphorylase. Pyridoxamine 5'-phosphate ([PMP](#)) is the next most common form in human tissues. Plant foods mainly contain pyridoxine ([PN](#)) and pyridoxine 5'-phosphate ([PNP](#)), which may occur as glucosides.

Before absorption, phosphorylated forms of vitamin B₆, such as [PLP](#) and [PMP](#), are broken down in the intestine by phosphatases to non-phosphorylated forms. These forms are then absorbed by the intestinal mucosa and transported to the liver, where they can be converted back to phosphorylated forms. Large doses of [PLP](#) and [PMP](#) are generally well absorbed (Hamm et al 1979). By contrast, [PN](#) glucoside is less well absorbed. The main urinary breakdown product is 4-pyridoxic acid, which accounts for about half of the vitamin B₆ compounds found in urine (Shultz & Leklem, 1981).

Table 1 provides measurements and equivalences for various forms of Vitamin B6 compounds.

Table 1. Forms and equivalence of Vitamin B₆ compounds

Units of measurement			
Pyridoxine (PN)	1g = 5.9 mmol	1mmol = 170 mg	Three naturally inter-convertible forms in the tissues
Pyridoxal (PL)	1g = 6.0 mmol	1mmol = 167 mg	Three naturally inter-convertible forms in the tissues
Pyridoxamine (PM)	1g = 6.0 mmol	1mmol = 168 mg	Three naturally inter-convertible forms in the tissues
Pyridoxal-5-phosphate (PLP)	1g = 4.1 mmol	1mmol = 247 mg	Principal active form
4-Pyridoxic acid (4-PA)	1g = 5.5 mmol	1mmol = 183 mg	Principal excretory form
Pyridoxine hydrochloride (PN.HCl)	1g = 4.9 mmol	1mmol = 206 mg	Usual form of supplements

Vitamin B6 is found in a wide range of foods including organ meats, muscle meats, breakfast cereals, vegetables and fruits. Bioavailability is generally in the region of 75% in a mixed diet (Tarr et al., 1981). It has been proposed that vitamin B6 requirements may be increased at higher protein intake (Baker et al., 1964; Hansen et al., 1996b; Linkswiler, 1978), although other studies have not shown this (Pannemans et al., 1994). Nevertheless, protein intake is generally taken into consideration in setting requirements for vitamin B6.

Clinical deficiency is rare. Dietary requirements can generally be achieved without fortified foods or supplements. The symptoms of deficiency include peripheral neuropathy (Kramarz et al., 2024), seborrheic dermatitis (Mueller & Vilter, 1950), microcytic anaemia (Snyderman et al., 1953), convulsions (Bessey et al., 1957; Coursin, 1954) and depression and confusion (Hawkins & Barsky, 1948).

Indicators used to assess requirements have ranged from measures of vitamin concentrations in plasma, blood cell or urine to functional measures such as erythrocyte aminotransferase saturation by pyridoxal 5'-phosphate or tryptophan metabolites. Most of these indicators change with dietary intake, but there is little information about what level would indicate a deficiency state (Sherwood, 2019). A review (Lui et al., 1985) suggested that plasma PLP is probably the best single indicator as it reflects tissue stores.

Excess vitamin B6 is mainly associated with peripheral neuropathy, particularly after long-term use of high-dose supplements rather than normal dietary intake. The effect is mainly sensory and may include paraesthesia, hyperaesthesia, numbness, pain, impaired proprioception, sensory ataxia, balance problems, gait disturbance and, in severe cases, difficulty walking (SLR, 2006). Emerging evidence also suggests that pyridoxine toxicity may involve small fibre neuropathy, which can be associated with autonomic dysfunction (dysautonomia), although the evidence for these manifestations is currently limited and requires further investigation (Bacharach et al., 2017; Muhamad et al., 2023). The evidence suggests a dose-duration relationship, where higher intakes may cause symptoms sooner, while lower intakes may require longer exposure before symptoms appear. Evidence has shown symptoms to improve after stopping vitamin B6 supplements, however, it is unclear whether more severe symptoms take longer to abate or are less likely to fully resolve (SLR, 2006).

High vitamin B6 exposure is likely to come from supplements, fortified products and formulated caffeinated beverages (also known as energy drinks), rather than food alone. Supplements may contain more than 10 times the RDI for vitamin B6, whereas no foods naturally contain levels this high. Supplement use is a key consideration for the risk of excess vitamin B6 intake. Vitamin B6 is present in many multivitamin, B-complex, magnesium, zinc, as well as products marketed for stress, sleep, nerve support, immunity, depression, premenstrual symptoms or general wellbeing. Consumers may take more than one product without recognising their total exposure (TGA, 2026).

Recommendations by Life Stage and Sex

The following Nutrient Reference Values for vitamin B6 have been established for the Australian and New Zealand populations. These recommendations are based on the best available scientific evidence and are designed to meet the nutritional needs of the general population across different life stages while minimising the risk of both deficiency and excess intake from dietary supplements. People who need nuanced advice on recommended nutrient intakes due to specific health conditions, certain medication use or other circumstances should seek individualised advice from a health professional.

The terms ‘Male’ and ‘Female’ in the Nutrient Reference Values are used as population categories because some nutrient requirements are influenced by physiological characteristics, including hormonal and reproductive factors. These categories may not fully reflect the diversity of sex characteristics, gender identities and individual circumstances across the Australian population. People whose physiology or medical circumstances differ from the assumptions underlying these categories, including some transgender, gender diverse and intersex people, may benefit from personalised advice from an appropriately qualified health professional.

Nutritional Adequacy Recommendations

The [AIs](#) (Adequate Intake) for infants were reviewed in 2006. The Estimated Average Requirements ([EARs](#)) and Recommended Dietary Intake ([RDIs](#)) for children and adults were reviewed in 2006.

Infants

Table 1 provides recommendations for vitamin B6 intake in infants at different stages.

Table 2. Recommendations for vitamin B6 intake in infants

Age	AI
0-6 months	0.1 mg/day
7-12 months	0.3 mg/day

Abbreviations: AI, Adequate Intake

Rationale: The [AI](#) for 0-6 months is calculated by multiplying the average intake of breast milk (0.78 L/day) by the average concentration of vitamin B6 present in human milk (0.13 mg/L) based on the studies of West & Kirksey (1976). For 7-12 months, the [AI](#) was extrapolated from that of the younger infants using a metabolic weight ratio ([FNB:OM](#), 1998).

Children & Adolescents

Table 3 summarises EAR and RDI recommendations for children and adolescents for different age groups and sexes based on extrapolation from adult values.

For alternative children’s age groups aligned with National Nutrition Survey data or school-age groups, see Appendix A – Alternative age groups for preschool, primary school and adolescent populations.

Table 3. Vitamin B6 intake recommendations for children and adolescents

Age	EAR	RDI
Both sexes		
1 to under 4 years	0.4 mg/day	0.5 mg/day
4 to under 9 years	0.5 mg/day	0.6 mg/day
Males		
9 to under 14 years	0.8 mg/day	1.0 mg/day
14 to under 18 years	1.1 mg/day	1.3 mg/day
Females		
9 to under 14 years	0.8 mg/day	1.0 mg/day
14 to under 18 years	1.0 mg/day	1.2 mg/day

Abbreviations: EAR, Estimated Everage Requirement; RDI, Recommended Dietary Intake.

Rationale: As there are few data on children and adolescents, the [EARs](#) were set based on the adult [EARs](#) adjusted for metabolic body weight and growth ([FNB:IOM](#), 1998). In the absence of information on the standard deviation of requirement, the [RDI](#) was set assuming a [CV](#) of 10% for the [EAR](#).

Adults

Table 4 provides recommendations for daily vitamin B6 intake for adults by sex and life stage.

Table 4. Vitamin B6 intake recommendations for adults by life stage and sex

Age	EAR	RDI
Males		
18 to under 30 years	1.1 mg/day	1.3 mg/day
30 to under 50 years	1.1 mg/day	1.3 mg/day
50 to under 65 years	1.4 mg/day	1.7 mg/day
65 to under 75 years	1.4 mg/day	1.7 mg/day
75 years and older	1.4 mg/day	1.7 mg/day
Females		
18 to under 30 years	1.1 mg/day	1.3 mg/day
30 to under 50 years	1.1 mg/day	1.3 mg/day
50 to under 65 years	1.3 mg/day	1.5 mg/day
65 to under 75 years	1.3 mg/day	1.5 mg/day
75 years and older	1.3 mg/day	1.5 mg/day

Abbreviations: EAR, Estimated Everage Requirement; RDI, Recommended Dietary Intake.

Rationale: Clinical deficiency is rarely seen at intakes below 0.5 mg/day, but various depletion-repletion studies suggest an average daily requirement of 1.1 mg/day in younger men for maintenance of tissue stores, although the range of study results was quite wide (Baker et al., 1964; FNB:IOM, 1998; Linkswiler, 1978; Miller et al., 1985; Miller & Linkswiler, 1967; Selhub et al., 1993; Yess et al., 1964). For younger women, the average requirement seems to be similar (Brown et al., 1975; FNB:IOM, 1998; Hansen et al., 1997; Hansen et al., 1996a, 1996b; Huang et al., 1998; Kretsch et al., 1995). The [EAR](#) appears to be higher for older people (Madigan et al., 1998) and men have higher requirements than women. The increase due to age and gender appears to be about 0.2 to 0.3 mg of food vitamin B6 per day. [RDIs](#) for all groups were set assuming a [CV](#) of 10% for the [EAR](#).

Pregnancy

Table 5 provides recommendations for daily vitamin B6 intake for pregnancy. LEAPP Australia Pregnancy Care Guidelines state: 'Conditional recommendation against - Do not routinely recommend vitamin B6 supplementation during pregnancy' (ALEC, 2026)

Table 5. Vitamin B6 intake recommendations for during pregnancy

Age	EAR	RDI
Pregnancy (aged 14 and over)	1.6 mg/day	1.9 mg/day

Abbreviations: EAR, Estimated Everage Requirement; RDI, Recommended Dietary Intake.

Rationale: The EAR in pregnancy was based on additional requirements shown by studies of changes in plasma concentrations in pregnancy, foetal sequestration data and supplemental studies (Cleary et al., 1975; Contractor & Shane, 1970; Hamfelt & Tuvemo, 1972; Lumeng et al., 1976; Shane & Contractor, 1980) that suggested that an additional allowance of 0.5 mg/day was justifiable. Because of the approximation of this figure, the adolescent [EAR](#) was set at the same level as that for older women. The [RDI](#) was set assuming a [CV](#) of 10% for the [EAR](#).

Lactation

Table 6 provides recommendations for daily vitamin B6 intake for lactation.

Table 6. Vitamin B6 intake recommendations for during lactation

Age	EAR	RDI
Lactation (aged 14 and over)	1.7 mg/day	2.0 mg/day

Abbreviations: EAR, Estimated Everage Requirement; RDI, Recommended Dietary Intake.

Rationale: The vitamin B6 in breast milk varies according to maternal vitamin B6 levels. The amount of vitamin B6 required to increase breast milk by a small increment is much higher than that increment. Accordingly, the additional requirement in lactation is higher than that suggested by the amount secreted in milk (Borschel et al., 1986; West & Kirksey, 1976). To ensure a breast milk vitamin B6 concentration of 0.13 mg/L, five times that amount must be consumed in addition to the [EAR](#) of 1.1 mg for non-lactating women. Because of the approximation of the estimate, the adolescent [EAR](#) was set as for older women. The [RDI](#) is set assuming a [CV](#) of 10% for the [EAR](#).

Upper level of intake

Table 7 summarises Upper Level ([UL](#)) recommendations for children and adolescents for various age groups and life stages to avoid the risk of excessive vitamin B6 consumption. This [UL](#) for infants was not reviewed in the 2026 update. *For alternative children's age groups aligned with national nutrition survey intake data or school-age groups, see Appendix A – Alternative age groups for preschool, primary school and adolescent populations.*

Table 7. Upper levels of Vitamin B6 intake recommended to avoid the risk of excessive consumption

Age	UL
Infants	
0–12 months	<i>Not possible to establish; source of intake should be breast milk, formula or food only.</i>
Children & Adolescents	
Males	
1 to under 4 years	4.5 mg/day
4 to under 9 years	6.5 mg/day
9 to under 14 years	10.0 mg/day
14 to under 18 years	14.0 mg/day
Females	
1 to under 4 years	4.0 mg/day
4 to under 9 years	6.5 mg/day
9 to under 14 years	10.0 mg/day
14 to under 18 years	12.5 mg/day
Adults	
18 years and older	14.0 mg/day
Pregnancy & Lactation	
Pregnancy (aged 14 and over)	14.0 mg/day
Lactation (aged 14 and over)	14.0 mg/day

Abbreviations: UL, Upper Level.

Rationale: Recommendations were based on evidence from both human and animal studies examining the association between vitamin B6 intake and peripheral neuropathy, the critical adverse effect associated with excessive vitamin B6 exposure. Human evidence identified a

reference point of 50 mg/day, derived from a weight-of-evidence assessment across multiple converging lines of evidence, including the Dalton and Dalton (1987) case-control study, a positive rechallenge case, additional case reports, and nutrивigilance data. Animal evidence provided a reference point based on a dog [LOAEL](#) of 50 mg/kg body weight/day (Phillips et al. 1978), equivalent to 3,145 mg/day when scaled to an adult reference ideal body weight of 62.9kg.

For the human evidence, application of an Uncertainty Factor ([UF](#)) of 3, reflecting uncertainty in the threshold for adverse effects, limitations in the evidence base, and potential interindividual variability in susceptibility, resulted in a [UL](#) of 16.7 mg/day. For the animal evidence, application of an [UF](#) of 270, comprising factors for interspecies extrapolation, intraspecies variability, subchronic-to-chronic extrapolation and the absence of a [NOAEL](#), resulted in a UL of 11.6 mg/day. A [UL](#) of 14.2 mg/day was estimated as the midpoint between the human-derived UL (16.7 mg/day) and animal-derived [UL](#) (11.6 mg/day). This value was rounded down to 14 mg/day to provide a simple and health-protective guidance value. The selected [UL](#) reflects the balance of evidence across both human and animal studies and accounts for remaining uncertainties regarding susceptibility, duration of exposure and the dose-response relationship for peripheral neuropathy. For further information on the approach and rationale for deriving the UL, please see Vitamin B6 UL Evidence-to-Decision Framework (NHMRC 2026a).

As there is insufficient evidence for other age groups, [ULs](#) for children and adolescents were extrapolated from the adult recommendation on a metabolic body weight basis using reference weights from the NHMRC Methodological Framework (NHMRC 2026b). Calculated values were rounded down to the nearest 0.5 mg/day, consistent with the approach used by EFSA, which reported values to one decimal place. See Appendix A — Alternative age groups for children.

The adult [UL](#) was also applied to pregnant and lactating populations. There is currently insufficient evidence to indicate that pregnancy or lactation modifies susceptibility to vitamin B6-induced peripheral neuropathy at intake levels below the adult [UL](#).

Most of evidence for Vitamin B6 toxicity comes from pyridoxine, there is insufficient evidence for other vitamer forms. As the vitamer forms are inter-convertible in the body tissue, the [UL](#) applies to all forms based on a precautionary approach.

Appendix A — Alternative age groups for preschool, primary school and adolescent populations

To align with reporting age groups in the Australian Bureau of Statistics (ABS) National Nutrition Survey, ages have also been grouped to provide levels for preschoolers (2 to under 5 years), primary school age (5 to under 12 years) and adolescents (12 to under 18 years) in Table A1. The derivation of these values used the same methodology as outlined in the document above and is based on the same adult reference value. If you are not comparing to National Nutrition Survey data or school-age groups, you should use Table 3.

Recommendations

Nutritional Adequacy Recommendations

Table A1. Alternative age groups for preschool, primary school and adolescents – vitamin B6 intake recommendations

Age	EAR	RDI
Both sexes		
12 to under 24 months	n/a [^]	n/a [^]
2 to under 5 years	0.4 mg/day	0.5 mg/day
Males		
5 to under 12 years	0.6 mg/day	0.7 mg/day
12 to under 18 years	1.0 mg/day	1.2 mg/day
Females		
5 to under 12 years	0.6 mg/day	0.7 mg/day
12 to under 18 years	0.9 mg/day	1.2 mg/day

Abbreviations: EAR, Estimated Everage Requirement; RDI, Recommended Dietary Intake.

[^] data not available from ABS

Upper Level

For reporting usual intake against the national nutrition survey results, ages have also been grouped to provide levels for pre-school (2 to under 5 years), primary school age (5 to under 12 years) and adolescents (12 to under 18 years) in Table A2. The derivation of the values uses the same methodology as Table 7 and is based on the same reference adult value. If you are not comparing to survey intake data or school age groups, you should use the values in Table 7.

Table A2. Alternative age groups for preschool, primary school and adolescents – Upper Levels of vitamin B6 intake recommended to avoid the risk of excessive consumption

Age	UL
Males	
12 to under 24 months	4.0 mg/day
2 to under 5 years	5.0 mg/day
5 to under 12 years	8.0 mg/day
12 to under 18 years	13.0 mg/day
Females	
12 to under 24 months	3.5 mg/day
2 to under 5 years	5.0 mg/day
5 to under 12 years	8.0 mg/day
12 to under 18 years	12.0 mg/day

Abbreviations: UL, Upper Level.

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