

REPORT ON VITAMIN K2 AND CHEESE

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TITLE:

Menaquinones, Bacteria, and the Food Supply: The Relevance of Dairy and Fermented Food Products to Vitamin K Requirements

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Table 2

Representative ranges of measured menaquinone concentration in dairy foods and fermented food products¹

| Food | Menaquinones ² | | | | | | | Reference |
|---------------------|---------------------------|---------|---------|---------------------|----------|-----------|---------|--------------|
| | MK-4 | MK-5 | MK-6 | MK-7 | MK-8 | MK-9 | MK-10 | |
| Milk ³ | | | | | | | | |
| Whole | 0.8 | 0.1 | ND | ND–2.0 ⁴ | ND | ND | ND | (28, 29) |
| Buttermilk | 0.2 | 0.1 | 0.1 | 0.1 | 0.6 | 1.4 | ND | (28) |
| Yogurt ⁴ | | | | | | | | |
| Whole | 0.6–1.0 | 0.1–0.3 | ND–0.2 | ND–0.4 | 0.2–2.0 | ND–4.7 | ND | (27–29) |
| Skimmed | ND | ND | ND | ND | ND–0.1 | ND | ND | (28) |
| Cheese ⁴ | | | | | | | | |
| Curd | 0.4 | 0.1 | 0.2 | 0.3 | 5.1 | 18.7 | ND | (28) |
| Hard | 4.7–10.2 | 1.5 | ND–3.0 | ND–2.3 | ND–16.9 | ND–51.1 | ND–6.5 | (20, 28, 32) |
| Semihard | NR | NR | 1.0–3.5 | ND–2.1 | 2.5–7.3 | 10.0–32.1 | ND–13.8 | (32) |
| Soft | 3.7 | 0.3 | 0.4–2.6 | ND–1.7 | 2.1–14.0 | 6.6–94.0 | ND–5.7 | (28, 32) |

Table 3

Menaquinones produced by bacterial species commonly used in industrial food fermentations¹²

| Species/subspecies | Food use | MK- | MK- | MK- | MK- | MK- | MK- |
|--|---|-----|-----|-----|-----|-----|-----|
| | | 5 | 6 | 7 | 8 | 9 | 10 |
| <i>Lactococcus lactis</i> subsp. <i>lactis</i> | Cheese, buttermilk, sour cream, cottage cheese, cream cheese, kefir | √ | | √ | √ | √√ | |
| <i>Lactococcus lactis</i> subsp. <i>cremoris</i> | Cheese, buttermilk, sour cream, cottage cheese, cream cheese, kefir | | | √ | √ | √√ | |
| <i>Leuconostoc lactis</i> | Cheese | | | √ | √ | √√ | |
| <i>Brevibacterium linens</i> | Cheese | | | | √ | | |
| <i>Brochontrix thermosphacta</i> | Meat | √ | √ | √√ | | | |
| <i>Hafnia alvei</i> | Cheese | | | | √ | | |
| <i>Staphylococcus xylosus</i> | Dairy, sausage | | √ | √√ | √ | | |
| <i>Staphylococcus equorum</i> | Dairy, meat | | √ | √√ | √ | | |
| <i>Arthrobacter nicotinae</i> | Cheese | | | √ | √√ | √ | |
| <i>Bacillus subtilis</i> “natto” | Natto | | | √√ | | | |
| <i>Propionibacterium shermanii</i> | Cheese | | | | | √ | |

¹MK, menaquinone; √, minor form; √√, major form.

²Danisco internal data. Note that most species within the genera *Lactobacillus*, *Bifidobacterium*, and *Streptococcus* commonly used in fermentation or added to foods as probiotics are not known to produce MK.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3941825/table/tbl2/>

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