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## Fermented wheat germ extract

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#### Abstract and key points | What is it? | Does it work? | Is it safe? | References









- Fermented wheat germ extract (FWGE) is produced from wheat germs of the genus Triticum vulgaris.
- The active ingredient in FWGE is not yet known. It has been claimed that orally used FWGE offers beneficial effects for cancer
- patients during chemo- and/or radiotherapy. The evidence from clinical trials to support claims of efficacy is weak. The oral intake of FWGE seems to cause no harm.

Fermented wheat germ extract (FWGE) is industrially produced and in clinical use. The production of FWGE involves fermenting wheat germs of the genus *Triticum vulgaris* by adding baker's yeast (Saccharomyces cerevisiae). The medically active substances of FWGE are not yet known.

It has been proposed that 2,6-dimethoxy-p-benzoquinone and 2-methoxy benzoquinone found in wheat germ might act antiproliferative because of its high redox potential. FWGE is believed to increase efficacy of chemo- and radiotherapy, to reduce its side effects and to improve quality of life.

Although eight controlled clinical trials consistently reported positive results, the evidence for the claimed benefits is very weak, due to high risk of bias in trials published to this date. No placebo-controlled trials have been carried out. There is no toxicity known by the intake of FWGE. Side effects are rare and mild.

Document history

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What is it? Description

#### Wheat germ is the embryo portion of the wheat kernel. It is a concentrated source of

added again after processing. Fermented wheat germ extract (FWGE) is industrially produced and in clinical use. Scientific names/brand names FWGE involves fermenting wheat germs of the genus *Triticum vulgaris* by adding baker's

vitamins, minerals, and protein, and is sustained by the larger, starch storage region of the

kernel—the endosperm. During the production of wheat flour, the wheat germ is usually

removed. In whole wheat products, however, the wheat germ is either not removed or

yeast (Saccharomyces cerevisiae). FWGE is produced as an over-the-counter drug in more than ten countries and sold under the names Avemar, Avemar pulvis, Ave Ultra, MSC and Avé. Ingredients

The production of FWGE involves fermenting (i.e. transforming sugar into ethanol by

microorganisms) wheat germs of the genus Triticum vulgaris by adding baker's yeast

temperature. The process takes about 18 hours. The dried product which is available on

the market contains 63.2% FWGE and as technological addatives 35% maltodextrin and 1.8% kolloidal silicondioxid<sup>1.2,6</sup>. Dimethoxy-p-benzoquinone is used to standardize and

(Saccharomyces cerevisiae), adding filtered air and controlling the pH-level and

#### robustify the production process and amounts up to 0.4 mg/g are found in the final product. 2-Methoxy benzoquinone can also be detected in the final product $\frac{2}{3}$ .

Application and dosage FWGE is dissolved in water and applied orally. The author's of clinical trials used dosages of FWGE ranging from 8.5 g once to 9 g twice daily $\frac{3-6}{}$ . In a study of children the authors administred 12 g/m2/day<sup>4</sup>. A dose of 8.5 g/day contains 1.7 mg of 2,6-dimethoxyp-benzoquinone which is equivalent to the consumption of 700 g of whole wheat bread<sup>Z</sup>. According to the U.S. Department of Agriculture, individuals who are on a diet primarily based on whole wheat products have a daily intake of about 15 g wheat

History and providers

germ<sup>8-10</sup>.

The idea of using FWGE for medical purposes was introduced by Hungarian Nobel laureate for medicine Dr. Albert Szent-Györgyi. He proposed the conjecture, that the benzoquinone found in wheat germ might act antiproliferative because of its high redox potential 11. Later, a way of industrially producing FWGE was invented and patented by Hungarian biochemist Mate Hidvegi. Mechanism of action/alleged indications/claims of efficacy

## apoptotic and immune modulatory effect of FWGE. While Szent-Györgyi attributed the

No single substance has been found that could explain the claimed antimetastatic,

main effect to benzoquinones, it seems now most unlikely that these are the main active ingredients<sup>2,11</sup>. n vitro studies and animal studies (partly unpublished) suggest different mechanisms of action. Explanations of the effectiveness of FWGE include, i) impeding the repair

mechanisms of chemotherapy-induced damage in the DNA (inactivation of poly (ADPribose) polymerase)<sup>12</sup>, ii) improving the tumor defence of the body (impeding major histocompatibility complex class 1 expression  $\frac{13}{2}$ , increasing intercellular adhesion molecule 1 expression 14 or iii) impeding the growth of malignant cells by changing the metabolism (change in pentose phosphate pathway)<sup>12,13</sup>. Apoptosis induced by FWGE<sup>12,15</sup> and additive/synergistic effects of FWGE with 5-FU, Oxaliplatin and Irinotecan on different human cell cultures were observed in several in vitro studies 16. FWGE is used as a supplement to chemo- and radiotherapy in the treatment of solid, malignant tumors, as it is believed to improve both the success of treatment, as well as patients' quality of life<sup>3-6,17</sup>. Furthermore, there are claims that FWGE can be used in chemotherapy to reduce the risk of neutropenic fever  $\frac{18}{}$ . Prevalence of use

## The exact prevalence of use of FWGE is not known.

FWGE is available as a nutrient supplement in many countries.

Daily dosage costs up to €4 at current prices.

## Does it work?

Cost and expenditure

Legal issues

Eight controlled clinical trials in adults were carried out with patients diagnosed with head

survival times 4.5, two studies identified reduced relapse rates 3.5, three trials showed improved quality of life<sup>6,17,19</sup> and another study found reduced incidence of febrile neutropenia 18. However, the evidence that treatment with FWGE confers benefits to cancer patients is very weak, as all study data were at high risk of bias: only one study was a randomized clinical trial and all studies were open labelled, had small sample sizes, and poor reporting quality. All trials used the same patented FWGE from one manufacturer. Is it safe?

and neck cancer, malignant melanoma, and colorectal carcinoma and in children with diverse malignancies 3 4 5 6 17 18 19; they are described in **Table 1**. All trials reported

benefits of FWGE treatment: two studies found longer overall and progression-free

Adverse events The American Food and Drug Administration (FDA) considers FWGE to be safe<sup>13</sup>. Side effects of FWGE include diarrhoea, nausea and vomiting, flatulence and constipation<sup>5</sup>.

Studies in animals showed neither toxicity nor mutagenic potential of FWGE.

# Contraindications

There are no known contraindications. Interactions

In vitro experiments and animal studies showed no pharmacological interactions with

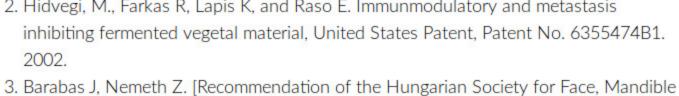
## agents used for chemotherapy $\frac{20}{2}$ . Warnings

There are no known warnings.

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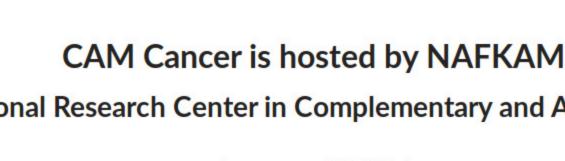
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Dietary approaches

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