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## DISEASE PREVENTIVE POTENTIAL OF

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# Fruit and Vegetables

A recent literature review, initiated by the German Nutrition Society and published in the *European Journal of Nutrition*, evaluates evidence from various studies and shows a considerable preventive potential of increased consumption of vegetables and fruit on a number of chronic diseases.<sup>2</sup> Study results were classified based on the overall strength of evidence regarding the preventive effect or a lack of an association between specific diseases and the consumption of vegetables and fruit.

### OVERALL FINDINGS

Based on a comprehensive analysis of the study results, the authors found:

**Convincing evidence** that increasing the consumption of fruit reduces the risk of hypertension, coronary heart disease, and stroke.

**Probable evidence** that

- The risk of cancer in general is inversely associated with fruit and vegetable consumption.
- There is no influence of increased consumption on the risk of type 2 diabetes mellitus, independent of overweight.

**Possible evidence** that

- Increased consumption of vegetables and fruit may prevent body weight gain, perhaps indirectly reducing the incidence of type 2 diabetes mellitus, since overweight is the most important risk factor for this disease.
- Increasing the consumption of vegetables and fruit lowers the risk of certain eye diseases, dementia, and the risk of osteoporosis.
- An increase in vegetable and fruit consumption may contribute to the prevention of asthma, COPD, and rheumatoid arthritis.

**Insufficient evidence** regarding an association between the consumption of vegetables and fruit and irritable bowel diseases, glaucoma, and diabetic retinopathy.

### DISCUSSION

This review shows a considerable preventive potential of an increase in consumption of vegetables and fruit by the general public in respect to a number of diseases. The chain of evidence according to the criteria of a risk-reducing effect with convincing evidence is well reflected in the available data on hypertension, coronary artery disease, and stroke. In contrast to these diseases, the risk-reducing effect of consumption of vegetables and fruit for cancer is assessed to be much smaller than in earlier evaluations, although the authors noted that an analysis of all fruit and vegetables and all cancers, as opposed to certain botanical families or certain cancer sites, can result in loss of information, but those details were beyond the scope of this review.

It should be noted that the strength of evidence neither indicates the degree of risk reduction nor the intake quantity that is necessary to achieve the risk-reducing effect. Such information cannot be derived from the presented data and was not a subject of this review.

### CONCLUSION

The risk-reducing effects of vegetable and fruit consumption are primarily the result of the influence of vegetables and fruit and their phytochemicals on inflammatory processes, cellular redox processes, and the endothelial and metabolic processes which are involved in the pathogenesis of various diseases.



This study used the following definitions to evaluate the association between fruit and vegetable consumption and 13 major diseases. These four different terms were assigned to categorize the level and strength of evidence:

***Convincing evidence***

At least 2 studies of the highest quality show consistent results

***Probable evidence***

Not less than 5 very good studies show consistent results but also noticeable weaknesses

***Possible evidence***

At least 3 studies show consistent results while a few other studies may show no risk relation or opposite risk relation.

***Insufficient evidence***

Data is lacking or a majority of the studies showed no risk relation or opposite risk relation.

## Association Between Fruit and Vegetable Consumption and Prevention of 13 Chronic Diseases

### HYPERTENSION

***Convincing evidence*** of the blood-pressure-lowering effect of an increase in the consumption of vegetables and fruit.

### CORONARY HEART DISEASE (CHD)

- ***Convincing evidence*** regarding the prevention of CHD by high consumption of vegetables and fruit.
- Protective association between the consumption of vegetables and fruit and the risk of CHD found in cohort studies.
- Intervention studies prove a beneficial influence of vegetables and fruit on metabolic pathways that are associated with the risk of CHD.

### STROKE

- ***Convincing evidence*** that a high intake of vegetables and fruit reduces the risk of stroke.
- Favorable influence of the consumption of vegetables and fruit seen on metabolic pathways which also have an impact on the risk of stroke.
- Inverse association indicated in cohort studies between the consumption of vegetables and fruit and the risk of stroke.

### TYPE 2 DIABETES MELLITUS

- ***Probable evidence*** that the risk of developing type 2 diabetes mellitus is not influenced by the consumption of vegetables and fruit.

- Vegetables and fruit indirectly influence the prevention of type 2 diabetes mellitus, as consumption might lower the risk of weight gain in adults.
- Risk of diabetes found to be significantly reduced in persons who consumed relatively large amounts of green leafy vegetables. (Other subgroups of vegetables and fruit have not been investigated.)

### OBESITY

- ***Probable evidence*** that an increase in vegetable and fruit consumption alone does not result in weight loss. Probable evidence that an increase in vegetable and fruit consumption leads to weight reduction, if this replaces food rich in fat or energy.
- ***Possible evidence*** that an increase in the consumption of vegetables and fruit contributes to weight stability (i.e., no weight increase occurs).
- ***Insufficient evidence*** available for children and adolescents regarding the association between vegetable and fruit consumption and weight development, due to a lack of intervention studies and the existence of only a few cohort studies showing no risk relation.

## CANCER

- **Probable evidence** of an inverse relationship between the consumption of vegetables and fruit and the risk of cancer.
- Risk reductions have been observed in some large cohort studies, suggesting that the consumption of vegetables and fruit influences the risk of cancer. This influence is only detectable if there are large differences in the consumption of vegetables and fruit between groups and could appear only in case of high exposure to carcinogens, like in smokers.

## DEMENTIA

- **Possible evidence** for a reduced risk of dementia with increasing consumption of vegetables and fruit; the consumption of vegetables seems more important than that of fruit.
- Daily consumption of vegetables and fruit compared to rare consumption was associated with a 30% risk reduction of dementia, including Alzheimer's, in one large cohort.
- Studies on cognitive performance suggest an inverse relation to the consumption of vegetables and fruit.

## ASTHMA

**Possible evidence** found regarding a protective effect of the consumption of vegetables and fruit in lowering the risk of asthma. Fruit intake seems to be more important than the consumption of vegetables.

## OSTEOPOROSIS

- **Possible evidence** that the prevention of osteoporosis is due to a higher consumption of vegetables and fruit.
- Another comprehensive literature review done by British experts concluded that a protective effect of a high intake of vegetables and fruit on bone health is possible, but the cause of this effect could not be determined.
- Many studies showed a positive association between the quantity of vegetable and/or fruit consumption and markers of bone health.

## EYE DISEASES

- **Possible evidence** regarding the prevention of macular degeneration and cataracts with higher consumption of vegetables and fruit.
- **Insufficient evidence** exists for the effect of vegetable and fruit intake on the risk of glaucoma and diabetic retinopathy, due to the lack of data.
- One cross-sectional study observed a lower risk for glaucoma with high intake of certain kinds of vegetables and fruit: for example, green collards and kale (-69%), fresh carrots (-64%), and canned or dried peaches (-47%).

## RHEUMATOID ARTHRITIS (RA)

- **Possible evidence** regarding the prevention of RA with a high intake of vegetables and fruit; rating reflects the low number of studies done.
- Some cohort studies show a reduced risk of RA with high consumption of vegetables and fruit.
- In the only available case-control study, a higher consumption of cooked vegetables (2.9 servings/day) was significantly associated with lower RA, while raw vegetables were not effective.

## CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

**Possible evidence** of the association between high intake of vegetables and fruit and the reduced risk of COPD, based on only a few cohort studies.

## CHRONIC INFLAMMATORY BOWEL DISEASES (IBD)

- **Insufficient evidence** regarding the association between the consumption of vegetables and fruit and the risk of developing IBDs.
- A high intake of fruit is associated with reduced risk of Crohn's disease, based on several case-control studies on Crohn's disease and ulcerative colitis. However, there was no statistical association found regarding vegetables.

## Common Consumer Question

*What form of fruit or vegetables is best?*

**Bottom line** Consume enough fruit and veggies each day, in whatever form fits your preference and lifestyle!

Buying a combination of fresh, canned, frozen, dried, and 100% juice minimizes waste, saves money, and assures that there is always a variety of fruit and vegetables available. Exclusively recommending one form of fruit or vegetable over another ignores the benefits of each form and limits consumer choices. Each form is full of important nutrients and phytochemicals.<sup>3, 4</sup>