

饮食与肺癌关系的 Meta 分析

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摘 要: [目的] 探讨饮食与肺癌发病的相互关系。[方法] 利用 Meta 分析专用软件 STATA 对我国 1990~2015 年间 55 篇公开发表的有关饮食因素与肺癌的病例对照研究资料进行定量综合分析。[结果] 酸食(OR=0.722, 95%CI:0.564~0.923)、辣食(OR=0.537, 95%CI:0.418~0.690)、蒜类食物(OR=0.773, 95%CI:0.668~0.894)、蔬菜(OR=0.578, 95%CI:0.495~0.675)、水果(OR=0.709, 95%CI:0.640~0.785)、豆类及其制品 (OR=0.634, 95%CI:0.445~0.903)、蛋类 (OR=0.527, 95%CI:0.378~0.736)、鱼类(OR=0.706, 95%CI:0.505~0.988)、维生素及胡萝卜素(OR=0.486, 95%CI:0.366~0.646)和饮茶(OR=0.622, 95%CI:0.542~0.713)是肺癌发病的保护因素。喜欢咸食(OR=2.114, 95%CI:1.542~2.898)、甜食(OR=1.509, 95%CI:1.186~1.920)、腌制食品(OR=1.504, 95%CI:1.177~1.922)、煎炸、烟熏或烧烤食品(OR=1.754, 95%CI:1.518~2.027)、动物内脏(OR=1.956, 95%CI:1.539~2.486)、食用动物油(OR=1.797, 95%CI:1.091~2.486)、少食蔬菜(OR=1.884, 95%CI:1.469~2.417)、少食水果 (OR=2.105, 95%CI:1.421~3.119)、少食奶制品及其制品(OR=1.470, 95%CI:1.025~2.107)、维生素及胡萝卜素摄入少(OR=1.647, 95%CI:1.305~2.080)和饮酒 (OR=1.382, 95%CI:1.213~1.575) 是肺癌发病的危险因素。食用植物油 (OR=0.968, 95%CI:0.434~2.158)、奶类及其制品 (OR=0.648, 95%CI:0.334~1.259)、肉类 (OR=0.823, 95%CI:0.641~1.055)、禽类(OR=0.763, 95%CI:0.433~1.347)、海产品(OR=0.686, 95%CI:0.417~1.130)、螺贝类(OR=0.609, 95%CI:0.248~1.494)、经常服用补品(OR=1.005, 95%CI:0.322~3.140)和高脂饮食(OR=1.397, 95%CI:0.769~2.540)对肺癌发病的作用无统计学意义。[结论] 饮食因素与肺癌发病密切相关,健康的饮食是肺癌发生的保护因素,不健康的饮食习惯可使肺癌的发病风险显著上升。

关键词: 肺癌;饮食;Meta 分析

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Relationship between Diet and Lung Cancer: A Meta-analysis

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Abstract: [Purpose] To investigate the relationship between diet and lung cancer through systemic review. [Method] Fifty-five published literatures of case-control studies on the relationship between dietary factors and lung cancer from 1995 to 2007 were collected and analyzed synthetically by software STATA for Meta-analysis. [Results] Acid food(OR=0.722, 95%CI:0.564~0.923), spicy food (OR=0.537, 95%CI:0.418~0.690), garlic food (OR=0.773, 95%CI:0.668~0.894), vegetables (OR=0.578, 95%CI:0.495~0.675), fruits (OR=0.709, 95%CI:0.640~0.785), bean and its products (OR=0.634, 95%CI:0.445~0.903), eggs (OR=0.527, 95%CI:0.378~0.736), fishes (OR=0.706, 95%CI:0.505~0.988), Vitamins and carotene(OR=0.486, 95%CI:0.366~0.646) and drinking tea(OR=0.622, 95%CI:0.542~0.713) were the protective factors of lung cancer. Diet with hyper salt (OR=2.114, 95%CI:1.542~2.898), sweet food(OR=1.509, 95%CI:1.186~1.920), pickle(OR=1.504, 95%CI:1.177~1.922), fried, smoked or grilled food (OR=1.754, 95%CI:1.518~2.027), animal viscera (OR=1.956, 95%CI:1.539~2.486), animal oil (OR=1.797, 95%CI:1.091~2.486), eating less vegetables(OR=1.884, 95%CI:1.469~2.417), eating less fruits(OR=2.105, 95%CI:1.421~3.119), less dairy (OR=1.470, 95%CI:1.025~2.107), less intake of vitamins and carotene (OR=1.647, 95%CI:1.305~2.080) and drinking wine (OR=1.382, 95%CI:1.213~1.575) were the risk factors of lung cancer. [Conclusion] Dietary factors are closely related to the incidence of lung cancer. Healthy diets are protective factors for lung cancer, while unhealthy diets can cause a significant increase in the risk of lung cancer.

Key words: lung cancer; diet; meta analysis

据统计,我国每年肺癌发病率的增长率为

26.9%,预计到2025年,我国将成为肺癌第一大国,肺癌病人数量将达到100万^[1]。吸烟已被证实是影响肺癌发病的重要因素,其他因素对肺癌发病也有一定影响,研究发现,健康的饮食习惯对肺癌发病具

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有保护作用,而不良的饮食习惯会增加肺癌发病的危险度。本研究对过去二十多年间发表的有关饮食因素与肺癌发病的病例对照研究文献进行综合分析,探讨饮食因素对肺癌发病的影响,为肺癌预防提供科学依据。

1 资料与方法

1.1 资料来源

通过中国期刊全文数据库、万方期刊数据库和维普期刊数据检索,检索策略:题名或摘要或关键词=‘肺癌’ and 题名或摘要或关键词=‘发病’ and 全文=‘饮食’,收集到国内 1974~2016 年间公开发表的研究饮食与肺癌关系的文献资料共计 600 多篇。

1.2 纳入标准

文献资料的纳入标准:①发表时间为 1974~2016 年;②国内发表的关于饮食与肺癌发病关系的分析性流行病学研究;③有明确规定的样本量;④提供原始数据 OR 值和 95%CI 或能转换成 OR 值和 95%CI 的数据;⑤可用相应的统计指标表达汇总的结果;⑥具有相似的暴露定义^[2,3]。

根据以上纳入标准,并参考 Lichtenstein 等的标准对收集到的 600 余篇文献进行质量评价和筛选,剔除研究质量差、不满足病例对照、重复报告、信息不完整而无法利用的文献后,最终纳入文献共计 55

篇^[4-58]。

1.3 统计分析

采用 Meta 分析专用软件 STATA 对筛选出的 55 篇文献进行分析。对研究文献所得的 OR 值进行异质性检验,当结果存在较为明显的异质性时,则采用随机效应模型;当结果不存在实质性异质性时,则采用固定效应模型^[3]。

2 结 果

2.1 研究资料基本情况

55 篇文献的发表时间是 1990~2015 年。本研究分别进行了喜欢酸食、甜食、咸食、辣食、蒜类食物、食用动物油、植物油、高脂饮食、少/多食蔬菜、少/多食水果、少/多食奶类及其制品、经常吃豆类及其制品、蛋类、鱼类、肉类、禽类、海产品、螺贝类、动物内脏、经常服用补品、维生素及胡萝卜素摄入多/少、经常吃腌制食品、煎炸烟熏或烧烤食品、有饮茶习惯以及有饮酒习惯与肺癌发病关系的 Meta 分析。

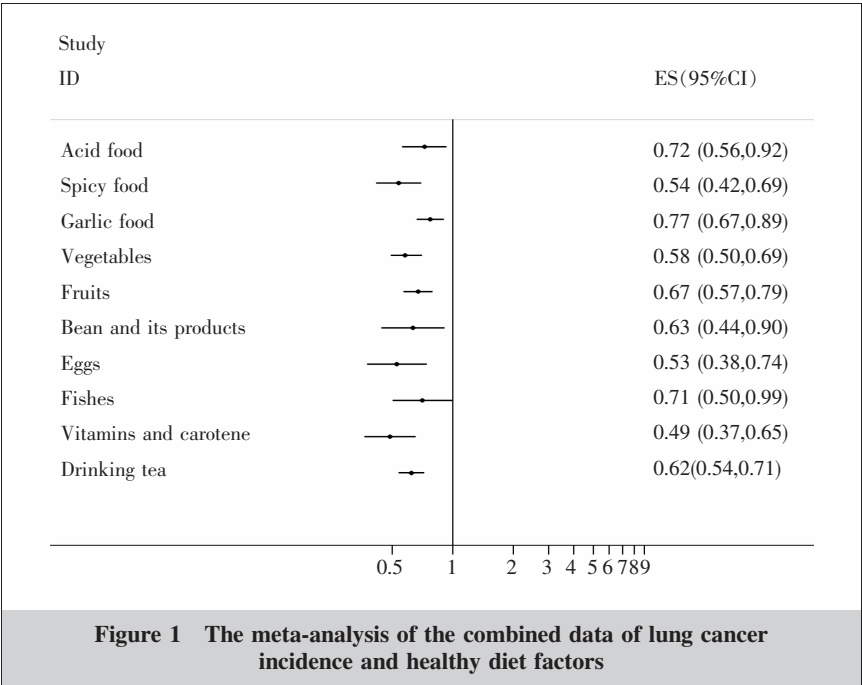
2.2 各饮食因素与肺癌的相关性分析

喜欢酸食和辣食、经常吃蒜类食物、新鲜蔬菜水果、豆类及其制品、蛋类、鱼类、维生素以及胡萝卜素、经常饮茶是肺癌发病的保护因素见 (Table 1, Figure 1)。

喜欢咸食和甜食、经常吃腌制食品、煎炸、烟熏

Table 1 The heterogeneity and the meta-analysis of the combined data of lung cancer incidence and healthy diet factors

Factors	Document number	Heterogeneity test		Effect model	The pooled OR(95%CI)
		χ^2	P		
Acid food	[14,26]	0.08	0.773	Fixed	0.722 (0.564~0.923)
				Random	0.722 (0.564~0.923)
Spicy food	[24,41]	1.50	0.221	Fixed	0.537 (0.418~0.690)
				Random	0.562 (0.390~0.808)
Garlic food	[24,31]	0.88	0.349	Fixed	0.773 (0.668~0.894)
				Random	0.773 (0.668~0.894)
Vegetables	[12,13,17,18,23,35,44,45,50]	13.29	0.102	Fixed	0.578 (0.495~0.675)
				Random	0.543 (0.423~0.695)
Fruits	[15,18,23,24,26,38~40,43,44,50]	16.69	0.054	Random	0.672 (0.574~0.785)
Bean and its products	[23,24,35,36,42,44,,50]	17.87	0.007	Random	0.634 (0.445~0.903)
Eggs	[25,40,44,46]	1.90	0.593	Fixed	0.527 (0.378~0.736)
				Random	0.527 (0.378~0.736)
Fishes	[24,25,50]	0.57	0.751	Fixed	0.706 (0.505~0.988)
				Random	0.706 (0.505~0.988)
Vitamins and carotene	[4,21,28,31]	1.75	0.626	Fixed	0.486 (0.366~0.646)
				Random	0.486 (0.366~0.646)
Drinking tea	[33,37,38,40,42,43,45,48~56,58]	60.33	<0.001	Random	0.622 (0.542~0.713)



或烧烤食品、动物内脏、食用动物油、少食蔬菜、少食水果、少食奶类及其制品、维生素以及胡萝卜素摄入少、经常饮酒是肺癌发病的危险因素（见 Figure 2, Table 2）。

结果非常接近,说明本次研究的合并结果较可靠。对于纳入的研究较少的指标,本次没有做漏斗图判断发表偏倚,对于纳入研究较多的指标做了漏斗图判断发表偏倚,大致对称(Figure 4~5)。

Table 2 The heterogeneity and the meta-analysis of the combined data of lung cancer incidence and diet risk factors

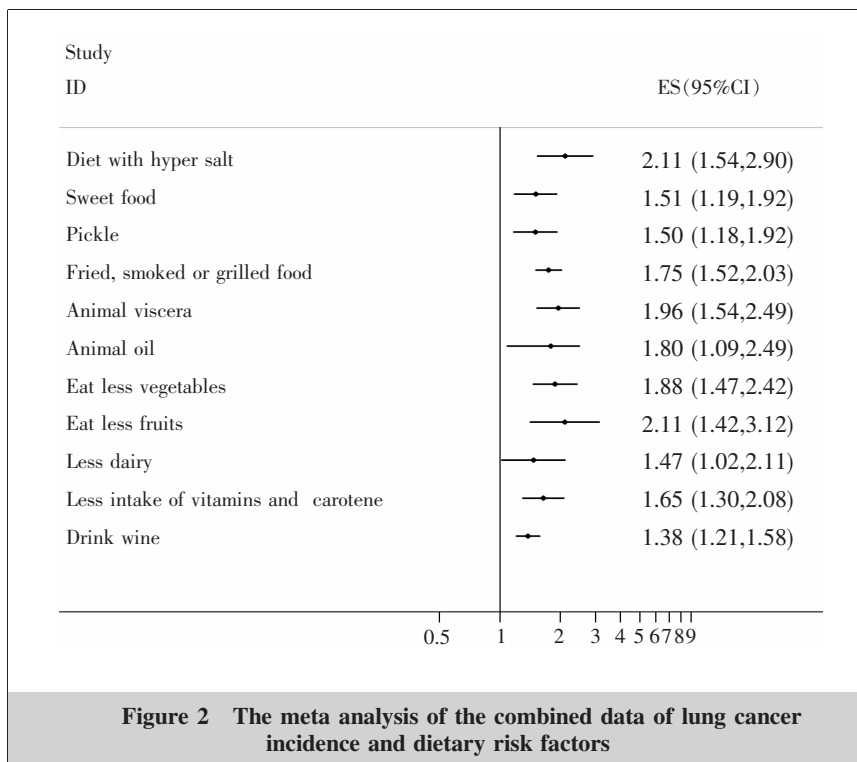
Factors	Document number	Heterogeneity test		Effect model	The pooled OR (95%CI)
		χ^2	P		
Diet with hyper salt	[22,25,39,41,50]	0.65	0.886	Fixed	2.114 (1.542~2.898)
				Random	2.114 (1.542~2.898)
Sweet food	[24,25,41]	1.97	0.161	Fixed	1.509 (1.186,1.920)
				Random	1.653 (1.042~2.622)
Pickle	[32,35,42,44,54,57,58]	19.34	0.004	Random	1.504(1.177~1.922)
Fried, smoked or grilled food	[13,17,35,44,45,50,54,57,58]	15.34	0.168	Fixed	1.754 (1.518~2.027)
				Random	1.835 (1.525~2.208)
Animal viscera	[19, 25]	0.36	0.550	Fixed	1.956 (1.539~2.486)
				Random	1.956 (1.539~2.486)
Animal oil	[17,24,26,45]	6.81	0.078	Random	1.797 (1.091~2.486)
Eat less vegetables	[7~9,11,26,27,46,56]	15.00	0.036	Random	1.884 (1.469~2.417)
Eat less fruits	[5,7,27,30,46]	15.86	0.003	Random	2.105 (1.421~3.119)
Less dairy	[30,46]	1.08	0.298	Fixed	1.470 (1.025~2.107)
				Random	1.468 (1.009~2.136)
Less intake of vitamins and carotene	[9,10]	1.65	0.648	Fixed	1.647 (1.305~2.080)
				Random	1.647 (1.305~2.080)
Drink wine	[6,16,20,25,27,29,34,41,42,45~47,49,52,53]	48.73	<0.001	Random	1.382 (1.213~1.575)

食用植物油、经常吃奶类及其制品、肉禽类、海产品、螺贝类、经常服用补品以及高脂饮食与肺癌发病无明显相关性（见 Table 3, Figure 3）。

2.3 敏感性分析与发表偏倚分析

本次 Meta 分析采用固定效应模型和随机效应模型分别计算 OR 值,并比较分析结果。对于无明显异质性的文献,采用两种模型计算,其结果的一致程度可在一定程度上反映合并结果的可靠性。

由 Table 1~3 可知,对于异质性检验无显著性的 15 个饮食因素分别用固定效应模型和随机效应模型估计其合并 OR 值,



3 讨论

目前有多项研究结果表明,煎炸、烟熏以及烧烤食品是公认的不健康食品,对各类癌症的发生均具有促进作用,肺癌也不例外。这些不健康食品不仅使食物丧失了它原有的营养价值还产生许多有害物质,如糖及脂肪会产生强致癌物质苯并芘,蛋白质和某些氨基酸经高温油炸后,产生一种热解衍生物二氮,致癌作用比苯并芘强 100 倍。此外,这些食品中丙烯酰胺的致癌性是香烟的 10 倍以上^[17,35]。另外,

经常吃高胆固醇食物也会增加患癌的概率,作用机制是食用过多的胆固醇后,引起胆酸增加,在肠内细菌的作用下,将这些物质转化成致癌物,所以应该避免多吃动物内脏和动物油^[19]。

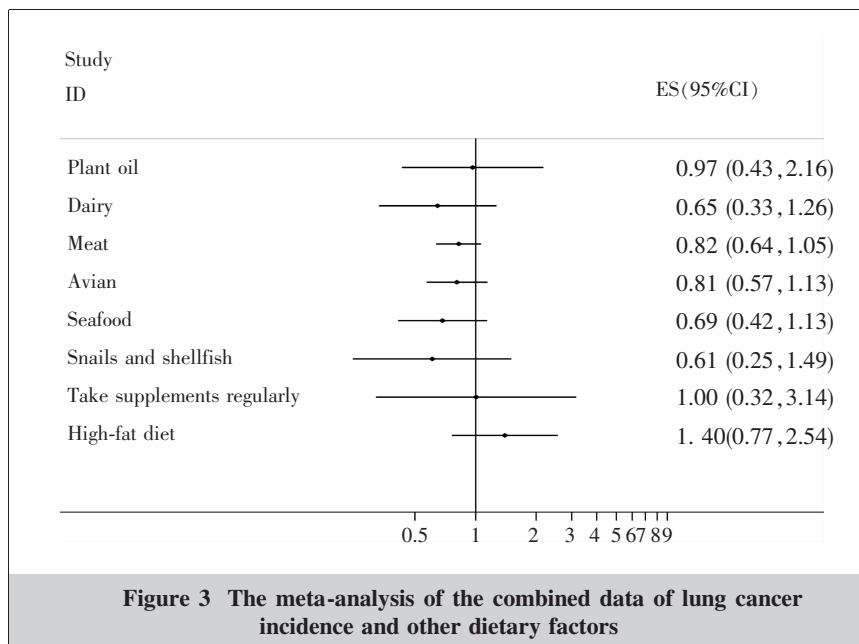
根据流行病学研究,一般的术语“盐”包括在烹调时盐的总量,也包括盐处理,包括盐和盐的食物。本次 Meta 分析提示喜欢吃咸食(即高盐饮食)和腌制食品是肺癌发病的危险因素,高盐饮食会促进幽门螺旋杆菌的繁殖,改变粘液的粘度,从而加剧 N-亚硝基化合物的暴露(已知的致癌物质)。而腌制食物中含有较多的亚硝酸盐,亚硝酸盐与氨基酸和低胺类反应,可形成亚硝胺和亚硝酰胺类致癌物质,从而

而增加癌症发病的风险^[59,60]。而蒜类食物不仅能阻断或减少亚硝胺化合物等致癌物的合成,阻断毒素、有毒化学物和重金属等致癌物的伤害,而且蒜类食物中富含硒和锗等微量元素有利于抑制癌细胞的生长。

本次分析结果显示饮酒也会增加肺癌发病的危险(OR=1.382,95%CI:1.213~1.575)。过度饮酒会对身体健康造成巨大的伤害,酒精致癌机制主要涉及乙醛及其主要代谢产物的致癌作用。一些分子病理生理的影响已经确定:与吸烟等不良习惯的互动下,

Table 3 The heterogeneity and the meta-analysis of the combined data of lung cancer incidence and other dietary factors

Factors	Document number	Heterogeneity test		Effect model	The pooled OR (95%CI)
		χ^2	P		
Plant oil	[21,23,41]	18.20	<0.001	Random	0.968 (0.434~2.158)
Dairy	[12,17,24,25,44]	20.00	<0.001	Random	0.648 (0.334~1.259)
Meat	[24,35,44,50]	3.64	0.457	Fixed	0.823 (0.641~1.055)
				Random	0.823 (0.641~1.055)
Avian	[44,50]	2.55	0.110	Fixed	0.807 (0.575~1.134)
				Random	0.763 (0.433~1.347)
Seafood	[22,24, 44,46,50]	21.29	<0.001	Random	0.686 (0.417~1.130)
Snails and shellfish	[24,50]	4.47	0.035	Random	0.609 (0.248~1.494)
Take supplements regularly	[31,41]	16.32	<0.001	Random	1.005 (0.322~3.140)
High-fat diet	[25,45,47]	12.49	0.006	Random	1.397 (0.769~2.540)



酒精先是氧化还原变化,形成自由基,导致肝损伤,引起性激素水平的升高和叶酸缺乏,从而产生致癌作用^[60]。

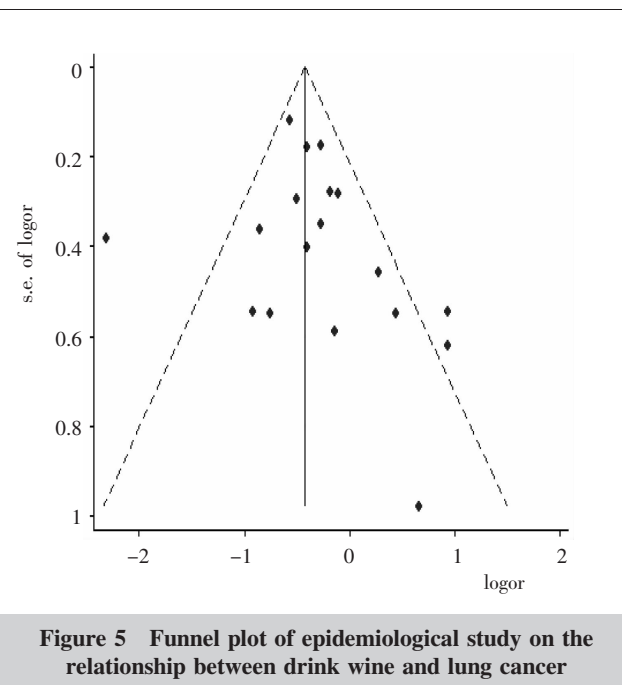
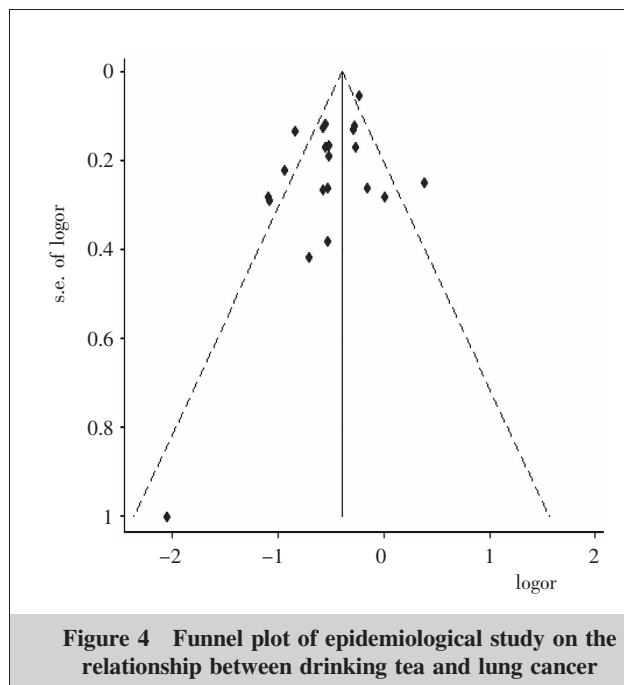
维生素和胡萝卜素都是抗氧化物,人体中过多氧自由基,会造成细胞损害,从而导致一些慢性疾病。维生素和胡萝卜素有促氧化作用,多吃富含维生素和胡萝卜素的蔬菜水果,有利于防止氧自由基对人体的伤害,对于预防一些慢性疾病有重要的重要,尤其是心脏病和癌症。由 Table 2 可知,摄入过

少的维生素和胡萝卜素会增加患肺癌的危险 (OR=1.647, 95%CI: 1.305~2.080), 但由其他研究可知,摄入过多会有反效果,如摄入过多胡萝卜素会增加吸烟者患肺癌的概率。少食蔬菜水果不仅会导致维生素和胡萝卜素摄入不足,而且也会导致纤维素摄入过低,从而增加患肺癌的概率。同时,经常饮茶也有抗氧化作用,对肺癌发病具有保护作用^[9,19,60]。

奶类及其制品是营养丰富的食品,含有碳水化合物、脂肪酸、蛋白质、维生素、矿物质等。然而,乳制品对人体健康的影响较复杂,乳制品对于预防癌症的作用

仍然有争议。一些研究表明,乳制品有利于癌症预防因其含有各种矿物质和维生素^[17,60]。但在本次分析中,经常吃奶类及其制品似乎并没有使患肺癌的风险降低 (OR=0.648, 95%CI: 0.334~1.259), 但平时奶类及其制品吃得少会增加患肺癌的危险 (其 OR=1.470, 95%CI: 1.025~2.107)。

总之,少饮酒、多吃蔬菜水果等健康的饮食习惯有利于降低患肺癌的概率。另外,养成良好的饮食习惯,有利于缓解肺癌患者病情的进展和肺癌的治愈。



由于肺癌患者单位时间内消耗能量高于正常人,所以应该补充足量的营养摄入,如蛋白质、维生素等,同时要多吃新鲜蔬菜水果。

本次研究采用多人、盲法对特征、设计、描述等多方面进行评价,消除了 Meta 分析中必然存在的偏倚,使 Meta 分析的可靠性得到有效保证。

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