

文献检索综合报告

羊栖菜活性多糖研究进展

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1 检索需求分析

检索需求分析，即课题分析，也就是经过对课题的初步分析，以及检索后根据对该课题的理解撰写。

羊栖菜多糖，首先需要对其进行了解。通过百度百科，维基百科，google 等搜索引擎的搜索，大致了解羊栖菜为何物？多糖为何物？羊栖菜多糖为何物？多糖活性为何物？关于活性，包括抗氧化，抗肿瘤，抗炎症，抗病毒等等，在多糖活性中，包括哪些已知抗性，此外我们可以有针对性的检索一种活性，比如抗氧化抗衰老活性，这样综述内容就会在宏观上有把控，在微观上有内容。

通过对羊栖菜多糖的初步了解，我们知道羊栖菜（*Sargassum fusiforme*）隶属于褐藻门马尾藻科马尾藻属，北起辽东半岛，南至雷州半岛，以浙江沿海最多。它是一种富营养的食用藻，享有“长寿菜”的盛誉。近年研究揭示，羊栖菜不仅是一种非常有潜力的天然抗氧化剂，而且对治疗肿瘤、心血管疾病、降低血糖和延缓衰老等方面都有一定的效果，具有广阔开发前景，日本已有相关饮品和保健品等销售。

现代研究发现，羊栖菜营养成分丰富，羊栖菜多糖（SFPS）是羊栖菜中最重要的活性成分之一。多糖含量高达 53.46%，利用高效毛细管电泳测定多糖组分由鼠李糖、葡萄糖、果糖、甘露糖和三种未知成分组成。近年来，通过药理试验表明，SFPS 在抗肿瘤，提高机体免疫力，降血脂，防治糖尿病，治疗老年痴呆等症都具有积极作用。目前羊栖菜多糖提取工艺趋于完整，纯化分级得到进一步完善，但对其发挥抗衰老作用的物质基础及作用途径仍缺乏认识。

通过以上分析，我们基本可以确定：

课题为羊栖菜活性多糖的研究进展。

2 数据库选择及主题词选择

2.1 选择检索工具（数据库）

检索工具名称	访问方式	检索年代	文献类型
百度百科搜索引擎	www.baidu.cn	-近几年	网页
超星电子图书	http://210.35.68.87:1089/	2000-2016	电子图书
中国期刊全文数据库（CNKI）	http://210.35.68.87/	2000-2016	期刊论文
万方数字化期刊全文数据库	http://210.35.68.87:8088/	2000-2016	期刊论文
维普中国科技期刊数据库	http://lib.cqvip.com/	2000-2016	期刊论文
Scopus	www.scopus.com	2000-2016	期刊论文
Web of Science	http://www.webofknowledge.com	2000-2016	期刊论文

ACS Publications	http://pubs.acs.org	2000-2016	期刊论文
RSC	http://pubs.rsc.org	2000-2016	期刊论文
Wiley Interscience	http://onlinelibrary.wiley.com/	2000-2016	期刊论文
ncbi	http://www.ncbi.nlm.nih.gov/	2000-2016	期刊论文
nature	http://www.nature.com/nature/index.html	2000-2016	期刊论文
science	http://www.sciencemag.org/	2000-2016	期刊论文

2.2 选择检索词

从课题字面选	从课题内涵选（同义词、近义词、上下位词）
羊栖菜/洋栖菜	马尾藻
多糖	褐藻糖胶
活性	抗衰老，抗氧化，抗肿瘤，抗炎

中文：（羊栖菜 or 洋栖菜） and (多糖 or 褐藻糖胶 or 褐藻胶 or 褐藻淀粉)

英文：("Hizikia fusiform*" or "Sargassum Fusiforme") and (Polysaccharide* or fucoidan or algin or laminaran)

2.3 拟定检索式

由于不同检索工具的字段不同，因此将检索式（亦称提问式）在“检索步骤及检索结果”的各个具体检索工具中给出。

3 检索步骤及检索结果

3.1 百度百科搜索引擎

3.1.1 检索式

A. 主题=羊栖菜 and 多糖 and 活性

3.1.2 检索步骤与结果

百度百科为您找到相关词条约6个

[羊栖菜多糖](#) [百度百科](#)

羊栖菜多糖具有显著抑制模型大鼠血中胆固醇、甘油三酯和低密度脂蛋白胆固醇的增长,升高高密度脂蛋白胆固醇的含量的作用。羊栖菜多糖能明显提高高糖糖尿病小鼠对糖的耐受能力...

2015-8-15

[羊栖菜](#) [百度百科](#)

羊栖菜(Hizikia fusiforme),一种藻类植物,别名鹿角尖、海菜芽、羊奶子、海大麦等。圆子纲,马尾藻科。藻体黄褐色,肥厚多汁,叶状体的变异很大,形状各种各样。株高...

2015-8-23

打开百度百科搜索：在第一行检索框内输入检索式 A，“and”用空格形式表示，得到约 6 条检索结果。经过筛选，选择其中 2 条：

[1]

【标题】羊栖菜多糖

【摘要】中文名称：羊栖菜提取物（羊栖菜多糖）英文名称：Sargassum powder extract(Sargassum fusiforme polysaccharide)植物来源：马尾藻科马尾藻属植物羊栖菜 Sargassum fusiforme (Hary) Seichell 提取精制而成。

【出处】百度百科

[2]

【标题】海藻多糖活性

【摘要】海藻生物活性物质大致可分为两种,一种是分子量较小,吸收后能直接或间接影响体内代谢物质,主要包括卤族化合物、萜类化合物、溴酚类化合物、对苯二酚、海藻单宁、昆布氨酸等;另一种是难以被消化吸收的细胞间粘性多糖,主要包括褐藻中的藻酸、褐藻糖胶、硫酸多糖、红藻中的琼胶、卡拉胶等。多糖是所有生命有机体的重要组分,并在控制细胞分裂、调节细胞生长以及维持生命有机体正常代谢等方面具有重要作用。

海藻多糖主要来自海带、鹿尾菜(羊栖菜)、巨藻、泡叶藻、墨角藻等海藻。海藻多糖主要包括褐藻胶、褐藻糖胶和褐藻淀粉。从海带中分离得到的褐藻胶、褐藻糖胶和褐藻淀粉粗品均为白色略带黄色的粉末。经纯化得到的褐藻酸钠为白色丝状物;褐藻糖胶为乳白色粉末;二者均溶于水、不溶于乙醇、丙酮、氯仿等有机溶剂。

【出处】百度百科

3.2 超星电子图书

3.2.1 检索式

B. 主题词=海洋*藻类

3.2.2 检索步骤与结果



用检索式 B 进行检索，命中 2 条结果：

[3]

【书名】海洋生物-藻类

【作者】张义浩等主编

【绪论】我们通常把小于 1 毫米左右的海藻统称为微型藻类：微型藻大多数为单细胞浮游藻类，个体很小，肉眼一般看不见，在水中营浮游生活，微型藻类繁殖力极强，只要环境条件适宜，常常在一天或几个小时里即能繁殖出自己的子代，如多数的硅藻都能一分为二、二分为四、四分为八……以几何级数快速繁殖，产生大量的后代。因此，在海洋及地球上的所有自然水域中，几乎都分布有硅藻，都有微型藻类的生长，

俗话说：“大鱼吃小鱼，小鱼吃虾米”，那么虾米吃什么呢？虾米就吃浮游藻类：海洋中只有藻类植物才能利用阳光进行光合作用，将二氧化碳(CO₂)和水(H₂O)转化成葡萄糖等有机物-其中葡萄糖最为重要，它是一种基本的有机物，在细胞里可以通过生物化学反应进一步转化成蛋白质、脂肪、核酸、维生素等其他有机物。由此，藻类植物就成了海洋中各种原生动物、微型动物、鱼、虾、蟹、贝类及其幼体的最初级饵料：据科学家测算，全世界海洋浮游藻类的年产量约在 5500 亿吨。它们是海洋动物最原始的基础饵料，是海洋中最初一级的有机物生产者，是形成海洋食物链的第一个环节-没有它们就没有海洋浮游动物，就没有鱼、虾、蟹、贝，也就谈不上海洋捕捞业、海洋动植物养殖业和水产食品工业。

海洋中到底有多少种微型藻类，现在还得出一个确切的数字。科学家们对海洋中数量最大的硅藻进行研究，已知有超过 10⁵ 个具有特征性的种(即包括变种、亚种、地理种等)，而可作为真正的种的记录也已超过 2 万种。可见，海洋微型藻类是一个资源巨大的宝库，有待我们去研究探索，以使其更好地为人类服务。

【出版】杭州：浙江大学出版社，2002

[4]

【书名】中国海洋浮游硅藻类

【作者】金德祥等著

【绪论】硅藻是具有色素体的单细胞植物，细胞壁富含硅质，多数生活在海洋和淡水中，有少数种类分布于潮湿的泥土里。根据硅藻的栖息状态，可划分为底栖的和浮游两类。浮游的一般没有行动器官，它们只能随波逐流。底栖的因具纵沟，故能活动水底。在近海的浮游生物群里，常杂有少量的底栖种类；在河口附近的海区，还有水种类出现。

在海洋中，除了沿岸的浅海地带高等藻类外，能够自制有机物的主要是浮游植物。浮游植物中大部分是浮游硅藻。浮游硅藻不但种类多，数量大，分布也广。它是浮游动物、贝类、鱼类以及须鲸类的直接或间接的饵料，是水域中动物机体的食物链中的一个重要环节。因此，浮游硅藻的盛衰必然会影响到浮游动物、经济鱼类和贝类的相应变化。渔场的位置，

往往亦可根据这些微小的植物及其与动物的相互关系决定的。

【出版】上海科学出版社, 1965

3.3 中国期刊全文数据库(CNKI)

3.3.1 检索式

C. 主题词=羊栖菜多糖*活性

3.3.2 检索步骤与结果

输入检索条件: (主题 羊栖菜多糖 并含 活性 精确)

从 不限 年到 不限 年 来源类别: 全部期刊 SCI来源期刊 EI来源期刊 核心期刊 CSSCI

检索 结果中检索

分组浏览: 学科 发表年度 基金 研究层次 作者 机构 免费订阅 定制检索式

2016(2)	2015(4)	2013(2)	2012(5)	2011(1)	2009(5)	2008(4)	2007(5)	2006(6)	2005(2)
2004(1)	2003(1)	2002(3)	2001(1)	2000(1)	>>				

排序: 主题排序 发表时间 被引 下载 切换到摘要 每页显示: 10 20 50

清除 导出 / 参考文献 分析 / 阅读 找到 46 条结果 浏览 1/3 下一页

<input type="checkbox"/>	篇名	作者	刊名	年/期	被引	下载	预览	分享
<input type="checkbox"/>	1 羊栖菜多糖对人肺癌细胞及肿瘤血管内皮细胞模型增殖活性的影响	况炜; 陈慧玲	现代实用医学	2011/03	16	162		
<input type="checkbox"/>	2 羊栖菜多糖对离体小鼠NK细胞活性和巨噬细胞功能的影响	陈慧玲; 况炜; 章	现代实用医学	2009/0	10			

用检索式 C 进行检索, 命中 46 条结果, 经过筛选, 选择其中 3 条:

[5]

【篇名】羊栖菜多糖药用活性的研究进展

【作者】李杰女, 汲晨锋, 季宇彬等

【摘要】:针对羊栖菜多糖的药用活性进行综述。其活性主要有抗肿瘤、调节免疫、降血脂血糖、抗氧化、抗血凝、增强内皮细胞增殖及对细胞氧化损伤的保护修复、促进生长发育、抗病毒等。

【出处】亚太传统医学, 2009 年 5 期

【原文】该数据库提供了全文。

[6]

【篇名】羊栖菜不同分子质量褐藻多酚抗氧化活性研究

【作者】杨小青, 卢虹玉, 李延平等。

【摘要】将羊栖菜(*Sargassum fusiforme*)经浸提、萃取和超滤等步骤获得不同分子质量的褐藻多酚。用普鲁士蓝法检测其总抗氧化能力; 采用 DPPH、羟自由基试剂盒、超氧阴离子试剂盒评价其对 DPPH、羟自由基和超氧阴离子的清除能力。结果显示, 羊栖菜褐藻多酚主要以高分子质量的形式存在; 乙酸乙酯相组分各项抗氧化指标均好于水相, 且乙酸乙酯相分子质量大于 30 000 组分对羟自由基与超氧阴离子的清除能力比没食子酸、Vc 和 VE 强。

【出处】中国海洋科学, 20013 年 4 期

【原文】该数据库提供了全文。

[7]

【篇名】羊栖菜多糖对高血脂模型大鼠血脂和抗氧化功能的影响

【作者】王尊文, 华玉琴, 李国平等。

【摘要】目的观察羊栖菜多糖对高血脂大鼠的降血脂和抗氧化作用。方法建立高血脂大鼠模型, 羊栖菜多糖(SFPS)0.4、0.8、1.6g · kg⁻¹ · d⁻¹灌肠给药4周, 比色法检测羊栖菜多糖对模型大鼠总胆固醇(TC)、甘油三酯(TG)、低密度脂蛋白胆固醇(LDL-C)、高密度脂蛋白胆固醇(HDL-C)和脂质过氧化物(LPO)、丙二醛(MDA)、超氧化物歧化酶(SOD)及谷胱甘肽过氧化物酶(GSH-Px)的影响。结果和结论羊栖菜多糖能显著降低高血脂模型大鼠血中TC、TG和LDL-C的含量, 降低LPO浓度和MDA含量, 同时升高HDL-C的含量, 增强SOD和GSH-Px的活性。

【出处】中国海洋药物杂志, 2008年12月第27卷

【原文】该数据库提供了全文。

3.4 万方数字化期刊全文数据库

3.4.1 检索式

D. 主题词=褐藻多糖*活性

3.4.2 检索步骤与结果

The screenshot shows the Wanfang Data search platform interface. At the top, there is a search bar with the text '褐藻多糖活性' and a search button. Below the search bar, there are navigation tabs for '学术论文', '期刊', '学位', '会议', '外文文献', '科技报告', '专利', '标准', '地方志', '成果', '法规', '机构', '图书', '专家', '学者'. The search results section shows '找到 299 篇论文'. On the left, there is a '学科分类' (Subject Classification) sidebar with categories like '医药、卫生' (124 articles), '工业技术' (56 articles), '生物科学' (53 articles), and '农业科学' (35 articles). The main search results list the first article: '海带褐藻多糖硫酸酯的抗氧化活性研究 (被引用 126 次)', published in '《中草药》' in 2003, by authors '张金斌', '于鹏展', '周革非', '李智昱', and '徐祖进'. A '相关学者' (Related Authors) sidebar lists names like '管华诗', '易杨华', '李智恩', '江晓路', '于广利', '耿美玉', '张全斌', '程忠玲', '牛锡珍', and '徐祖洪'.

用检索式 D 进行检索, 命中 299 条结果, 经过筛选, 选择其中 4 条:

[8]

【篇名】羊栖菜研究进展概述

【作者】张华芳

【摘要】概述了近 5 年来羊栖菜生药鉴定、化学成分及其药理作用的研究进展。

【出处】时珍国医国药, 2005 年 6 期

【原文】该数据库提供了全文。

[9]

【篇名】羊栖菜多糖抑脂沉积及其机制研究

【作者】姬云涛, 王娟, 张会等。

【文摘】目的 研究羊栖菜多糖(SFPS)对秀丽隐杆线虫脂肪沉积的影响, 并探讨其机制。方法 用不同浓度SFPS配制NGM培养同步化秀丽隐杆线虫, 经油红O染色后, 裂解虫体, 在490nm波长处测定吸光度值, 同时采用外翻肠囊法, 考察不同浓度SFPS被大鼠小肠吸收的情况。结果 在含不同浓度SFPS配制的NGM培养基上生长的线虫, 当SFPS浓度越高, 线虫吸光度值越小, 与对照组相比差异显著。在低剂量浓度下(<0.6mg/ml), 大鼠小肠对羊栖菜多糖吸收不明显。结论 SFPS可减少动物体内脂质含量, 其机制可能与小肠的吸收有关。

【出处】中国组织化学与细胞化学杂志, 2015 年 1 期

【原文】该数据库提供了全文。

[10]

【篇名】羊栖菜多糖活性研究评述

【作者】王润生，东方。

【文摘】目的：阐述羊栖菜多糖的主要药用活性以及作用机制。方法：检索查阅近年相关的实验文献资料，并进行归纳总结。结果：羊栖菜多糖在抗肿瘤、影响免疫功能、降血糖、降血脂等方面有显著的药理作用，并且毒副作用小。结论：羊栖菜多糖药用价值大，具有非常广阔的应用前景。

【出处】黑龙江医药，2013年5期

【原文】该数据库提供了全文。

[11]

【篇名】羊栖菜提取物抗动植物病原菌活性及化学成分初步分析

【作者】林雄平，郑怡，陈晓清。

【文摘】采用纸片法对羊栖菜 *Sargassum fusiforme* 脂类的不同极性组分和乙醇提取物的薄层层析(TLC)分离带进行抗动植物病原菌的实验，结果表明，羊栖菜脂溶性化合物以弱极性脂为主，但其强极性脂具有较强的抗玉米大斑病菌活性。乙醇提取物有4条TLC分离带，分别表现出不同程度的抗菌活性，其中Rf=0.16带对肠炎病病原菌的抑制作用最强，抑菌圈达12mm。GC-MS分析羊栖菜的薄层层析分离带的组分发现多以醇类为主，15-冠-5醚可能是其高活性的来源。

【出处】热带海洋学报，2009年2期

【原文】该数据库提供了全文。

3.5 维普中国科技期刊数据库 (<http://lib.cqvip.com/>)

3.5.1 检索式

E. (主题=羊栖菜多糖+活性)

3.5.2 检索步骤与结果

The screenshot displays the CQVIP (China Qianqian Periodical Resource Integration Service Platform) search interface. The search criteria are as follows:

- Time: 1989 - 2016
- Scope: 全部期刊 (All Journals)
- Subject: 选择学科 (Select Discipline)
- Search Term 1: 羊栖菜多糖 (Sargassum polysaccharide)
- Search Term 2: 活性 (Activity)
- Operator: 与 (AND)
- Buttons: 重新搜索 (Re-search), 在结果中搜索 (Search in results), 在结果中添加 (Add to results), 在结果中去除 (Remove from results), 检索 (Search), 清除 (Clear)

The search results section shows:

- 中文科技期刊数据库 > 检索结果
- 您的检索式: 13篇; 题名或关键词=羊栖菜多糖 并且 题名或关键词=活性
- 全选 清除 导出 已选 0 条
- 按时间筛选: 全部
- Result 1: 题名: 羊栖菜活性多糖的提取与生物活性研究进展

用检索式 E 进行检索，命中文献 13 条，经过筛选，选择 2 条：

[12]

【篇名】绣球菌多糖的提取及对果蝇寿命的影响

【作者】李颖，王翰，赵志强等

【摘要】[目的] 研究绣球菌多糖对果蝇寿命的影响。[方法] 采用热水浸提法从绣球菌中提取多糖，并采用三氯乙酸法对多糖进行纯化，并研究绣球菌多糖对果蝇寿命的影响，为绣球菌的开发利用提供试验依据。[结果] 热水浸提法提取的粗糖含量与得率分别为 47. 6%和 15. 26%；三氯乙酸法纯化后的多糖含量与得率分别为 58. 3%和 7. 7%。在 0. 2 ~ 5. 0 g/L 时，绣球菌多糖能延长果蝇的寿命和半数死亡时间。当绣球菌水溶粗多糖在 0. 2 g/L 时，雄果蝇平均寿命延长 26. 6%，半数死亡时间为(46. 4 ±2. 6) d，最高寿命为(55. 7 ± 1. 8) d，雄果蝇的寿命延长率最大。[结论] 绣球菌多糖对果蝇的寿命有延长作用，对雄性的抗衰老效果好于雌性。

【出处】安徽农业科学，2014 年 13 卷

【原文】该数据库提供了专利说明书全文。

[13]

【篇名】红芪多糖 3 作用小鼠胸腺组织蛋白双向电泳技术的建立

【作者】韦艳霞，卫东锋，程卫东等。

【摘要】目的 建立和优化红芪多糖 3(HPS-3) 作用后小鼠胸腺组织蛋白质组双向电泳技术方法。方法 采用标准裂解法提取 HPS-3 100 mg/(kg·d) 灌胃 14 d 小鼠的胸腺组织总蛋白，后续进行三氯乙酸(TCA) - 丙酮沉淀法和去脂蛋白纯化法获取胸腺组织蛋白，以固相 pH 梯度胶条进行双向凝胶电泳，并对等电聚焦程序进行改良和优化，同时将去脂蛋白纯化法运用于 A549 细胞蛋白的纯化并进行双向电泳，银染色后进行凝胶图像比较。结果 去脂蛋白纯化法不仅能减少蛋白降解，而且增加蛋白的溶解性，因此去脂蛋白纯化法所得蛋白的双向电泳图谱显示更好的溶解性和重复性，此外在双向凝胶电泳(2-DE) 时，聚焦电压在传统聚焦条件上进行优化，使横向和纵向拖尾有明显改善，成功建立了背景清晰，蛋白分离良好、分辨率较高的胸腺组织蛋白的双向电泳体系。去脂蛋白纯化法同样适用于 A549 细胞蛋白提取纯化。结论建立了 HPS-3 作用后小鼠胸腺组织蛋白质组提取纯化的方法，采用去脂蛋白纯化法可以更有效地提取胸腺组织蛋白。利用优化后的实验方法，获得了 HPS-3 作用后小鼠胸腺组织蛋白 2-DE 图谱，为后续研究打下基础。

【出处】时珍国医国药，2012 年 23 卷 7 期

【原文】该数据库提供了专利说明书全文。

3.6 Scopus

3.6.1 检索式

F. 主题词=active polysaccharide*SFPs

3.6.2 检索步骤与结果

搜索	通知	列表	手
TITLE-ABS-KEY (sargassum fusiforme) AND PUBYEAR > 1999 编辑 保存 设置通知 设置推送流			
111 文献搜索结果 查看次要文献 查看 4 个专利搜索结果 分析搜索结果 排序对象			
在搜索结果内搜索... <input type="text"/> 全部 导出 下载 查看引文格式 查看“施引文献” 添加新列表 更多...			
精简 <input type="button" value="限制范围"/> <input type="button" value="排除"/>	<input type="radio"/> Bioassay-guided extraction of crude fucose-containing sulphated polysaccharides from <i>Sargassum fusiforme</i> with response surface methodology Fu, Z., Li, H., Liu, H., (...), Wang, M., Guan, H. 2016 Journal of Ocean University View at Publisher		
年份 <input type="radio"/> 2016 (10) <input type="radio"/> 2015 (13) <input type="radio"/> ...	<input type="radio"/> Effects of hypo- and hypersalinity on photosynthetic performance of <i>Sargassum fusiforme</i> (Fucales, Heterokontophyta) Xie, X.J., Wang, X.L., Lin, L.D., (...), Wu, M.J., Wang, G.C. 2016 Photosynthetica View at Publisher		

用检索式 F 进行检索，命中 240 条结果，经过筛选，选择其中 8 条：

[14]

【篇名】 Bioassay-guided extraction of crude fucose-containing sulphated polysaccharides from *Sargassum fusiforme* with response surface methodology

【作者】 Fu, Z., Li, H., Liu, H., Hu, S., Li, Y., Wang, M., Guan, H.

【摘要】 The response surface methodology (RSM) combined with bioassays was employed to optimize the extraction process of crude fucose-containing sulphated polysaccharides (cFCSP) from *Sargassum fusiforme*. The central composite design (CCD) was used with four variables, five levels, and four responses. The four variables were pH value of hydrochloric acid solution, extraction temperature ($^{\circ}$ C), ratio of liquid to raw material (mL g^{-1}), and extraction time (h), respectively. Chemical and bioassay indices were used in combination as the response parameters, which included the yield of cFCSP, fucose content, proliferation rate of spleen cells, and lipopolysaccharide-induced proliferation of splenocytes. The experimental data were fitted to a second-order polynomial equation using multiple regression analysis, and examined using the appropriate statistical methods. The best extraction conditions were as follows: the pH value of hydrochloric acid solution was 3.50; the extraction temperature was 100° C; the ratio of liquid to raw material was 15.00 mL g^{-1} and the extraction time was 2.50 h. The experimental yield was close to the predicted from the model. The extract could promote spleen lymphocyte proliferation, especially the lipopolysaccharide-induced lymphocyte proliferation in vitro, which suggested that its immunomodulatory effect on B lymphocytes. Therefore, cFCSP extracted from *S. fusiforme* could be utilized as an immunostimulant in functional foods and pharmaceutical industry in future.

【出处】 Journal of Ocean University of China, Volume 15, Issue 3, 1 June 2016, Pages 533-540

【原文】 该数据库提供了全文。

[15]

【篇名】 Effects of hypo- and hypersalinity on photosynthetic performance of *Sargassum fusiforme* (Fucales, Heterokontophyta)

【作者】 Wang, X.L., Lin, L.D., He, L.W., Gu, W.H., Gao, S., Yan, X.F., Pan, G.H., Wu, M.J., Wang, G.C.

【文摘】 Photoprotection mechanisms protect photosynthetic organisms, especially under stress conditions, against photodamage that may inhibit photosynthesis. We investigated the effects of short-term immersion in hypo- and hypersalinity sea water on the photosynthesis and xanthophyll cycle in *Sargassum fusiforme* (Harvey) Setchell. The results indicated that under moderate light [$110 \mu \text{mol}(\text{photon}) \text{m}^{-2} \text{s}^{-1}$], the effective quantum yield of PSII was not reduced in *S. fusiforme* fronds after 1 h in hyposalinity conditions, even in fresh water, but it was

significantly affected by extreme hypersalinity treatment (90‰ sea water). Under high light [HL, $800 \mu \text{mol}(\text{photon}) \text{m}^{-2} \text{s}^{-1}$], photoprotective mechanisms operated efficiently in fronds immersed in fresh water as indicated by high reversible nonphotochemical quenching of chlorophyll fluorescence (NPQ) and de-epoxidation state; the quantum yield of PSII recovered during the subsequent relaxation period. In contrast, fronds immersed in 90‰ sea water did not withstand HL, barely developed reversible NPQ, and accumulated little antheraxanthin and zeaxanthin during HL, while recovery of the quantum yield of PSII was severely inhibited during the subsequent relaxation period. The data provided concrete evidence supporting the short-term tolerance of *S. fusiforme* to immersion in fresh water compared to hypersalinity conditions. The potential practical implications of these results were also discussed.

【出处】 *Photosynthetica*, Volume 54, Issue 2, 1 June 2016, Pages 210-218

【原文】 该数据库提供了全文。

[16]

【篇名】 Inactivation of murine norovirus-1 in the edible seaweeds *Capsosiphon fulvescens* and *Hizikia fusiforme* using gamma radiation

【作者】 Park, S.Y., Kang, S., Ha, S.D.

【文摘】 This study investigated the effects of gamma radiation (3-10 kGy) upon the inactivation of murine norovirus-1 (MNV-1), a human norovirus (NoV) surrogate. The edible green and brown algae, *fulvescens* (*Capsosiphon fulvescens*) and *fusiforme* (*Hizikia fusiforme*), respectively, were experimentally contaminated with 5-6 log₁₀ plaque forming units (PFU)/ml MNV-1. The titer of MNV-1 significantly decreased ($P < 0.05$) as the dose of gamma radiation increased. MNV-1 titer decreased to 1.16-2.46 log₁₀ PFU/ml in *fulvescens* and 0.37-2.21 log₁₀ PFU/ml in *fusiforme* following irradiation. However, all Hunters ('L', 'a' and 'b') and sensory qualities (appearance, color, flavor, texture and overall acceptability) were not significantly ($P > 0.05$) different in both algae following gamma radiation. The Weibull model was used to generate non-linear survival curves and to calculate G_d values for 1, 2, and 3 log₁₀ reductions of MNV-1 in *fulvescens* ($R^2 = 0.992$) and *fusiforme* ($R^2 = 0.988$). A G_d value of 1 (90% reduction) corresponded to 2.89 and 3.93 kGy in *fulvescens* and *fusiforme*, respectively. A G_d value of 2 (99% reduction) corresponded to 7.75 and 9.02 kGy in *fulvescens* and *fusiforme*, respectively, while a G_d value of 3 (99.9% reduction) in *fulvescens* and *fusiforme* corresponded with 13.83 and 14.93 kGy of gamma radiation, respectively. A combination of gamma radiation at medium doses and other treatments could be used to inactivate ≥ 3 log₁₀ PFU/ml NoV in seaweed. The inactivation kinetics due to gamma radiation against NoV in these algae might provide basic information for use in seaweed processing and distribution.

【出处】 *Food Microbiology*, Volume 56, June 01, 2016, Pages 80-86

【原文】 该数据库提供了全文。

[17]

【篇名】 Antimicrobial activity of some seaweeds species from Red sea, against multidrug resistant bacteria

【作者】 El Shafay, S.M., Ali, S.S., El-Sheekh, M.M.

【文摘】 This study evaluates the antibacterial activity of diethyl ether, methanol, ethanol and chloroform extracts of red algae *Ceramium rubrum* (Rhodophyta), *Sargassum vulgare*, *Sargassum fusiforme* and *Padina pavonia* (Phaeophyta) collected from Red sea, Egypt. The algal extracts were tested for their antibacterial activity against ten multidrug resistant clinical isolates of Gram

positive and Gram negative bacteria. The highest inhibition activity among all extracts was obtained with 100 μ l diethyl ether extract *S. fusiforme* against *Staphylococcus aureus* 2 and 50 μ l ethanol extract of *S. vulgare* against *Klebsiella pneumoniae*. The algal extract of *S. fusiforme* and *S. vulgare* was characterized by Gas chromatography-mass spectrometry (GC-MS). The compounds with antimicrobial activity were identified, such as phenols, terpenes, acetogenins, indoles, fatty acids and volatile halogenated hydrocarbons. Transmission electron microscopy was applied for determining the morphological changes in *S. aureus* 2 and *K. pneumoniae* treated with 100 μ l diethyl ether extract of *S. fusiforme* and 50 μ l ethanol extract of *S. vulgare*, respectively. Perforation of cell wall, leakage of cytoplasmic contents, severe distortion of outer cell shape, inner chromatin mild scattered cytoplasmic vacuolation, rupture of cell wall, and decreased cell size for both bacterial isolates treated with 100 μ l diethyl ether of *S. fusiforme* extract and 50 μ l *S. vulgare* ethanolic extract were recorded.

【出处】 Egyptian Journal of Aquatic Research, Volume 42, Issue 1, 1 March 2016, Pages 65-74

【原文】 该数据库提供了全文。

[18]

【篇名】 *Sargassum fusiforme* (Fucales, Phaeophyceae) has no characteristic stem in the genus *sargassum*

【作者】 Shimabukuro, H., Terawaki, T., Yoshida, G.

【文摘】 *Sargassum fusiforme* is a very useful product for fisheries and is well known in Japan; however there are few detailed reports about its morphological characteristics. This species was initially assigned to the genus *Cystophyllum* and was subsequently categorized in the genus *Turbinaria* because of a lack of distinction between its leaves and vesicles. Recently, this species was categorized in the genus *Sargassum* based on the results of molecular studies; however, a debate has arisen between researchers who propose that the species belongs to the genus *Sargassum* and those in Japan who maintain that it belongs to the genus *Hizikia*. This difference in opinion is caused by a large morphological variation in the leaves among the different latitudes in which the species grows. The leaves of *S. fusiforme* growing in temperate regions are narrow, while those growing in low-latitude regions are lanceolate with dentate margins. The branches of *Sargassum* spp. generally arise from the stems on the holdfast; however, the branches of *S. fusiforme* arise directly from the holdfast. The biennial *S. fusiforme* has no stem, which is a characteristic of the genus *Sargassum*. Having a short stem or not is not important as a characteristic of genus *Sargassum*.

【出处】 Journal of Japanese Botany, Volume 91, Issue 1, February 2016, Pages 33-40

【原文】 该数据库提供了全文。

[19]

【篇名】 Structural characterization and effect on anti-angiogenic activity of a fucoidan from *Sargassum fusiforme*

【作者】 Cong, Q., Chen, H., Liao, W., Xiao, F., Wang, P., Qin, Y., Dong, Q., Ding, K.

【文摘】 A fucoidan FP08S2 was isolated from the boiling-water extract of *Sargassum fusiforme*, purified by CaCl₂ precipitation and chromatography on DEAE-cellulose and Sephacryl S-300. FP08S2 contained fucose, xylose, galactose, mannose, glucuronic acid, and 20.8% sulfate. The sulfate groups were attached to diverse positions of fucose, xylose, mannose, and galactose

residues. The backbone of FP08S2 consisted of alternate 1,2-linked α -D-Manp and 1,4-linked β -D-GlcpA. Sugar composition analysis and ESI-MS revealed that the oligosaccharides from branches contained fucose, xylose, galactose, glucuronic acid and sulfate. FP08S2 could significantly inhibit tube formation and migration of human microvascular endothelial cells (HMEC-1) dose-dependently. These results suggested that the fucoidan FP08S2 from brown seaweeds *S. fusiforme* could be a potent anti-angiogenic agent.

【出处】 Carbohydrate Polymers, Volume 136, 20 January 2016, Pages 899-907

【原文】 该数据库提供了全文。

[20]

【篇名】 Evaluation of the effects of amyloid β aggregation from seaweed extracts by a microliter-scale high-throughput screening system with a quantum dot nanoprobe

【作者】 Ogara, T., Takahashi, T., Yasui, H., Uwai, K., Tokuraku, K.

【文摘】 Inhibitors of amyloid β ($A\beta$) aggregation have the potential to serve as lead compounds for anti-Alzheimer's disease (AD) agents because $A\beta$ aggregation is a key step in AD pathogenesis. Recently, we developed a novel microliter-scale high-throughput screening (MSHTS) system for $A\beta$ aggregation inhibitors that applied fluorescence microscopic analysis with quantum dot nanoprobe, and attempted to comprehensively screen the inhibitors from spices using this system (Ishigaki et al., PLoS One, 8, e72992, 2013). In this study, we tried to evaluate the inhibitory activities of 11 seaweed extracts on $A\beta$ aggregation using the MSHTS system. The half-maximal effective concentration (EC₅₀) of the ethanolic extracts from all seaweeds exceeded 4.9mg/ml, indicating that the extracts inhibit $A\beta$ aggregation although this activity was significantly lower than that displayed by members of the Lamiaceae, a family of herbal spices that showed highest activity among 52 spices tested in our 2013 study. On the other hand, the EC₅₀ of boiling water extracts was 0.013-0.42mg/ml which was comparable with the EC₅₀ of the extracts from the Lamiaceae family. These results suggest that the extraction efficiency of the inhibitors by boiling water extraction was higher than that by ethanolic extraction. Moreover, analysis of fluorescence micrographs, which were obtained from the MSHTS system, revealed that the morphology of the $A\beta$ aggregates coincubated with boiling water extracts differed from control aggregates, suggesting that the MSHTS system is also useful for screening substances that affect the morphology of aggregates.

【出处】 Journal of Bioscience and Bioengineering, Volume 120, Issue 1, 1 July 2015, Pages 45-50

【原文】 该数据库提供了全文。

[21]

【篇名】 Biosorption of Hg(II) and Cu(II) by biomass of dried *Sargassum fusiforme* in aquatic solution

【作者】 Huang, S., Lin, G.

【文摘】 Abstract The biosorption of heavy metals Hg(II) and Cu(II) from aquatic solution by biomass of dried *Sargassum fusiforme* was studied in the paper. The *Sargassum fusiforme* was able to absorb appreciable amount of mercury and copper from the aquatic solutions within 60 min of contact time with the metal solution and exhibited high removal of mercury and copper at low equilibrium concentrations. The specific adsorption of both Hg(II) and Cu(II) increased at low concentration of biomass and decreased when biomass concentration exceeded 2.0 g/L. The binding of mercury followed Freundlich model while copper supported Langmuir isotherm for

adsorption with their r^2 values of 0.971 and 0.923, respectively. The maximum adsorption per unit masses of *Sargassum fusiforme* (mg/L) at equilibrium (q_{max}) for Hg(II) and Cu(II) were calculated to be 30.86 and 7.69 mg/g, respectively. The biosorption by *Sargassum fusiforme* was best described using a pseudo-second-order kinetic model for copper and mercury ions in solution in the study. The adsorption was pH dependent as the maximum mercury biosorption and copper adsorption was happened at solution pH of 8-10.

【出处】Journal of Environmental Health Science and Engineering, Volume 13, Issue 1, 12 December 2015, 论文编号 180

【原文】该数据库提供了全文。

[22]

【篇名】Fucosterol, a sterol extracted from *Sargassum fusiforme*, shows antidepressant and anticonvulsant effects

【作者】Zhen, X.-H., Quan, Y.-C., Jiang, H.-Y., Wen, Z.-S., Qu, Y.-L., Guan, L.-P.

【文摘】We previously showed that extracts of *Sargassum fusiforme* significantly reduce immobility time in the forced swim test and tail suspension test, suggesting that these extracts possess antidepressant-like effects. Here, fucosterol extracted from *S. fusiforme* was evaluated for antidepressant and anticonvulsant activities in mice. Fucosterol (10, 20, 30 and 40 mg/kg) significantly shortened immobility time in the forced swim test and tail suspension test for 30 min after treatment but had no effect on locomotor activity in the open field test. Fucosterol significantly increased serotonin, norepinephrine and the metabolite 5-hydroxyindoleacetic acid in mouse brain, suggesting that the effects of fucosterol may be mediated through these neurotransmitters. As assessed using maximal electroshock, fucosterol (20, 40, 100 mg/kg) possessed anticonvulsant activity, whereas rotarod toxicity test results indicated that fucosterol did not induce neurotoxicity at the same dose levels in mice. Thus, fucosterol may be a useful antidepressant adjunct candidate for treating depression in patients with epilepsy. A significant increase in hippocampal brain-derived neurotrophic factor (BDNF) levels was found in the fucosterol 20 mg/kg group ($P < 0.05$). Our findings suggested that fucosterol may possess an antidepressant-like effect, which may be mediated by increasing central BDNF levels.

【出处】European Journal of Pharmacology, Volume 768, 5 December 2015, Pages 131-138

【原文】该数据库提供了全文。

3.7 Web of science

3.7.1 检索式

G. 主题词=active polysaccharide*SFPs

3.7.2 检索步骤与结果

用检索式 G 进行检索，命中 343 条结果，经过筛选，选择其中 3 条：

[23]

【篇名】 Pharmacology of delayed aging and extended lifespan of *Caenorhabditis elegans*

【作者】 James J. Collins, Kimberley Evason, Kerry Kornfeld

【摘要】 The identification and analysis of compounds that delay aging and extend lifespan is an important aspect of gerontology research; these studies can test theories of aging, lead to the discovery of endogenous systems that influence aging, and establish the foundation for treatments that might delay normal human aging. Here we review studies using the nematode *Caenorhabditis elegans* to identify and characterize compounds that delay aging and extend lifespan. These studies are considered in four groups: (1) Studies that address the free-radical theory of aging by analyzing candidate compounds with antioxidant activities including vitamin E, tocotrienols, coenzyme Q, and Eukarion-8/134. (2) Studies that analyze plant extracts (blueberry and Ginkgo biloba) that contain a mixture of compounds. (3) Studies of resveratrol, which was identified in a screen for compounds that affect the activity of the Sir2 protein that influences lifespan. (4) Studies based on screening compound libraries using *C. elegans* aging as a bioassay, which led to the identification of the anticonvulsant medicines ethosuximide and trimethadione. There has been exciting progress in the analysis of compounds that influence *C. elegans* aging, and important challenges and opportunities remain in determining the mechanisms of action of these compounds and the relevance of these observations to aging of other animals.

【出处】 science direct (experimental gerontology) 41 (2006) 1032-1039

【原文】 该数据库提供了全文。

[24]

【篇名】 Assessing Cell and Organ Senescence Biomarkers

【作者】 Bruno Bernardes de Jesus, Maria A. Blasco

【文摘】 A major goal in cancer and aging research is to discriminate the biochemical modifications that happen locally that could account for the healthiness or malignancy of tissues. Senescence is one general antiproliferative cellular process that acts as a strong barrier for cancer progression, playing a crucial role in aging. Here, we focus on the current methods to assess cellular senescence, discriminating the advantages and disadvantages of several senescence biomarkers.

【出处】 Circulation Research, 2012,111:97-109

【原文】 该数据库提供了全文。

[25]

【篇名】 Assessing Cell and Organ Senescence Biomarkers

【作者】 Bruno Bernardes de Jesus, Maria A. Blasco

【文摘】 A major goal in cancer and aging research is to discriminate the biochemical modifications that happen locally that could account for the healthiness or malignancy of tissues. Senescence is one general antiproliferative cellular process that acts as a strong barrier for cancer progression, playing a crucial role in aging. Here, we focus on the current methods to assess cellular senescence, discriminating the advantages and disadvantages of several senescence biomarkers.

【出处】 Circulation Research, 2012,111:97-109

【原文】 该数据库提供了全文。

[26]

【篇名】 Decline in transcriptional activity of Nrf2 causes age-related loss of glutathione synthesis, which is reversible with lipoic acid

【作者】 Jung H. Suh*†, Swapna V. Shenvi*†, Brian M. Dixon*

【摘要】 Glutathione (GSH) significantly declines in the aging rat liver. Because GSH levels are partly a reflection of its synthetic capacity, we measured the levels and activity of -glutamylcysteine ligase (GCL), the rate-controlling enzyme in GSH synthesis. With age, both the catalytic (GCLC) and modulatory (GCLM) subunits of GCL decreased by 47% and 52%, respectively ($P < 0.005$). Concomitant with lower subunit levels, GCL activity also declined by 53% ($P < 0.05$). Because nuclear factor erythroid2-related factor 2 (Nrf2) governs basal and inducible GCLC and GCLM expression by means of the antioxidant response element (ARE), we hypothesized that aging results in dysregulation of Nrf2-mediated GCL expression. We observed an 50% age-related loss in total ($P < 0.001$) and nuclear ($P < 0.0001$) Nrf2 levels, which suggests attenuation in Nrf2-dependent gene transcription. By using gel-shift and supershift assays, a marked reduction in Nrf2ARE binding in old vs. young rats was noted. To determine whether the constitutive loss of Nrf2 transcriptional activity also affects the inducible nature of Nrf2 nuclear translocation, old rats were treated with (R)-lipoic acid (LA; 40 mg/kg i.p. up to 48 h), a disulfide compound shown to induce Nrf2 activation in vitro and improve GSH levels in vivo. LA administration increased nuclear Nrf2 levels in old rats after 12 h. LA also induced Nrf2 binding to the ARE, and, consequently, higher GCLC levels and GCL activity were observed 24 h after LA injection. Thus, the age-related loss in GSH synthesis may be caused by dysregulation of ARE-mediated gene expression, but chemoprotective agents, like LA, can attenuate this loss.

【出处】 PNAS, March 9, 2004, vol. 101, no. 10: 3381 - 3386

【原文】 该数据库提供了全文。

3.8 ACS Publications

3.8.1 检索式

H. 主题=active polysaccharide*SFPs

3.8.2 检索步骤与结果

Authors & Reviewers Librarians & Account Managers ACS Members Alerts About Us ACS & Open Access

Search Results

Results: 1 – 20 of 5160 Follow results:

CONTENT TYPE	
Journal Article	4885
Book Chapter	434
C&EN Archives Article	7

Refine Search

ADVERTISEMENT

ThermoFisher SCIENTIFIC

HIGH THROUGHPUT QUANTITATIVE PROTEOMICS USING ISOBARIC TAGS

Download

SORT: Relevance Date

用检索式 H 进行检索，命中 51 条结果，经过筛选，选择其中 2 条：

[27]

【篇名】 Effect of the Lycium barbarum polysaccharides on age-related oxidative stress in aged mice

【作者】 X.M. Li a,* , Y.L. Mab, X.J. Liu c

【文摘】Oxidative damage of biomolecules increases with age and is postulated to be a major causal factor of various physiological function disorders. Consequently, the concept of anti-age by antioxidants has been developed. Lycium barbarum fruits have been used as a traditional Chinese herbal medicine and the data obtained in in vitro models have clearly established the antioxidant potency of the polysaccharides isolated from the fruits. In the present study, the age-dependent changes in the antioxidant enzyme activity, immune function and lipid peroxidation product were investigated and effect of Lycium barbarum polysaccharides on age-induced oxidative stress in different organs of aged mice was checked. Lycium barbarum polysaccharides (200, 350 and 500 mg/kg b.w. in physiological saline) were orally administrated to aged mice over a period of 30 days. Aged mice receiving vitamin C served as positive control. Enzymatic and non-enzymatic antioxidants, lipid peroxides in serum and tested organs, and immune function were measured. Result showed that increased endogenous lipid peroxidation, and decreased antioxidant activities, as assessed by superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GSH-Px) and total antioxidant capacity (TAOC), and immune function were observed in aged mice and restored to normal levels in the polysaccharides-treated groups. Antioxidant activities of Lycium barbarum polysaccharides can be comparable with normal antioxidant, vitamin C. Moreover, addition of vitamin C to the polysaccharides further increased the in vivo antioxidant activity of the latter. It is concluded that the Lycium barbarum polysaccharides can be used in compensating the decline in TAOC, immune function and the activities of antioxidant enzymes and thereby reduces the risks of lipid peroxidation accelerated by age-induced free radical.

【出处】 Journal of Ethnopharmacology, 111 (2007) 504-511

【原文】 该数据库提供了全文。

[28]

【篇名】 Endothelial Cdkn1a (p21) Overexpression and Accelerated Senescence in a Mouse Model of Fuchs Endothelial Corneal Dystrophy

【作者】 Mario Matthaei,1,2 Huan Meng,1 Alan K. Meeker,3,4 Charles G. Eberhart,1,3,4 and Albert S. Jun1

【文摘】 Stress of the endoplasmic reticulum and oxidative stress play critical roles in the pathogenesis of Fuchs Endothelial Corneal Dystrophy (FECD). In the normal aging cornea, cellular stress has been associated with a loss in proliferative capacity (premature senescence) of corneal endothelial cells (CECs). The present study used a transgenic Col8a2Q455K/Q455K knock-in mouse model of early-onset FECD to identify the endothelial expression profile of specific cellular stress response - related targets, which may be relevant to lateonset FECD.

【出处】 IOVS, September 2012, Vol. 53, No. 10

【原文】 该数据库提供了全文。

3.9 RSC

3.9.1 检索式

I. 主题词=SFPs*active polysaccharide

3.9.2 检索步骤与结果



用检索式 I 进行检索，服务器未反应，可能由于网速原因导致网页无法显示！

3.10 Wiley Interscience

3.10.1 检索式

J. 主题=Sargassum fusiforme polysaccharide*Hizikia fusiforme*SFPs

3.10.2 检索步骤与结果


home > Advanced Search

Search Results

There are 442 results for: SPFS

Sort by Best Match

VIEW [1 - 20](#) | [21 - 40](#) | [41 - 60](#) | [61 - 80](#) | [Next >](#)


[Stationary phase and mature infectious forms of *Legionella pneumophila* produce distinct viable but non-culturable cells](#)
 ENVIRONMENTAL MICROBIOLOGY
 Volume 16, Issue 2, February 2014, Pages: 382–395, Badli H. Al-Bana, Moreen T. Haddad and Rafael A. Garduño
 Version of Record online: 22 AUG 2013, DOI: 10.1111/1462-2920.12219
[Abstract](#) | [Article](#) | [PDF\(1932K\)](#) | [References](#) | [Request Permissions](#)

FILTER LIST

PUBLICATION TYPE

- Journals (389)
- Books (50)
- Reference Works (1)
- Database (2)
- Lab Protocols (0)

用检索式 J 进行检索，命中 79 条结果，经过筛选，选择其中 1 条：

[29]

【篇名】 Structure of a fucoidan from the brown seaweed *Fucus serratus* L.

【作者】 Maria I. Bilan, Alexey A. Grachev, Alexander S. Shashkov

【文摘】 A fucoidan consisting of L-fucose, sulfate and acetate in a molar proportion of 1:1:0.1 and small amounts of xylose and galactose were isolated from the brown seaweed *Fucus serratus* L. The fucoidan structure was investigated by 1D and 2D 1H and 13CNMR spectroscopy of its desulfated and de-O-acetylated derivatives as well as by methylation analysis of the native and desulfated polysaccharides. A branched structure was suggested for the fucoidan with a backbone of alternating 3- and 4-linked α -L-fucopyranose residues, β -a-L-Fucp-(1 \rightarrow 4)- α -L-Fucp-(1 \rightarrow), about half of the 3-linked residues being substituted at C-4 by trifucoside units α -L-Fucp-(1 \rightarrow 4)- α -L-Fucp-(1 \rightarrow 3)- α -L-Fucp-(1 \rightarrow). Minor chains built up of 4-linked α -fucopyranose and β -xylose residues were also detected, but their location, as well as the position of galactose residues, remained unknown. Sulfate groups were shown to occupy mainly C-2 and sometimes C-4, although 3,4-diglycosylated and some terminal fucose residues may be nonsulfated. Acetate was found to occupy C-4 of 3-linked Fuc and C-3 of 4-linked Fuc in a ratio of about 7:3.

【出处】 Carbohydrate Research 341 (2006) 238 – 245

【原文】 该数据库提供了全文。

3.11 NCBI

3.11.1 检索式

K. 主题词=active polysaccharide*SPFS*ageing

3.11.2 检索步骤与结果

Search NCBI databases

Active polysaccharide Search

Results found in 28 databases for "Active polysaccharide"

Literature		Genes			
Books	359	books and reports	EST	0	expressed sequence tag sequences
MeSH	0	ontology used for PubMed indexing	Gene	153	collected information about gene loci
NLM Catalog	35	books, journals and more in the NLM Collections	GEO DataSets	895	functional genomics studies
PubMed	25,468	scientific & medical abstracts/citations	GEO Profiles	1,918	gene expression and molecular abundance profiles
PubMed Central	58,282	full-text journal articles	HomoloGene	0	homologous gene sets for selected organisms
					sequence sets from phylogenetic and population

PubMed.gov PubMed SFPs Search

US National Library of Medicine National Institutes of Health

Article types: Summary 20 per page Sort by Most Recent

Search results: Items: 1 to 20 of 145

1. [Children with Moderate Acute Malnutrition with No Access to Supplementary Feeding Programmes Experience High Rates of Deterioration and No Improvement: Results from a Prospective Cohort Study in Rural Ethiopia](#)
James P. Sadler K. Wondafrash M. Argaw A. Luo H. Geleta B. Kedir K. Getnet Y. Belachew T. Bahwere P.

Titles with your search terms: Human gastric cancer cell line SGC-7901 apoptosis induced by [Biomed Mater Eng. 2014] Single feature polymorphisms (SFPs) for drought tolerance in pigeon [Funct. Integr. Genomics. 2011] [Study on the apoptosis and its mechanism of lovo human c [Shi Yan Sheng Wu Xue Bao. 2005]

用检索式 K 进行检索，命中于 pubmed 共 25468 条结果，经过筛选，选择其中 4 条：
[30]

【篇名】 Characterization of polysaccharides extracted from brown seaweeds

【作者】 L.-E. Rioux a, S.L. Turgeon a, M. Beaulieu b,

【摘要】 The structural characteristics of polysaccharides extracted from Quebec's seaweed have not been fully established to date. *Ascophyllum nodosum*, *Fucus vesiculosus* and *Saccharina longicuris* were studied in this research. The seaweeds were treated with selective solvents to extract laminaran and fucoidan in mixture (fraction A), fucoidan (fraction B), and alginate (fraction C). Analyses were performed to determine their content in sulphates, total sugars and uronic acids. H NMR was additionally performed on alginate extract. Results showed that the laminaran extracted from *S. longicuris* contained 99.1% of the total sugars while the extracts from *A. nodosum* and *F. vesiculosus* contained 89.6% and 84.1%, respectively. The fucoidan found in fractions A and B was shown to have different structures. *F. vesiculosus* and *S. longicuris* showed important variations in terms of total sugars, uronic acids and molecular weight of polysaccharide. *A. nodosum*, on the other hand, had a more stable composition, with the exception of the polysaccharide molecular weight. Alginate from *S. longicuris* had the lowest molecular weight (106.6 kDa) with a FMM blocks proportion of 0.07 and FG blocks of 0.25. Their characterization will lead to a better understanding of their functional characteristics and promote the exploitation of this natural resource.

【出处】 Carbohydrate Polymers 69 (2007) 530 – 537

【原文】 该数据库提供了全文。

[31]

【篇名】 Fucoidans from the brown seaweed *Adenocystis utricularis*: extraction methods, antiviral activity and structural studies

【作者】 Nora M.A. Ponce, a Carlos A. Pujol, b Elsa B. Damonte, b Mari' a L. Flores

【文摘】 The brown seaweed *Adenocystis utricularis* (family Adenocystaceae, order Ectocarpales sensu lato) was extracted in parallel with three solvents usually utilized for obtaining fucoidans: distilled water, 2% calcium chloride solution and diluted hydrochloric acid (pH 2) solution. In each case, the extraction was effected at room temperature and then at 70 ° C. The

extraction yields and characteristics of the products were similar in the three cases, with only minor differences. The analytical features of the products indicate that two different types of fucoidans are present in this seaweed. One of them, mostly extracted at room temperature, is composed mainly of L-fucose, D-galactose and ester sulfate (the ‘galactofucan’). The other product (the ‘uronofucoidan’) is the major component of the extracts obtained at 70 ° C. It is composed mainly of fucose, accompanied by other monosaccharides (mostly Man, but also Glc, Xyl, Rha and Gal), significant amounts of uronic acids and low proportions of sulfate ester. Fractionation with the cationic detergent cetrimide has allowed achieving a better separation of the galactofucan and uronofucoidan components. The galactofucans show a high inhibitory activity against herpes simplex virus 1 and 2, with no cytotoxicity, whereas the uronofucoidans carry no antiviral activity.

【出处】 Carbohydrate Research 338 (2003) 153 - 165

【原文】 该数据库提供了全文。

[32]

【篇名】 Human regulatory T cells induce T-lymphocyte senescence

【作者】 Jian Ye,¹ Xingxu Huang,² Eddy C. Hsueh,³ Qunyuan Zhang,⁴ Chunling Ma,

【文摘】 Regulatory T (Treg) cells have broad suppressive activity on host immunity, but the fate and function of suppressed responder T cells remains largely unknown. In the present study, we report that human Treg cells can induce senescence in responder naive and effector T cells in vitro and in vivo. Senescent responder T cells induced by human Treg cells changed their phenotypes and cytokine profiles and had potent suppressive function. Furthermore, Treg-mediated molecular control of senescence in responder T cells was associated with selective modulation of p38 and ERK1/2 signaling and cell-cycle - regulatory molecules p16, p21, and p53. We further revealed that human Treg-induced senescence and suppressor function could be blocked by TLR8 signaling and/or by specific ERK1/2 and p38 inhibition in vitro and in vivo in animal models. The results of the present study identify a novel mechanism of human Treg cell suppression that induces targeted responder T-cell senescence and provide new insights relevant for the development of strategies capable of preventing and/or reversing Treg-induced immune suppression.

【出处】 bloodjournal.hematologylibrary.org by guest on November 10, 2013

【原文】 该数据库提供了全文。

[33]

【篇名】 Immune surveillance of senescent cells — biological significance in cancer- and non-cancer pathologies

【作者】 Lisa Hoenicke¹ and Lars Zender

【文摘】 Cellular senescence, a state of stable growth arrest, can occur in response to various stress stimuli such as telomere shortening, treatment with chemotherapeutic drugs or the aberrant activation of oncogenes. Senescent cells communicate with their environment by secreting various cytokines and growth factors, and it has become clear that this ‘secretory phenotype’ can have pro- as well as anti-tumorigenic effects. Recent work from our laboratory showed that premalignant, senescent hepatocytes are recognized and cleared through an antigen-specific immune response and that this immune response, designated as ‘senescence surveillance’ is crucial for tumor suppression in the liver [(Kang, T.W. et al. (2011) Senescence surveillance of pre-malignant hepatocytes limits liver cancer development. Nature, 479, 547 - 551]. It is an

emerging concept that immune responses against senescent cells have a broader biological significance in cancer- as well as non-cancer pathologies and current data suggest that distinct immune responses are engaged to clear senescent cells in different disease settings.

【出处】Carcinogenesis vol.33 no.6 pp.1123 - 1126, 2012

【原文】该数据库提供了全文。

3.12 Nature&Science

3.12.1 检索式

L. 主题词=SFPs*polysaccharide

3.12.2 检索步骤与结果

The image shows two screenshots of the Nature.com website. The top screenshot is a search result page for 'Sargassum Fusiforme Polysaccharides'. The search bar contains the query, and filters for 'Journal: Nature' and 'Journal: Nature News' are applied. The results section shows 'Showing 0 results' and a message: 'Sorry, no results were found. Please check the spelling of the keywords in your query, any filters you have applied or try a...'. A promotional banner for 'Genome Variation in Precision Medicine 2016' is visible on the right. The bottom screenshot shows a search for 'polysaccharide'. The search bar contains the query, and filters for 'Non-research content', 'Research journals', and 'Job listings' are shown. The results section displays: 'Your search for "polysaccharide" returned 10 results.'

用检索式 L 进行检索，服务器未反应或者存在极少数的相关文献，这点和其出版相关文献有关，羊栖菜多糖研究属于半基础半应用型研究，而 nature 或者 science 更适合于一些基础性研究！

4 检索效果评价

4.1 检索词的选择

4.1.1 从课题字面选择

本课题为，羊栖菜多糖活性研究，从课题字面选择的检索词，其相互间的关系多为限定关系，即利用布尔逻辑与进行组配，可提高查准率。例如，本课题从字面选出：羊栖菜，多糖，活性。在检索年代上，本报告选择 2000-2016 年（近十五年）。

4.1.2 从课题内涵选择

因为羊栖菜作为一种马尾藻科马尾藻属的海藻，名称或物种可能不尽相同，另外，羊栖菜多糖中富含丰富的岩藻糖和褐藻多糖，已知大部分提取多糖中发挥活性的，多为褐藻多糖，一个课题如果仅从字面选择检索词，则会影响查全率。还应当从课题的内在涵义中选择，多为同义词、近义词、上下位词，当然，也有限定词（用于进一步提高查准率）。例如，本报告选出下列同义词：褐藻糖胶，马尾藻等，在检索式中用布尔逻辑或进行组配。

4.2 检索技术

4.2.1 布尔检索

所选择的检索工具都具有布尔逻辑与、逻辑或检索技术，只是具体算符的表示方法略有不同，使用布尔逻辑与组配技术，缩小了检索范围，增强了检索的专指性，可提高检索信息的查准率；使用“布尔逻辑或”检索技术，扩大了检索范围，能提高检索信息的查全率。

4.2.2 限制检索

A. 字段限制：在现代检索工具中，为了确定检索词在文献记录中出现的位置，采用字段（或叫检索项、检索入口）来限制查找的范围，从而提高查全率或查准率。

B. 年代限制：2000—2016 年。

C. 匹配限制：为提高查全率，均选用了模糊匹配检索。

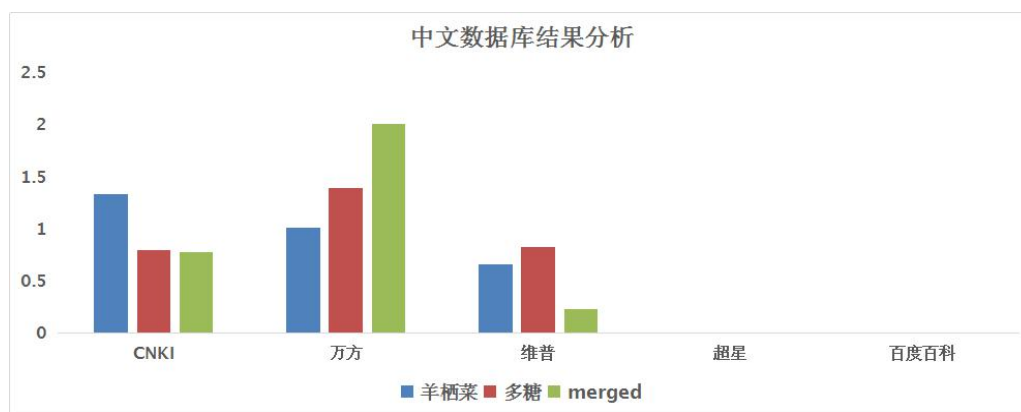
4.3 数据库的选择

本报告限定在中文检索工具和英文检索工具，均选择了综合型的检索工具，因为所选的检索工具几乎能囊括国内外的文献资料。

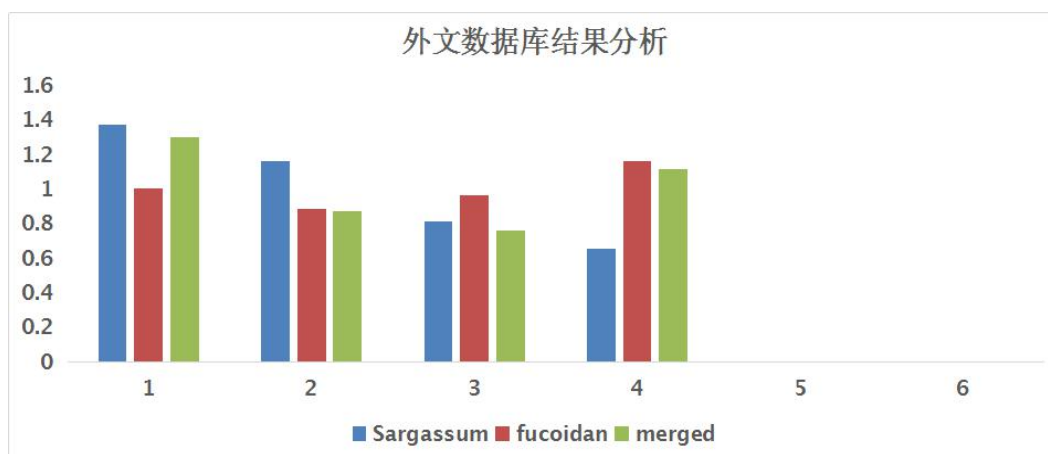
从上述检索工具的检索情况看出，国内期刊方面，“中国期刊全文数据库”的查全率是最好的，其查准率也相对较高。“万方数据库”也可查出不少相关文章，但是存在一个查准率不高的问题。“超星电子图书”只适用于查找相关书籍，但是全部为基础知识，内容也相关太少，不建议使用此种搜索方式。“维普中国科技期刊数据库”则存在很大的弊端，查找到的文献比较少，且并不能很好的符合搜索条件。

国外期刊方面，“NCBI”应该说是最为理想的一种搜索引擎，它包含的 PUBMED 中，可以搜索出大量相关文献，此外，还可以就关键词在书籍，报刊，学术论文，蛋白序列，基因

序列等等多个方面查询，是一个很全面的搜索引擎，且对外免费使用。相较于“ACS Publications”，“RSC”，“Wiley Interscience”，查找文献并不全面，且相关度有待进一步验证。而具有相对权威的一些杂志期刊，比如“science”和“nature”，因为是相较于基础性的研究，并不适用于此次的课题研究参考，故不推荐使用。其具体的数据比例参考图表1和图表2。



图表1 中文数据库结果分析



图表2 外文数据库结果分析

5 文献综述

羊栖菜多糖活性研究进展

张亚

(温州大学 生命与环境科学学院)

摘要: 针对羊栖菜多糖的提取纯化过程，药用活性进行阐述。羊栖菜多糖活性主要包括抗氧化抗衰老，调节免疫，降血糖降血脂，抗肿瘤，抗病毒等。

关键字: 羊栖菜多糖；活性；研究进展

羊栖菜 (*Sargassum fusiforme*) 隶属于褐藻门马尾藻科马尾藻属，北起辽东半岛，南至雷州半岛，以浙江沿海最多。它是一种富营养的食用藻，享有“长寿菜”的盛誉。近年研究

揭示,羊栖菜不仅是一种非常有潜力的天然抗氧化剂,而且对治疗肿瘤、心血管疾病、降低血糖和延缓衰老等方面都有一定的效果,具有广阔开发前景,日本已有相关饮品和保健品等销售^[1,7]。

现代研究发现,羊栖菜营养成分丰富,羊栖菜多糖(SFPS)是羊栖菜中最重要的活性成分之一。多糖含量高达 53.46%,利用高效毛细管电泳测定多糖组分由鼠李糖、葡萄糖、果糖、甘露糖和三种未知成分组成^[2,3]。近年来,通过药理试验表明,SFPS 在抗肿瘤,提高机体免疫力,降血脂,防治糖尿病,治疗老年痴呆等症都具有积极作用。目前羊栖菜多糖提取工艺趋于完整,纯化分级得到进一步完善,但对其发挥抗衰老作用的物质基础及作用途径仍缺乏认识^[4,5]。

1.羊栖菜组分分析

羊栖菜是目前公认的保健型食品,含有多种营养成分^[8,11],如氨基酸、矿物质、多糖、甾醇化合物和萜类化合物等,具有较高的营养价值和特殊的生物活性。

1.1 蛋白质和氨基酸

在对大量海域的羊栖菜进行营养组成分析后,李丽等^[9,12]发现羊栖菜营养均衡,具有高蛋白、低脂肪、低热量的特点。羊栖菜中氨基酸的含量为 0.15% ~ 1.57%^[13],其中谷氨酸、丙氨酸及天门冬氨酸含量较为丰富,并含有人体不能合成的 8 种必需氨基酸,即亮氨酸、缬氨酸、色氨酸、精氨酸、赖氨酸、苏氨酸、蛋氨酸、异亮氨酸^[10,12]。

1.2 矿物质与微量元素

海藻中含有大量无机元素,具有天然矿物质食品的美誉。陈耀祖等^[14]对羊栖菜中的微量元素进行了半定量分析测定,结果发现羊栖菜中富含人体所需的各种微量元素,营养元素铁、钙、锌的含量较高,而毒性元素铜的含量相对较低^[12]。此外,羊栖菜中碘的含量较高,表明羊栖菜具有较好的聚集碘的能力^[15]。同时,部分研究发现羊栖菜具有较强的富集砷的能力,其富集的砷大部分以有机砷的形式存在^[16,17]。

1.3 膳食纤维

羊栖菜中的多糖是膳食纤维的优质来源。据 Lahaye^[27]报道,羊栖菜膳食纤维的总量为 49.2%,其中不溶性膳食纤维占 16.3%,可溶性膳食纤维占 32.9%。而在可溶性膳食纤维中,灰分含量较蛋白质多;在不溶性膳食纤维中,蛋白质含量较多。

1.4 甾醇化合物

钱浩等^[28]对浙江南部羊栖菜的乙醇提取物进行化学成分研究,从中分离得到大量甘露醇和 3 种甾醇化合物,通过化学方法和光谱分析鉴定了其中 2 个化合物的化学结构,分别为岩藻甾醇(fucosterol)和 saringosterol(图 1)。

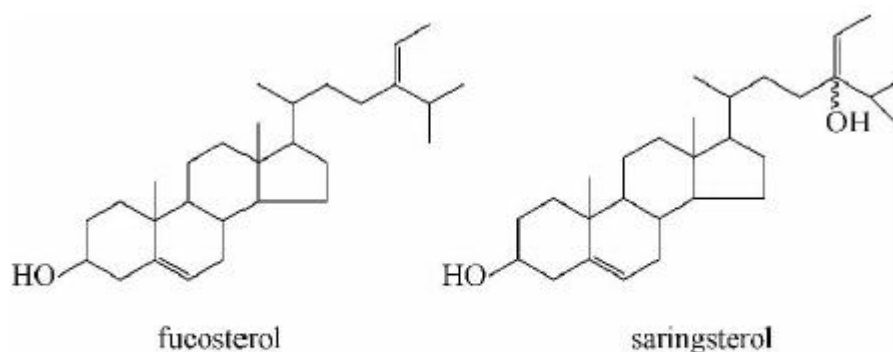


图 1 羊栖菜中分离鉴定的 2 种甾醇化学结构

2.羊栖菜多糖主要作用成分

多糖碳水化合物(总糖)是海藻的主体成分,占干重的20%~70%,多糖为其主要组成部分。它是从全藻中提取到的一种水溶性多糖,包括褐藻酸(alginic acid)、褐藻多糖硫酸酯(fucoidan, FCD)及褐藻淀粉(laminaran)。褐藻酸主要是以 β -1,4键相结合的D-甘露糖醛酸聚合物,在羊栖菜中含量较高,占20.8%^[2]。褐藻多糖硫酸酯主要由L-岩藻糖和硫酸根组成,其含量较少,一般在0.5%~10%之间。季宇彬等采用HPCE法分析羊栖菜多糖主要由甘露糖、果糖、岩藻糖和半乳糖组成,还含有微量的鼠李糖、木糖和葡萄糖。

褐藻酸(alginic acid)主要是由 β -1,4-D-甘露糖醛酸和 α -1,4-L-古洛糖醛酸组成,且以 β -(1,4)糖苷键连接成线性高聚物,在羊栖菜多糖中含量最多,可用作食品添加剂。而褐藻淀粉(laminaran)在羊栖菜中含量相对较少,其主要成分为 β -1,3-葡聚糖^[1]。

褐藻糖胶(fucoidan)又称褐藻多糖硫酸酯(fucose-containing sulfated polysacchrides),是一类水溶性天然硫酸化杂聚多糖,存在于褐藻细胞间。主要含有糖醛酸、半乳糖、甘露醇和木糖等^[21]。研究表明,褐藻糖胶能影响褐藻的许多生物活性^[22]。目前国内对褐藻糖胶结构的研究较少,特别是对羊栖菜褐藻糖胶结构的研究几近空白。早在

20世纪80年代末,有日本学者报道了日本产的羊栖菜(*Hizikia fusiforme*)中褐藻糖胶的化学成分。Dobashi等^[23]从羊栖菜中分离得到2种褐藻糖胶,分子量分别为95000和42000。Nishide等^[24,25]对日本产的21种褐藻中的褐藻糖胶进行分析,发现褐藻糖胶的化学组成为硫酸根30%,岩藻糖16.5%,糖醛酸10.0%,中性糖组成Fuc:Gal:Rha:Glc:Man:Xyl为33:23:16:15:11:2,糖醛酸组成GlcUA:GalUA:ManUA为61:28:11。而Nishino等^[26]认为其化学组成为岩藻酸25.2%,糖醛酸22.4%,硫酸根22.7%,中性糖组成为Fuc:Gal:Xyl:Man为51:31:10:8。

3.羊栖菜多糖活性

3.1 抗氧化抗衰老活性

SFPS具有清除活性氧的作用,是有效的自由基清除剂。季宇彬^[30,34]研究表明SFPS对L615小鼠血、肝、脾中的脂质过氧化物(LPO)含量有显著降低作用,过氧化氢酶(CAT)、超氧化物歧化酶(SOD)活性有促进作用,但对小鼠血、肝、脾中的谷胱甘肽过氧化物酶活性均无影响。

羊栖菜多糖可保护高脂血症时机体内抗氧化酶类活性,使自由基代谢紊乱情况得以纠正,从而维持机体氧化及抗氧化系统的动态平衡,减少自由基的毒副作用,进而降低脂质过氧化作用对血管的损伤。贾之慎等进行的清除自由基的实验表明褐藻多糖硫酸酯具有清除超氧离子自由基(O⁻²)的能力。

在抗衰老研究方面,体外实验证明,羊栖菜多糖对H₂O₂诱导的胰岛 β 细胞凋亡具有保护作用,并且该作用与PI3K-Akt通路有关;体内实验证明,羊栖菜多糖的抗氧化活性与其抗肿瘤、降血脂和降血糖活性都相关,并且在恢复环磷酰胺免疫抑制小鼠的免疫能力方面发挥重要作用。本实验室前期研究也表明,经疏水树脂分离的水提羊栖菜多糖组分具有清除羟自由基和DPPH的作用,并减小CCI₄对小鼠的急性氧化损伤^[16,19]。

最新研究表明,枸杞多糖通过激活Nrf2/ARE通路提升抗氧化水平,从而对缺血再灌注小鼠的视网膜损伤起到保护作用。ARE是II相解毒酶、抗氧化蛋白、蛋白酶体、分子伴侣等基因的重要增强子,在内外界的氧化应激作用下,Nrf2/ARE通路将被激活并发挥细胞防御作用。正常生理条件下,转录因子Nrf2(NF2E2-related factor 2,其在果蝇中的同源物命名为CncC)在细胞质中与其抑制蛋白Keap1(Kelch-like ECH-associated protein 1)结合处于非活性、易降解状态。当自由基或化学物质刺激时,Keap1的构象改变或者Nrf2直接被磷酸化,导致Nrf2与Keap1解离并活化。活化的Nrf2进入细胞核与ARE结合,启动ARE下游一系列基因的转录,从而提高细胞能量和抗氧化能力,抑制代谢过程和氧化损伤^[17,18]。羊栖菜多糖与枸杞多糖在成分上相近,其中含有大量的褐藻糖胶,岩藻糖,硫酸根离子等等,在抗氧化抗衰老方

面发挥重大作用的分子，羊栖菜多糖在 Nrf2-Are 通路上的研究也值得耐人寻味。

3.2 调节免疫

羊栖菜多糖通过恢复或提高机体的免疫能力，能够提升机体对肿瘤的抗性，也为研究羊栖菜多糖抗肿瘤的机制提供了参考和依据。王扬等通过研究发现，给小鼠腹腔注射 SFPS 后，有助于小鼠 SRBC 抗体的生成，提高小鼠的脾指数，促进小鼠 T 淋巴细胞呈量效性增殖。钟文和严全能的研究表明，SFPS 有很强的抑瘤效果，通过提高小鼠的胸腺指数、脾指数，增强荷瘤小鼠 NK 细胞和腹腔吞噬细胞的活性，以及促进 ConA 诱导脾淋巴细胞增殖，来提高小鼠机体的免疫功能^[30]。

而陈慧玲和况烁则考察了 SFPS 对离体小鼠 NK 细胞、巨噬细胞的影响和脾细胞免疫调节活性，结果所有给药浓度组中：30mg/L 浓度 SFPS 给药组对离体小鼠 NK 细胞活性的促进作用效果最显著；10mg/L 浓度组作用 48h 的 SFPS 对促进小鼠腹腔巨噬细胞分泌 NO 效果最显著；100mg / L 浓度组促使 IL-2 和 TNF- α 分泌量升高的效果最显著，推测 48h 内呈时效关系；SFPS 对 IFN- γ 分泌量的影响具有明显的量效关系，而不同时间组的差异不显著^[27,29]。

3.3 降血糖降血脂

羊栖菜水提取物能有效地抑制并降低高血脂动物的胆固醇(TC)、甘油三酯(TG)和低密度脂蛋白胆固醇(LDLC)含量的增长^[33]，升高高密度脂蛋白胆固醇(HDL-C)和前列腺环素(PGI₂)含量，其作用与其多糖的结构特性有关，可能有抑制胰脂肪酶及胆固醇酯酶的释放，从而延缓机体对脂肪的吸收起到降低血脂的作用。

羊栖菜多糖在机体内几乎不被消化吸收，可在肠道内吸水后形成胶体，阻止脂类物质向小肠壁的扩散，因而减少了机体对脂肪的吸收，其降血脂作用可能与其膳食纤维性质有关。作用机制并非是促进体内脂质的代谢与消除，而可能是减少外源性脂质在胃肠道的吸收^[31,32]。

3.4 抗肿瘤

钱浩^[28]等认为羊栖菜提取物的有效化学成分是甘露醇、岩藻甾醇、及另一甾体混合物。目前羊栖菜的药用功能研究较多地集中在抗肿瘤活性及提高机体免疫功能二方面。季宇彬^[30,34]等做了 SFPS 对荷瘤小鼠红细胞免疫促进作用的机制研究以及复方海藻多糖合剂抗癌作用的实验研究，研究认为 SFPS 能提高巨噬细胞的吞噬能力，并能激活吞噬作用。此外，SFPS 不仅对荷瘤小鼠红细胞膜上 C3b 受体有直接作用，还能调节血清中红细胞免疫抑制因子和免疫促进因子的含量和活性，故对红细胞免疫具促进作用^[34,35]。

季宇彬的研究还表明 SFPS 能降低小鼠红细胞膜过氧化脂质(LPO)含量，抑制红细胞膜蛋白与收缩蛋白交联高聚物(HMP)的形成，并能增加红细胞膜封闭度及唾液酸的含量，增强红细胞膜超氧化物歧化酶(SOD)、过氧化氢酶(CAT)等的活性，故能提高小鼠红细胞的免疫功能。蒋谷人等以同属的马尾藻提取物进行抗肿瘤实验，也证明其对 Sarcoma-180 肉瘤株小鼠有一定的抑瘤效果。

3.5 抗病毒

羊栖菜多糖及其分离产物对单纯疱疹病毒 1 型(HSV-1)和柯萨奇病毒(CVB3)所引起细病变(CPE)有抑制作用^[36]。不仅具有直接杀灭病毒的作用，而且还可进入细胞或吸附在细胞表面，从而达到抑制或杀伤病毒的效果。

3.6 其他活性

SFPS 复方制剂对小鼠的免疫器官及生殖器官的辐射损伤具有一定的保护作用。SFPS 还有抗疲劳和抑制杀伤病毒等作用。用氮蓝四唑还原体系统测定发现 1 个组分，均有清除超氧离子的作用，比芸香苷清除能力弱，与抗坏血酸相当，较之要弱，认为羊栖菜的抗肿瘤、降胆固醇等作用必然与这种清除超氧离子有关^[37,38]。

4. 结语

羊栖菜在我国沿海分布广,可食药两用。其主要活性成分羊栖菜多糖具有多方面的药理活性,尤其在抗肿瘤,提高免疫,降血糖、血脂都有突出的效果,并且,毒副作用小。羊栖菜多糖存在非常广阔的应用前景,必将为进一步开发羊栖菜多糖研制新药提供理论依据^[39]。

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