

# New Drug Development (新藥研發)

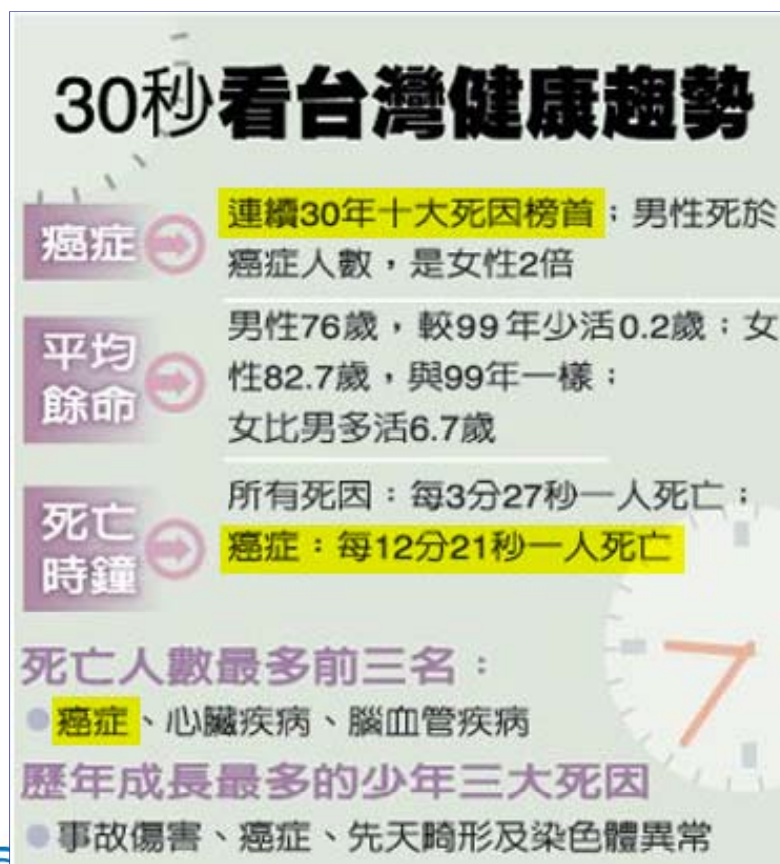


# SciFinder®

*CAS Patent Forum*

衛生署每年公布國人十大死因，其中惡性腫瘤(俗稱癌症)，連續30年蟬聯十大死因之首，罹癌發作年紀也逐漸降低當中，顯見癌症對國人健康的威脅正逐漸擴大當中。

研發抗癌新藥刻不容緩，如何利用SciFinder加速研發時程呢？



# 研發—乃最關鍵、最具決定性的步驟

## 新藥開發過程

\* <https://scifinder.cas.org>

How SciFinder work on it ?

### 1. 研發★

尋找合適的研發項目、文獻檢索與專利追蹤。



### 2. 臨床前

製備技術、不同劑型、藥物穩定性、藥理學。



### 3. 臨床

臨床試驗、生物有效性實驗。



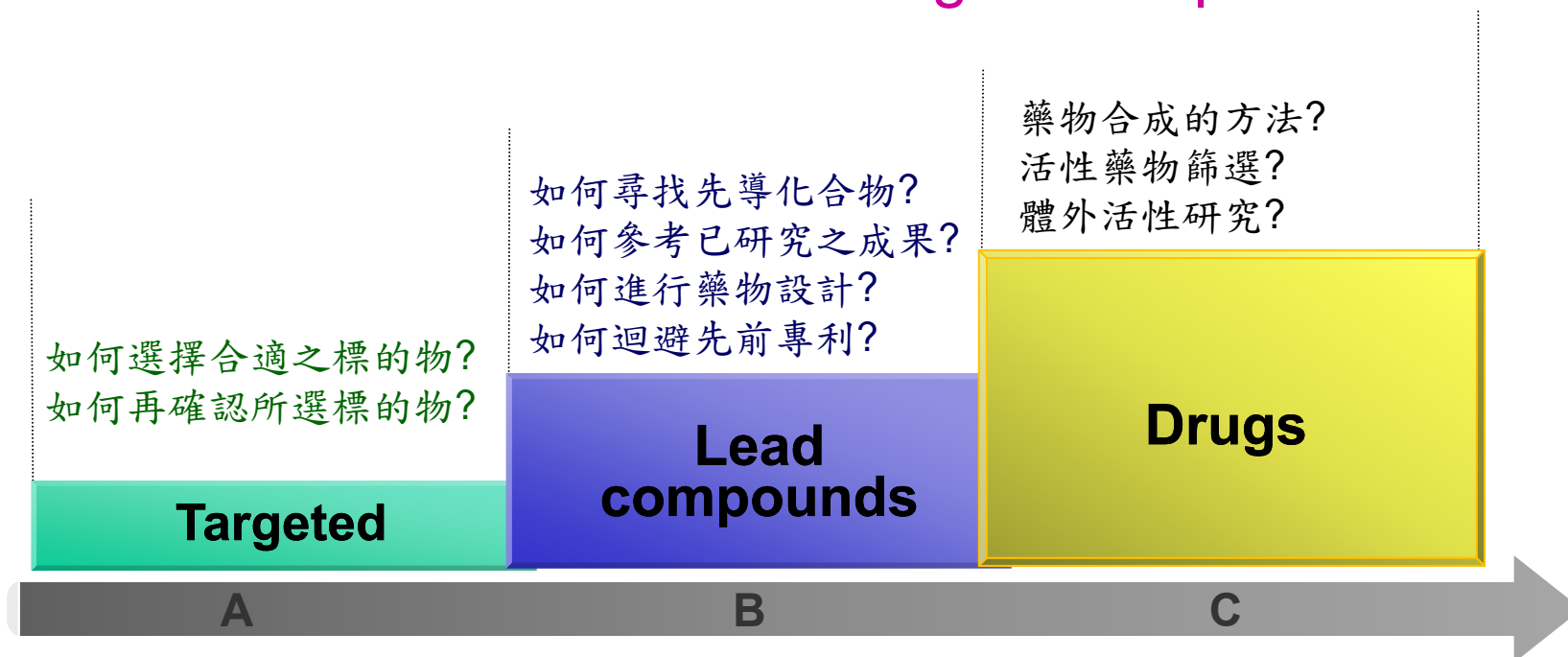
### 4. 上市

不良反應監測。



# SciFinder

## ~Total Solution of New Drug Development~



標的物選擇-  
需閱讀大量文獻加以佐證

**SciFinder** 收錄最豐富之文獻資料，再加上強大的分析功能，  
省時又省力！

先導化合物的設計&合成

**SciFinder**可直接串聯物質與合成反應式，並可以**Markush**結構檢索，進行專利布局與攻防。



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CAS is a division of the American Chemical Society

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## 如何選擇合適之標的物？

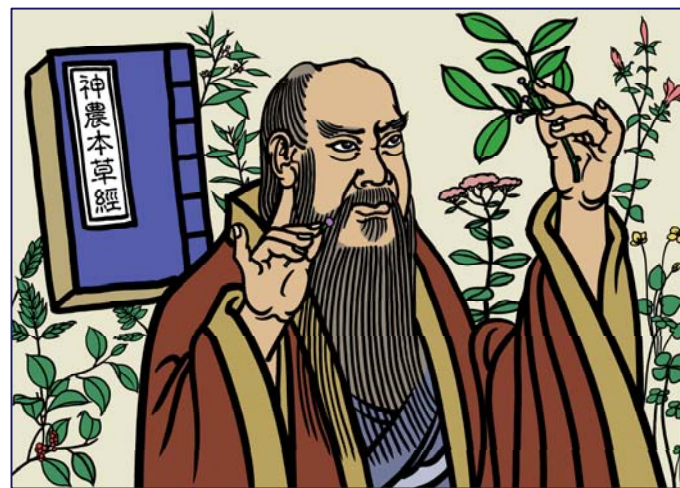




## “抗癌中藥~現代醫學好幫手”

手術、化療、放療是現代醫學治療惡性腫瘤的三大要法，各有所長。中醫辨證論治，綜合患者全身整體表現來分析考量，立方遣藥，而非只侷限於腫瘤，整體觀念較強，可彌補現代醫學的不足。中藥治癌有以下特點：

- ✓ 1、可以彌補手術治療、放射治療、化學治療的不足：  
手術固然能切除腫瘤，但還有殘癌、或區域淋巴轉移等，運用中藥術後長期治療，可以防止復發和轉移。
- ✓ 2、減輕放、化療對消化道和造血系統之副作用；另，對於癌症末期患者或不能手術和放、化療的病人，中藥治療提供另一救命途徑。
- ✓ 3、不影響勞動力：癌症患者局部狀況好轉的同時，全身狀況也會改善，甚至能勝任日常的工作。
- ✓ 4、副作用小：沒有骨髓抑制方面的副作用，對消化道也不會有嚴重的影響。



本文以中草藥作為抗癌藥物為例，探討：

- 所有研發相關文獻。
- 研發情形綜覽。
- 研發標的物搜尋、評估。
- 標的物之物理、化學性質與相關資訊。
- 先導化合物(Lead Compound) 之優化。
- 先導化合物(Lead Compound) 之自行進行藥物設計。
- Markush 結構檢索~進行專利布局與迴避設計。
- 黃芩(Baicalein)之最佳合成方式。





# 以中草藥作為抗癌藥物之 ~所有研發相關文獻~



以中草藥(Chinese herbals for medicine)為主題進行文獻檢索  
 ~ SciFinder幫助使用者獲得最全面、最相關之文獻訊息~

Research Topic

Chinese herbals for medicine

Examples:

*The effect of antibiotic residues on dairy products**Photocyanation of aromatic compounds*

## Research Topic Candidates

4 Topics 1 Selected

Select All Deselect All

勾選6078篇關鍵字被緊密探討之文獻

## Research Topic Candidates

## References

<input checked="" type="checkbox"/>	6078 references were found containing the two concepts "Chinese herbals" and "medicine" <u>closely associated with one another.</u>	6078
<input type="checkbox"/>	16893 references were found where the two concepts "Chinese herbals" and "medicine" were present anywhere in the reference.	16893
<input type="checkbox"/>	30227 references were found containing the concept "Chinese herbals".	30227
<input type="checkbox"/>	897392 references were found containing the concept "medicine".	897392

Get References

1.最全面：“concept” (概念式比對字詞)

=> SciFinder會同時檢索關鍵字詞之同義字、單複數變化等

2.最相關：“closely associated with one another”

=>表示此二關鍵字詞在文章中是被“緊密探討”(彼此間隔很近)



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References Get Substances Get Reactions Get Related Tools Send to SciPlanner

5124 References 0 Selected 關鍵字(Chinese herbal medicine)會被highlight出來 Export 03

Select All Deselect All Sort by: Accession Number

1. **Leaching characteristics and species of arsenic in Chinese herbal medicines** Full Text  
 By Yuan, Chungang; Wang, Jincong; Jin, Yi  
 From Abstracts of Papers, 244th ACS National Meeting & Exposition, Philadelphia, PA, United States, August 19-23, 2012 (2012), ENVR-278. | Language: English, Database: CAPLUS  
 In this present study, the leaching characteristics and species of arsenic in both herbs and decoction were investigated. The total arsenic was detd. by at. fluorescence spectrometry and the species (AsIII, AsV, MMAV and DMAV) were analyzed by liq. chromatog.-at. fluorescence spectrometry coupling system. The leaching characteristics of arsenic in **herbal medicines** were also evaluated by various extrn. methods including ultrasonic, microwave and decoction. High concns. of total arsenic were found in some of herbs (77.8-7139.5 ng g<sup>-1</sup>), but the concn. of arsenic in decoction was low. Much more...

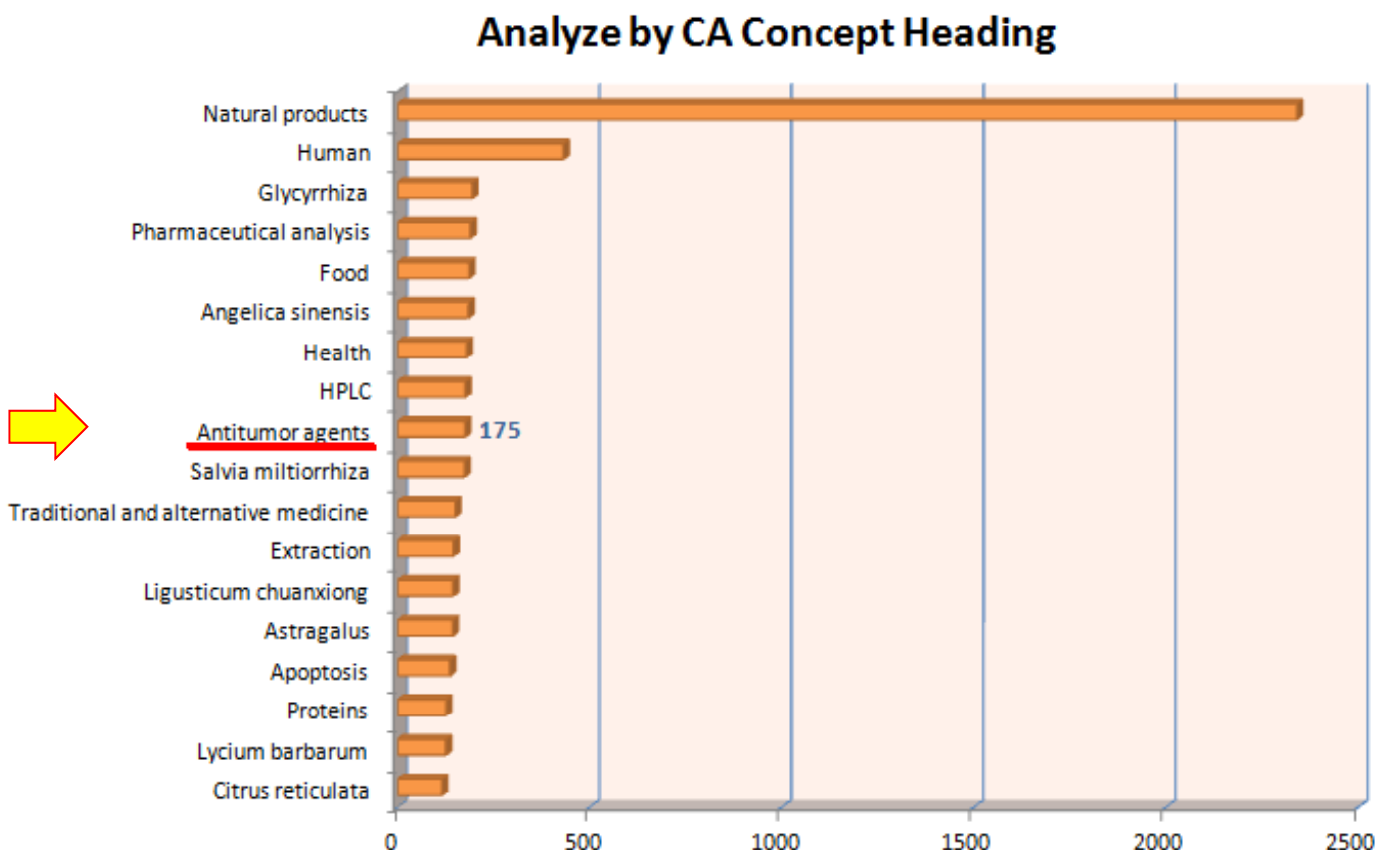
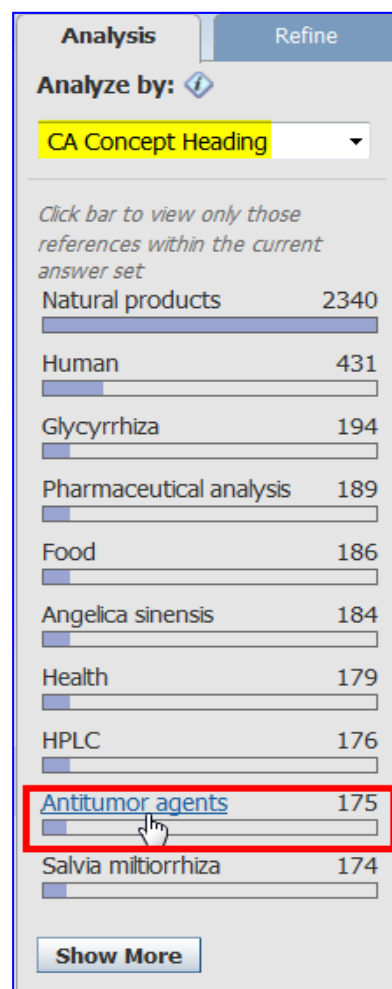
2. **Chinese herbal medicines to inhibit the replication of influenza viruses** Full Text  
 By Miyazaki, Tadaaki  
 From Nippon Yakurigaku Zasshi (2012), 140(2), 62-65. | Language: Japanese, Database: CAPLUS

3. **Changes in the intestinal absorption mechanism of icariin in the nanocavities of cyclodextrins** Full Text  
 By Zhang, Ye; Wang, Qiang-Song; Cui, Yuan-Lu; Meng, Fan-Cui; Lin, Ke-Ming  
 From International Journal of Nanomedicine (2012), 7, 4239-4249. | Language: English, Database: CAPLUS  
 Icarin is a bioactive **herbal** ingredient isolated from Herba epimedii, which has been widely used for the treatment of osteoporosis and male sexual dysfunction in traditional **Chinese medicine**. The major objective of this work is to investigate the different enhancing effects of  $\beta$ -cyclodextrin ( $\beta$ -CD) and hydroxypropyl- $\beta$ -cyclodextrin (HP- $\beta$ -CD) on the intestinal absorption of icariin, and to identify the mol. mechanisms of this action. Host-guest-type interactions of icariin with cyclodextrins nanocavities were unambiguously demonstrated by the phase-soly. diagram, UV spectroscopy, Fourier tran...

4. **Application and research progress on molecular distillation technology in pharmaceutical industry** Full Text  
 By Hang, Zhijun; Ying, Anguo; Wu, Hao  
 From Huagong Shengchan Yu Jishu (2012), 19(2), 37-40. | Language: Chinese, Database: CAPLUS  
 This paper introduced the basic principle and tech. characteristics of mol. distn., which was a new-type liq.-liq. sepn. and purifn. technol. which has advantages of lower distn. temp., shorter heating time, higher sepn. efficiency, etc. The application and research progress on mol. distn. in the effective components sepd. from the crude product in **Chinese herbal medicine** and synthetic drugs such as vitamins, unsatd. fatty acids, volatile oil, etc were reviewed. Research and application in this field in China started relatively later, and then the optimum conditions of sepn. and purifn. need...

分析文獻的**研究領域(CA Concept Heading)**，找**“對”**研發方向

~ SciFinder 可**分析**出**所有**的研發領域，並佐以**文獻**，幫助使用者取得**最完整**之資料~

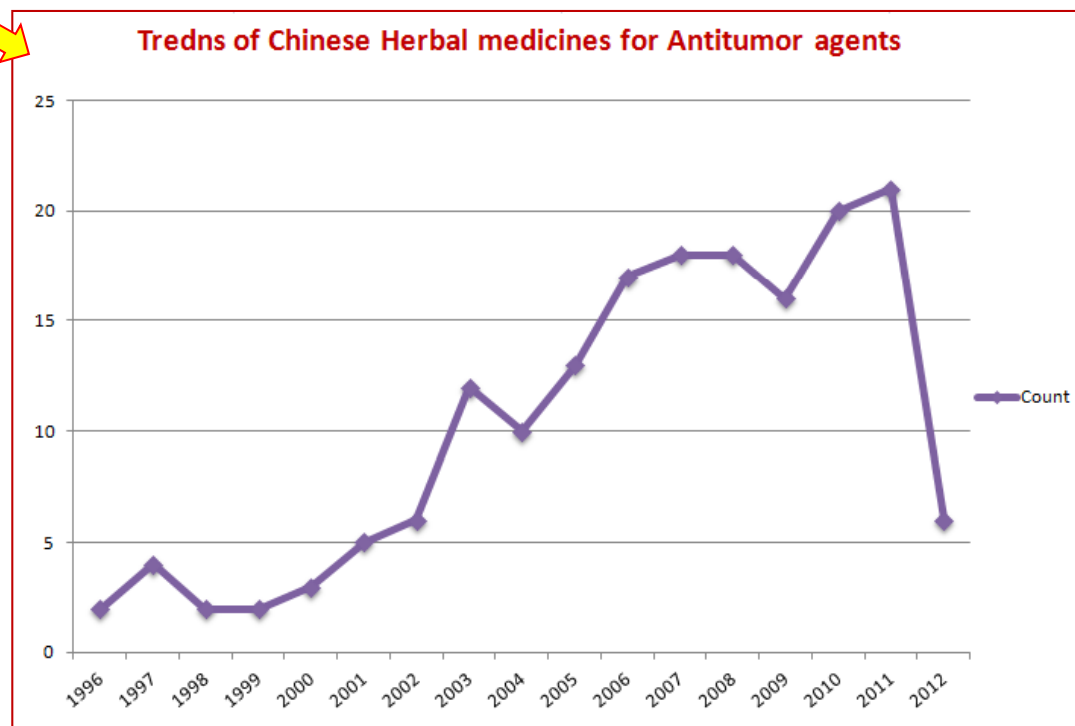




# 以中草藥作為抗癌藥物之 ~研發情形綜覽~

# 以中草藥作為抗癌藥物：近20年的研究走勢圖

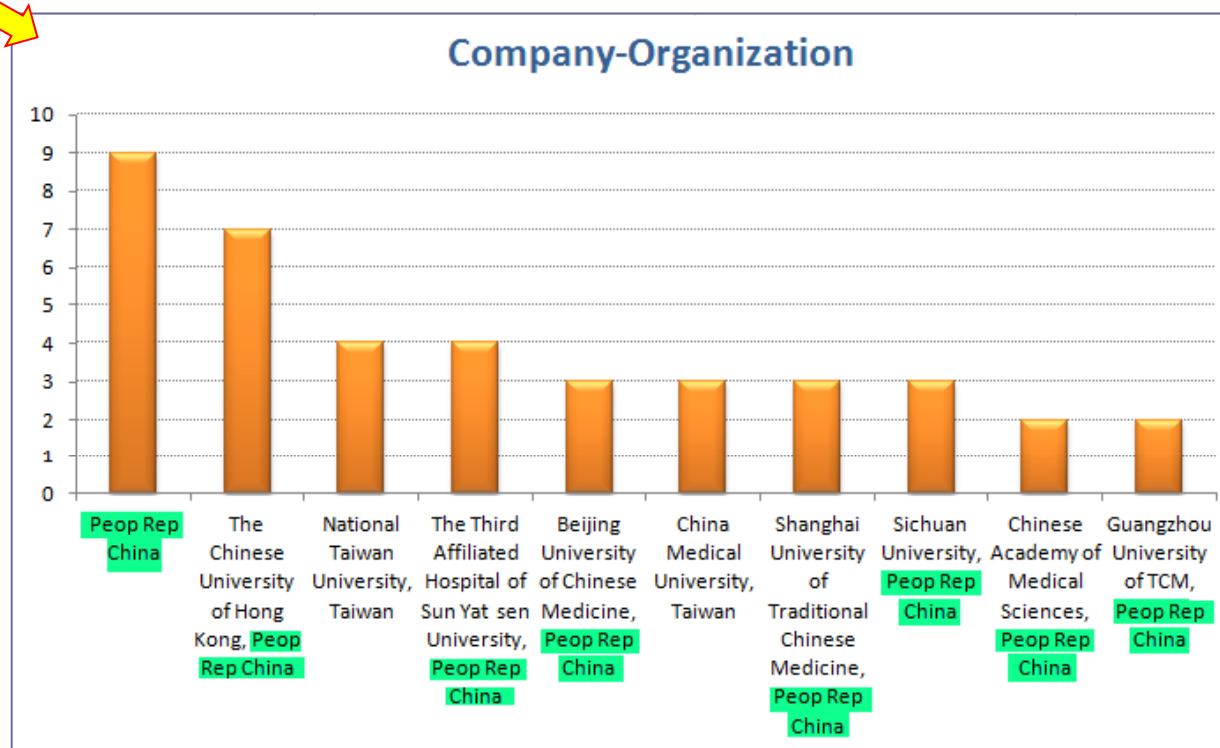
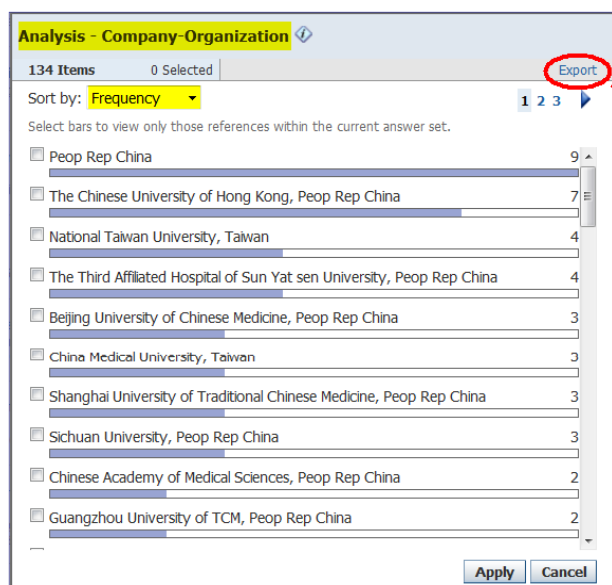
~ 以2010-2011研究能量最高 ~





# 主要的研究公司/機構柱狀圖：追蹤競爭者或尋找合作夥伴

~ 主要研究機構以中國(Peop Rep China) 最多 ~



## 中國 (Peop Rep China) 在以中草藥作為抗癌藥物之 研究領域(CA Concept Heading)分析

~ 針對Reop Rep China：分析其歷年的文獻研究分布情形，尋找研發可切入的方向~

CA Concept Heading	2012	2011	2010	2009	2008
Antitumor agents	4	18	10	15	12
Natural products		11	7	10	7
Cell proliferation	2				
Human		9	7	11	6
Cytokines	2				
Apoptosis		8	2	7	2
Kidney	2				
Signal transduction			4		
Cell proliferation		4			
Traditional & alternative medicine			3		
Proliferation inhibition				4	
Adenocarcinoma	1				
Neoplasm				3	
Antioxidants		3			
Pharmaceutical injections					4
Androgen receptors	1				
Bax proteins		3		2	
Hepatocellular carcinoma				3	
Polysaccharides					3
Antibiotics	1				
Bcl-2 proteins		3		2	
Cell infiltration			2		
Alkaloids					2
Antiviral agents	1				



# 以中草藥作為抗癌藥物之 ~研發標的物搜尋、評估~

# 175篇以中草藥作為抗癌藥物(Antitumor agent)之核心文獻

~依被引用次數(Citing References)排序：直接找到最重要的文獻~

**References** Get Substances Get Reactions Get Related Tools Send to SciPlanner

175 References 0 Selected

Select All Deselect All Sort by: **Citing References** ↓

Answers per Page [5] 1 2 3 4

1. **Indirubin derivatives inhibit Stat3 signaling and induce apoptosis in human cancer cells** Full Text  
 By Nam, Sangkil; Buettner, Ralf; Turkson, James; Kim, Donghwa; Cheng, Jin Q.; Muehlbeyer, Stephan; Hippe, Frankie; Vatter, Sandra; Merz, Karl-Heinz; Eisenbrand, Gerhard; et al  
 From Proceedings of the National Academy of Sciences of the United States of America (2005), 102(17), 5998-6003. | Language: English, Database: CAPLUS  
 Stat3 protein has an important role in oncogenesis and is a promising anticancer target. Indirubin, the active component of a traditional **Chinese herbal medicine**, has been shown previously to inhibit cyclin-dependent kinases, resulting in cell cycle arrest. Here, the authors show that the indirubin derivs. E564, E728, and E804 potently block constitutive Stat3 signaling in human breast and prostate cancer cells. In addn., E804 directly inhibits Src kinase activity (IC50 = 0.43 µM) in an in vitro kinase assay. Levels of tyrosyl phosphorylation of c-Src are also reduced in cultured cells 30 ...

2. **Induction of apoptosis in prostate cancer cell lines by a flavonoid, baicalin** Full Text  
 By Chan, Franky L.; Choi, H. L.; Chen, Z. Y.; Chan, Peter S. F.; Huang, Y.  
 From Cancer Letters (Shannon, Ireland) (2000), 160(2), 219-228. | Language: English, Database: CAPLUS  
 The flavonoid baicalin (baicalein 7-D-β-glucuronate), isolated from the dried root of Scutellaria baicalensis Georgi (Huang Qin), is widely used in the traditional **Chinese herbal medicine** for its anti-inflammatory, anti-pyretic and anti-hypersensitivity effects. In the present study, we investigated the in vitro effects of baicalin on the growth, viability, and induction of apoptosis in several human prostate cancer cell lines, including DU145, PC-3, LNCaP and CA-HPV-10. The cell viability after treating with baicalin for 2-4 days was quantified by a colorimetric 3-(4,5-dimethylthiazol-2-yl)...

3. **Anti-cancer properties of anthraquinones from Rhubarb** Full Text  
 By Huang, Qing; Lu, Guodong; Shen, Han-Ming; Chung, Maxey C. M.; Ong, Choon Nam  
 From Medicinal Research Reviews (2007), 27(5), 609-630. | Language: English, Database: CAPLUS  
 A review. Rhubarb has been used as a traditional **Chinese medicine** since ancient times and today it is still present in various **herbal** preps. In this review the toxicol. and anti-neoplastic potentials of the main anthraquinones from Rhubarb, Rheum palmatum, will be highlighted. It is interesting to note that although the chem. structures of various anthraquinones in this plant are similar, their bioactivities are rather different. The most abundant anthraquinone of rhubarb, emodin, was capable of inhibiting cellular proliferation, induction of apoptosis, and prevention of metastasis. Thes...

4. **Potential anticancer activity of tanshinone IIA against human breast cancer** Full Text  
 By Wang, Xiujie; Wei, Yuquan; Yuan, Shulan; Liu, Guanlian; Lu, Yanrong; Zhang, Jie; Wang, Wendong  
 From International Journal of Cancer (2005), 116(5), 799-807. | Language: English, Database: CAPLUS  
 Tanshinone IIA is a deriv. of phenanthrene-quinone isolated from Danshen, a widely used **Chinese herbal medicine**. It has antioxidant properties and cytotoxic activity against multiple human cancer cell lines, inducing apoptosis and differentiation of some human cancer cell lines. Our purpose was to confirm its anticancer activity on human breast cancer in vitro and in vivo and to elucidate the mechanism of its activity. Human breast cancer cells were tested in vitro for cytotoxicity, colony formation inhibition, BrdU incorporation and gene expression profiling after treatment with tanshinone...

~127 ~100 ~91 ~85

# 靛玉紅衍生物抑制 Stat 3 訊息傳導並誘發癌症細胞之凋亡

Return

Previous Next

## 1. Indirubin derivatives inhibit Stat3 signaling and induce apoptosis in human cancer cells

By: Nam, Sangkil; Buettner, Ralf; Turkson, James; Kim, Donghwa; Cheng, Jin Q.; Muehlbeyer, Stephan; Hippe, Frankie; Vatter, Sandra; Merz, Karl-Heinz; Eisenbrand, Gerhard; Jove, Richard

Stat3 protein has an important role in oncogenesis and is a promising anticancer target. Indirubin, the active component of a traditional Chinese herbal medicine, has been shown previously to inhibit cyclin-dependent kinases, resulting in cell cycle arrest. Here, the authors show that the indirubin derivs. E564, E728, and E804 potently block constitutive Stat3 signaling in human breast and prostate cancer cells. In addn., E804 directly inhibits Src kinase activity ( $IC_{50} = 0.43 \mu M$ ) in an in vitro kinase assay. Levels of tyrosyl phosphorylation of c-Src are also reduced in cultured cells 30 min after E804 treatment. Tyrosyl phosphorylation of Stat3, which is known to be phosphorylated by c-Src, was decreased, and constitutive Stat3 DNA binding-activity was suppressed in cells 30 min after E804 treatment. The antiapoptotic proteins Mcl-1 and Survivin, which are encoded in target genes of Stat3, were down-regulated by indirubin derivs., followed by induction of apoptosis. These results demonstrate that E804 directly blocks the Src-Stat3 signaling pathway, suggesting that the antitumor activity of indirubin compds. is at least partially due to inhibition of this pathway.

### Indexing

Pharmacology (Section1-6)

### Concepts

#### Proteins

Mcl-1 (myeloid cell leukemia sequence-1); indirubin derivs. inhibit Stat3 signaling and induce apoptosis in human cancer cells

Biological study, unclassified; Biological study

#### Transcription factors

STAT3 (signal transducer and activator of transcription 3); indirubin derivs. inhibit Stat3 signaling and induce apoptosis in human cancer cells

Biological study, unclassified; Biological study

#### Antitumor agents

Human  
Prostate gland, neoplasm

#### Apoptosis

Mammary gland, neoplasm  
Signal transduction, biological

文獻中出現的重要的概念，幫助研究者迅速掌握文獻重點。

詳細的物質索引：CAS RN、物質名稱。

### Substances

479-41-4D Indirubin, derivs.  
144697-17-6 c-Src kinase  
152478-56-3 Jak1 kinase  
371761-91-0 Survivin

靛玉紅

Survivin (凋亡抑制基因)

indirubin derivs. inhibit Stat3 signaling and induce apoptosis in human cancer cells

Biological study, unclassified; Biological study

物質用途說明。

301323-96-6  
301323-97-7  
854171-26-9  
854171-28-1  
854171-29-2  
854171-31-6  
854171-33-8  
854171-35-0  
854171-37-2

可再hyperlink至物質資料。

### Source

Proceedings of the National Academy of Sciences of the United States of America

Volume102

Issue17

Pages5998-6003

Journal

2005

CODEN:PNASAG

ISSN:0027-8424

DOI:10.1073/pnas.0409467102

### Company/Organization

Molecular Oncology Program  
H. Lee Moffitt Cancer Center and Research Institute  
Tampa, FL, USA 33612

### Accession Number

2005:424591  
CAN143:53076  
CAPLUS

### Publisher

National Academy of Sciences

### Language

English



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除了靛玉紅，  
還有沒有其他標的物可選擇呢？



## Categorize 功能：針對文獻細分為72個學科領域

~利用Categorize的**三階層**分類功能，可鉅細靡遺的進行篩選，**精準**挑選**研發標的**的~

Categorize

1. Select a heading and category.

Category Heading	Category
All	Medicine (84)
Biology	Substances in medicine (220)
<b>Biotechnology</b>	Toxicology & forensics (11)
General chemistry	Substances in biological uses (17)
Genetics & protein chemistry	Agriculture (6)
Technology	Food (11)
Polymer chemistry	Substances in adverse effects (10)
Synthetic chemistry	Substances in food chemistry (1)
Physical chemistry	
Analytical chemistry	
Environmental chemistry	

主領域：生物技術

次領域：藥用物質

2. Select index terms of interest.

Index Terms	Selected Terms
<div>1 2 3</div> <div>Select All Deselect All</div> <div> <input type="checkbox"/> Natural products, pharmaceutical 31           <input type="checkbox"/> Polysaccharides 11           <input type="checkbox"/> Baicalein 黃芩 9           <input type="checkbox"/> Berberine 黃連素 9           <input type="checkbox"/> Alkaloids 生物鹼 7           <input type="checkbox"/> Flavonoids 黃酮類化合物 7           <input type="checkbox"/> Baicalin 6           <input type="checkbox"/> Oridonin 冬凌草甲素 6           <input type="checkbox"/> Tanshinone IIA 丹參酮 5           <input type="checkbox"/> Curcumin 薑黃素 4           <input type="checkbox"/> 5-Fluorouracil 3           <input type="checkbox"/> Emodin 大黃素 3           <input type="checkbox"/> Ginsenoside Rg1 人參皂甙 3           <input type="checkbox"/> Proteins, general 3           <input type="checkbox"/> Proteins, specific or class 3         </div>	

藥物名稱與其文獻數量

Biotechnology > Substances in medicine

OK

Cancel

## Categorize 功能：分析”可應用於工業生產的物質”

**Categorize** ⓘ

1. Select a heading and category.

Category Heading ⓘ	Category ⓘ
All	Prepared substances (38)
Biology	Reactants & reagents (28)
Biotechnology	Purified substances (15)
General chemistry	Reactions (7)
Genetics & protein chemistry	Bio-prepared substances (5)
Technology	<b>Manufactured substances (2)</b>
Polymer chemistry	
<b>Synthetic chemistry</b>	
Physical chemistry	
Analytical chemistry	
Environmental chemistry	

主領域：合成化學

2. Select index terms of interest.

Index Terms ⓘ	Selected Terms ⓘ
<b>Select All</b> <b>Deselect All</b>	
<input type="checkbox"/> Natural products, pharmaceutical	1
<input type="checkbox"/> Polysaccharides	1

Synthetic chemistry > Manufactured substances

OK Cancel

## Categorize 功能：挑選“黃芩”作為研發標的

**Categorize** ⓘ

**1. Select a heading and category.**

Category Heading ⓘ	Category ⓘ
All	Medicine (84)
Biology	Substances in medicine (220)
<b>Biotechnology</b>	Toxicology & forensics (11)
General chemistry	Substances in biological uses (17)
Genetics & protein chemistry	Agriculture (6)
Technology	Food (11)
Polymer chemistry	Substances in adverse effects (10)
Synthetic chemistry	Substances in food chemistry (1)
Physical chemistry	
Analytical chemistry	
Environmental chemistry	

**2. Select index terms of interest.**

Index Terms ⓘ	
1 2 3 ▶	
Select All Deselect All	
<input type="checkbox"/> Natural products, pharmaceutical	31
<input type="checkbox"/> Polysaccharides	11
<input checked="" type="checkbox"/> <b>Baicalein</b>	9
<input type="checkbox"/> Berberine	9
<input type="checkbox"/> Alkaloids	7
<input type="checkbox"/> Flavonoids	7
<input type="checkbox"/> Baicalin	6
<input type="checkbox"/> Oridonin	6
<input type="checkbox"/> Tanshinone IIA	5
<input type="checkbox"/> Curcumin	4
<input type="checkbox"/> 5-Fluorouracil	3
<input type="checkbox"/> Emodin	3
<input type="checkbox"/> Ginsenoside Rg1	3
<input type="checkbox"/> Proteins, general	3
<input type="checkbox"/> Proteins, specific or class	3

**Selected Terms ⓘ**

Click 'x' to remove the category from 'Selected Terms'

✕ Biotechnology > Substances in medicine (1 Terms)

Biotechnology > Substances in medicine > 1 Index Term(s) Selected

OK Cancel

## 利用文獻“再次確認”以黃芩作為研發標的可行性

References Get Substances Get Reactions Get Related Tools Send to SciPlanner

9 References 0 Selected Save Print Export

Select All Deselect All Sort by: Accession Number ↓ Answers per Page [50]

Display:

- 1. A phase I study of the Chinese herbal medicine PHY906 as a modulator of irinotecan-based chemotherapy in patients with advanced colorectal cancer** Full Text

By Kumar, Shivani; Conus, M.; Shtli, Rana; Michal, Wadler; Scott, Stephenson; Joss, O'Bourke; Mark, Brandman; Wayne, Tilton; Robert, Liu; Shun, Huang; Jiao, Zaoli; et al

From Clinical Colo... ~1

晚期大腸癌病人，利用 **irinotecan** 化療時，以中草藥**PHY906**作為一調控劑之 **phase I** 研究。

PHY906 is a novel Chinese herbal prepri. that has been used in the Orient for over 1000 years to treat a wide range of gastrointestinal side effects including diarrhea, abdominal cramps, vomiting, fever, and headache. Preclin. and clin. studies were conducted to further investigate the biol. and clin. activities of this herbal medicine. To ensure standardization and maintain interbatch reliability of PHY906, high performance liq. chromatog. (HPLC) was used to establish a "chem. fingerprint" of PHY906. In vivo preclin. studies using the murine Colon 39 tumor model showed that PHY906 protected...
- 2. Flavonoid baicalein suppresses adhesion, migration and invasion of MDA-MB-231 human breast cancer cells** Full Text

By Wang, Ling; Ling, Yun; Chen, Yan; Li, Cheng-Ling; Feng, Feng; You, Qi-Dong; Lu, Na; Guo, Qing-Long

From Cancer Lett... ~15

Baicalein is a 類黃酮黃芩抑制 MDA-MB-231人類乳癌細胞之附著、移動與入侵。 and anti-cancer therapy. However, the mol. mechanism of its anti-cancer activity remains poorly understood and warrants further investigations. The purpose of this study is to verify the activity of baicalein to inhibit the invasion of MDA-MB-231 human breast cancer cells. The results indicated that baicalein suppressed MDA-MB-231 cell adhesion to fibronectin-coated substrate, wound healing migration and invasion through the Matrigel in a concn.-dependent manner. Western blot and gelatin...
- 3. Baicalein, a flavonoid extracted from a methanolic extract of Oroxyllum indicum inhibits proliferation of a cancer cell line in vitro via induction of apoptosis** Full Text

By Roy, M. Kumar; Nakahara, K.; Thalang, V. Na; Trakoonvivakorn, G.; Takenaka, M.; Isobe, S.; Tsushida, T.

From A... ~11

黃芩，一取自 **Oroxyllum indicum** 甲醇粹取物中提煉出的黃酮類化合物，經由誘導細胞凋亡抑制試管內癌細胞增生。

anti-hypersensitivity effects, inhibited in vitro proliferation of HL-60 cells. The flavonoid baicalein was found as an active component in the ext. Anal. of freeze-dried fruits of the plant indicated that this component comprised about 4% of the material by dry wt. In this study, we investigated the in vitro effects of baicalein on the viability and induction of apoptosis in the HL-60 cell line. The cell viability after treating with ...
- 4. Role of Baicalein in the regulation of proliferation and apoptosis in human myeloma RPMI8226 cells** Full Text

By Li, Qiu-bai; You, Yong; Chen, Zhi-chao; Lu, Jian; Shao, Jing; Zou, Ping

From C... ~9

黃芩在人類骨髓瘤 **RPMI8226** 細胞株中，細胞增生與細胞凋亡的調控過程所扮演的角色。 Chinese herbal medicine, which has been utilized in anti-inflammatory therapy. The effects of Baicalein on apoptosis and proliferation of myeloma cells and on the expression of 12-lipoxygenase (12-LOX) in these cells were detd. Baicalein inhibited proliferation and induced apoptosis of the human myeloma cell line RPMI8226 in a time- and dose-dependent manner and caused G0/G1-phase arrest, indicating that cell arrest is involved in inhibiting growth of myeloma cells....





~探討**標的物(黃芩)**之物理、  
化學**性質**與相關**資訊**~

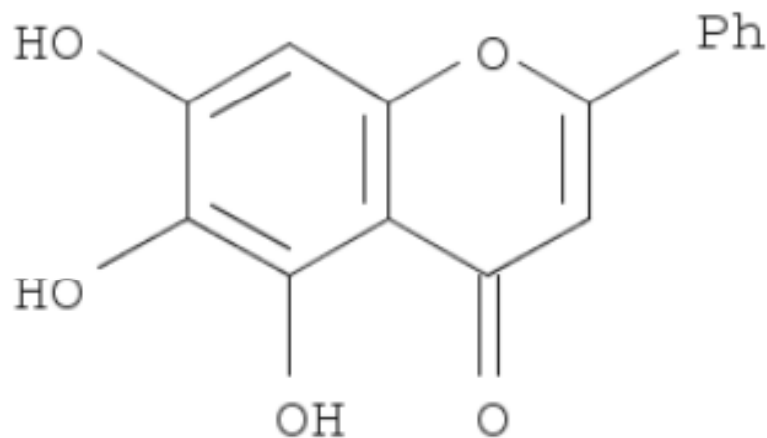
## Get Substances : 取得文獻中的相關物質

取得9篇黃芩(Baicalein)文獻中的相關物質

Reference Detail **Get Substances** Get Reactions Get Cited Get Citing Get Full Text Send to SciPlanner

42. Substance Detail  
491-67-8

## Baicalein (黃芩)



~2039



References

相關文獻



Reactions

相關化學反應



Commercial Sources

全球供應商資料

C<sub>15</sub> H<sub>10</sub> O<sub>5</sub>4*H*-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-

Spectra 光譜資料  
Experimental Properties 實驗性數據

## Baicalein (黃芩)之詳細物質資訊

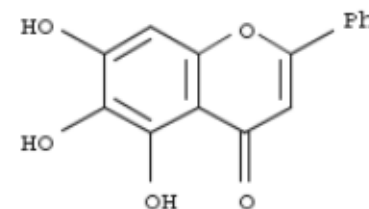
### CAS 註冊碼

42.

CAS Registry Number: 491-67-8

C<sub>15</sub> H<sub>10</sub> O<sub>5</sub>4*H*-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-

Baicalein (6CI); Flavone, 5,6,7-trihydroxy- (7CI,8CI); 5,6,7-Trihydroxyflavone; Baikalein; NSC 661431; Noroxylin



化學結構式

### 完整化學名稱 (包含商品名、俗名)

~2,039 References

Document Types: Conference, Dissertation, Journal, Patent

### CAS Role (物質角色): 黃芩已被研究 的文獻領域

CAS Role	Patents	Nonpatents	Nonspecific Derivatives from Patents	Nonspecific Derivatives from Nonpatents
Analytical Study	✓	✓		✓
Biological Study	✓	✓	✓	✓
Combinatorial Study	✓			
Formation, Nonpreparative		✓		✓
Occurrence	✓	✓		✓
Preparation	✓	✓	✓	
Process	✓	✓		✓
Properties	✓	✓	✓	✓
Prophetic in Patents	✓			
Reactant or Reagent	✓	✓		
Uses	✓	✓	✓	✓

▶ Bioactivity Indicators **NEW**▶ Target Indicators **NEW**

SciFinder

CAS is a division of the American Chemical Society

www.cas.org

## 詳細化學性質：預測性數據

### Predicted Properties: Biological Chemical Density Lipinski and Related Spectra Structure-related Thermal

Biological Properties	Value	Condition	Note	Top
Bioconcentration Factor	345	pH 1 Temp: 25 °C	(30)	
Bioconcentration Factor	342	pH 4 Temp: 25 °C	(30)	
Bioconcentration Factor	36.8	pH 7 Temp: 25 °C	(30)	
Bioconcentration Factor	1.0	pH 10 Temp: 25 °C	(30)	
Chemical Properties	Value	Condition	Note	Top
Koc	2280	pH 1 Temp: 25 °C	(30)	
Koc	1320	pH 6 Temp: 25 °C	(30)	
Koc	1.0	pH 9 Temp: 25 °C	(30)	
logD	3.64	pH 2 Temp: 25 °C	(30)	
logD	3.61	pH 5 Temp: 25 °C	(30)	
logD	-0.48	pH 10 Temp: 25 °C	(30)	
Mass Solubility	Sparingly Soluble (0.076 g/L)	pH 1 Temp: 25 °C	(30)	
Mass Solubility	Sparingly Soluble (0.076 g/L)	pH 4 Temp: 25 °C	(30)	
Mass Solubility	Sparingly Soluble (0.70 g/L)	pH 7 Temp: 25 °C	(30)	
Mass Solubility	Soluble (15 g/L)	pH 8 Temp: 25 °C	(30)	在鹼性條件下容易溶解
Mass Solubility	Very Soluble (432 g/L)	pH 9 Temp: 25 °C	(30)	
Mass Solubility	Very Soluble (1000 g/L)	pH 10 Temp: 25 °C	(30)	
Molar Solubility	Sparingly Soluble (2.8E-4 mol/L)	pH 1 Temp: 25 °C	(30)	
Molar Solubility	Sparingly Soluble (2.8E-4 mol/L)	pH 4 Temp: 25 °C	(30)	
Molar Solubility	Sparingly Soluble (2.6E-3 mol/L)	pH 7 Temp: 25 °C	(30)	
Molar Solubility	Slightly Soluble (0.054 mol/L)	pH 8 Temp: 25 °C	(30)	在鹼性條件下容易溶解
Molar Solubility	Very Soluble (1.60 mol/L)	pH 9 Temp: 25 °C	(30)	
Molar Solubility	Very Soluble (3.70 mol/L)	pH 10 Temp: 25 °C	(30)	
pKa	6.31±0.40	Most Acidic Temp: 25 °C	(30)	
Vapor Pressure	7.27E-14 Torr	Temp: 25 °C	(30)	
Density Properties	Value	Condition	Note	Top
Density	1.548±0.06 g/cm3	Temp: 20 °C Press: 760 Torr	(30)	
Molar Volume	174.5±3.0 cm3/mol	Temp: 20 °C Press: 760 Torr	(30)	

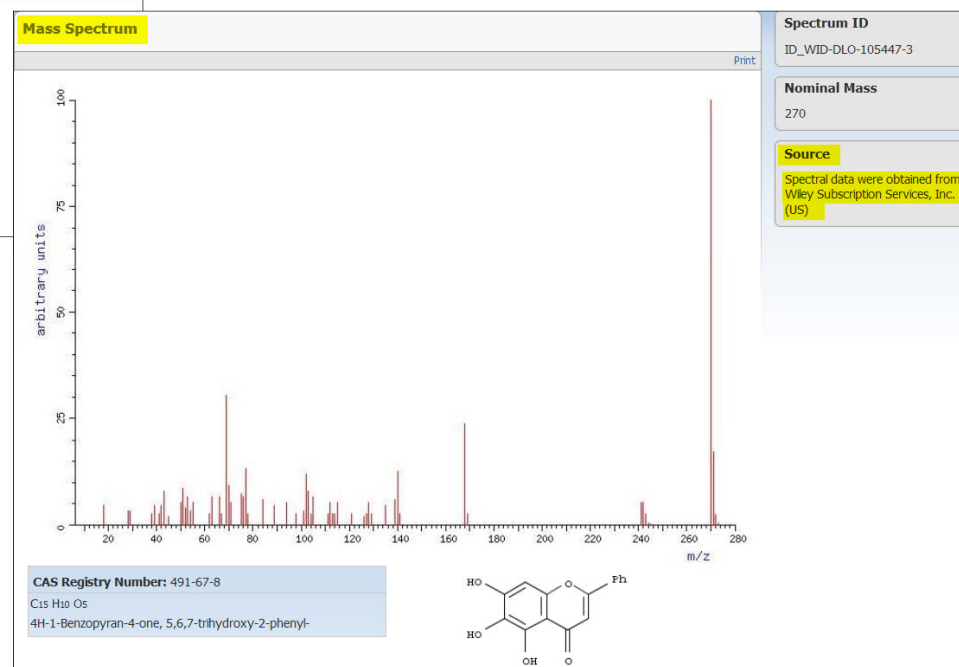
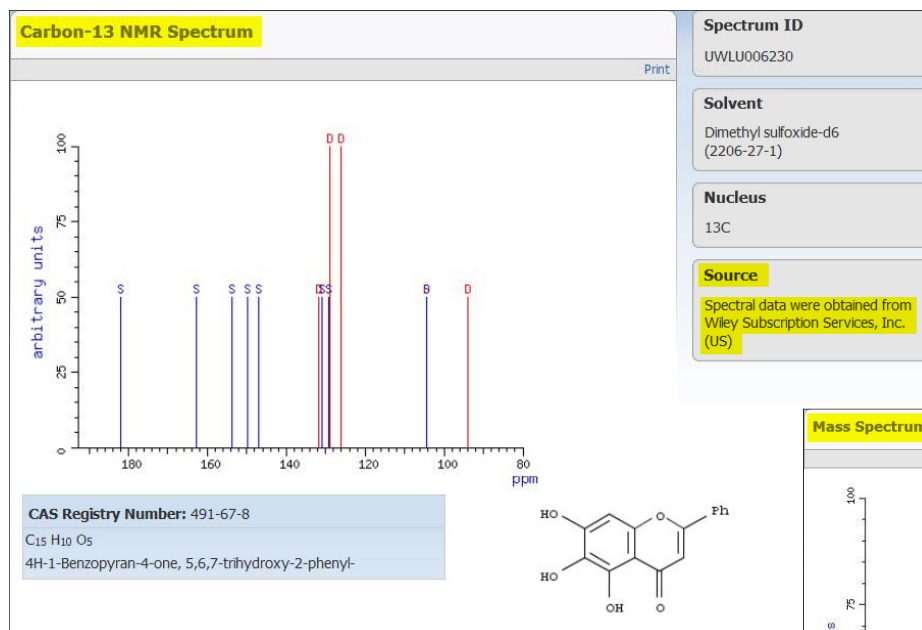
## 詳細化學性質：實驗性數據

### Experimental Properties: Biological Chemical Lipinski and Related Spectra Structure-related Thermal

Biological Properties	Value	Condition	Note	Top
ADME (Absorption, Distribution, Metabolism, Excretion)	See full text	1 of 2	(2)CAS	
Half-Life (Biological)	See full text		(8)CAS	
Minimum Inhibitory Concentration	See full text	1 of 2	(25)CAS	
NOAEL/LOAEL	See full text		(27)CAS	
Chemical Properties	Value	Condition	Note	Top
Acid/Base Dissociation Constant (Ka/Kb)	See full text		(1)CAS	
logD	See full text		(11)CAS	
logP	See full text	1 of 2	(12)CAS	
Potential of Electrode Reaction	See full text		(28)CAS	
Lipinski and Related Properties	Value	Condition	Note	Top
logP	See full text	1 of 2	(12)CAS	
Spectra Properties	Value	Condition	Note	Top
Carbon-13 NMR Spectrum	<a href="#">See spectrum</a>		(4)WSS	
Carbon-13 NMR Spectrum	See full text	1 of 6	(5)CAS	
Circular Dichroism Spectrum	See full text		(6)CAS	
IR Absorption Spectrum	See full text	1 of 5	(9)CAS	
IR Spectrum	See full text		(10)CAS	
Mass Spectrum	<a href="#">See spectrum</a>		(4)WSS	
Mass Spectrum	See full text	1 of 23	(6)CAS	
Proton NMR Spectrum	See full text	1 of 11	(9)CAS	
Raman Spectrum	See full text		(29)CAS	
Two-Dimensional NMR Spectrum	See full text		(26)CAS	
UV and Visible Absorption Spectrum	See full text	1 of 14	(6)CAS	
UV and Visible Spectrum	See full text	1 of 3	(23)CAS	
Structure-related Properties	Value	Condition	Note	Top
Bond Length	See full text		(3)CAS	
Molecular Structure	See full text		(26)CAS	



# 各種光譜資料與來源





## Commercial Source (廠商資訊)：全球供應商資料

~Pricing & Availability：可直接連結至供應商網頁，進行線上購物~

**Commercial Sources**

102 Commercial Sources 0 Selected Keep Selected Remove Selected Print Export

11 commercial sources with the Pricing & Availability (New) Pricing & Availability are displayed Keep Analysis Clear Analysis

Select All Deselect All Sort by: Catalog Name ↑ Answers per Page [20]

2. **2012 TCI AMERICA Fine Chemicals**  
 Supplier Name: TCI America, Catalog Publication Date: 30 May 2012  
 Order Number: T2721  
 Quantity: 1 g, 5 g  
 491-67-8 Baicalein  
[Link](#) [Pricing & Availability](#) Check pricing and availability with supplier.

3. **2012 TCI EUROPE Fine Chemicals**  
 Supplier Name: TCI EUROPE N.V., Catalog Publication Date: 30 May 2012  
 Order Number: T2721  
 Quantity: 1 g, 5 g  
 491-67-8 Baicalein  
[Link](#) [Pricing & Availability](#) **NEW**

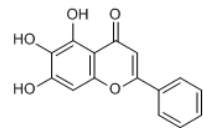
5. **2012 TCI Shanghai Fine Chemicals**  
 Supplier Name: TCI (Shanghai) Development Co., Ltd., Catalog Publication Date: 30 May 2012  
 Order Number: T2721  
 Quantity: 1 g, 5 g  
 491-67-8 Baicalein  
[Link](#) [Pricing & Availability](#) **NEW**

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**Baicalein**  
 (CAS Number : 491-67-8)

Structure Synonym 5,6,7-Trihydroxyflavone



**General Information**

Product Number T2721

Packing Unit	Price	Available Stock			Quantity
		Portland	Philadelphia	Japan *	
1g	86.00 USD	Please contact us.	Please contact us.	8	0
5g	280.00 USD	Please contact us.	Please contact us.	8	0

\* Items available from stock in Japan will be delivered in 10 business days  
 \* Please contact us if you need further information.  
 (Sales Dept Tel: 800-423-8616 / 503-283-1681 email: sales@tciamerica.com)

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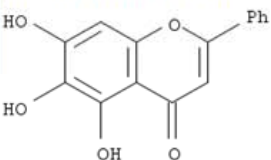
## Commercial Source (廠商資訊)：全球供應商資料

~Export 資料：直接取得包裝規格、報價與供應商資料、~

Microsoft Excel - Baicalein Commercial Source-11\_08\_24\_2012\_104052 [相容模式]

1  SciFinder®

2 CAS Registry Number: 491-67-8

3 

Order #	Chemical Name	CAS Index Name	Quantity	Price	Purity	Grade	Catalog Name	Pricing and Availability Info	Supplier Name	Street Address
5	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TCI America	9211 N. Harbortgate Street TCI Bldg. 4-10-2, Nihonbashi-Honcho Chuo-ku
6	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TOKYO CHEMICAL INDUSTRY CO.	3-1-13, Nihonbashi-Honcho Chuo-ku
7	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TOKYO KASEI HAMBAL CO., LTD.	2-6-1, Awaji-Cho Chuo-ku, Osaka-shi
8	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TOKYO KASEI Osaka Office	Boerenveldseweg 6 Haven 1063
9	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TCI EUROPE N.V.	Mergenthalerallee 79-81 The Magdalen Centre Robert Robinson Avenue, The Oxford Science Park
10	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TCI Deutschland GmbH	No.96 Pu Gong Road, Shanghai Chemical Industry Park
11	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	Tokyo Chemical Industry UK Ltd.	Bharanee Subalesh Building, B1, H-71, 5th Main Road Annanagar (East)
12	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TCI (Shanghai) Development Co., Ltd.	Boerenveldseweg 6 Haven 1063
13	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	\$86.00 \$280.00	≥98.0%	2012 TCI AMERICA Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TCI Chemicals (India) Pvt. Ltd.	
14	T2721	Baicalein	4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-	1 g 5 g	EUR64.55 EUR220.00	≥98.0%	2012 TCI EUROPE Fine Chemicals	<a href="http://www.tcichemicals.com/eshop/">http://www.tcichemicals.com/eshop/</a>	TCI EUROPE N.V.	



~以黃芩(Baicalein)當先導化合物(Lead Compound)，  
進行優化~

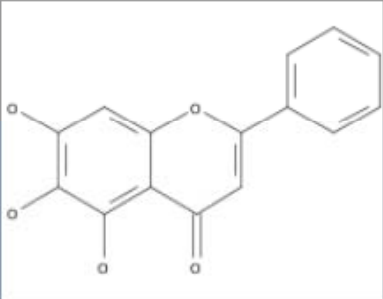
## Substructure Search (基底結構衍生檢索)

~以黃芩 (Baicalein) 的結構式為基底，做側鏈或官能基團之衍生 ~

**Explore Substances**

Chemical Structure Chemical Structure ⓘ

Markush  
Molecular Formula  
Property **NEW**  
Substance Identifier



Click image to change structure or view detail

Search type: ⓘ

- ☐ Exact Structure
- ☒ Substructure
- ☐ Similarity

☐ Show precision analysis

**Search**

**Characteristic(s)**

- ☒ Single component 只找衍生結構為單一化合物
- ☐ Commercially available
- ☐ Included in reference(s)

# Substructure Search (基底結構衍生檢索)

~共3,586個衍生化合物 => 提供多種藥物設計的選擇~

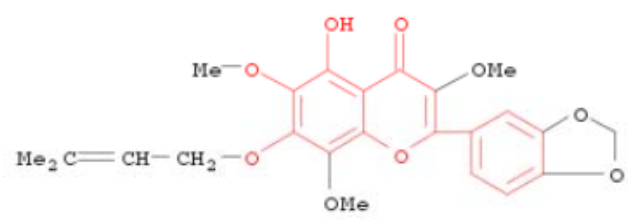
Substances Get References Get Reactions Tools Send to SciPlanner

**3586 Substances** 0 Selected Save Print Export

Select All Deselect All Sort by: CAS Registry Number Answers per Page [50] 1 2 3 4 5 6 ... 72 View:

1. Substance Detail  
1388084-65-8

直接連結至相關文獻

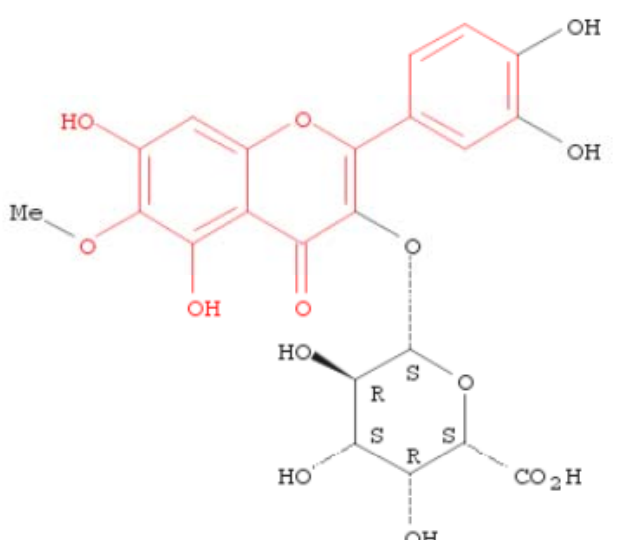


References

**C<sub>24</sub> H<sub>24</sub> O<sub>9</sub>**  
4*H*-1-Benzopyran-4-one, 2-(1,3-benzodioxol-5-yl)-5-hydroxy-3,6,8-trimethoxy-7-[(3-methyl-2-buten-1-yl)oxy]-

2. Substance Detail  
1386936-78-2

直接連結至相關文獻



References

**C<sub>22</sub> H<sub>20</sub> O<sub>14</sub>**  
INDEX NAME NOT YET ASSIGNED

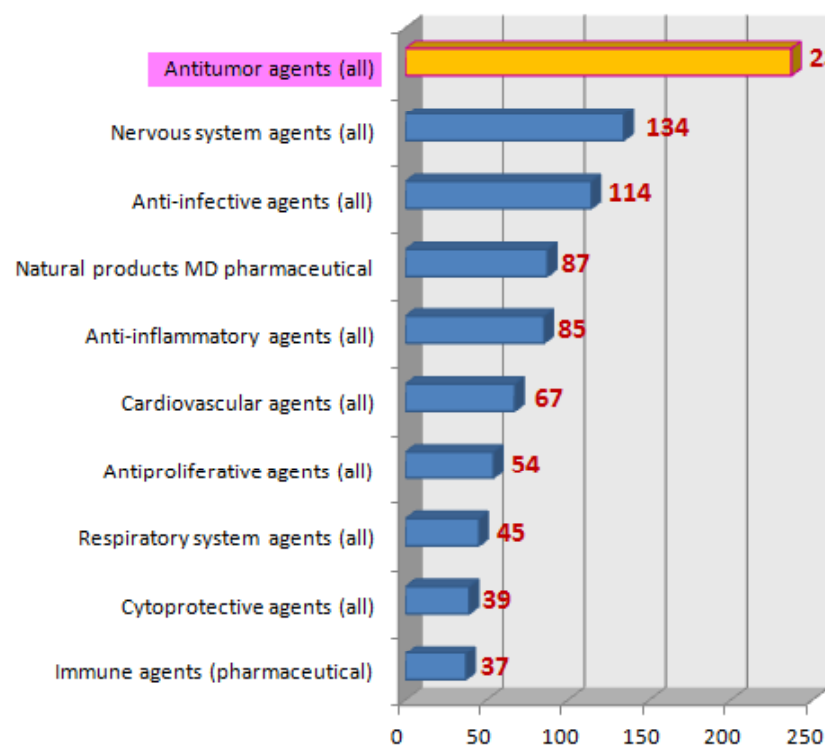
Absolute stereochemistry.



## 3,586 個衍生化合物以活性指標(Bioactivity Indicators)分析

~直接挑出 Antitumor agents 物質，再串連文獻與反應，節省研發時間~

### Bioactivity Indicators



#### 3. Substance Detail 1345982-18-4

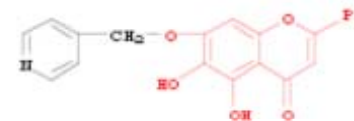


**C<sub>23</sub> H<sub>18</sub> O<sub>6</sub>**  
4*H*-1-Benzopyran-4-one, 5,7-dihydroxy-6-[(4-methoxyphenyl)methoxy]-2-phenyl-

~1 相關文獻

相關化學反應

#### 4. Substance Detail 1345982-13-9



**C<sub>21</sub> H<sub>15</sub> N O<sub>5</sub>**  
4*H*-1-Benzopyran-4-one, 5,6-dihydroxy-2-phenyl-7-(4-pyridinylmethoxy)-

~1 相關文獻

相關化學反應

3. Substance Detail  
1345982-18-4

**C23 H18 O6**  
4H-1-Benzopyran-4-one, 5,7-dihydroxy-6-[(4-methoxyphenyl)methoxy]-2-phenyl-

References

具"抗癌"活性指標物質~文獻佐證

~新合成的黃芩素衍生物造成人類腫瘤細胞之

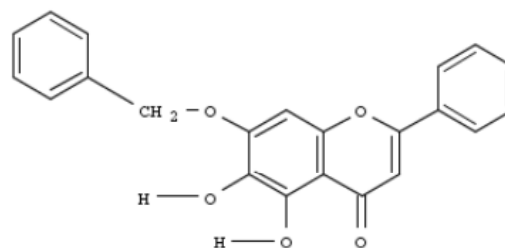
凋亡並活化AMP-activated 蛋白激酶~

Return

### Novel synthetic baicalein derivatives caused apoptosis and activated AMP-activated protein kinase in human tumor cells

By: Ding, Derong; Zhang, Baozi; Meng, Tao; Ma, Ying; Wang, Xin; Peng, Hongli; Shen, Jingkan

Studies on the anti-proliferative activities of novel baicalein derivs. demonstrated that compds. 8 (I) and its 4-fluorobenzyl analog 9 were able to activate AMPK by enhancing the levels of phosphorylated AMPK $\alpha$ , and showed more potent anti-proliferative effects than baicalein and AICAR in A431, SK-OV-3, DU 145 and HeLa cells, suggesting an alternative therapeutic approach for benzyl baicalein in cancer therapy.



I

### Indexing

Pharmacology (Section1-3)

Section cross-reference(s): 26

Concepts

Substances

### Source

*Organic & Biomolecular Chemistry*  
Volume9  
Issue21  
Pages7287-7291  
Journal; Online Computer File  
2011  
CODEN:OBCRAK  
ISSN:1477-0520  
DOI:10.1039/c1ob06094e

### Company/Organization

State Key Laboratory of Drug  
Research, Shanghai Institute of  
Materia Medica  
Chinese Academy of Sciences  
Shanghai, Peop. Rep. China  
201203

### Accession Number

2011:1303046  
CAN155:605962  
CAPLUS

### Publisher

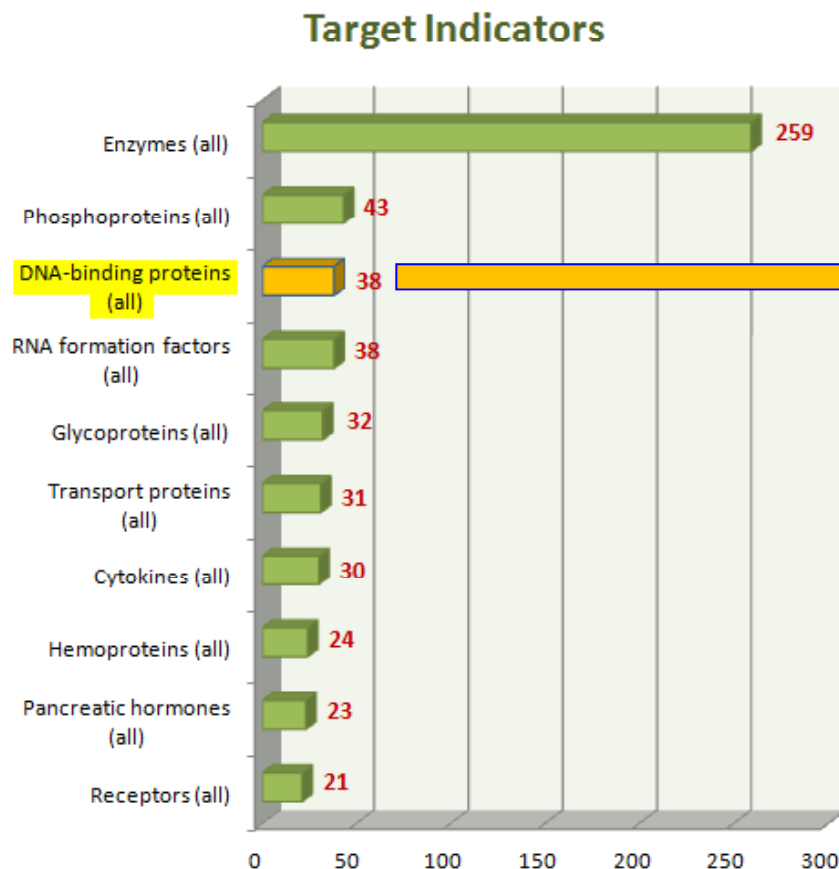
Royal Society of Chemistry

### Language

English

## 以作用指標(Target Indicators)分析：還有哪些可應用對象？

~若以DNA-binding proteins當作用對象，還有哪些可開發或應用的化合物？~



**8. Substance Detail**  
685143-63-9

~3 相關文獻  
 相關化學反應

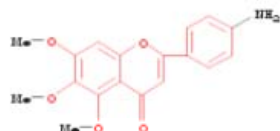
**C<sub>18</sub> H<sub>17</sub> N O<sub>5</sub>**  
4H-1-Benzopyran-4-one, 2-(4-aminophenyl)-5,6,7-trimethoxy-

---

**9. Substance Detail**  
1355483-74-7

~1 相關文獻  
 相關化學反應

**C<sub>18</sub> H<sub>15</sub> Br O<sub>5</sub>**  
4H-1-Benzopyran-4-one, 2-(4-bromophenyl)-5,6,7-trimethoxy-

8. Substance Detail  
685143-63-9C<sub>18</sub> H<sub>17</sub> N O<sub>5</sub>

4#1-Benzopyran-4-one, 2-(4-aminophenyl)-5,6,7-trimethoxy-

## References

~3

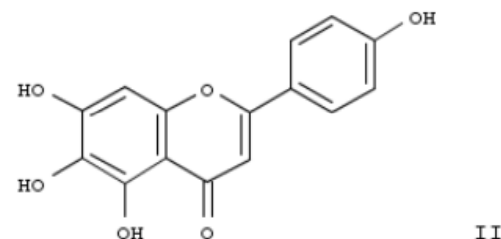
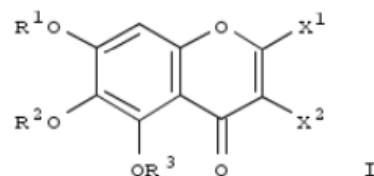
以DNA-binding proteins當作用對象~文獻佐證  
~製備chromone衍生物治療敗血性休克、  
器官損傷與其他疾病~

## 3. Preparation of chromone derivatives for treatment of septic shock, organ injury, and other disorders

By: Yen, Mao-Hsiung; Wu, Edwin S. C.

Assignee: Jenken Biosciences, Inc., USA

The title compds. I [wherein R<sup>1</sup>-R<sup>3</sup> = independently H, alkyl, alkenyl, alkynyl, SO<sub>3</sub>H, PO<sub>3</sub>H<sub>2</sub>, carbohydrate, etc.; X<sup>1</sup> and X<sup>2</sup> = independently Ar-X<sup>3</sup>-T; Ar = none, Ph, furanyl, thienyl, pyridyl, cyclohexyl, or PhCH<sub>2</sub>; X<sup>3</sup> = H, C, N, O, S, etc.; with provisos] or pharmaceutically acceptable salts thereof are prepd. For example, the compd. II was prepd. in a multi-step synthesis. I are useful for the prevention and treatment of septic shock, organ injury, and other disorders (no data).



## Patent Information

Patent No.	Kind	Date	Application No.	Date
WO 2004037193	A2	May 6, 2004	WO 2003-US33578	Oct 22, 2003
WO 2004037193	A3	Feb 17, 2005		
CA 2421887	A1	Apr 22, 2004	CA 2003-2421887	Mar 13, 2003
CA 2502975	A1	May 6, 2004	CA 2003-2502975	Oct 22, 2003

## 亦可限定分子量、溶點、沸點等參數縮小範圍

**Refine by Property Value** ⓘ

Select a property on the left, and specify values or limits on the right. Repeat for multiple properties.

Properties - 1 selected	Values - Predicted Molecular Weight
<b>Experimental</b>	Specify range:
<input type="checkbox"/> Boiling Point	<input type="text" value="0.0"/> to <input type="text" value="500"/>
<input type="checkbox"/> Melting Point	Min: 0.0 Max:
<b>Predicted</b>	
<input type="checkbox"/> H Acceptors	
<input type="checkbox"/> H Donors	
<input checked="" type="checkbox"/> Molecular Weight	
<input type="checkbox"/> logP	
<input type="checkbox"/> Freely Rotatable Bonds	
<input type="checkbox"/> Bioconcentration Factor	
<input type="checkbox"/> Boiling Point	
<input type="checkbox"/> Density	
<input type="checkbox"/> Enthalpy of Vaporization	
<input type="checkbox"/> Flash Point	
<input type="checkbox"/> H Acceptor/Donor Sum	
<input type="checkbox"/> Koc	
<input type="checkbox"/> logD	
<input type="checkbox"/> Mass Intrinsic Solubility	
<input type="checkbox"/> Mass Solubility	
<input type="checkbox"/> Molar Intrinsic Solubility	
<input type="checkbox"/> Molar Solubility	
<input type="checkbox"/> Molar Volume	

☐ Include substances with no values for selected properties.

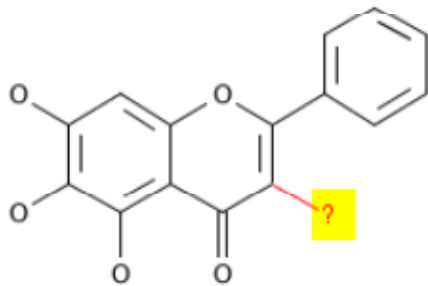
**Reset** **Refine** **Cancel**

## 或只探討特定位置的取代情形

**Refine by Atom Attachment** ⓘ

1. Click an atom to display the attachments present at that site.      2. Select attachment(s) of interest.

**Substructure**



**Atom Attachments**

Select All   Deselect All

<input type="checkbox"/> H or None	2113
<input type="checkbox"/> O	1407
<input type="checkbox"/> C	49
<input type="checkbox"/> Br	5
<input type="checkbox"/> Cl	4
<input type="checkbox"/> S	1
<input type="checkbox"/> N	1
<input type="checkbox"/> I	1
<input type="checkbox"/> Other	5
<input type="checkbox"/> A - Any (not H)	1468
<input type="checkbox"/> Q - Any (not C,H)	1419
<input type="checkbox"/> Ak - Alkyl chain	46
<input type="checkbox"/> X - Halogen	10
<input type="checkbox"/> Cb - Carbocycle	2
<input type="checkbox"/> Hy - Heterocycle	1

? =

**Refine**   **Cancel**

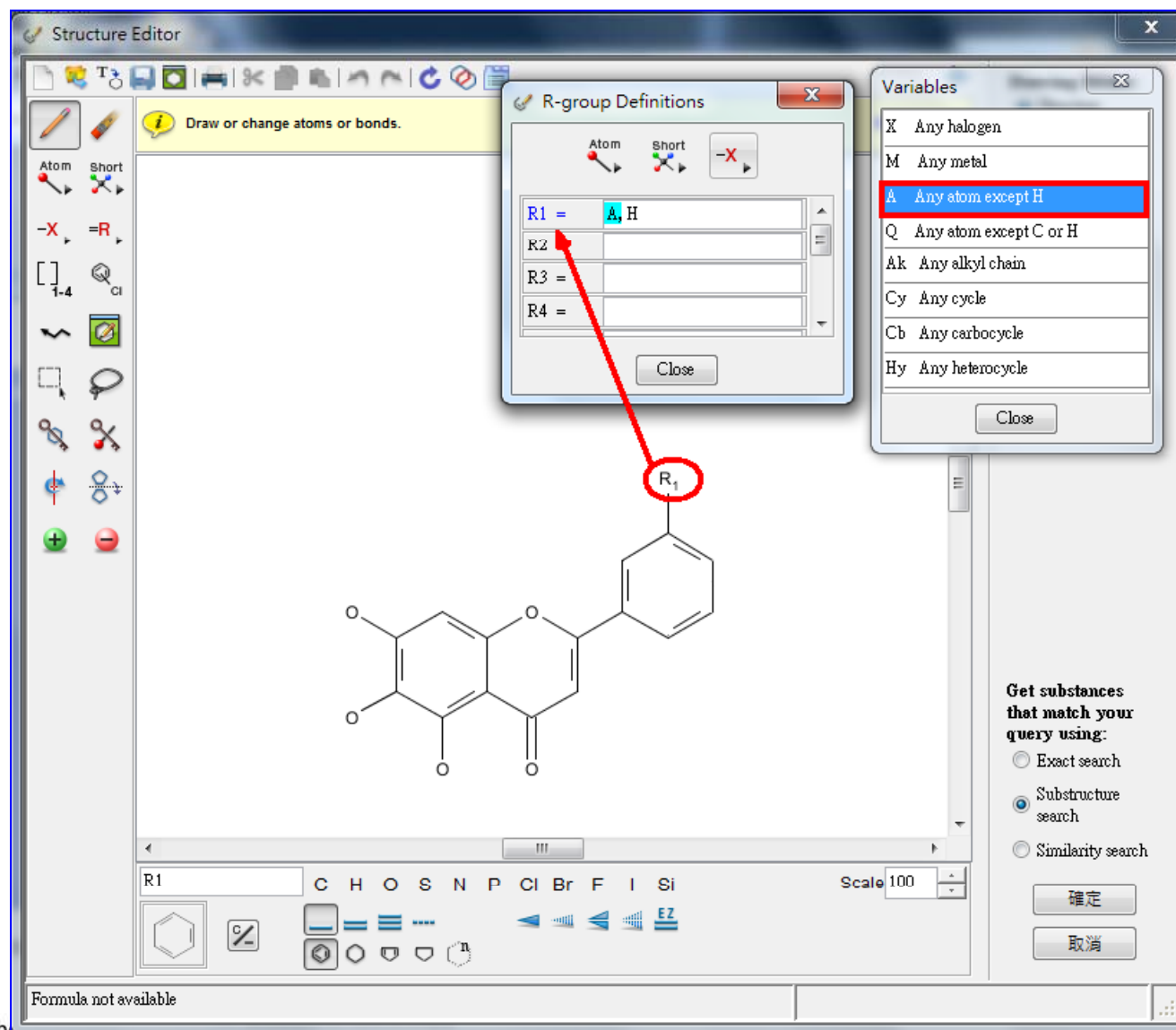




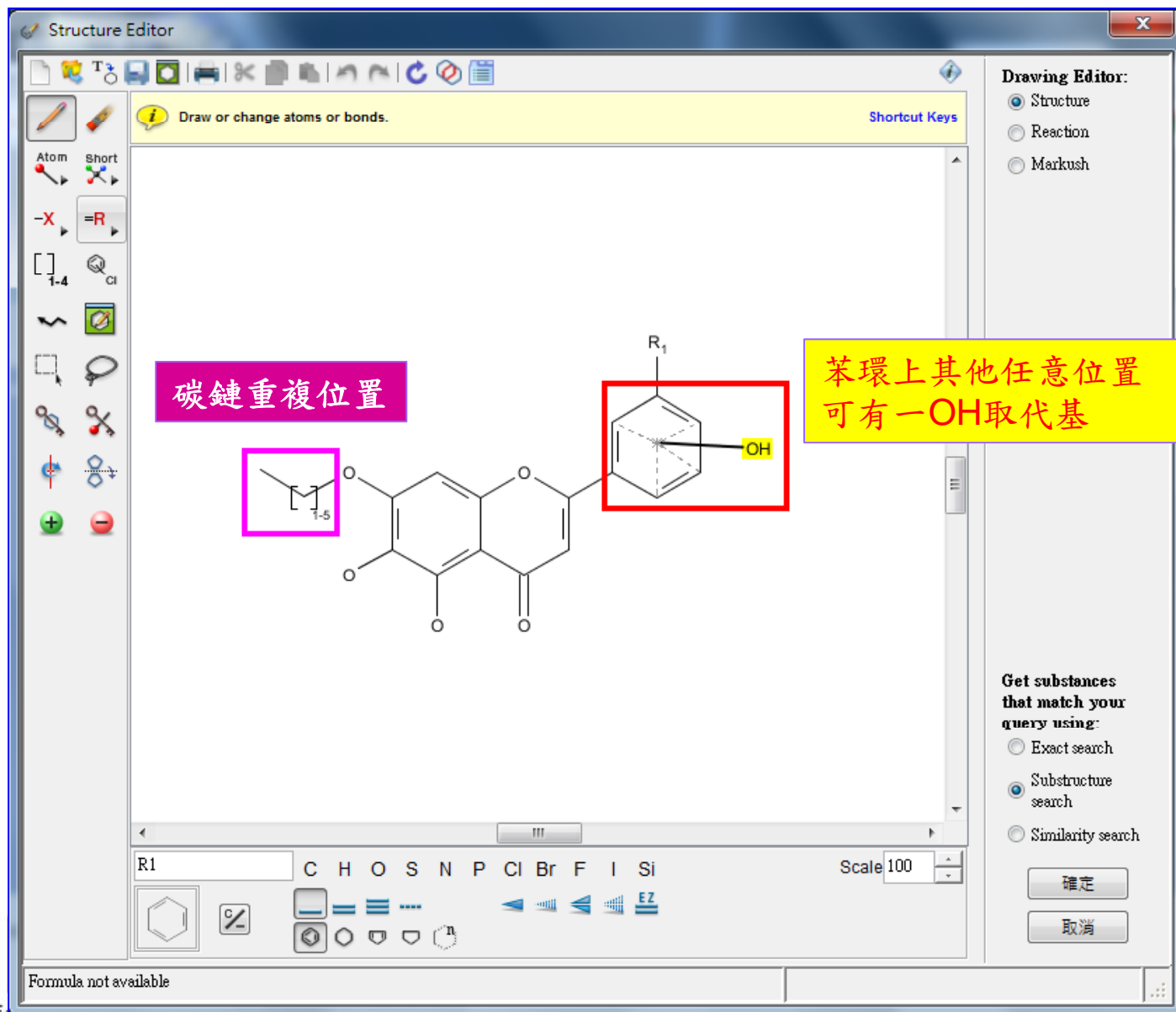
~以黃芩(Baicalerin)當先導化合物(Lead Compound)，  
自行進行藥物設計~

# 自行設計取代基R1

~例如: R1包含所有原子~



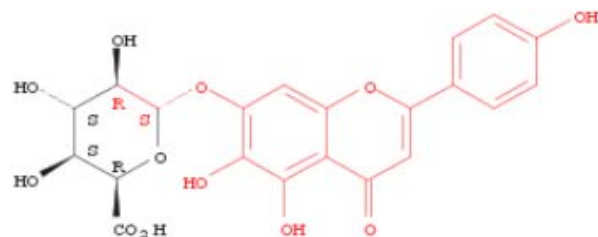
## 內部結構設計



# 獲得符合設計要求的化合物

## 30. Substance Detail 1258510-15-4

~1

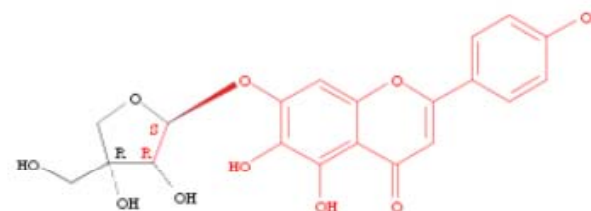


Absolute stereochemistry.

**C21 H18 O12**  
INDEX NAME NOT YET ASSIGNED

## 36. Substance Detail 1217268-01-3

~1

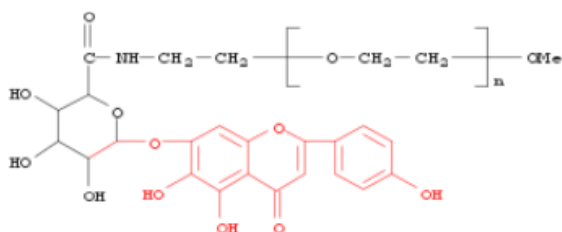


Absolute stereochemistry., Rotation (-).

**C20 H18 O10**  
4*H*-1-Benzopyran-4-one, 7-(D-apio-β-D-furanosyloxy)-5,6-dihydroxy-2-(4-hydroxyphenyl)-

## 46. Substance Detail 1180659-38-4

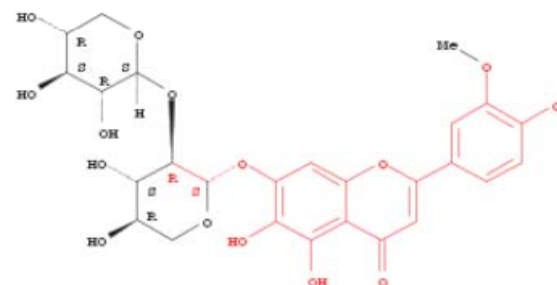
~2



**(C2 H4 O)<sub>n</sub> C24 H25 N O12**  
Poly(oxy-1,2-ethanediyl), α-[2-[[1-*O*-[5,6-dihydroxy-2-(4-hydroxyphenyl)-4-oxo-4*H*-1-benzopyran-7-yl]-β-D-glucopyranuronoyl]amino]ethyl]-ω-methoxy-

## 105. Substance Detail 847032-40-0

~1



Absolute stereochemistry.

**C26 H28 O15**  
4*H*-1-Benzopyran-4-one, 5,6-dihydroxy-2-(4-hydroxy-3-methoxyphenyl)-7-[(2-*O*-β-D-xylopyranosyl-β-D-xylopyranosyloxy)-



# Markush 結構檢索

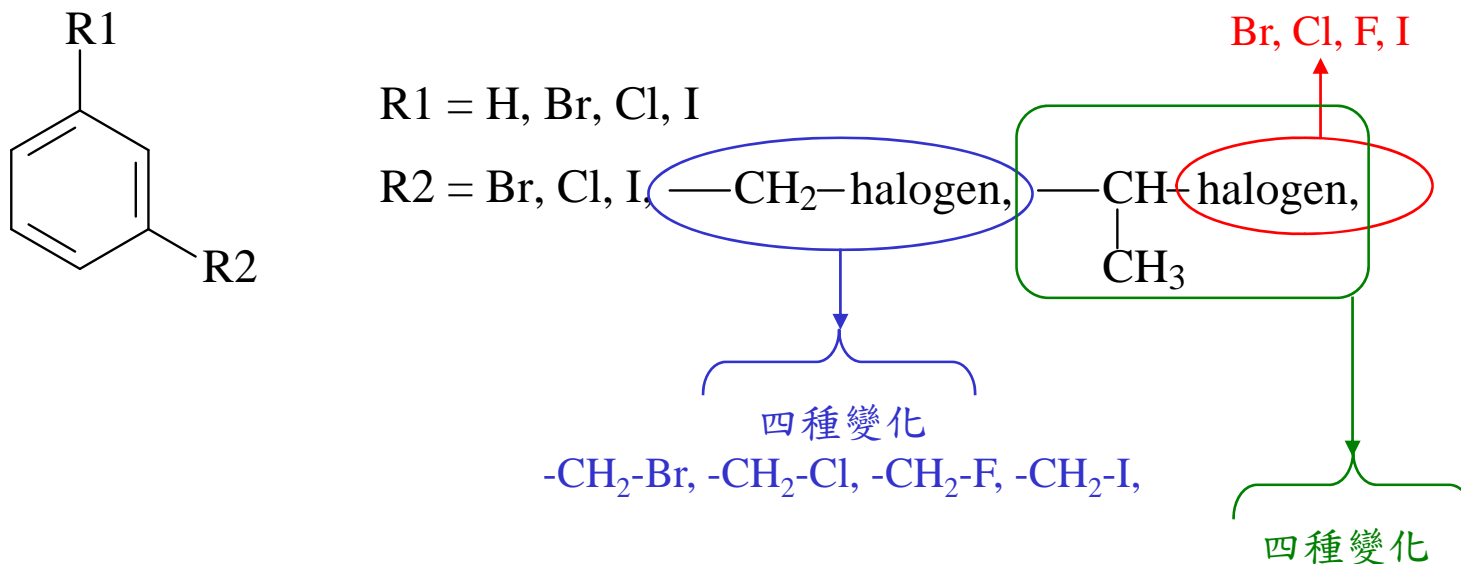
## ~進行專利布局與迴避設計~

## 在專利中描述物質的方式：

- 特定物質[Specific Substance]：
  - 以特定的化學結構所陳述的特定物質，會有CAS RN.
- 預測性物質[Prophetic Substance]：
  - 使用Markush結構所陳述的預測物質，一個Markush可以陳述上百或上千的化學物質
  - Patent中所陳述的預測物質，不會被標示CAS RN.
  - Markush 檢索，是Substructure檢索的補充。



## Example of Markush Structure



- R1有4種變化，R2有11種變化，所以上述的這一個 Markush Structure，就可代表44種 ( $R1 \times R2 = 4 \times 11 = 44$ ) 不同的化合物。
- 這一群化合物，我們可稱其為族性結構。
- 由此可知，若結構上的可變性稍多一些，一個 Markush Structure 可代表上千種結構。

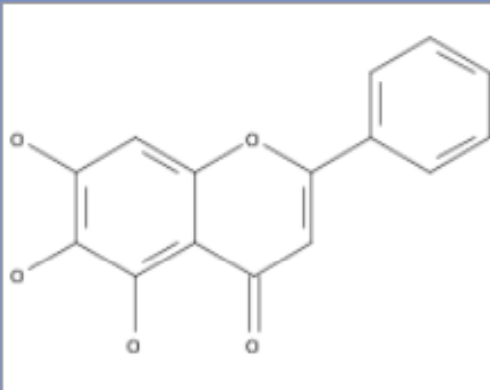
## Markush Search (以Markush結構檢索)

~將黃芩 (Baicalein) 的結構式拆解，進行檢索~

Explore Substances

Chemical Structure  
**Markush**  
Molecular Formula  
Property NEW  
Substance Identifier

Markush ⓘ



Search

Click image to change structure or view detail

Search type: ⓘ  
☐ Allow variability only as specified  
☒ Substructure

# Markush Search Results

~共有394篇專利，裡面有涵蓋被拆解後之黃芩 (Baicalein)結構式~

**References** | Get Substances | Get Reactions | Get Related | Tools | Send to SciPlanner

394 References | 0 Selected | Save | Print | Export

Select All | Deselect All | Sort by: Accession Number | Answers per Page [50] | 1 2 3 4 5 6 7 8 | Display: [icon]

- 1. Preparation of 5,7-dihydroxy-6-methoxyflavones** | Full Text  
By Aoki, Katsuyuki  
From Jpn. Kokai Tokkyo Koho (2012), JP 2012116785 A 20120621. | Language: Japanese, Database: CAPLUS  
A method for prepn. of the title compds. I (n = 0-5; R1 = OH, C1-4 alkoxy) such as eupatilin and jaceosidin involves a step of converting 5,6,7-trimethoxy-8-acylflavones II [n = same as above; R2 = same as R1; R3 = C1-4 alkyl, (un)substituted C7-9 phenylalkyl] into 5,7-dihydroxy-6-methoxy-8-acylflavones III (R4 = same as R2; R5 = same as R3; n = same as above) by demethylation. Thus, a mixt. of 2,6-diacetyl-3,4,5-trimethoxyphenol, 3,4-dimethoxybenzaldehyde, NaOMe, and MeOH was stirred at 80° for 4 h to give 97.4% aldol condensation product, which was further treated with iodine in...
- 2. Incorporation of flavan-3-ols and gallic acid derivatives into lignin to improve biomass utilization** | Full Text  
By Grabber, John H.; Ralph, John  
From U.S. Pat. Appl. Publ. (2012), US 20120094330 A1 20120419. | Language: English, Database: CAPLUS  
A method of manufg. modified lignin and the resulting non-natural modified lignin product in which a lignin-producing polymn. reaction is performed using a polymerizable monomer having the structure: wherein at least one of the polymerizable monomers is incorporated into the resulting lignin.
- 3. Stimulation of neuroregeneration by flavonoid glycosides** | Full Text  
By Zenobi-Wong, Marcy  
From PCT Int. Appl. (2012), WO 2012047763 A2 20120412. | Language: English, Database: CAPLUS  
Flavonoid glycosides, such as isoquercitrin, are shown to stimulate the formation of neuritis and neuronal synapses in neurons and neuronal progenitor (stem) cells.
- 4. Preparation of flavonols with improved antioxidant and vasodilatory activity** | Full Text  
By Yap, Suwan; Williams, Spencer John; Woodman, Owen Llewellyn  
From Aust. Pat. Appl. (2008), AU 2006233256 A1 20080515. | Language: English, Database: CAPLUS  
Flavonols I [M = (X)m; P = (Y)p; R is selected from the group consisting of H, alkyl, alkenyl, alkynyl, heteroalkyl, cycloalkyl, heterocycloalkyl, aryl, heteroaryl, and acyl, each of which may be optionally substituted; R1 is an org. moiety that is capable of being converted into a charged group; each X and Y is independently selected from the group consisting of H, halogen, CN, NO2, CF3, OCF3, alkyl, alkenyl, alkynyl, haloalkyl, haloalkenyl, heteroalkyl, cycloalkyl, cycloalkenyl, heterocycloalkyl, heterocycloalkenyl, aryl, heteroaryl, (cycloalkyl)alkyl, (heterocycloalkyl)alkyl, arylalkyl, he...

**Analysis** | Refine

Analyze by: [icon]

Document Type [v]

Click bar to view only those references within the current answer set

Patent 394

Show More

**Categorize**

More detailed analysis based on CAS indexing

Categorize

# 製備5,7-dihydroxy-6-methoxyflavones

## Reference Detail



Get Substances



Get Reactions



Get Cited



Get Citing



Get Full Text



Send to SciPlanner

[Link](#)
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[Export](#)

[Return](#)

[Previous](#)

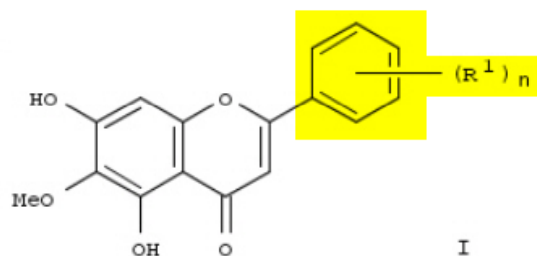
[Next](#)

### 1. Preparation of 5,7-dihydroxy-6-methoxyflavones

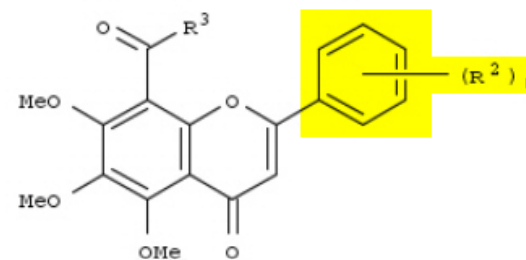
By: Aoki, Katsuyuki

Assignee: Tsumura and Co., Japan

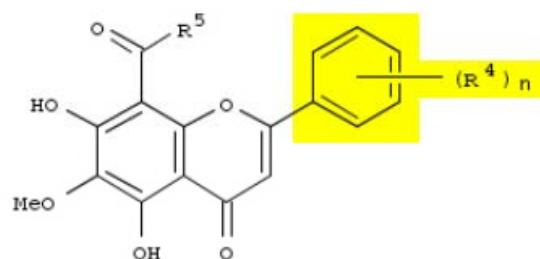
A method for prepn. of the title compds. I ( $n = 0-5$ ;  $R^1 = OH$ , C1-4 alkyl, C1-4 alkoxy) such as eupatilin and jaceosidin involves a step of converting 5,6,7-trimethoxy-8-acylflavones II [ $n = \text{same as above}$ ;  $R^2 = \text{same as } R^1$ ;  $R^3 = \text{C1-4 alkyl, (un)substituted C7-9 phenylalkyl}$ ] into 5,7-dihydroxy-6-methoxy-8-acylflavones III ( $R^4 = \text{same as } R^2$ ;  $R^5 = \text{same as } R^3$ ;  $n = \text{same as above}$ ) by demethylation. Thus, a mixt. of 2,6-diacetyl-3,4,5-trimethoxyphenol, 3,4-dimethoxybenzaldehyde, NaOMe, and MeOH was stirred at  $80^\circ$  for 4 h to give 97.4% aldol condensation product, which was further treated with iodine in DMSO at  $180^\circ$  for 45 h to give 91.0% II [ $R^3 = CH:CHC_6H_4(OMe)_2-3,4$ ,  $R^3 = (OMe)_2-3,4$ ]. The flavone was reduced with H using Pd/C in MeOAc/MeOH at room temp. for 24 h to give II [ $R^3 = CH_2CH_2C_6H_4(OMe)_2-3,4$ ,  $R^2 = (OMe)_2-3,4$ ] (IV). IV and Bu<sub>4</sub>NI were dissolved in CH<sub>2</sub>Cl<sub>2</sub>, treated with BCl<sub>3</sub> at  $-78^\circ$ , and the reaction mixt. was stirred for 5 h while heating to room temp. and at  $0^\circ$  for 1 h to give 70.9% III [ $R^5 = CH_2CH_2C_6H_4(OMe)_2-3,4$ ,  $R^4 = (OMe)_2-3,4$ ]. This was treated with Sc(OTf)<sub>3</sub> in ClCH<sub>2</sub>CH<sub>2</sub>Cl under reflux for 24 h to give 85.6% eupatilin.



I



II



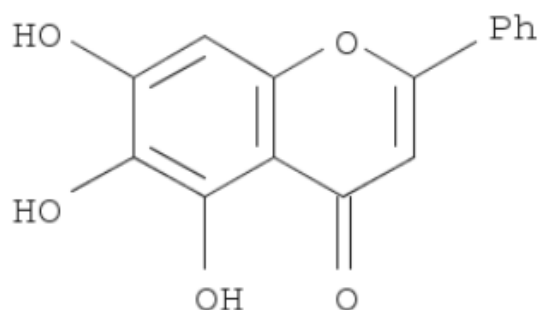
III



# ~黃芩(Baicalarin)之 最佳合成方式~

## 物質直接連結至化學反應式

### 1. Substance Detail 491-67-8



C<sub>15</sub> H<sub>10</sub> O<sub>5</sub>

4#1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-

[Spectra](#)  
[Experimental Properties](#)

~2045



Reactions

### Get Reactions

#### Limit results by reaction role:

- ☒ Product
- ☐ Reactant
- ☐ Reagent
- ☐ Reactant or reagent
- ☐ Catalyst
- ☐ Solvent
- ☐ Any role

Get

Cancel



## 共63筆化學反應式

~其中16筆有Experimental Procedure (原文中之反應過程)~

Reactions Get References Tools Send to SciPlanner

**63 Reactions** 0 Selected Save Print Export

16 reactions with the Experimental Procedure Experimental Procedures Available are displayed Keep Analysis Clear Analysis

Select All Deselect All Sort by: Accession Number Answers per Page [15] 1 2

Display:

☐ 41. [View Reaction Detail](#) Link  
5 Steps *Hover over any structure for more options.*

[Step 2.1]

▼ Overview

Steps/Stages	Notes
1.1 R:BF <sub>3</sub> -Et <sub>2</sub> O, 15 min, reflux	Reactants: 3, Reagents: 3, Solvents: 2, Steps: 5, Stages: 6, Most stages in any one step: 2
2.1 R:KOH, S:H <sub>2</sub> O, S:EtOH, < 15°C; 8 h, rt	
2.2 R:H <sub>2</sub> O	
3.1 2 h, reflux	
4.1	
5.1 12 h, reflux	References
	<a href="#">Methods of synthesizing flavonoids and chalcones</a> Full Text By Shaw, Jiajiu et al From U.S. Pat. Appl. Publ., 20040242907, 02 Dec 2004

► Experimental Procedure

# 利用分析功能~再篩選出產率>80%的反應

**Analysis** **Refine**

Analyze by:

**Product Yield**

Click bar to view only those reactions within the current answer set

**80-89%** **2**

**Show More**

**Reactions**

16 Reactions 0 Selected Save Print Export

2 reactions with the Product Yields **80-89%** are displayed Keep Analysis Clear Analysis

Select All Deselect All Sort by: Accession Number

Answers per Page [2] Display:

15. [View Reaction Detail](#) [Link](#) [Similar Reactions](#)  
**Single Step** Hover over any structure for more options.

**89%**

► Overview

▼ Experimental Procedure  
 Baicalein Baicalein was prepared by the modified procedure outlined above either from flavone 2 (reflux, 18 h) in 89% yield. mp 258-260° C. (lit. 263-264° C.). R<sub>f</sub> (CH<sub>2</sub>Cl<sub>2</sub>:EtOAc=5:1) 0.4. <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>) δ: 6.61 (1 H, s), 6.92 (1 H, s), 7.56 (3 H, m), 8.05 (2 H, d, J=8.1 Hz), 8.81 (1 H, s), 10.57 (1 H, s), 12.65 (1 H, s). IR (KBr) cm<sup>-1</sup>: 3411, 1654. UV λ<sub>max</sub> (EtOH) nm (log ε): 326 (4.17), 276 (4.42), 215 (4.49). MS m/z: 270 (M<sup>+</sup>).

16. [View Reaction Detail](#) [Link](#) [Similar Reactions](#)  
**Single Step** Hover over any structure for more options.

**81%**

► Overview

▼ Experimental Procedure  
 Baicalein Baicalein was prepared by the modified procedure outlined above either from oroxylin A (reflux, 12 h) in 81% yield. mp 258-260° C. (lit. 263-264° C.). R<sub>f</sub> (CH<sub>2</sub>Cl<sub>2</sub>:EtOAc=5:1) 0.4. <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>) δ: 6.61 (1 H, s), 6.92 (1 H, s), 7.56 (3 H, m), 8.05 (2 H, d, J=8.1 Hz), 8.81 (1 H, s), 10.57 (1 H, s), 12.65 (1 H, s). IR (KBr) cm<sup>-1</sup>: 3411, 1654. UV λ<sub>max</sub> (EtOH) nm (log ε): 326 (4.17), 276 (4.42), 215 (4.49). MS m/z: 270 (M<sup>+</sup>).

# 黃芩(Baicalein)之合成方式：Overview、Experiment Procedure

Reactions Get References Tools Send to SciPlanner

16 Reactions 1 Selected Save Print Export

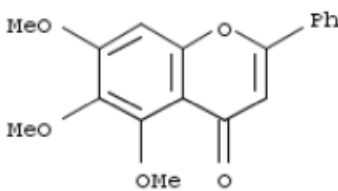
2 reactions with the Product Yields **80-89%** are displayed Keep Analysis Clear Analysis

[Select All](#) [Deselect All](#) Sort by: Accession Number

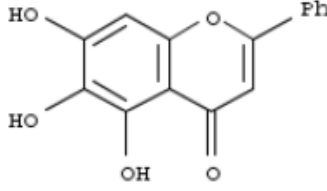
Answers per Page [2] Display:

☒ 15. [View Reaction Detail](#) [Link](#) [Similar Reactions](#)

**Single Step** *Hover over any structure for more options.*



→



黃芩  
(產率: 89%)

**89%**

▼ **Overview**

Steps/Stages	Notes
1.1 18 h, reflux	Reactants: 1, Steps: 1, Stages: 1, Most stages in any one step: 1

**References** 可直接連結至出處文獻

[Methods of synthesizing flavonoids and chalcones](#) [Full Text](#)

By Shaw, Jiajiu et al  
From U.S. Pat. Appl. Publ., 20040242907, 02 Dec 2004

▼ **Experimental Procedure**

Baicalein Baicalein was prepared by the modified procedure outlined above either from flavone 2 (reflux, 18 h) in 89% yield. mp 258-260° C. (lit. 263-264° C.). R<sub>f</sub> (CH<sub>2</sub>Cl<sub>2</sub>:EtOAc=5:1) 0.4. <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>) δ: 6.61 (1 H, s), 6.92 (1 H, s), 7.56 (3 H, m), 8.05 (2 H, d, J=8.1 Hz), 8.81 (1 H, s), 10.57 (1 H, s), 12.65 (1 H, s). IR (KBr) cm<sup>-1</sup>: 3411, 1654. UV λ<sub>max</sub> (EtOH) nm (log ε): 326 (4.17), 276 (4.42), 215 (4.49). MS m/z: 270 (M<sup>+</sup>).

利用反應物再往前延伸，找出最合適、最簡單之起始原料

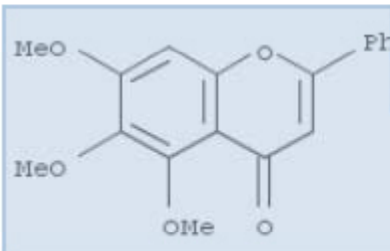
Reactions Get References Tools Send to SciPlanner

16 Reactions 1 Selected Save Print Export

2 reactions with the Product Yields 80-89% are displayed Keep Analysis Clear Analysis

Select All Deselect All Sort by: Accession Number Answers per Page [2] Display:

☒ 15. View Reaction Detail Link Similar Reactions  
Single Step Hover over any structure for more options.



**CAS Registry Number:** 973-67-1

- View Substance Detail
- Explore by Structure
- Synthesize this...**
- Get Reactions where Substance is a
- Get Commercial Sources
- Get Regulatory Information
- Get References
- Export as Image
- Export as molfile
- Send to SciPlanner

Overview  
Experimental Procedure

直接獲得合成此物質的化學反應

## 產率>80%，共9筆反應式

~反應物仍然太複雜，須繼續往前搜尋，看是否有更簡單的起始物？~

Reactions Get References Tools Send to SciPlanner

**9 Reactions** 0 Selected Save Print Export

Select All Deselect All Sort by: Product Yield Answers per Page [9] Display:

☐ 1. View Reaction Detail Link Similar Reactions  
Single Step *Hover over any structure for more options.*

**87%**

**仍並非一結構簡單的起始物**

▼ Overview

**Steps/Stages**

1.1 R:I<sub>2</sub>, S:DMSO, 2 h, reflux  
1.2 S:H<sub>2</sub>O

**Notes**

Reactants: 1, Reagents: 1, Solvents: 2, Steps: 1, Stages: 2, Most stages in any one step: 2

**References**

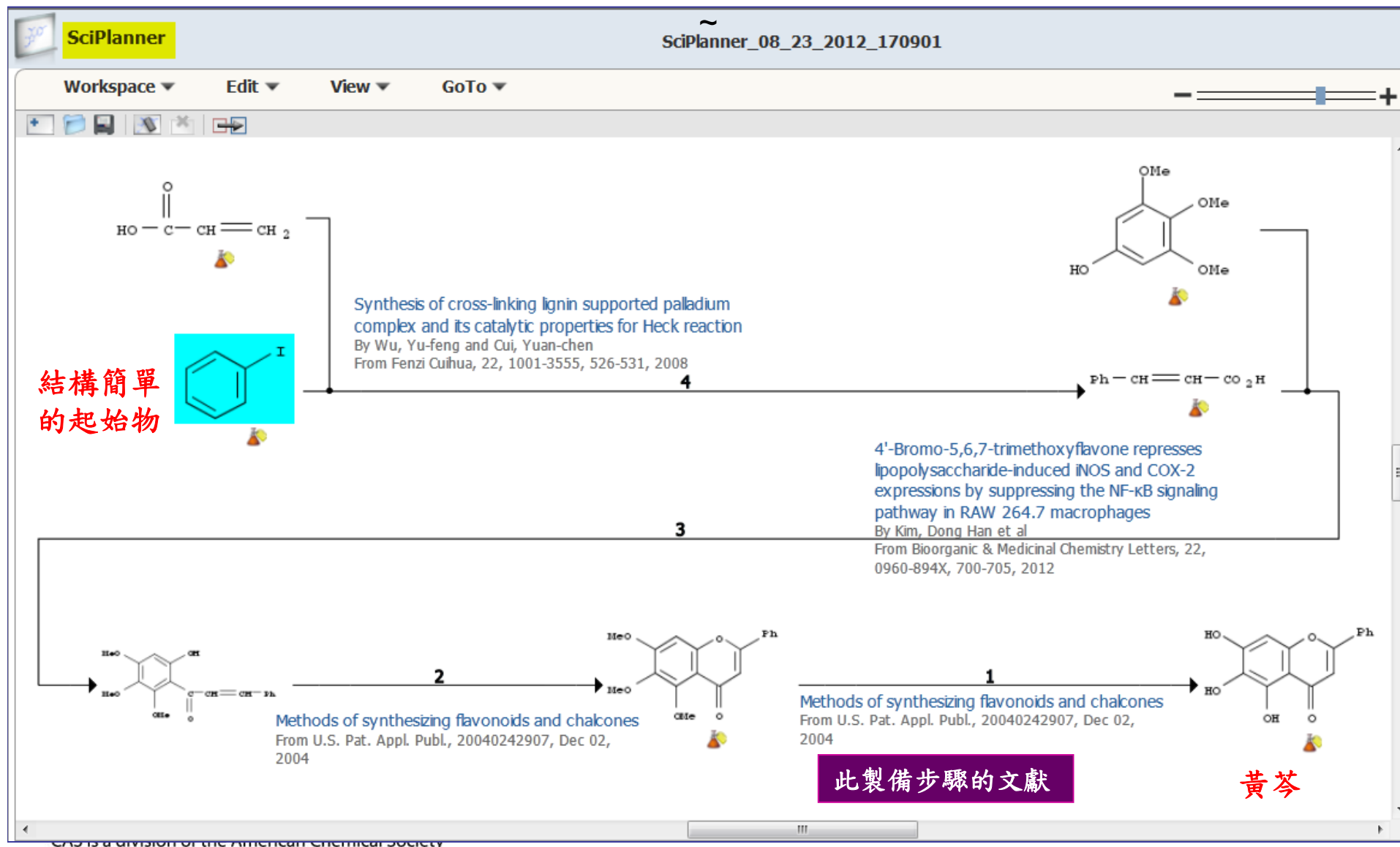
Methods of synthesizing flavonoids and chalcones Full Text  
By Shaw, Jiajiu et al  
From U.S. Pat. Appl. Publ., 20040242907, 02 Dec 2004

▼ Experimental Procedure

5,6,7-Trimethoxyflavone (Flavone 2) A mixture of chalcone 1 (7.2 g, 23 mmol) and iodine (200 mg) in DMSO (25 ml) was refluxed for 2 h, and then carefully poured onto crushed ice (200 g). The precipitate was filtered and washed with 20% Na<sub>2</sub>SO<sub>3</sub>. Purification by flash column chromatography (SiO<sub>2</sub>, hexane:EtOAc=3:1) yielded 6.3 g (87%) of flavone 2 and 0.8 g (2.5%) of recovered chalcone 1. mp 146-147° C. (lit. 164-165° C.). <sup>1</sup>H-NMR (DMSO-d<sub>6</sub>) δ: 3.93 (3 H, s), 3.97 (3 H, s), 3.99 (3 H, s), 6.72 (1 H, s), 6.83 (1 H, s), 7.50 (3 H, m), 7.88 (2 H, d, J=8.7 Hz). IR (KBr) cm<sup>-1</sup>: 1633. MS m/z: 313 (MH<sup>+</sup>).

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Page 1

**Synthesis of Baicalein**

HO-C(=O)-CH=CH<sub>2</sub>

Ph-I

Synthesis of cross-linking lignin supported palladium complex and its catalytic properties for Heck reaction  
By Wu, Yu-feng and Cui, Yuan-chen  
From Fenzi Cuihua, 22, 1001-3555, 526-531, 2008

4

Ph-CH=CH-CO<sub>2</sub>H

4'-Bromo-5,6,7-trimethoxyflavone represses lipopolysaccharide-induced iNOS and COX-2 expressions by suppressing the NF-κB signaling pathway in RAW 264.7 macrophages  
By Kim, Dong Han et al  
From Bioorganic & Medicinal Chemistry Letters, 22, 0960-894X, 700-705, 2012

3

Methods of synthesizing flavonoids and chalcon  
From U.S. Pat. Appl. Publ., 20040242907, Dec 02, 2004

2

1

Baicalein

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~每一步驟的反應條件、詳細操作步驟與物質資訊~

Synthesis of Baicalein\_SciPlanner\_08\_24\_2012\_135538.pdf - Adobe Acrobat Pro

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Reaction Information

Page 2

Reaction	Stages	Notes	Yield
1	1.1 18 h, reflux	Reactants: 1, Steps: 1, Stages: 1	89%

**反應條件、操作步驟**

**References**  
Methods of synthesizing flavonoids and chalcones  
By Shaw, Jiajiu et al  
From U.S. Pat. Appl. Publ., 20040242907, 02 Dec 2004

**Experimental Procedure**  
Baicalein Baicalein was prepared by the modified procedure outlined above either from flavone 2 (reflux, 18 h) in 89% yield, mp 258-260° C. (lit. 263-264° C.).  $R_f$  ( $CH_2Cl_2$ :EtOAc=5:1) 0.4.  $^1H$ -NMR ( $DMSO-d_6$ )  $\delta$ : 6.61 (1 H, s), 6.92 (1 H, s), 7.56 (3 H, m), 8.05 (2 H, d,  $J=8.1$  Hz), 8.81 (1 H, s), 10.57 (1 H, s), 12.65 (1 H, s). IR (KBr)  $cm^{-1}$ : 3411, 1654. UV  $\lambda_{max}$  (EtOH) nm (log  $\epsilon$ ): 326 (4.17), 276 (4.42), 215 (4.49). MS  $m/z$ : 270 ( $M^+$ ).

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Substance Information

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<p><b>491-67-8</b></p> <p><math>C_{15}H_{10}O_5</math> 4H-1-Benzopyran-4-one, 5,6,7-trihydroxy-2-phenyl-</p> <p><b>Related Info:</b> ~ 2045 References Reactions Commercial Sources</p>	<p><b>591-50-4</b></p> <p><math>C_6H_5I</math> Benzene, iodo-</p> <p><b>Related Info:</b> ~ 12005 References Reactions Commercial Sources Regulatory Information</p>	<p><b>621-82-9</b></p> <p><math>Ph-CH=CH-COO_2H</math> <math>C_9H_8O_2</math> 2-Propenoic acid, 3-phenyl-</p> <p><b>Related Info:</b> ~ 9927 References Reactions Commercial Sources Regulatory Information</p>
<p><b>642-71-7</b></p> <p><math>C_8H_{12}O_4</math> Phenol, 3,4,5-trimethoxy-</p> <p><b>Related Info:</b> ~ 392 References Reactions Commercial Sources Regulatory Information</p>	<p><b>74064-14-5</b></p> <p><math>C_{18}H_{18}O_5</math> 2-Propen-1-one, 1-[5-hydroxy-2,3,4-trimethoxyphenyl]-3-phenyl-</p> <p><b>Related Info:</b> ~ 24 References Reactions</p>	<p><b>79-10-7</b></p> <p><math>C_3H_4O_2</math> 2-Propenoic acid</p> <p><b>Related Info:</b> ~ 64103 References Reactions Commercial Sources Regulatory Information</p>
<p><b>973-67-1</b></p> <p><math>C_{18}H_{18}O_5</math> 4H-1-Benzopyran-4-one, 5,6,7-trimethoxy-2-phenyl-</p> <p><b>Related Info:</b> ~ 99 References Reactions Commercial Sources</p>		

**反應式中所涉及的物質資訊**

Reaction	Stages	Notes	Yield
3	1.1 R:SOCl <sub>2</sub> , S: Benzene, reflux 1.2 R:BF <sub>3</sub> -Et <sub>2</sub> O, S: PhMe	Reactants: 2, Reagents: 2, Solvents: 2, Steps: 1, Stages: 2	98%

**References**  
4'-Bromo-5,6,7-trimethoxyflavone represses lipopolysaccharide-induced iNOS and COX-2 expressions by suppressing the NF- $\kappa$ B signaling pathway in RAW 264.7 macrophages  
By Kim, Dong Han et al

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~每一步驟中之相關文獻~

Synthesis of Baicalein\_SciPlanner\_08\_24\_2012\_135538.pdf - Adobe Acrobat Pro

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**References**

[4'-Bromo-5,6,7-trimethoxyflavone represses lipopolysaccharide-induced iNOS and COX-2 expressions by suppressing the NF-κB signaling pathway in RAW 264.7 macrophages](#)

By Kim, Dong Han; Yun, Chang Hyeon; Kim, Min Hwan; Naveen Kumar, Ch.; Yun, Bo Hee; Shin, Ji-Sun; An, Hyo Jin; Lee, Young Hun; Yun, Yong Don; Rim, Hong-Kun; et al  
From [Bioorganic & Medicinal Chemistry Letters](#) (2012), 22(1), 700-705. Language: English, Database: CAPLUS, DOI:10.1016/j.bmcl.2011.10.067

The regulations of the NO and PGE2 productions are research topics of interest in the field of anti-inflammatory drug development. In the present study, 5,6,7-trimethoxy- and 5,6,7-trihydroxyflavones 3a-3g were synthesized from cinnamic acid derivs. In particular, 4'-bromo-5,6,7-trimethoxyflavone (3b) most potently inhibited the productions of NO and PGE2 in LPS-treated RAW 264.7 cells ( $IC_{50} = 14.22 \pm 1.25$  and  $10.98 \pm 6.25 \mu M$ , resp.), and these inhibitory effects were more potent than those of oroxylin A or baicalein. Consistent with these findings, 3b concn.-dependently reduced the LPS-induced expressions of iNOS and COX-2 at the protein and mRNA levels. In addn., the release of TNF- $\alpha$ , IL-6, and IL-1 $\beta$  and the mRNA expressions of these cytokines were reduced by 3b in a concn.-dependent manner. Furthermore, 3b attenuated the LPS-induced transcriptional activities of NF-κB and this was accompanied by parallel redns. in the degrdn. and phosphorylation of IκB- $\alpha$ , and consequently by a decrease in the nuclear translocation of the p65 subunit of NF-κB. Taken together, these results suggest that suppressions of the expressions of iNOS, COX-2, TNF- $\alpha$ , IL-6, and IL-1 $\beta$  via NF-κB inactivation are responsible for the anti-inflammatory effects of 3b.

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[Methods of synthesizing flavonoids and chalcones](#)

By Shaw, Jiajiu; Lee, An-Rong; Huang, Wen-Hsin  
From [U.S. Pat. Appl. Publ.](#) (2004), US 20040242907 A1 20041202, Language: English, Database: CAPLUS

Simple and efficient total syntheses of flavonoids including baicalein, oroxylin A and wogonin are described herein. Simultaneous syntheses of oroxylin A and wogonin are also described. For example, 3,4,5-trimethoxyphenol reacted with cinnamoyl chloride in the presence of boron trifluoride etherate to give chalcone I, which was cyclized to flavone II. II could then be treated with 47% HBr/HOAc for 2 h or 18 h to give oroxylin A or baicalein, resp. Wogonin was prepd. in 24% yield from I after selective demethylation with 47% HBr/HOAc for 2 h followed by treatment with iodine/DMSO for 2 h; oroxylin A was also obtained in 46% yield.

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