The Good, The Bad, & The Ugly in the International Herb Community: Systematic Reviews & Meta-analyses of Randomized Controlled Clinical Trials & An Update on the ABC-AHP-NCNPR Botanical Adulterants Program

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CMA Annual Conference
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“The Good”

- Increased consumer use of herbs
- Increased professional use of herbs
- Increased amount of systematic reviews & meta-analyses showing positive results/trends in controlled clinical trials
Total Herbal Dietary Supplement Sales Up 7.5% in 2015 In All Channels of Trade in the U.S.
Total Est. = $6.92 Bn
Sales of Herbal Dietary Supplements in US Increased 7.5% in 2015

Consumers spent $6.92 billion on herbal supplements in 2015, marking the 12th consecutive year of growth

By Tyler Smith, Kimberly Kawab, Veronica Ecklb, and James Johnson
c

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b SPINS; Chicago, Illinois
c Nutrition Business Journal, New Hope Natural Media; Boulder, Colorado

Introduction

Consumer spending on herbal dietary supplements in the United States reached an all-time high in 2015. Retail sales of herbal supplements totaled an estimated $6.92 billion in 2015 (Table 1), a 7.5% increase from the previous year. Consumers spent approximately $480 million more on herbal products in 2015 year — an increase that marks the 12th consecutive year of growth for these products.

These figures, and the rest of the data presented in HerbalGram’s 2015 Herb Market Report, were generously provided by the following organizations: SPINS LLC, a market research firm based in Chicago, which collaborated with IRI (Information Resources Inc.), also a Chicago-based market research company, to determine mainstream multi-outlet retail sales of herbal dietary supplements, and the Nutrition Business Journal (NBJ), a publication of New Hope Natural Media, a media and publishing company with headquarters in Boulder, Colorado.

Horehound, for the third year in a row, was the most popular herbal supplement in the US mainstream channel. Sales of horehound supplements increased by $115 million from the previous year, a 36.7% increase from 2013. Since 2013, supplement sales, with horehound as the top ingredient, have grown by a total of almost $300 million in the mainstream outlet channel.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Estimated Retail Sales of Herbal Supplements*</th>
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<tbody>
<tr>
<td>2000</td>
<td>$4.225 billion</td>
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<tr>
<td>2001</td>
<td>$4.361 billion</td>
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<tr>
<td>2002</td>
<td>$4.275 billion</td>
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<tr>
<td>2003</td>
<td>$4.146 billion</td>
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Growth in Herbal Medicine Scientific & Clinical Literature from 1977 - 2007

• Review of all published articles on herbal medicine appearing between 1977 - 2007 in any language in Medline/PubMed.

• Over 30-yr study period, amount of HM articles published rose from 739 in 1977 to 6,364 in 2007.

• The largest numbers were reviews & RCTs.
High Quality of Herb Clinical Trials

• Swiss university researchers’ review concludes that design quality of herb/phytomedicine clinical trials vs. conventional drug trials are comparatively equal & even higher in some cases.

• 86 phyto RCTs vs. 277 for conventional

Research on Herbs & Phytomedicines
Levels of Evidence
Evidence-based Herbal Medicine

- **Experimental Science**
  - Chemical data
  - In vitro pharmacological data
  - In vivo pharmacological & toxicological data  
    Laboratory Animals:
    • mice,
    • rats,
    • guinea pigs,
    • lawyers,
    • et al.

- **Human Data**
  - Ethnobotanical record
  - Folklore
  - Systems of Traditional Medicine – Ayurveda & TCM
  - Empirical/observational data
  - Case Reports
  - Human Clinical Trials
    - Uncontrolled/Observational Trials
    - Randomized Controlled Trials (the “Gold Standard”)
      - Systematic Reviews
      - Meta-analyses
Systematic Review & Meta-Analysis

• **SR:** A *systematic review* is a type of literature *review* that collects & critically analyzes multiple research studies or papers on a single subject.

• **MA:** A *meta-analysis* is a subset of a systematic review; usually a more homogeneous statistical evaluation than an SR.
SYSTEMATIC REVIEWS AND META-ANALYSES SUPPORT THE EFFICACY OF NUMEROUS POPULAR HERBS AND PHYTOMEDICINES

Mark Blumenthal


There has been controversy in the past decade about the pros and cons of evidence-based medicine (EBM). Proponents argue that EBM is the best way to assess the safety and efficacy of various therapeutic interventions, whether they be conventional pharmaceutical drugs or phytomedicines derived from herbs. Many in the complementary and alternative medicine (CAM) scientific community believe that EBM methods of assessment, primarily the randomized controlled clinical trial (RCT), are often too simplistic and reductionistic to appropriately and successfully measure the effectiveness of herbal and other CAM interventions.

Situations met the inclusion criteria (covering a total of 5489 patients): 18 RCTs compared SJW with placebo, and 17 RCTs compared SJW with conventional pharmaceutical antidepressants. The authors conclude, “The available evidence suggests that the hypericum extracts tested in the included trials a) are superior to placebo in patients with major depression; b) are similarly effective as standard antidepressants; c) and have fewer side effects than standard antidepressants.” Why was this information not communicated in the media? First, Cochrane does not publish press releases on its reviews. Second, as many observers are aware, the media tends to prefer to run stories about negative findings.

The perennial favorite, garlic, has been used in folklore for various cardiovascular conditions and has been used for both blood lipid reduction and as a mild hypotensive addition to its empirically documented antivampira. Although recent RCTs have shown negative results on the lowering activity of garlic preparations, a recent review confirmed mild blood pressure (BP)-lowering effects.
Conclusions of Systematic Reviews & Meta-analyses

These are statistical pooling of previously published research papers, and often depend on how narrow or wide the researchers set the inclusion/exclusion criteria.
St. John’s wort

*Hypericum perforatum*
St. John’s Wort Extract

*Hypericum perforatum*

Treats Mild-to-Moderate Depression (MA)

- 29 RCTs on various SJW preparations in M-A; n = 5489
  - 18 RCTs compared SJW w/ placebo
  - 17 RCTs compared SJW w/ conventional Rx drugs

**CONCLUSION:** “The available evidence suggests that the hypericum extracts tested in the included trials

- a) are superior to placebo in patients with major depression;
- b) are similarly effective as standard antidepressants;
- c) and have fewer side effects than standard antidepressants.”

Ashwagandha
*Withania somnifera*
Ashwagandha

(*Withania somnifera*)

Reduces Anxiety & Stress (SR)

- 5 trials

- M-A not possible due to different preparations, dosages, & trials having different primary outcome measurement
  - 2 preparations contained proprietary extracts w/ both root & leaf extr.

- **Conclusion:** All 5 studies concluded that WS intervention resulted in greater score improvements (significantly in most cases) than placebo in outcomes on anxiety or stress scales.

Brahmi
Bacopa monnieri

www.en.wikipedia.org
SR Suggests Bacopa Extracts Improve Free Recall Memory

- Total 64 studies located; 6 met all inclusion criteria; all were R, DB, PC, parallel-group studies, 12-wks
  - 3 RCTs = KeenMind® (SFI Flordis; Australia),
  - 2 trials = BacoMind® (Natural Remedies, India),
  - 1 trial = Mediherb® Bacopa (Mediherb, Australia).

- Bacopa extract is efficacious in improving free recall of information in subjects w/out significant memory impairment.

Bacopa MA

- # studies available: 289
- # studies included: 9
  
  [7 = healthy; 2 = impaired memory]
- N = 437
- Duration: 12-24 wks

**CONCLUSION:** Bacopa extract has potential to improve cognitive performance, particularly speed of attention by reducing choice reaction time.

- The effect on memory remains inconclusive but dosage of 300 mg daily could be considered as a reference point for effective dosage of bacopa extract for future studies on treatment of cognitive impairment in clinical settings.

Cinnamon
Cinnamomum zeylanicum; C. cassia
Cinnamon
*Cinnamomum zeylanicum; C. cassia*

Glycemic Control / Fasting Blood Glucose (MA)

- 8 trials included; 5.5 - 16 wks
- Results show cinnamon & cinnamon extr supplementation significantly lowered FBG.
- **Conclusion:** M-A shows that intake of cinnamon/cinnamon extract by type 2 diabetics or prediabetics lowers blood glucose significantly, although modestly.
- Although the hypoglycemic activity of cinnamon is comparable w/ metformin, more mechanistic work is needed to definitively use cinnamon w/ this drug for diabetes therapy.
Cinnamon & Glycemic Control

- 5 RCTs in SR/MA; n= 375
- Cinnamon improved FPG levels in all studies, although only 2 were significant.
- HbA1c was improved significantly in 2 studies, but in 2 other studies HbA1c actually increased at end of intervention.
- These inconsistencies are likely due to significant heterogeneity among the studies, e.g., length of intervention.
- Therefore, we conclude that in combination w/ medications, cinnamon does seem to have a modest benefit on blood glucose levels.
- More research is required to determine the optimal therapeutic dose.
• 10 RCTs in SR/MA; n = 543
• CONCLUSION: Consumption of cinnamon is associated w/ a statistically significant decrease in levels of FPG, TC, LDL-C, & TG levels, & an increase in HDL-C levels.
• No significant effect on hemoglobin A$_{1c}$ was found.
• Numerous weaknesses in SR/MA including diff C doses, pts using Rx hypoglycemic meds & some not, no reporting of possible statin use, etc.

Comfrey
Symphytum officinale, S. spp.

SR Shows Benefits of Comfrey’s External Use

• 26 papers: 13 RCTs, 5 non-randomized CTs, & 8 observational studies

• CONCLUSIONS: Individual clinical trials showed evidence of benefit for ankle distortion, back pain, abrasion wounds, & OA.

• Topical application appears to be safe but further rigorous assessment is needed. SRs focusing on particular indications may clarify the treatment effect & safety of external C preparations.

Cranberry

Vaccinium macrocarpon, Ericaceae
Cranberry Prevents Urinary Tract Infections

- 10 studies [7 trials on C juice; 3 on C tablets] in M-A; n = 1049 subjects
- CONCLUSION: “...evidence from 4 RCTs indicates that cranberry products can be effective in reducing UTIs. However, it may only be effective in certain sub-populations.”
- Some evidence indicates that C juice may be effective in women w/ symptomatic UTIs, but evidence is inconclusive for elderly.

Cranberry Prevention M-A

- 24 RCTs; n = 4473

- **Conclusion:** The addition of 14 further studies suggests that cranberry juice is less effective than previously indicated.

- Cranberry juice cannot currently be recommended for prevention of UTIs.

- Other preparations (e.g., powders) need to be quantified using standardized methods to ensure the potency, & contain enough of the 'active' ingredient, before being evaluated in clinical studies or recommended for use. [ca 36 mg PACs/d]

Cranberry Juice May Be Effective for Treatment of UTIs in Certain Populations (MA)

- 13 RCTs; n = 1616
- Dose = 0.4 g - 4 g/day C pwd or extr in capsule; or 64.8 - 194.4 g/day of C juice
- 6 months in most trials
- Problems re heterogeneity of C preps
- **Results:** C. may be most beneficial in a 2x/d dose as juice, in women w/ recurrent UTIs, female populations generally, & in children specifically.
Echinacea Extracts Safely Reduce Risk of Respiratory Tract Infection Recurrence & Complications (MA)

- 6 RCT of 101 trials found; n = 2458
- Three independent studies found that in individuals with higher susceptibility, stress, or a state of immunological weakness, *Echinacea* halved the risk of recurrent respiratory infections.
- **CONCLUSION:** Evidence indicates that *Echinacea* potently lowers risk of recurrent respiratory infections & complications thereof.
- Immune modulatory, antiviral, & anti-inflammatory fx might contribute to the observed clinical benefits, which appear strongest in susceptible individuals.

Garlic

Allium sativum

SR + M-A: Garlic Moderately Lowers BP

- Review of 25 controlled & uncontrolled trials publ betw/ 1955 – 2007 measuring garlic’s activity on BP:
  - 11 trials met inclusion criteria:
    - 9 RCTs compared garlic preparations to placebo,
    - 2 trials compared garlic on BP to a conventional hypotensive drug (n=525).
- There was a significant positive difference betw/ measurements of systolic BP in garlic groups compared to placebo, while there was no significant difference in diastolic BP.
- Conclusion: “This systematic review and meta-analysis suggest that garlic preparations are superior to placebo in reducing blood pressure in individuals with hypertension.”

Anti-hypertensive Effect of Garlic (SR/MA)

• 9 RCTs; n=577

• The authors conclude that the observed improvements are clinically relevant and garlic preparations offer promise as alternative treatments for reducing high BP.

• BUT, as of now, there is insufficient evidence to have confidence that garlic preparations are an effective alternative or complementary/adjunct herbal medication to conventional antihypertensive drugs.
  
Garlic Is Superior to Placebo in Reducing Blood Pressure in Hypertensive Patients (MA)

• 17 RCTs
• Garlic intake caused a 3.75-mm Hg reduction in SBP and 3.39-mm Hg reduction in DBP compared w/ controls.
• CONCLUSION: Garlic supplements are superior to controls (placebo in most trails) in reducing BP, especially in hypertensive patients.

Garlic Intake May Positively Affect the Risk of Gastric Cancer (MA)

• 145 papers identified; 17 included in review.
• High, low, & any intake of garlic were all associated w/ reduced gastric cancer risk, w/ higher intake, however defined, offering most protection.

Safety & Efficacy of Ginkgo Extract EGb 761® for Treating Dementia in Elderly (MA)

- 7 of 15 RCTs; n = 2625
- Change in, activities of daily living, and global rating significantly favored EGb 761 vs. placebo.
- CONCLUSION: MA confirmed efficacy & good tolerability (safety) of ginkgo extract EGb 761 in patients w/ dementia.

Ginkgo Extract EGb 761® in Dementia w/ Behavioral & Psychological Symptoms (SR)

- 4 RCTs; n = 1,628 outpatients w/ mild-to-moderate dementia

**CONCLUSIONS:** The pooled analyses provide evidence of efficacy of EGb 761® at 240 mg/day in treatment of out-patients suffering from Alzheimer's, vascular, or mixed dementia with BPSD.

神仙の薬草として珍重に取り扱われる数多くの高麗人参は、30種類ほどのサポニン成分が含まれています。
栄養補給、健康維持、疲労回復など、さまざまな効能を持つすぐれた健康食品です。
大切に育て上げた高麗人参で感じる甘さを感じます。
Asian Red Ginseng & Erectile Dysfunction (SR)

- 7 of 28 trials on ginseng & ED-related effects met inclusion criteria.
- n = 363 men, aged 24-70 years.
- Total doses = 1800 mg - 3000 mg Korean red ginseng root (steamed fresh roots) / day
- 4 - 12 weeks
- Conclusion: 6 trials reported an improvement in erectile function in ginseng subjects.

Asian Ginseng & Ischemic Heart Disease (MA)

- 18 RCTs; n= 1549
- Results of MA suggest that ginseng-based medications treat angina pectoris more effectively than nitrates.

Evidence for Red Clover for Treatment of Menopausal Hot Flashes (MA)

• 8 RCTs; n = 665

• CONCLUSION: Results showed that red clover, vs. placebo, was effective in reducing menopausal hot flashes when administered for 3-4 months, but their effect did not persist at 12 months, nor did RC reduce HF frequency.

Pelargonium sidoides May Reduce Severity of Acute Bronchitis & Sinusitis (SR)

- 8 RCTs: 3 RCTs on adults w/ acute bronchitis (n=746), 3 RCTs on children w/ acute bronchitis (n=819)

- CONCLUSIONS: *P. sidoides* may be effective in alleviating symptoms of acute rhinosinusitis and common cold in adults, but doubt exists.

- It may be effective in relieving symptoms in acute bronchitis in adults & children, & sinusitis in adults.

Green Tea Consumption Lowers Blood Pressure (MA)

- 186 articles found; 13 selected; 1367 subjects
- Significant reductions in SBP (P<0.001) and DBP (P=0.002) were seen in subjects consuming GT compared w/ control subjects.
- Subgroup analyses further suggested that positive effect of GT polyphenols on BP was measured only in studies using a low-dose G polyphenol (<582.8 mg) daily.

The Bad
& The Ugly
Adulteration of Botanical Raw Materials, Extracts, & Essential Oils
Maternal Ginseng Use Associated With Neonatal Androgenization

Gideon Koren, MD, ABMT, FRCP; Samuel Randor, MD, ND; Sheelagh Martin, RN; Denis Danneman, MD, FRCP
Elevated serum digoxin levels in a patient taking digoxin and Siberian ginseng.

McRae S. 

Abstract

A 74-year-old man taking a constant dose of digoxin for many years was found to have an elevated serum digoxin level. Common causes of elevated serum digoxin were ruled out, and the patient's digoxin level remained high after treatment. The patient then revealed that he was taking Siberian ginseng, a popular herbal remedy. The patient stopped taking the ginseng and his digoxin level soon returned to an acceptable level. The digoxin therapy was resumed. The patient resumed taking ginseng and his serum digoxin level again rose. Digoxin therapy was maintained at a constant daily dose, the ginseng was stopped, and digoxin levels again returned to within the therapeutic range. It is unclear whether some component of the ginseng interfered with digoxin elimination or caused a false serum assay result. The author cautions physicians to be alert to the potential interaction between digoxin and Siberian ginseng.
“Siberian Ginseng” Adulteration
Periploca as culprit in digoxin assay confusion.
[Awang DVC. CMAJ. 1996 Nov 1;155(9):1237]

Siberian ginseng toxicity may be case of mistaken identity

The article “Elevated serum digoxin levels in a patient taking digoxin and Siberian ginseng” (Can Med Assoc J 1996;155:293-5), by Dr. Shelagh McRae, contains serious chemical inaccuracies and probably represents yet another case of botanical misidentification by clinical investigators.

First, the statement that “eleuthero-seng for digoxin and digitoxin content, no tests for eleutherosides were conducted, which would have determined the validity of the claim that the plant ingested was Eleutherococcus senticosus. I suspect that the apparent rise in the patient’s serum digoxin levels was due to a contribution from cardiac glycosides in P. sepium, a common substitute for E. senticosus. This case further emphasizes the need for serious regulatory attention to assure the identity, purity and quality of marketed botanicals.
Eleutherococcus senticosus & Periploca sepium
The botanical supply chain is global; adulteration is a global challenge.
A BRIEF HISTORY OF ADULTERATION OF HERBS, SPICES, AND BOTANICAL DRUGS

BY STEVEN FOSTER
“Thou shall not commit adultery.”

7th Commandment. 
Exodus 20:14.
“The Bad”

Accidental Adulteration

• Lack of full compliance with appropriate GACPs, GMPs, etc.

• Lack of adequate training of harvesters, collectors, workers in processing, and/or manufacturing plants in supply chain
on Adulteration of Arnica montana

By Stefan Gafner, PhD\(^a\) and Wendy Applequist, PhD\(^b\)

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\(^b\)Missouri Botanical Garden, PO Box 299, St. Louis, MO 63166

*Corresponding author: email

**Keywords:** Arnica montana, arnica flower, adulterant, adulteration, \textit{Heterotheca inuloides}

Goal: The goal of this bulletin is to provide timely information and/or updates on issues of adulteration of Arnica montana flower to the international herbal products industry and extended natural products community in general. It is intended to present the available data on the occurrence of adulteration, the market situation, and consequences for the consumer and the industry.

1 General Information

1.1 Common name: Arnica\(^1\)

1.2 Other common names:

- English: Leopard's bane, European arnica, mountain tobacco, wolfsbane\(^1\)
- Chinese: \textit{Shan jin hua} （山金花）\(^3\)
- French: Arnica, arnique, bétone des montagnes, herbe aux chutes, souci des alpes, tabac des Vosges\(^2\)
- German: Amselblume, Berg Wolksschleim, Engelstrock, Fallblume, Webblume

on Adulteration of Skullcap

By Stefan Gafner, PhD and Mark Blumenthal
*Corresponding author: email

Keywords: Scutellaria lateriflora, skullcap herb, adulterant, adulteration

Goal: The goal of this bulletin is to provide timely information and/or updates on issues of adulteration of Scutellaria lateriflora to the international herbal products industry and extended natural products community in general. It is intended to complement the previously published works regarding skullcap adulteration, e.g., the American Herbal Pharmacopoeia Skullcap Monograph published by Upton et al.¹ and the article by Foster in HerbalGram,² by presenting new data on the occurrence of adulteration, the market situation, and consequences for the consumer and the industry.

1 General Information
1.1 Common name: Skullcap³

1.2 Other common names:
How Herb Quality, Safety, and Claims Are Regulated
Adulteration of Skullcap with American Germander

By Steven Foster

Summary

Skullcap (Scutellaria lateriflora, Lamiaceae), a native American plant, has been used by herbalists and medical practitioners—primarily as a mild nerve sedative—throughout the history of American herbalism. In the early 1980s, it was erroneously implicated as being a possible source of liver toxicity, mostly in combination herbal products. By the early 1990s, it became clear that suspected adulteration or substitution of members of the genus Teucrium were the source of the alleged toxicity that falsely implicated skullcap. Various herbal research groups have published methods for the authentication of skullcap. A paper published in 2011 suggests the problem still exists. Various papers relative to the toxicity of Teucrium species and authentication of skullcap are...

ing skullcap in the journal Annuals of Bioanalytical Chemistry.² The method described was based on separating using a liquid...
Skullcap Adulteration
Laboratory Guidance Document

By Stefan Gafner, PhD
Chief Science Officer, American Botanical Council
Technical Director, ABC-AHP-NCNPR Botanical Adulterants Program

1. Purpose

Skullcap (Scutellaria lateriflora, family Lamiaceae) herb has a long history of adulteration, evidenced in comments from over 100 years ago by Felter and Lloyd that "Scutellaria versicolor Nuttall and Scutellaria canescens Nuttall are the species generally collected by herbalists and substituted for Scutellaria lateriflora."1 Besides the substitutions with other species from the genus Scutellaria, adulteration with germander (Teucrium) species containing hepatotoxic furano neo-clerodane diterpenes has been reported in the early 1990s and seems to persist in the herb trade in North America and possibly elsewhere.2 This Laboratory Guidance Document presents a review of the various publicly-available analytical technologies and methods used to differentiate between authentic S. lateriflora and its potentially adulterating species, listed in Table 1.

2. Scope

The purpose of the guidance document is to assist laboratories associated with the certification of identical specimen and batch numbers with methods for the differentiation of authentic skullcap from adulterating species.
“The Ugly”

Intentional Adulteration

= Fraud
on Bilberry (Vaccinium myrtillus) Extracts

By Stefan Gafner, PhD
*Corresponding author: email

**Keywords:** Vaccinium myrtillus, bilberry extract, adulterant, adulteration

Goal: The goal of this bulletin is to provide information and/or updates on issues of adulteration of bilberry extract to the international herbal industry and extended natural products community in general. It is intended to complement the previously published works with information on bilberry extract adulteration, e.g., the American Herbal Pharmacopeia monograph published by Upton et al.,¹ and the article by Foster and Blumenthal in HerbalGram² by presenting new data on the occurrence of adulteration, the market situation, and consequences for the consumer and the industry.

1 General Information
#14 top-ranked herbal DS in US in mainstream market in 2012
<table>
<thead>
<tr>
<th>Adulterant</th>
<th>Source/Reference</th>
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<tbody>
<tr>
<td>Red Dye No.2 (Azo dye)</td>
<td>21, 23</td>
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<tr>
<td>Charcoal</td>
<td>21</td>
</tr>
<tr>
<td>Vaccinium species</td>
<td></td>
</tr>
<tr>
<td>V. uliginosum</td>
<td>22</td>
</tr>
<tr>
<td>V. vitis-idaea</td>
<td>22</td>
</tr>
<tr>
<td>Anthocyanosides from unrelated plants:</td>
<td></td>
</tr>
<tr>
<td>Sambucus nigra (elderberry)</td>
<td>21</td>
</tr>
<tr>
<td>Morus australis, M. spp. (Chinese mulberry)</td>
<td>3rd party lab data</td>
</tr>
<tr>
<td>Glycine max (Chinese black soybean hull)</td>
<td>21, 3rd party lab data</td>
</tr>
<tr>
<td>Oryza sativa (Black rice hull)</td>
<td>3rd party lab data</td>
</tr>
</tbody>
</table>
1. Purpose

Market demand for bilberry (Vaccinium myrtillus, Ericaceae) fruit extracts, combined with high prices and falling profit margins have resulted in unscrupulous manufacturers selling various ingredients labeled "bilberry extract." Adulteration predominantly occurs with anthocyanin-rich extracts from other species, e.g., bog bilberry (V. uliginosum), lingonberry (V. vitis-idaea), European elder (Sambucus nigra, Adoxaceae), and Chinese mulberry (Morus australis, Moraceae). Additional adulterants reportedly include black soybean (Glycine max, Fabaceae) hull or black rice (Oryza sativa, Poaceae) extracts, and synthetic colorants like amaranth dye, an azo dye prohibited for use by the United States Food and Drug Administration (FDA) as a suspected carcinogen, and/or charcoal.1 This Laboratory Guidance Document presents a review of the various analytical technologies and methods used to differentiate between authentic bilberry extracts and potential adulterants.

2. Scope

Previous pharmacopeial test methods for bilberry fruit extract based on UV/Vis absorption of the extract (spectrophotometric methods) are acceptable for quantification of total anthocyanidins, but have proven insufficient to detect adulteration with anthocyanin-rich extracts from other species or synthetic dyes; therefore, other analytical techniques must be used to comply with the legal requirement (for example, according to the Good Manufacturing Practice rule in the United States, and in other countries) to confirm the identity of bilberry fruit extracts. This review is a compilation of published analytical methods for bilberry fruit extracts, and an evaluation of the utility of each method to authenticate bilberry extracts or to detect potential adulterants. This Laboratory Guidance Document does not cover the analysis of bilberry leaves or bilberry leaf extracts but may have applications for other anthocyanin-rich berry ingredients, some of which may be used as adulterants.2  

on Adulteration of Actaea racemosa

By Stefan Gafner, PhD*  
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Keywords: Adulterant, adulteration, black cohosh, Actaea cimicifuga, Actaea dahurica, Actaea heraclefolia, Actaea racemosa, Chinese cimicifuga, Cimicifuga racemosa

Goal: The goal of this bulletin is to provide timely information and/or updates on issues of adulteration of black cohosh (Actaea racemosa, Ranunculaceae) to the international herbal industry and extended natural products community in general. It is intended to complement the previously published works with information on black cohosh adulteration, e.g., the American Herbal Pharmacopeia monograph published by Upton et al., and the review paper by Foster, by presenting new data on the occurrence of adulteration, the market situation, and consequences for the consumer and the industry.

1 General Information

1.1 Common name: black cohosh
Black Cohosh Adulteration

Herbs for Female Reproductive Health

Herbal Insect Repellents
Black Cohosh: #6 selling herbal DS in US in 2015 in mainstream retail stores.
Black Cohosh Adulterants

Chinese cimicifuga • Sheng ma

Actaea dahurica
Xing an sheng ma

Actaea cimicifuga
Sheng ma

Actaea heracleifolia
Da san ye sheng ma
Species Misidentification in Black Cohosh Products in Canada

Robin J. Marley, Semar Omar, Scott Jordan, Mona Marty, Shahid Perwaz, Richard Bertrand, Pauline Lacroix

Natural Health Products Directorate, Marketed Health Products Directorate, Inspectional Laboratories Quebec Region, Health Products and Food Branch Inspectorate
Health Products and Food Branch, Health Canada, Ottawa, ON, CANADA K1A 0K9

Introduction
Black cohosh, Actaea racemosa L. (Polygonaceae), is an indigenous North American wild plant that has been used for centuries by various Native American tribes for a variety of purposes, including for medicinal, herbal, and other uses. Black cohosh extracts have been extensively used in alternative medicine for the treatment of a variety of conditions. Black cohosh products are marketed for various ailments, including for menopause, osteoarthritis, and other conditions. However, there are concerns over the authenticity and purity of black cohosh products in the market. Misidentification of black cohosh products can lead to the use of products that do not meet the expected therapeutic efficacy or safety standards.

Methods and Materials

Chemicals and Standards
High performance liquid chromatography (HPLC) grade acetonitrile, methanol, and water were used (Thermo Scientific). Standard solutions of apo-acteic acid (5 mg/mL), acteic acid (5 mg/mL), and black cohosh extract (5 mg/mL) were prepared in HPLC grade methanol.

Experimental Design

Results

- Figure 1: Mass spectra showing the fragmentation pattern of apo-acteic acid from the Kalmiopsis plant and commercial black cohosh two.
- Figure 2: Mass spectra showing the fragmentation pattern of acteic acid from the Kalmiopsis plant and commercial black cohosh two.
- Figure 3: Mass spectra showing the fragmentation pattern of a representative sample of black cohosh.

Discussion

Physiological markers for the identification of black cohosh in marketed products:

- Feature 1: X-ray analysis of the plant material showing the characteristic arrangement of seeds in the pod structure.
- Feature 2: FT-IR spectra showing the presence of specific chemical compounds.
- Feature 3: UV-Vis spectra showing the characteristic absorption peaks.

Conclusion

The results of the study suggest that black cohosh products are often misidentified due to the presence of other related species. Further research is required to develop reliable methods for distinguishing between authentic and misidentified black cohosh products. This will ensure that consumers are provided with products that meet the expected therapeutic efficacy and safety standards.

Table 2: Results of the LC-MS phytochemical analysis

<table>
<thead>
<tr>
<th>Sample</th>
<th>Presence of Actecic Acid</th>
<th>Presence of Apo-Actecic Acid</th>
<th>Presence of Black Cohosh</th>
<th>Identification by LC-MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Authentic</td>
</tr>
<tr>
<td>Sample 2</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Misidentified</td>
</tr>
<tr>
<td>Sample 3</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Authentic</td>
</tr>
</tbody>
</table>

Note: LC-MS = Liquid Chromatography-Mass Spectrometry.
Keywords: Adulterant, adulteration, black cohosh, *Actaea cimicifuga*, *Actaea dahurica*, *Actaea heracleifolia*, *Actaea racemosa*, Chinese cimicifuga, Cimicifuga racemosa

1. Purpose

In recent years, adulteration of black cohosh (*Actaea racemosa*, Ranunculaceae) roots and rhizomes has become more apparent. Adulteration predominantly occurs with Chinese species of *Actaea* such as *A. heracleifolia*, *A. dahurica*, and *A. cimicifuga* (all known by the common name Chinese cimicifuga and by the Chinese name of *sheng ma*). Additionally, the Chinese cimicifuga (*sheng ma*) market is commonly adulterated with *Serratula chinensis* (guangdong *sheng ma* [Asteraceae]). Adulteration has also been reported with North American *Actaea* species growing in the same area as black cohosh, such as *A. pachypoda*, *A. rubra*, and *A. podocarpa*. This Laboratory Guidance Document presents a review of the various analytical technologies used to differentiate between authentic *A. racemosa* and its potentially adulterating species.

2. Scope

The various analytical methods were reviewed with the specific purpose of identifying strengths and limitations of the existing methods for differentiating *A. racemosa* from its potentially adulterating species. Analysts can use this review to help guide the appropriate choice of techniques for their specific black cohosh products for qualitative purposes. The recommendation of a specific method for testing *A. racemosa* materials in their particular matrix in this Laboratory Guidance Document does not imply that any method is a requirement of this guidance.
1. Purpose
2. Scope
3. Common & scientific names
   3.1 Common Name
   3.2 Other Common Names
   3.3 Latin Binomial
   3.4 Synonyms
   3.5 Botanical Family
4. Botanical Description
5. Identification & Distinction using Macroanatomical Characteristics
6. Identification & Distinction using Microanatomical Characteristics
7. Genetic Identification & Distinction
8. Chemical Identification & Distinction
   8.1 Chemistry of Actaea racemosa & the Potential Adulterants
   8.2 Laboratory Methods
      8.2.1 HPTLC
      8.2.2 HPLC and UHPLC
      8.2.3 MS-Fingerprinting
      8.2.4 NMR
9. Conclusion
Black Cohosh LGD Outline -2

- Table 1. Scientific names, family, and common names of known black cohosh adulterants
- Table 2. Nomenclature of major triterpene glycosides from *A. racemosa* according to Qiu et al.
- Table 3. Comparison among the different approaches to authenticate *A. racemosa*
- Table 4. Comments on the published HPLC methods for *A. racemosa*
### Determining Appropriate, Fit-for-Purpose Testing Methods: Laboratory Guidance Documents

<table>
<thead>
<tr>
<th>Type of test</th>
<th>Scutellaria lateriflora</th>
<th>Actaea racemosa</th>
<th>Vaccinium myrtillus</th>
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<td>1</td>
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<td>Microscopy</td>
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<td><strong>Total</strong></td>
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<td><strong>36</strong></td>
<td><strong>39</strong></td>
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| Number of reviewers | 21 | 20 | 16 |
on Adulteration of *Hydrastis canadensis* root and rhizome

By Michael Tims, PhD

*Maryland University of Integrative Health, 7750 Montpelier Road, Laurel, MD 20723*

Correspondence: [e-mail](mailto:)

**Keywords**: *Hydrastis canadensis*, goldenseal root, adulterant, adulteration

Goal: The goal of this bulletin is to provide information and/or updates on issues regarding adulteration of goldenseal (*Hydrastis canadensis*) root to the international herbal industry and extended natural products community in general. It is intended to present the available data on occurrence of adulteration, the market situation, and consequences for the consumer and the industry.

1 General Information
   1.1 Common name: Goldenseal

1.2 Other common names:
Goldenseal Root
*Hydrastis canadensis*


Chinese Goldthread

*Coptis chinensis*

http://www.stchn.com/uploadfile/200743017435634674.jpg

http://image.made-in-china.com/2f0j00gBCEvMkcADqb/Coptis-Rhizoma-Coptis-Root-Berberine.jpg
Goldenseal Root Adulteration
*Hydrastis canadensis*

<table>
<thead>
<tr>
<th>Historical adulterants</th>
<th>Recent adulterants</th>
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<tr>
<td>Blue cohosh <em>(Caulophyllum thalictroides)</em></td>
<td>Barberry <em>(Berberis</em> spp.)*</td>
</tr>
<tr>
<td>Celandine poppy <em>(Stylophorum diphyllum)</em></td>
<td>Celandine <em>(Chelidonium majus)</em></td>
</tr>
<tr>
<td>Coptis/Gold Thread <em>(Coptis</em> spp.)*</td>
<td>Japanese Goldthread <em>(Coptis japonica)</em></td>
</tr>
<tr>
<td>European Peony <em>(Paeonia officinalis)</em></td>
<td>Oregon Grape <em>(Mahonia aquifolium)</em></td>
</tr>
<tr>
<td>Lady Fern <em>(Athyrium filix-femina)</em></td>
<td>Yellow Root <em>(Xanthorrhiza simplicissima)</em></td>
</tr>
<tr>
<td>Small Yellow Lady’s Slipper <em>(Cypripedium calceolus)</em></td>
<td>Yellow Dock <em>(Rumex</em> spp.)*</td>
</tr>
<tr>
<td>Stoneroot <em>(Collinsonia canadensis)</em></td>
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<tr>
<td>Trillium/Birth Root <em>(Trillium</em> spp.)*</td>
<td></td>
</tr>
<tr>
<td>Twin Leaf <em>(Jeffersonia diphylla)</em></td>
<td></td>
</tr>
<tr>
<td>Seneca Snakeroot <em>(Polygala senega)</em></td>
<td></td>
</tr>
<tr>
<td>Virginia Snakeroot <em>(Aristolochia serpentaria)</em></td>
<td></td>
</tr>
<tr>
<td>Yellow Root <em>(Xanthorrhiza simplicissima)</em></td>
<td></td>
</tr>
</tbody>
</table>

Published data on authenticity of commercial products is limited.
on Adulteration of Grape Seed Extract

By Steve Kupina\textsuperscript{a} and Stefan Gafner, PhD\textsuperscript{b}*

\textsuperscript{a}Polyphenolics, Madera, CA 93637
\textsuperscript{b}American Botanical Council
Technical Director, ABC-AHP-NCNPR Botanical Adulterants Program
*Corresponding author: email

Keywords: Vitis vinifera, grape seed extract, adulterant, adulteration

Goal: The goal of this bulletin is to provide timely information and/or updates on issues of adulteration of grape seed extract (GSE\textsuperscript{7}) to the international herbal products industry and extended natural products community in general. It is intended to present the available data on the occurrence of adulteration, the market situation, and consequences for the consumer and the industry.

1 General Information
1.1 Common name: Grape\textsuperscript{2}

1.2 Other common names:
Benzethonium chloride and/or Benzalkonium chloride for “Grapefruit Seed Extract”
The Adulteration of Commercial “Grapefruit Seed Extract” with Synthetic Antimicrobial and Disinfectant Compounds

By John H. Cardellina II, PhD

Material called “grapefruit seed extract” (GFSE) has been sold in the natural products market for 3 decades or more as an ingredient in or preservative for cosmetic and dermatological preparations and also in dietary supplements. GFSE, supposedly an extract of the seeds of the common grapefruit (Citrus x paradisi, Rutaceae), has been touted in popular literature as a natural antimicrobial agent for both topical and internal use, including, but not limited to, eczema, acne, cold sores, athlete’s foot, sore throats, thrush, vaginal infections, colds, various gastrointestinal disorders and infections, allergies, and gingivitis. Much of the commercially available GFSE is produced via proprietary methods that purportedly involve the use of catalytic processes and the addition of solvents and/or other chemicals. For example, in the case of one of the leading branded consumer products labeled as containing “grapefruit seed extract,” this process has not been fully disclosed or explained in any publicly available literature, but is claimed to involve a multistep process that includes boiling ground, dried seeds and pulp in water, then... distillation, catalytic conversion and ammoniation... to yield GFSE, the active ingredient of which “...is a quaternary ammonium chloride (a diphenol hydroxybenzene reacted with ammonium chloride) similar to benzethonium chloride.”

In 1991, a collaboration led by Nishina (Food Research Laboratory, Nippon Oil and Fats Co.; Tokyo, Japan) published the first analysis of commercial GFSE and reported that preparative high-performance liquid chromatography (HPLC) led to identification of methyl p-hydroxybenzoate, a preservative, and triclosan, a microbicide and disinfectant. Five years later, Sakamoto et al., at the Japanese National Institute of Health Sciences in Tokyo, repeated the analysis of GFSE using HPLC-ESIMS (electrospray ionization mass spectrometry) with ethanolic extracts of the plant itself, and identified methyl p-hydroxybenzoate, triclosan, benzethonium chloride, tolylenzine, and other compounds. Unlike the Nishina analysis, the Sakamoto et al. analysis did not detect p-hydroxybenzoate. In a later study, Takeoka et al. examined the contents of the same product analyzed by Nishina et al. by HPLC-ESIMS/ESIMS/MS, but they found no triclosan. However, they did find a mixture of benzalkonium chlorides as an impurity, with 22% of the extract weight. These studies prompted the American Botanical Council to develop an HPLC-UV-MS method for the quantitative analysis of GFSE.

*Cited in:* Cardellina J. The adulteration of commercial “Grapefruit Seed Extract” with synthetic antimicrobial and disinfectant compounds.
“Grapefruit Seed Extract” Laboratory Guidance Document

- Currently in Peer Review.
- There are no compendial methods for so-called “grapefruit seed extract”.

Coming Soon
Ginseng: #31 & #33 in sales in 2015 in US mainstream & natural channel markets, respectively.
TOWARD AN UNDERSTANDING OF
GINSENG ADULTERATION:
THE TANGLED WEB OF NAMES, HISTORY, TRADE, AND PERCEPTION

By Steven Foster
### Botanical Adulterants Bulletins

<table>
<thead>
<tr>
<th>1. Published</th>
<th>2. Completed (pending final edits)</th>
<th>3. In Peer-Review</th>
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<tr>
<td>2. Bilberry fruit extract</td>
<td>2. Saw palmetto fruit</td>
<td>2. Synthetic antimicrobials sold as “Grapefruit Seed Extract”</td>
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<tr>
<td>3. Black cohosh root &amp; rhizome</td>
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<td>4. Goldenseal root &amp; rhizome</td>
<td></td>
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<td>5. Grape seed extract</td>
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<td>6. Skullcap herb</td>
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<tr>
<td>2. Cranberry fruit extract</td>
<td>2. Eleuthero root</td>
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<td>4. Maca root</td>
<td>4. Tea tree leaf oil</td>
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</tr>
<tr>
<td>5. <em>Rhodiola rosea</em> &amp; extr.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2. <em>Tribulus terrestris</em> aerial parts/fruit</td>
</tr>
</tbody>
</table>
St. John’s Wort: #38 in sales in US in 2015 in mainstream channel.
Ginkgo Extract Adulteration in the Global Market: A Brief Review

Ginkgo biloba (Ginkgoaceae) leaf extract is one of the most popular and well-researched herbal preparations. Worldwide, ginkgo is accepted as a formal medicine for enhancing mental acuity, a use supported by dozens of clinical trials based on a few proprietary extracts manufactured in Europe. It is also sold as a food supplement in Europe, a dietary supplement in the United States and elsewhere, and as a natural health product in Canada. Unfortunately, in the past decade, growing evidence has emerged of the production and sale of sub-standard and adulterated ginkgo extracts in the international supply chain, much of it reportedly coming from China.

In 2003, an investigation into the quality of 10 commercial ginkgo extracts from suppliers in Europe, Asia, and North America found one sample with an unusually high content of rutin, a flavonol glycoside that occurs in many plant species (including ginkgo), and one sample with almost no ginkgo terpene lactones (e.g., the ginkgolides A and B, and bilobalide, which are exclusively found in ginkgo) or ginkgo flavonols. The authors suggested that pure rutin was added to one sample to increase the content in total flavonol glycosides. Similarly, a separate study found that four out of 14 commercial ginkgo products sourced in the Edmonton (Alberta, Canada) area were likely adulterated with pure flavonols (rutin and the non-glycosylated [aglycones] quercetin, kaempferol, and isorhamnetin).

A comparison of HPLC (high-performance liquid chromatography) fingerprints of ginkgo extracts from 19 different sources published in 2006 suggested that three products were adulterated with added rutin. In 2008, the adulteration issue was raised again by Hermann Kurth of the German extract manufacturing company Finzelberg in a conference describes an HPLC-UV method using genistein as a marker compound to detect adulteration of ginkgo extracts with extracts from the fruit of Japanese sophora. Adulteration with rutin of commercial ginkgo products purchased in the Turkish market was reported by Demirezer et al. in 2014. Also in 2014, Australian researchers led by Hans Wohlmuth of Integra Healthcare in Australia published a relatively simple method to detect adulteration of ginkgo extract in commercial dietary supplement products. By using the HPLC conditions of the United States Pharmacopeia before and after hydrolysis (the breaking of a molecule by adding water), the authors discovered admixtures of the flavonols quercetin and kaempferol in three of the eight commercial samples that were analyzed. The three adulterated samples also contained genistein, an isoflavone that has not been found in ginkgo leaves, but is characteristic of some plants in the pea family (Fabaceae), including in the genus Sophora. The authors noted that current pharmacopeial methods are not sufficient to detect ginkgo adulteration and proposed to analyze the samples

Genistein or No Genistein?
Styphnolobium japonicum
Sophora japonica
Fabaceae
Ashwagandha
Withania somnifera
Cranberry

Vaccinium macrocarpon, Ericaceae

Cranberry: #2 & #14 in sales in US in 2015 in mainstream & natural channels, respectively.
Pomegranate Fruit Juice & Extracts
Extracts Adulterated w/ Exogenous Ellagic Acid
Three leading nonprofit organizations have initiated this large-scale program to educate members of the herbal and dietary supplement industry about ingredient and product adulteration. Partners include the American Botanical Council (ABC), the American Herbal Pharmacopoeia (AHP), and the University of Mississippi’s National Center for Natural Products Research (NCNPR).

Adulteration News

Adulteration Reports

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About the Program

Botanical Adulterants Monitor Newsletter

Adulterants Bulletins Coming Soon!

Additional Quality Control Resources

Register here to access and receive Botanical Adulterants Program content.
Dear Reader

It is my pleasure to introduce to you the first edition of the “Botanical Adulterants Monitor.” Adulteration of botanical materials has been a topic of continued media attention and sensational press coverage of research publications. For example, there is the highly flawed DNA barcoding study by Newmaster et al. published in *BMC Medicine* October. The authors of the paper curiously concluded that close to 60% of the 44 tested North American herbal products contained materials from undeclared botanical sources. This study led to increased confusion by consumers and producers of herbal products, and to attacks in the mainstream media on the dietary supplement industry with calls for more stringent regulations. (See the ABC critique, here.)

Our goal for this newsletter is to provide newly available information on issues surrounding accidental and intentional adulteration — and, to a lesser extent, the equally important problems of contamination — as reported by regulatory agencies or in published studies. In general, the content of the “Botanical Adulterants Monitor” will focus on providing solutions to current problems related to adulteration and botanical ingredient authenticity … MORE

Stefan Gafner, PhD
Chief Science Officer, ABC
Technical Director, ABC-AHP-NCNPR Botanical Adulterants Program
“Monitor” is available free-access every 2-3 months via Botanical Adulterants Program homepage or by registering on ABC website: www.herbalgram.org.
Total Publications, Sept 15, 2016

- *HerbalGram* articles 7
- Botanical Adulterant Bulletins 6
- Laboratory Guidance Documents 3
- “Botanical Monitor” Newsletter 8

Total 24
Thank You!

- Kamsahamnida
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- Xie Xie
- Gracias
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- Obrigado
- Merci
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- Shukrya
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Support from International Professional Societies of Medicinal Plant Experts

The American Society of Pharmacognosy

Society for Medicinal Plant and Natural Product Research
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NHP Research Society of Canada
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4. American Society of Pharmacognosy (ASP)
5. AOAC International
6. Council of Colleges of Acupuncture and Oriental Medicine (CCAOM)
7. Homeopathic Pharmacopoeia Convention of the United States (HPUS)
8. Integrative Healthcare Policy Consortium (IHCC)
9. Irish Register of Herbalists (IRH)
10. National Institute of Medical Herbalists (NIMH) (UK)
11. Natural Health Products Research Society (NHPRS)
12. Personalized Lifestyle Medicine Institute (PLMI)
13. Society for Medicinal Plant & Natural Products Research (GA)
Trade Associations

1. International Alliance of Dietary/Food Supplement Associations (IADSA)
2. American Herbal Products Assn. (AHPA)
3. Australian Self Medication Industry (ASMI)
4. Australian Tea Tree Industry Assn. (ATTIA)
5. British Herbal Medicine Assn. (UK)
6. Canadian Health Foods Assn. (CHFA)
7. Complementary Medicines Australia (CMA)
8. Consumer Healthcare Products Association (US) (CHPA)
9. Council for Responsible Nutrition (US) (CRN)
10. National Animal Supplement Council (US)
11. Natural Products Association (US) (NPA)
12. Natural Products New Zealand (NZ)
13. United Natural Products Alliance (US) (UNPA)

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Metagenics, Inc.
Natreon
Natural Alternatives International
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Natural Grocers by Vitamin Cottage
Natural Remedies Pvt. Ltd.
Nature's Sunshine Products
Nature's Way
Naturex, Inc.
NBTY, Inc.
New Chapter, Inc.
The New Frontier Foundation Fund of the Greater Cedar Rapids Community Foundation

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Novel Ingredients
NOW Foods
Nu Skin Enterprises/Pharmanex
Organic India
Ortho Molecular Products
Pacific Nutritional Inc.
Paragon Laboratories
Pathway International Pty Ltd Limited
Perrigo Company
Pharmatoka
Pharmavite, LLC
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<td>Rosenbush and Zimmerman Family Fund</td>
<td>Valensa International</td>
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Natural Health Community & Natural Products Industry Media

1. Alive Magazine (Canada)
2. Delicious Living
3. Engredea
4. Holistic Primary Care
5. Informa Exhibitions US
6. Integrator Blog
7. Media Relations, Inc.
8. Modern Healthcare Practitioner
9. Natural Foods Merchandiser
10. Natural Products INSIDER
11. NewHope360.com
12. Nutraceuticals World
13. Nutraingredients-USA.com
15. Nutrition Industry Executive
16. Nutritional Outlook
17. Vitamin Retailer
18. Whole Foods Magazine
The botanical supply chain is global; adulteration is a global challenge.
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- 6,500+ HerbClips in database
- 26 HerbEClip mailings sent ea. yr.
- Links/PDFs of original articles, clinical trials, etc.
HerbMedPro

View the HerbMedPro tutorial video [here].

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Evidence for Efficacy (Human Data)
- Clinical Trials (298)
- Observational Studies/Case Reports (68)
- Traditional and Folk Use (80)

Evidence of Activity
- Animal Studies (370)
- Pharmacodynamics (449)
- Analytical Chemistry (152)
- Pharmacokinetics (ADME) (38)
- Genetics & Molecular Biology (68)

Safety Data
- Adverse Effects & Toxicity (42)
- Interactions (37)
- Contraindications (4)

Formulas/Blends
- Modern Methods of Preparation (41)
- Patents (7)
**Ginkgo biloba**

**EVIDENCE FOR EFFICACY (HUMAN DATA)**

**Clinical Trials**

Update of 2002 Cochrane evidence-based review of Ginkgo biloba for cognitive impairment and dementia found that while safe with no excess adverse effects compared to placebo, overall the evidence for predictable and clinically significant benefit is inconsistent and unconvincing. Birks 2007

**PubMed**

Among 80 patients with vestibular symptoms, 13 patients (16%) had tried some form of complementary therapy for their vestibular symptoms. Ginkgo biloba and acupuncture were the two most popular treatments. Six of the 13 patients reported that their choice of treatment(s) helped them. Baguley 2006
The American Botanical Council’s Adopt-an-Herb Program provides a mutually beneficial opportunity to support ABC’s nonprofit educational efforts and promote a company’s most important herbs.

One of the benefits of supporting the Adopt-an-Herb Program is that it ensures that the most current information on the adopted herb is available through ABC’s powerful HerbMedPro™ database.

HerbMedPro provides online access to abstracts of scientific and clinical publications on more than 250 commonly used medicinal herbs. A free version, HerbMed*, is available to the general public. HerbMed features 20 to 30 herbs from HerbMedPro that are rotated on a regular basis with an emphasis on adopted herbs. HerbMedPro is available as a member benefit to all ABC members at the Academic Membership level and up.

In addition to ensuring that recently published information on an adopted herb is up to date on HerbMedPro, another benefit adopters enjoy is being included among their peers in each issue of ABC’s acclaimed quarterly peer-reviewed scientific journal, HerbalGram, on the ABC website, and at scientific, medical, and other educational conferences. Press releases also are issued on new adoptations, bringing attention to the program, the adopted herb, and the adopting company. Each adopted herb is featured on its own page on the ABC website.

Parties interested in taking part in the Adopt-an-Herb Program are invited to contact ABC Development Director Denise Meikel at 512-926-4900, extension 120, or by email at denise@herbalgram.org.

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**Herbal Adopters**

- DMH ingredients
- Baobab
- Rooibos
- Bulbine
- Broccoli
- Indian Frankincense
- Black Chokeberry
- Elderberry
- Stinging Nettle
- Kava
- Black Cumin
ABC Members In >81 countries!

- **Researchers**
  - Ethnobotanists, pharmacognosists, natural product chemists, et al.

- **Health professionals**
  - Physicians, pharmacists, nurses, dietitians, naturopaths, acupuncturists, herbalists, massage therapists, et al.

- **Institutions & NGOs**
  - Universities, medical & pharmacy schools, libraries, poison control centers, hospitals, botanical gardens & arboreta, nonprofits, et al.

- **Industry**
  - Growers, Importers, Manufacturers in the Herbal & Dietary supplement, natural food, cosmetic pharmaceutical industries, et al.

- **Government agencies**
  - FDA, FTC, PTO, Canada NHPD, Australian TGA, Brazilian ENVIA, et al.

- **Consumers**
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Educating the public on the rational use of herbs, teas, essential oils, phytomedicines, plant-based food concentrates, and other plant-based & fungal ingredients