

Medical Informatics

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Biomedical Health Informatics

- Biomedical and Health Informatics has to do with all aspects of understanding and promoting the effective organization, analysis, management, and use of information in health care. While the field of biomedical and health informatics shares the general scope of these interests with some other health care specialties and disciplines, biomedical and health informatics has developed its own areas of emphasis and approaches that have set it apart from other disciplines and specialties.
- American Medical Informatics Association, American College Of Medical Informatics

Medical Informatics

- The Science of managing information for health care research, education, and administration by applying, integrating, and evaluating information technology along with its associated policies, procedures, and organizational cultures.
- American Medical Informatics Association, American College Of Medical Informatics

Pose a Question?

Are there any natural medicine treatment options available for SLE and are there any studies supporting their use in SLE patients? i.e.. DHEA, EFA,s, Antioxidants, Herbs.



THE PATIENTS KNOW MORE ABOUT
THEIR DISEASES THAN ME. I MUST
GET FASTER MODEM, HIGHER
SPEED INTERNET ACCESS THAN
THEM



©Mortenson

Why would someone want a natural medicine treatment options?



Conventional Treatment Options MicroMedex Database

•Steroids

•Adverse Effects

•COMMON

- cataracts
- Cushing's syndrome
- euphoria, depression
- GI distress, peptic ulcer
- growth depression
- hypertension, sodium and fluid retention
- hypokalemia
- impaired wound healing
- increased risk of infection
- muscle weakness
- skin atrophy

•SERIOUS

- HPA axis suppression
- glaucoma
- hyperglycemia
- tuberculosis reactivation
- osteoporosis
- increased intracranial pressure, seizures
- CHF

• **Immunosuppressants**

• Adverse Effects

• **COMMON**

- gastrointestinal hypersensitivity, nausea (12%), vomiting (12%)
- alopecia, photosensitivity, rash
- anorexia, diarrhea, N/V, stomatitis

• **SERIOUS**

- cancer (rare)
- hepatotoxicity (3-10%)
- infection (20% in renal transplant patients)
- leukopenia (5-16%)
- thrombocytopenia
- megaloblastic anemia
- pancreatitis (2-12%)
- arachnoiditis (with intrathecal administration)
- cirrhosis, elevated liver function test, hepatic fibrosis, atrophy, necrosis, and failure
- gastrointestinal bleeding, mucositis, ulceration
- hyperuricemia, nephropathy, renal failure
- interstitial pneumonitis (acute, chronic), methotrexate-induced lung disease
- myelosuppression

- **Antimalarials**

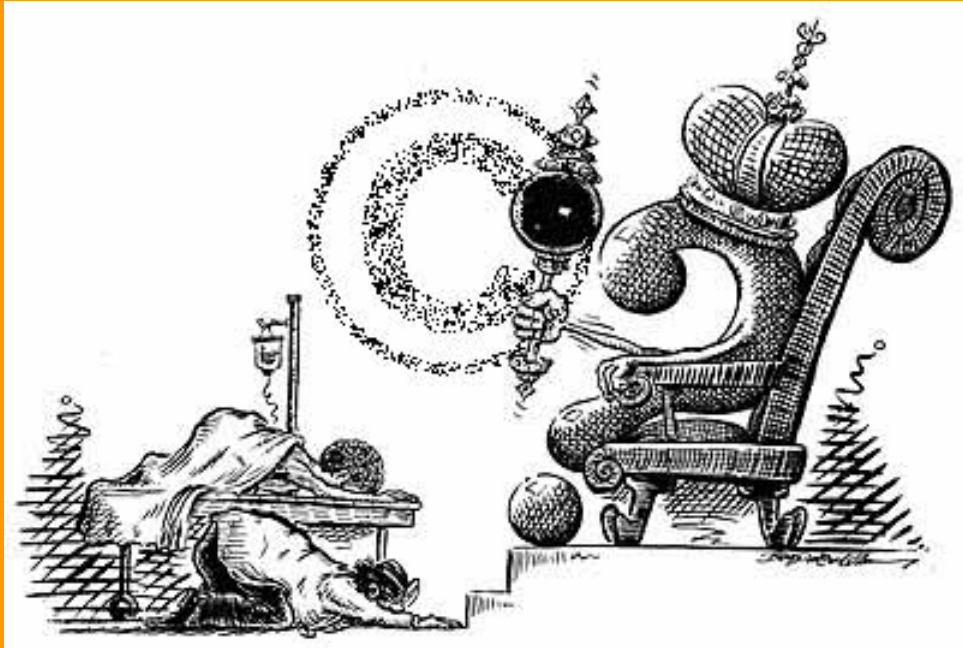
- **Adverse Effects**

- **COMMON**

- headache
 - myopathy
 - nausea/vomiting/diarrhea
 - skin and mucosal pigmentation

- **SERIOUS**

- agranulocytosis
 - ocular toxicity
 - ototoxicity (rare)





EBM Evidence Pyramid



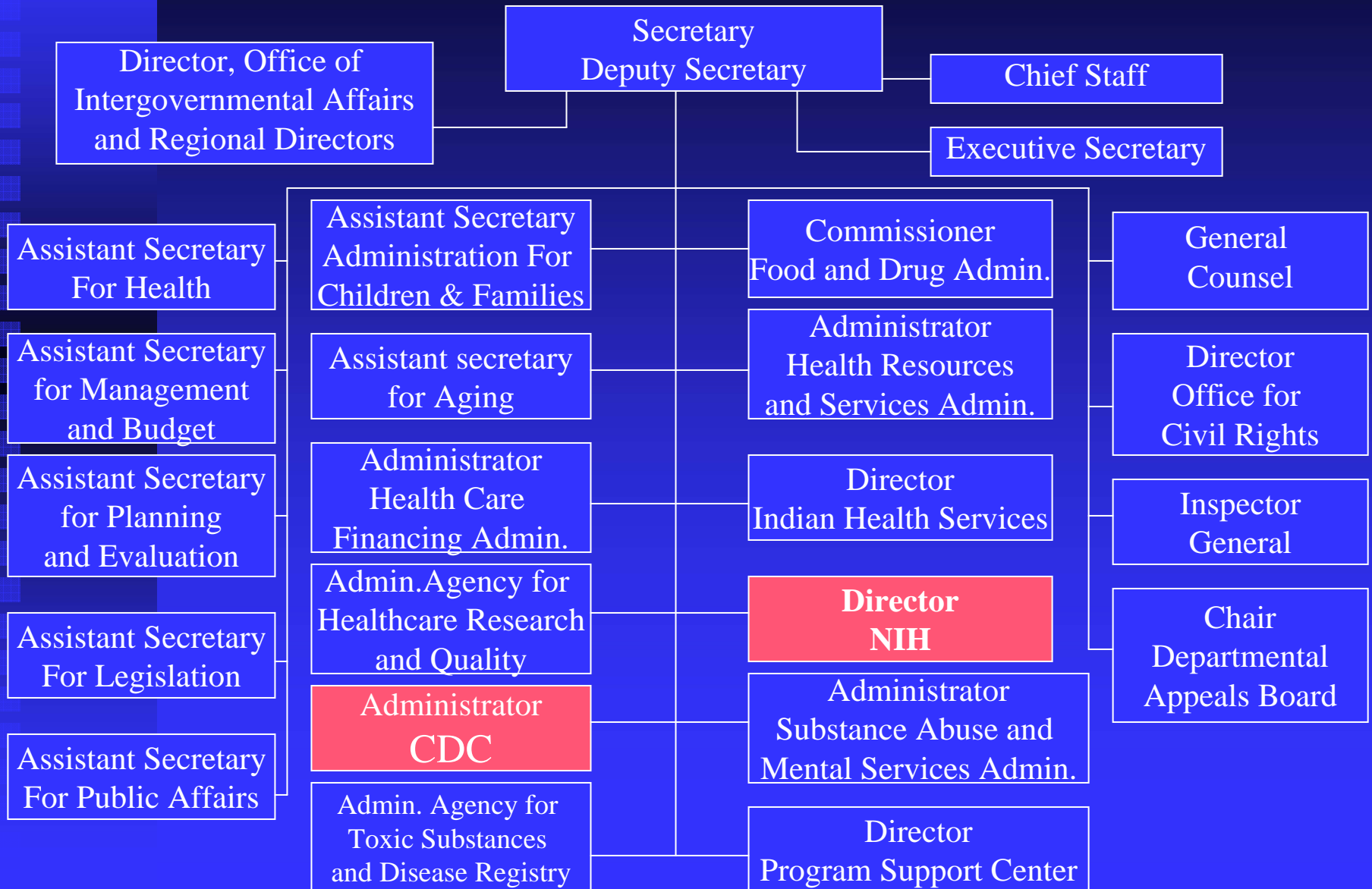
Reference Databases Used

- PubMed
- OVID
- Google Scholar
- Alt Medex
- MicroMedex
- Natural Medicine
- CAM
 - Lexus Nexus
 - Medical Library

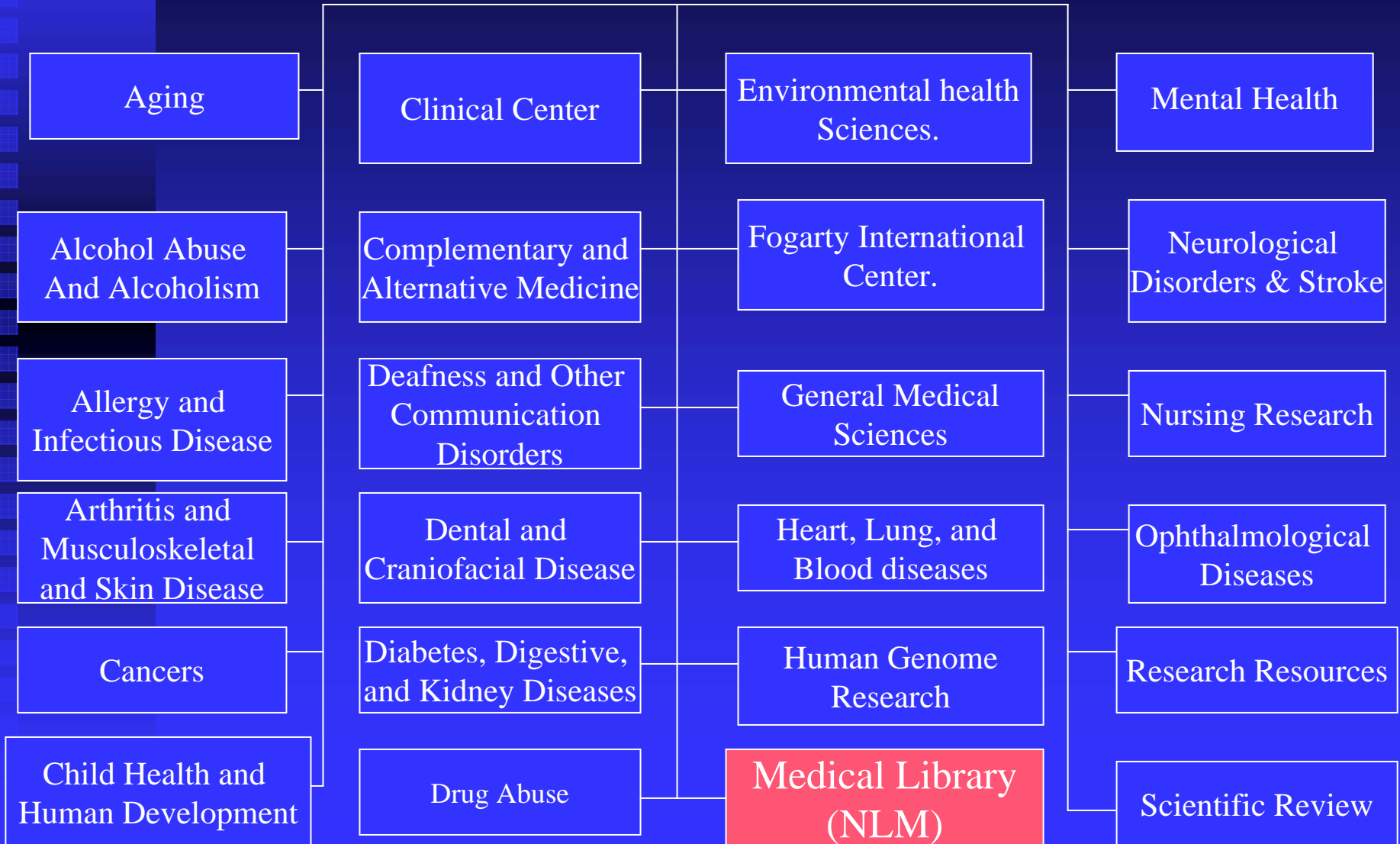
PubMed Search Strategy

<http://www.ncbi.nlm.nih.gov/sites/entrez/>

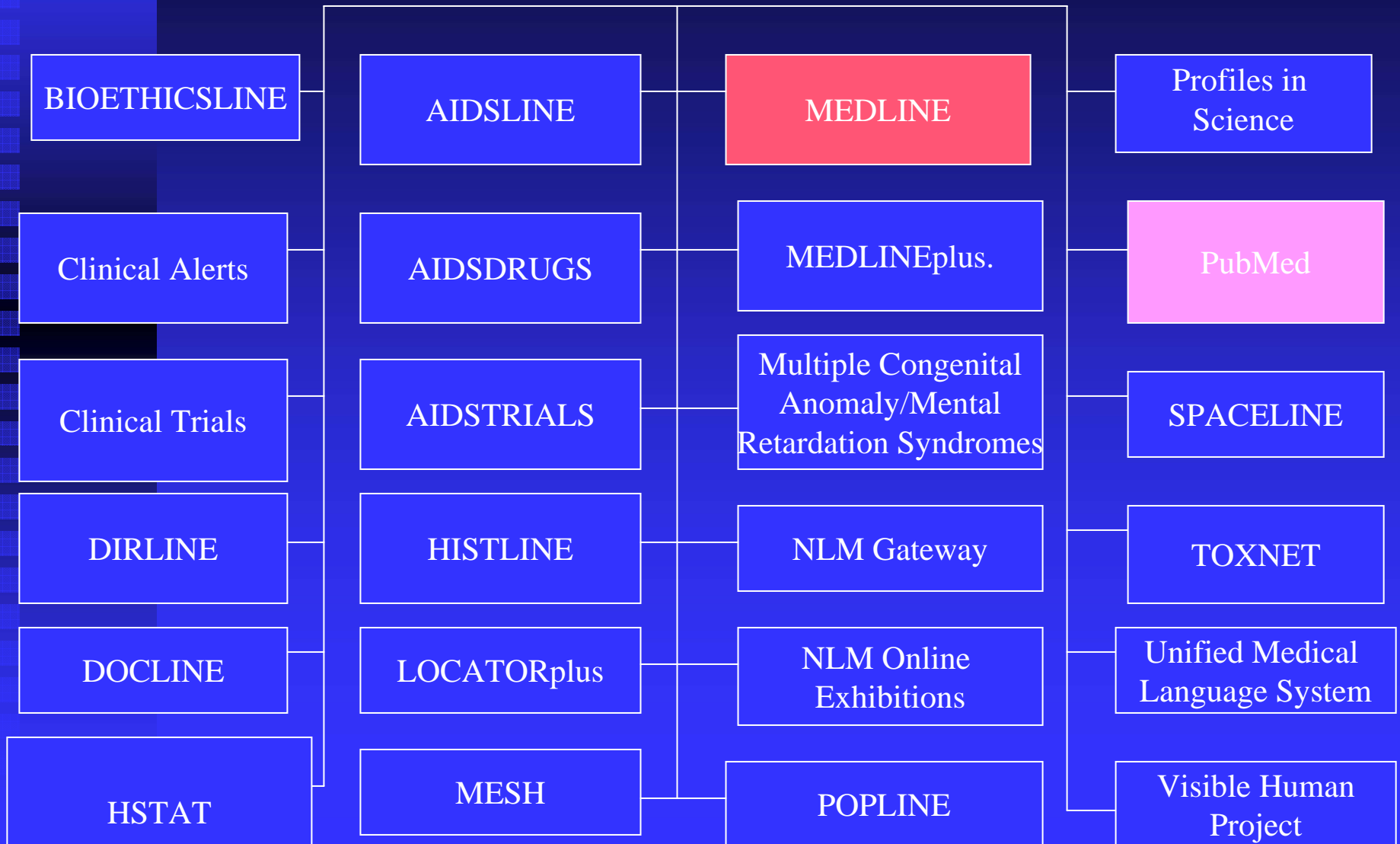
Department of Health and Human Services



National Institute of Health



Databases by NLM



Search Topic Concepts

- Systemic Lupus Erythematosus
- Autoimmune Disease
- Natural Medicine/Treatment/Prevention
- Antioxidants/Free radicals
- Chinese Herbal Medicine
- Fish Oils
- Hormonal DHEA/Pregnenolone
- Glucosamine Sulfate (Glycosaminoglycans)

Possible Search Terms Based on Concepts Further Delineated (Thesaurus features)

- S.L.E. OR SLE OR “systemic lupus erythematosus” OR lupus OR (autoimmune disease)

AND

- (Natural Medicine) OR antioxidants, vitamins OR herbs OR trace minerals, hormones OR glycosaminoglycans

Using Boolean Operators

- AND (searching only combined concepts) i.e. (heart disease) AND diabetes
- OR (searching any or all alternate concepts) i.e. “heart disease” OR diabetes
- NOT (searching some while excluding other concepts from your search) i.e. (heart disease) NOT diabetes

Grouping phrases and using truncation

- “Phrases” , (Phrases) i.e.
“systemic lupus erythematosus”
- Truncation * i.e. arthritis,
arthropathy, arthritides,
truncate arth* singular/plural

Thesaurus Functionality

- MESH – MEdical Subject Heading
- Under MESH Search lupus yields: lupus, Lupus Erythemaosis, Systemic etc.

Search Strategies

- Keyword/Textword Search
- Thesaurus functions
- Clinical Trials Retrieval
- May want to avoid summary information except as needed to further define/assist search strategy.
- Journal articles and other sources for original studies and their respective citations
- “Limit” use minimized as much as possible except clinical trials, randomized controlled trials, meta-analysis, and possibly humans.
- Databases will include PubMed/OVID, Google Scholar, AltMedex(Micromedex), Natural Medicine, CAM (Complementary Alternative Medicine)

#	Search #13 Field: All Fields, Limits: Meta-Analysis	14:0	<u>0</u>
1		9:25	
8			
#	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune)	14:0	<u>7</u>
1	AND (DHEA OR D.H.E.A. OR dehydroepiandrosterone OR pregnenolone) Field: All Fields,	7:23	
7	Limits: Randomized Controlled Trial		
#	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune)	14:0	<u>1</u>
1	AND (DHEA OR D.H.E.A. OR dehydroepiandrosterone OR pregnenolone) Field: All Fields,	6:54	<u>7</u>
4	Limits: Clinical Trial		
#	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune)	14:0	<u>1</u>
1	AND (DHEA OR D.H.E.A. OR dehydroepiandrosterone OR pregnenolone)	2:28	<u>5</u>
3			<u>4</u>

# 2 2	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune OR arthritis) AND (glucosamine OR "glucosamine sulfate") Field: All Fields, Limits: Clinical Trial	14:1 9:10	<u>4</u> <u>8</u>
# 2 1	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune OR arthritis) AND (glucosamine OR "glucosamine sulfate")	14:1 2:54	<u>4</u> <u>4</u> <u>8</u>
# 2 0	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND (glucosamine OR "glucosamine sulfate") Field: All Fields, Limits: Clinical Trial	14:1 1:14	<u>1</u>
# 1 9	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND (glucosamine OR "glucosamine sulfate") Field: All Fields, Limits: Meta-Analysis	14:1 0:41	<u>0</u>

2
4

Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune OR arthritis) AND ("fish oil" OR "essential fatty acid" OR "fatty acid" OR "omega 3 essential fatty acid" OR "omega 6 essential fatty acid" OR "omega 9 essential fatty acid" OR omega) Limits: Clinical Trial

14:2 5
9:01 4

# 4	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND (antioxidant OR "vitamin E" OR "vitamin C" OR selenium OR betacarotene OR "vitamin A" OR zinc OR "coenzyme q10" OR "alpha lipoic acid") Field: All Fields, Limits: Clinical Trial, Humans	13:5 2:11	<u>10</u> <u>6</u>
# 3	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND (antioxidant OR "vitamin E" OR "vitamin C" OR selenium OR betacarotene OR "vitamin A" OR zinc OR "coenzyme q10" OR "alpha lipoic acid") Field: All Fields, Limits: Meta-Analysis	13:40: 06	<u>0</u>
# 2	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND (antioxidant OR "vitamin E" OR "vitamin C" OR selenium OR betacarotene OR "vitamin A" OR zinc OR "coenzyme q10" OR "alpha lipoic acid") Field: All Fields, Limits: Clinical Trial	13:39: 25	<u>10</u> <u>8</u>
# 1	Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND (antioxidant OR "vitamin E" OR "vitamin C" OR selenium OR betacarotene OR "vitamin A" OR zinc OR "coenzyme q10" OR "alpha lipoic acid")	13:38: 59	<u>62</u> <u>64</u>
# 0	pubmed clipboard	14:39: 05	<u>11</u> <u>9</u>

#1
0

Search (S.L.E. OR SLE OR "systemic lupus erythematosus" OR lupus OR autoimmune) AND ("chinese herb" OR 'chinese herbal medicine" OR herb OR "herbal botanical" OR "herbal botanical medicine" OR botanical OR "botanical medicine")

14:00 2
:38



Google Scholar Search Strategy

[Advanced Scholar Search](#)

[Scholar Preferences](#)

[Scholar Help](#)

The "**AND**" operator is unnecessary -- we include all search terms by default. [[details](#)]

Scholar

Results **1 - 10** of about **11,800** for [[S.L.E.](#) OR [SLE](#) OR "[systemic lupus erythematosis](#)" OR [lupus](#) OR [autoimmune](#)] AND [[antioxidant](#) OR "[vitamin E](#)" OR "[vitamin c](#)" OR [selenium](#) OR betacarotene OR "[vitamin A](#)" OR [zinc](#) OR "[coenzyme q10](#)" OR "[alpha lipoic acid](#)"].
(**0.23** seconds)

[Advanced Scholar Search](#)

[Scholar Preferences](#)

[Scholar Help](#)

The "**AND**" operator is unnecessary -- we include all search terms by default. [[details](#)]

Scholar

Results 1 - 10 of about 2,010 for [[S.L.E.](#) OR [SLE](#) OR "[systemic lupus erythematosis](#)" OR [lupus](#) OR [autoimmune](#)] AND [[antioxidant](#) OR "[vitamin E](#)" OR "[vitamin c](#)" OR [selenium](#) OR [betacarotene](#) OR "[vitamin A](#)" OR [zinc](#) OR "[coenzyme q10](#)" OR "[alpha lipoic acid](#)"] AND "[clinical trial](#)" AND [treatment](#) . (0.25 seconds)

[Advanced Scholar Search](#)

[Scholar Preferences](#)

[Scholar Help](#)

The "**AND**" operator is unnecessary -- we include all search terms by default. [[details](#)]**Scholar**

Results **1 - 10** of about **951** for [[S.L.E.](#) OR [SLE](#) OR "[systemic lupus erythematosus](#)" OR [lupus](#)] AND [[antioxidant](#) OR "[vitamin E](#)" OR "[vitamin c](#)" OR [selenium](#) OR [betacarotene](#) OR "[vitamin A](#)" OR [zinc](#) OR "[coenzyme q10](#)" OR "[alpha lipoic acid](#)"] AND "[clinical trial](#)" AND [treatment](#). (**0.26** seconds)

[Advanced Scholar Search](#)

[Scholar Preferences](#)

[Scholar Help](#)

The "**AND**" operator is unnecessary -- we include all search terms by default. [[details](#)]

Scholar

Results **1 - 10** of about **778** for [[S.L.E.](#) OR [SLE](#) OR "[systemic lupus erythematosus](#)" OR [lupus](#)] AND ["[vitamin E](#)" OR "[vitamin c](#)" OR [selenium](#) OR [betacarotene](#) OR "[vitamin A](#)" OR [zinc](#) OR "[coenzyme q10](#)" OR "[alpha lipoic acid](#)"] AND "[clinical trial](#)" AND [treatment](#). (0.25 seconds)



AltMedex Search Strategy

T. SYSTEMIC LUPUS ERYTHEMATOSUS

1. OVERVIEW: EFFICACY: Adult, possibly effective DOCUMENTATION: Adult, fair

2. SUMMARY: – Two short-term studies suggest that DHEA supplementation has a beneficial effect on symptoms of systemic lupus erythematosus in females – Further studies with larger patient populations are required

3. ADULT:

a. DHEA supplementation in SLE at a dose of 200 mg per day for 3 to 6 months showed no statistical difference in SLAM or SLEDAI scores in 19 female patients with mild or moderate disease. However, significant decrease in lumbo-sacral spin bone density as is normally seen with chronic corticosteroid use was present in the placebo group but the DHEA group, though on similar corticosteroid therapy, had a marked decrease in bone density (van Vollenhoven et al, 1999).

b. Statistically significant improvements were found in a case-study involving 23 female patients with mild to moderate SLE. The women were started on a dose of 50 milligrams (mg) DHEA daily and increased in a step-wise fashion to a maximum of 600 mg per day produced a variety of results. Twelve of the patients stopped the study due to side effects, while 10 continued with no side effects and achieved remission of symptoms. The most common side effect was acne and was not related to either serum levels of DHEA/DHEAS or dose of DHEA. All patients were assessed by Systemic Lupus Erythematosus Disease Activity Index (SLEDAI), Systemic Lupus Activity Measure (SLAM), patient and physician VAS, VAS pain, and Krup FSS. SLEDAI, SLAM, and patient VAS scores over the 6-month period demonstrated a statistically significant decrease in disease activity. However, FSS did not change. Due to the variation of clinical response as well as side effects in the range of dosing, predictable levels were investigated. These levels were largely variable but did increase with dose given. Because FSS scores did not change over 6 months, though patients claimed to have less fatigue, FSS may have been a poor measurement tool for this group. This study showed that while DHEA is not currently approved for use in SLE, benefits might exist. Response, however, seems to vary with the individual and is not dose dependent (Barry et al, 1998).

c. DHEA supplementation in systemic lupus erythematosus (SLE) patients caused decreases in the SLE disease activity index (SLEDAI) scores, patient and physician overall disease assessment, and prednisone requirements in a double-blind, placebo-controlled trial over 6 months in 28 female patients. There were many marginal benefits of DHEA (200 milligrams/day oral) in the 14 patients taking DHEA, while there were increases in SLE disease activity in the placebo group. However, statistically significant reductions in the treatment group were found only in the patient's overall assessment of the disease after 3 months ($p=0.138$). Lupus flares occurred in 8 placebo patients and 3 DHEA patients ($p=0.053$), as determined by the primary rheumatologist. No laboratory parameters showed significant changes. The DHEA group showed a slight reduction in prednisone requirement after 3 months, whereas the placebo group showed a slight increase in prednisone requirement; however, these values did not reach any statistical significance (van Vollenhoven et al, 1995).

d. DHEA supplementation, 200 milligrams/day for 3 to 6 months, reduced systemic lupus erythematosus (SLE) symptoms in an open study of 10 female patients with mild to moderate SLE and various disease manifestations. At study end, SLE disease activity index (SLEDAI) scores decreased, although not statistically significantly. Physician's overall assessment of the patient's disease improved significantly following DHEA therapy (37.2 to 27.2, $p=0.040$). The patient's overall disease assessment also improved, but not statistically significantly. In the three patients who demonstrated proteinuria prior to the study, DHEA produced a trend towards a decrease. DHEA decreased the required dosage of prednisone (or prednisone equivalent) per day for symptomatic treatment, at 3 months (14.5 to 9.4 mg/day, $p=0.028$) and 6 months (14.8 to 5.6 mg/day, $p=0.042$) (van Vollenhoven et al, 1994).



Natural Medicine Database

Search for: Systemic lupus erythematosus (SLE)

Matches: 4

Possibly Effective:

[DHEA](#) **(Possibly Effective)**

Systemic lupus erythematosus (SLE)

Taking DHEA orally in conjunction with conventional treatment may help reduce SLE disease activity, frequency of flare-ups, and corticosteroid doses needed ([2113](#),[2114](#),[2136](#),[6447](#),[6068](#),[12561](#),[12574](#)). It may also help SLE symptoms such as muscle ache and oral ulcers ([12561](#)). DHEA also seems to improve bone mineral density in SLE patients being treated with high dose corticosteroids ([6068](#),[6097](#),[6447](#)).

[FLAXSEED](#) **(Possibly Effective)**

Systemic lupus erythematosus (SLE) nephritis

Taking flaxseed orally seems to improve renal function in people with systemic lupus erythematosus (SLE) nephritis. There is evidence that daily use of flaxseed can lower serum creatinine ([6802](#),[8021](#)).

Possibly Ineffective:

[FISH OIL](#) **(Possibly Ineffective)**

Systemic lupus erythematosus (SLE)

Taking fish oils orally doesn't seem to reduce disease activity or improve renal function when taken for a year in patients with SLE ([7571](#)). There's some weak evidence that fish oils plus a low-fat diet might reduce lupus symptoms, but it's too preliminary to recommend this combination ([7572](#)).

Insufficient Evidence:

[THUNDER GOD VINE](#) **(Insufficient Evidence)**

Systemic lupus erythematosus (SLE)

There is preliminary evidence that thunder god vine may be effective for nephritis associated with SLE

NIH CAM Database

Evidence Report/Technology Assessment: Number 89

Effects of Omega-3 Fatty Acids on Lipids and Glycemic Control in Type II Diabetes and the Metabolic Syndrome and on Inflammatory Bowel Disease, Rheumatoid Arthritis, Renal Disease, Systemic Lupus Erythematosus, and Osteoporosis

Summary

NIH CAM Database

Rheumatoid Arthritis

Chinese Thunder God Vine

Omega-3 Fatty Acids

NIH CAM Database

Highlights

October 2002

Spotlight on Research

By Year

[2005](#) | [2004](#) | [2003](#) | [2002](#) | [2001](#) | [2000](#) | [1999](#)

Chinese Thunder God Vine Gives Relief from Rheumatoid Arthritis Symptoms

by Elizabeth Freedman

Online Research Data

- Health Data Retrieval Sources
 - ICD, ICD-CM, DRG Codes
 - CDC WONDER, NHANES, WISQARS – Injury data
 - Cancer Query Registries i.e. NCI-SEER
 - BRFSS - YRBS
 - AHRQ – MEPSnet -
 - AHQR – HCUPNet – Healthcare Cost Utilization Project
 - Health Department Reporting Data
 - EPA
 - U.S. Census Bureau
 - WHO
 - MANY MANY others





Hill's Postulates for Causation (1965)

- **Strength of Association:** The larger the relative effect, the more likely the causal role of the factor. (RR, OR)
- **Dose-response:** If the risk increases with increasing dose of the risk factor, the more likely the causal role of the factor. (Pancreatic cancer and coffee, lung cancer and tobacco)
- **Consistency:** If similar associations are found in different studies in different populations, the more likely the causal role of the factor. (Medical informatics/Studies/Literature retrieval)
- **Temporality:** Risk factor exposure must precede the outcome. (Effect cannot precede cause, Effect>>Cause AND NOT Cause>>Effect)
- **Intervention:** Reduction or removal of the risk factor must reduce the risk of the outcome. (Intervention Trial)
- **Biological Plausibility** a plausible mechanism exists that may explain the risk. (thimersol and autism, Medical informatics/Studies/Literature retrieval)
- **Coherence:** Associations between the risk factor and the outcome must be consistent with existing knowledge. (exercise and obesity, Generally accepted knowledge)

- **Interpreting the Medical Literature Outline**

- Resident Name _____

- Date _____

- Citation:

- When reading the assigned article consider these questions for discussion at the Journal Club meeting?

- **General Considerations**

- 1. Is the title of the article consistent with the content of the article?

- 2. What were the author(s) conclusions and how strongly were they worded?

- 3. Did the research question warrant doing a study on this topic i.e. unnecessary, clinical practical significance?

- **Systematic Design Considerations**

- 4. What were the dependent (outcome) variables? Were they clearly defined and adequately measured?

- 5. What were the independent (exposure/intervention/predictor) variables? Were they clearly defined and adequately measured?

- 6. What was the design of the study? Was there an adequate control group, blinding, randomization? Were confounders balanced or excluded in the design?

- 7. If the authors conclusions are correct to whom can they be generalized to based on the sample selected?

- **Statistical Considerations**

- 8. Were any associations established and if so what was/were the strength of the associations? Was there statistical significance?

- Interpreting the Medical Literature
- Statistical Considerations - Continued
- 9. Was the statistical test used to determine statistical significance appropriate and correctly interpreted?
- 10. What do you estimate the potential was for type 1 or type 2 error in the study?
- 11. Were the authors conclusions justified based on your assessment of the strengths and weaknesses of this study?
- 12. How could the study design have been improved?

Questions

?

References

- Englebardt SP. Health Care Informatics: An Interdisciplinary Approach
- Medical Informatics: Knowledge Management and Data Mining in Biomedicine

Selected References On Lecture Series

■ Epidemiology

- Gordis L. Epidemiology. 3rd Ed. 2004.

■ Research Methods

- Gehlbach SH. Interpreting the Medical Literature. Practical Epidemiology For Clinicians. 5th Ed. 2006.
- Hulley SB, Designing Clinical Research. An Epidemiologic Approach. 3rd Ed. 2006.

■ Statistics

- Norman GR, Streiner DL. Biostatistics: The Bare Essentials. 2nd Ed. 2000.