



EAHIL Conference, Köln, 21st September 2002

Wisdom world-wide?

*Portals to bio-medical information
viewed from a user perspective*

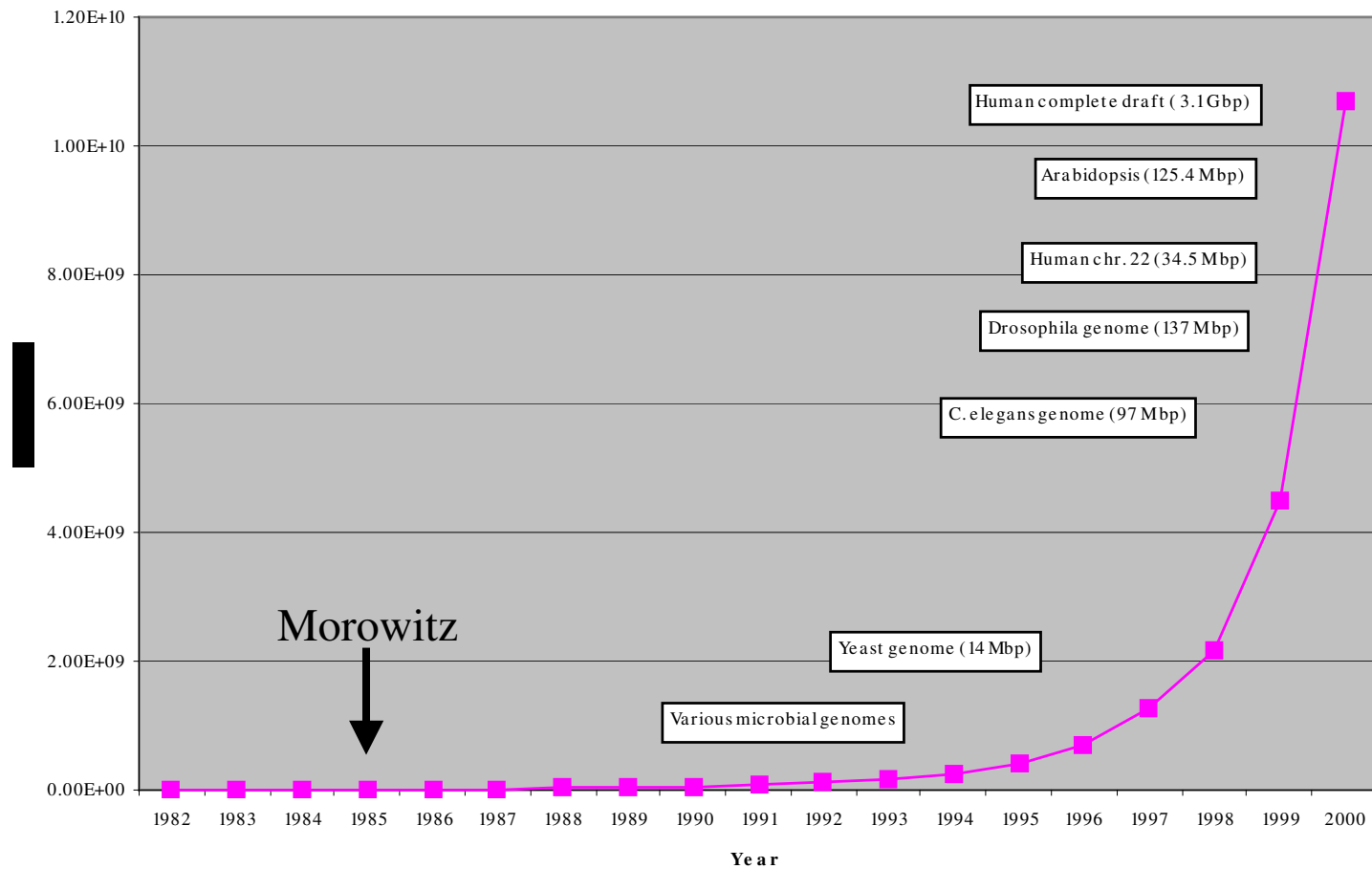
Les Grivell
European Molecular Biology Organization

“Biological research has reached a point where new generalizations and higher order biological laws are being approached, but may be obscured by the simple mass of data”

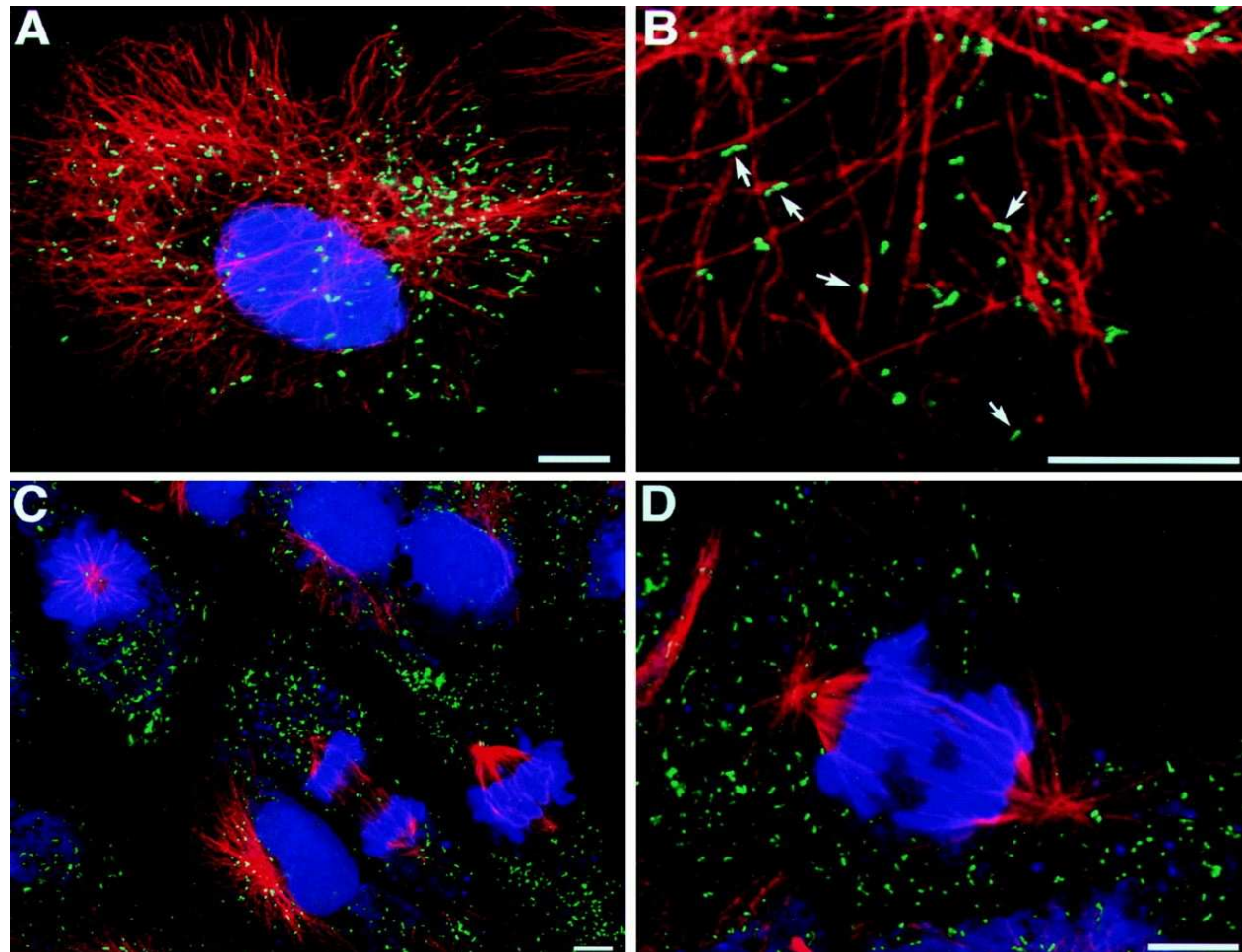
Harold Morowitz, 1985

Report to the U.S. National Academy of Sciences

One part of the information explosion



New technologies also generate digital information



The problem



...and the user perspective



Biological information: current reality

- Knowledge scattered across the literature in many thousands of non-computer readable journal articles
- Hundreds of different databases, many in flat-file format
- Non-uniform or lack of external identifiers
- Lack of interoperability at the level of syntax and semantics

What do most users want?

- Intuitive interfaces
- To navigate smoothly from one resource to another
- Immediate availability of authoritative information; **free of charge** at the point-of-use
- Information that can be integrated / manipulated / visualized /output in another form

A sample scenario.....



Friedreich ataxia is a disease characterized by neurodegeneration and cardiomyopathy. The gene responsible for the disease is frataxin. It encodes a mitochondrial protein required for iron homeostasis and is evolutionarily conserved from yeast to man.

- Critically assess the experimental evidence that frataxin functions in iron-sulphur cluster synthesis.
- Review the effectiveness of anti-oxidants as treatment for the disease.
- Assemble as far as possible all other known information on the frataxin gene and the action of its protein

Now choose a portal ...



* [\[TOP \]](#) | [\[Part 1 \]](#) | [\[Part 2 \]](#) | [\[Part 3 \]](#) | [\[All \]](#) | [\[Journals \]](#) | [\[\]](#)

Part 1: Molecular Biology Search and Analysis

- [3D-ALI](#) - Database relating Proteins Structures and Sequences (see [Documentation](#)) at [EMBL-Heidelberg](#) [W3](#)
- [AA Analysis](#) ★ - Protein Identification in SwissProt and PIR using Amino Acid Composition at [EMBL-Heidelberg](#) [W3](#)
- [AA CompIdent](#) - Protein Identification in SwissProt using Amino Acid Composition at [ExpASy](#), Switzerland [W3](#)
- [AA CompSim](#) - Compare the Amino Acid Composition of a SwissProt Entry with Other Entries at [ExpASy](#), Switzerland [W3](#)
- [AA Sequence Analysis](#) - Multiple Analysis of a Native or Modified Amino Acid Sequence at [Rockefeller U.](#) [W3](#)
- [AbCheck](#) - Test an Antibody Sequence Against the Kabat Database at [U. College-London](#), UK [W3](#)
- [ALIGN](#) - Optimal Global Alignment of Two Sequences with No Short-cuts at [EERIE-Nimes](#), France and [Align](#) at [MIPS](#), Germ
- [AllAll](#) ★ - Relationships in a Set of Related Peptides at [ETH-Zürich](#), Switzerland [W3](#)
- [AllAllDB](#) ★ - Search the All-Against-All Database of SwissProt at [ETH-Zürich](#), Switzerland [W3](#)
- [AMAS](#) - Analysis of Protein Multiple Sequence Alignments at [U. Oxford](#), UK [W3](#)
- [ASC](#) ★ - Analytic Surface Calculation of PDB Protein Structures at [EMBL-Heidelberg](#) [W3](#)
- [ATLAS](#) ✓ - Search DNA and Protein Sequence Databases at [MIPS](#), Germany [W3](#)
- [BCM Search Launcher](#) at [Baylor College of Medicine](#) [W3](#)
- [BEAUTY](#) - BLAST Enhanced Alignment Utility (see [Documentation](#)) at [Baylor College of Medicine](#) [W3](#)
- [BERLIN](#) - RNA Databank of 5S rRNA and 5S rRNA Gene Sequences at [CAOS/CAMM](#), The Netherlands [W3](#)
- [BIOACCELERATOR](#) at [Weizmann Institute of Science](#), Israel [W3](#)
- [bioCUI](#) - Multiple Access to Biological Servers at [OCMS-Oxford](#) [W3](#)
- [Biological Units](#) - Expanded PDB Entries with Full Biological Units at [Brookhaven National Laboratory](#) [FTP](#)
- [Biologist's Search Palette](#) - Collection of Search Engines for Biological Databases at [Oxford U.](#), UK [W3](#)
- [BLAST](#) - Basic Local Alignment Research Tool at [NCBI](#), [BLAST](#) (hiv, vector, etc) at [Stanford U.](#), [BLAST](#) at [GenomeNet](#), Ja
- [BLAST](#) (with Entrez and SRS Links) at [Baylor College of Medicine](#) and [BLAST](#) at [EPFL](#), Switzerland [W3](#)
- [BLASTPAT](#) - BLAST-based Pattern Database Search (see [Documentation](#)) at [Baylor College of Medicine](#) [W3](#)
- [BLITZ](#) ★ - Fast comparison of protein sequences against SwissProt (see [Documentation](#)) at [EBI](#), UK [W3](#)
- [BLOCKS](#) - Database of Highly Conserved Regions in Proteins [W3](#) and [BLOCKS-WAIS](#) [Gopher](#) at [Fred Hutchinson Cancer](#)
- [BioMagResBank](#) - A Database of NMR-Derived Protein Structures at [BIMAS-NIH](#) [W3](#)
- [BioSCAN](#) - Biological Sequence Comparative Analysis at [U. North Carolina](#) [W3](#)
- [BMCD](#) - Biological Macromolecule Crystallization Database at [CARB](#) [W3](#)

There's plenty of choice!



* [[TOP](#)] [[Part 1](#)] [[Part 2](#)] [[Part 3](#)] [[All](#)] [[Journals](#)]

Part 2: Bibliographic, Text and WWW Searches

- [AA-Index](#) - Amino Acid Index Database at [GenomeNet](#), Japan and [NAKAI](#) at [CAOS/CAMM](#), The Netherlands ^{W3}
- [AGRICOLA](#) ✓ - Bibliographic References (Plant Genome Subset) at [USDA-NAL](#) ^{Gopher}
- [Annual Reviews](#) ✓ - Bibliographic Searches at [LMMB-National Cancer Institute](#) ^{W3}
- [ArchiePlexForm](#) - Search Files Available by Anonymous FTP at [LeRC-NASA](#) ^{W3}
- [ATCG](#) ✓ - Anderson's Timesaving Comparative Guides for Restriction Enzymes, Modifying Enzymes, Clone Libraries and Fi
- [Beckman-Bioresearch](#) ✓ - Information on Protein and DNA Applications, Meetings and Product Information at [Beckman I](#)
- [BIBLIO](#) - Molbio Journal Searches at [Genethon](#), France ^{Gopher} and [Biology Journal Contents](#) at [CERN](#), Switzerland ^{W3}
- [BIBSYS](#) - Interuniversity Bibliographic System in Norway ^{W3}
- [BIOBIB](#) - Biocomputing Bibliography at [ICGEB-Trieste](#), Italy ^{Gopher} and [CompAlgo](#) at [CERN](#), Switzerland ^{W3}
- [BioCatalog](#) - Catalog of Molecular Biology Programs at [EBI](#), [Bio-catalogue](#) at [Genethon](#), France and [BIOCAT](#) at [CAOS/](#)
- [Bio-Email](#) - List of Biomedical E-Mail Servers and [Bio-Email-Search](#) at [Washington U.](#) ^{W3}
- [Bioline](#) - Bio-Publications at [Base de Dados Tropical](#), Brazil ^{W3}
- [BioMOO](#) - The Biologists' Virtual Meeting Place at [Weizmann Institute of Science](#), Israel ^{W3}
- [Bionet Journal](#) Articles and [Bionet News](#) ^{Gopher}
- [BIOSCI](#) Archives at [EMBnet-UK](#) ^{Gopher} and [BIOSCI](#) at [CERN](#), Switzerland ^{W3}
- [BioSpace](#) ✓ - Find People, Companies and Resources in Biotech Industry at [Synergistic Designs](#) ^{W3}
- [Biotech Company WWW Registry](#) ✓ - [Martin Leach's](#) List of Commercial Net sites/Email addresses for Molecular Biolog
- [Biotechnology Abstracts DataBase](#) at [Stack-Serpukhov](#), Russia ^{Gopher}
- [Biotechnology Bibliographies](#) at [BIC-U. Maryland/College Park](#) ^{W3}

Although some may be difficult to find ...

Not Found

The requested URL /htbin/bfind_litdb was not found on this server.

Apache/1.3.26 Server at fire2.scl.genome.ad.jp Port 80

*(23% web-links invalid after 1 yr; rising to 53% after 6 years
Lawrence et al., 2001)*

Try again ...

Comprehensive Yeast Genome Database

[home](#) [index](#) [? help](#)

Gene / ORF

Yeast - Full text search

▶ [Search:](#)
homology, div.

DB
[PPI / Complex](#)

[Ascomycota](#)

▶ [View/Get](#)
chromosomes,
seq.

▶ [Tables](#)
misc., RNAs

▶ [Catalogues](#)

▶ [Pathways](#)

Your Query:

Please note: this search-engine is not capable of logical operations as "AND" or "OR"

Another attempt

NCBI PubMed National Library of Medicine NLM

PubMed Nucleotide Protein Genome Structure PopSet

Search PubMed for Friedreich ataxia OR frataxin OR iron homeost Go Clear

Limits Preview/Index History Clipboard Details

Display Summary Sort Save Text Clip Add Order

Show: 20 Items 1-20 of 90983 Page 1 of 4550

1: [Stanger O, Semmelrock HJ, Wonisch W, Bos U, Pabst E, Wascher TC.](#)
Effects of Folate Treatment and Homocysteine Lowering on Resistance Vessel Reactivity in Atherosclerotic Subjects.
J Pharmacol Exp Ther. 2002 Oct 1;303(1):158-162.
PMID: 12235246 [PubMed - as supplied by publisher]

2: [Vergely C, Perrin-Sarrado C, Clermont G, Rochette L.](#)
Postischemic Recovery and Oxidative Stress Are Independent of Nitric-Oxide Synthases Modulation in Isolated Rat I
J Pharmacol Exp Ther. 2002 Oct 1;303(1):149-157.
PMID: 12235245 [PubMed - as supplied by publisher]

3: [Minko T, Stefanov A, Pozharov V.](#)
Selected Contribution: Lung hypoxia: antioxidant and antiapoptotic effects of liposomal alpha-tocopherol.
J Appl Physiol. 2002 Oct;93(4):1550-60.
PMID: 12235059 [PubMed - in process]

4: [Thimmulappa RK, Mai KH, Srisuma S, Kensler TW, Yamamoto M, Biswal S.](#)
Identification of Nrf2-regulated Genes Induced by the Chemopreventive Agent Sulforaphane by Oligonucleotide Microarray.
Cancer Res. 2002 Sep 15;62(18):5196-5203.
PMID: 12234984 [PubMed - as supplied by publisher]

About Entrez
Text Version
Entrez PubMed
Overview
Help | FAQ
Tutorial
New/Noteworthy
E-Utilities
PubMed Services
Journal Browser
MeSH Browser
Single Citation
Matcher
Batch Citation
Matcher
Clinical Queries
LinkOut
Cubby
Related Resources
Order Documents
NLM Gateway
TOXNET
Consumer Health

and another

The screenshot shows the NCBI PubMed search interface. The search bar contains the query "Friedreich AND ataxia AND Erataxin AND iron A". The search results section displays "No items found." which is circled in red. Below the search bar, there are navigation tabs for "Nucleotide", "Protein", "Genome", and "Structure". The search bar also includes "Limits", "Preview/Index", "History", "Clipboard", and "Details" options. The NCBI logo and "National Library of Medicine NLM" are visible at the top. The search bar includes a "Search PubMed" dropdown menu, a "Go" button, and a "Clear" button. The search results section includes a "See Details" link.

Bookmarks Location: <http://www.ncbi.nlm.nih.gov/80/entrez/query.fcgi?CMD=search&DB=PubMed>

Instant Message The Net Members Marketplace RealPlayer

NCBI PubMed National Library of Medicine NLM

Search PubMed for Go Clear

Structure

Limits Preview/Index History Clipboard Details

No items found.

See [Details](#).

PubMed Nucleotide Protein Genome Structure

About Entrez

Text Version

Entrez PubMed

Overview

Help | FAQ

Tutorial

New/Noteworthy

E-Utilities

PubMed Services

Journal Browser

MeSH Browser

Single Citation

Matcher

Batch Citation

And again ? ...

CiteSeer
Scientific Literature Digital Library

GoogleTM


Ask Jeeves[®]
Ask.com

DÖGPILE[®]
All results, no mess.

altavista
THE SEARCH COMPANY

metacrawler[®]
Search the Search Engines!

Success?

 [Advanced Search](#) [Preferences](#) [Language Tools](#) [Search Tips](#) [Google Search](#)

[Web](#) [Images](#) [Groups](#) [Directory](#)

Searched the web for **Friedreich ataxia Frataxin iron homeostasis yeast iron-sulphur antioxidant**

Antioxidants - Wholesale Pricing on Proancynol
[www.healthwisdom.com](#) Free shipping with purchase over \$50. Safe online ordering

Friedreich Ataxia
... mitochondrial **iron homeostasis** ... JM (2001) **Antioxidant** ... mitochondrial **iron-sulphur** ... Normal serum **iron** ... with **Friedreich's ataxia** ... in **yeast** ... the **frataxin** ...
Description: An in depth look at this disorder. Includes a summary, diagnosing, molecular genetic testing, clinical...
Category: Health > Conditions and Diseases > ... > Friedreich Ataxia
[www.geneclinics.org/profiles/friedreich/ - 85k](#) - [Cached](#) - [Similar pages](#)

[PDF]debenone and reduced cardiac hypertrophy in Friedreich's ataxia
File Format: PDF/Adobe Acrobat - [View as HTML](#)
... acting as an **antioxidant** ... 8 and of **yeast** ... of cell **iron homeostasis** ... DISCUSSION **Friedreich's ataxia** ... 20 **Frataxin** deficient cells ... deficiency of **iron** ...
[www.ataxie.com/new/heart.pdf - Similar pages](#)

[PDF]Clinical, biochemical and molecular genetic correlations in ...
File Format: PDF/Adobe Acrobat
... November 1999 **Friedreich's** ... of progressive **ataxia** ... of **iron sulphur** ... lipid soluble **antioxidant** ... homologue of **frataxin** ... function, **iron homeostasis** ... the YFH1 **yeast** ...
[www2.mcgill.ca/biology/undergra/c524a/9-275.pdf - Similar pages](#)

[PDF]PII: S0166-2236(00)01584-8
File Format: PDF/Adobe Acrobat - [View as HTML](#)
... Disruption of the **yeast** ... There is increased **iron** ... in the gene for **frataxin** ... type identical to **Friedreich's ataxia** ... abnormalities in copper **homeostasis** ...
[neuro.med.cornell.edu/NYH-CMC/bealenergetics.pdf - Similar pages](#)



A next generation, scalable information service for the life sciences that will interlink factual and image data repositories with the research literature

*EU Quality of Life research infrastructure:
platform under construction*



- Distributed network of information resources
- Europe-based; world-wide role (**Act locally - think globally!**)



The E-BioSci platform

- Free access to the academic research community
- Set of *distributed* resources (literature, sequence- and image-databases)
- Integrated access to bibliographic abstracts, full text, factual and image databases
- Full-text search implemented via **conceptual fingerprinting**
 - Cross-repository
 - Cross-language
 - Implementation of effective 2-way links between databases and literature via gene symbol recognition

A discovery tool

powered by
Collexis[®]

Conceptual fingerprints

powered by
Collexis[®]

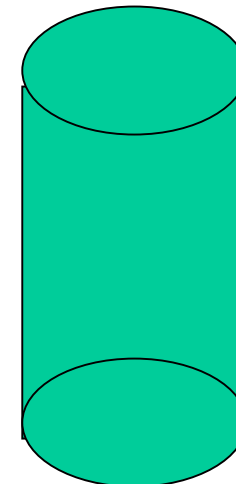


Full text document

Linkage of index
terms to thesaurus

C19881	0.99
C92992	0.67
C02002	0.66
C99229	0.44
C00392	0.33
C93939	0.21

Fingerprint
database



- 1 CFP = 400 bytes
- Abstraction: 250.000 pages/PC/day
- Matching: 500.000 CFP's: 40 millisc.

powered by
Collexis[®]

Cut-and-paste search

Vocabulary search:
Please type a term and search the standard vocabulary

Textual search:

Match **all** the concepts found (short input)

Match **any** of the concepts found (pasting text; natural language)

Friedreich ataxia is a disease characterized by neurodegeneration and cardiomyopathy. The gene responsible for the disease is frataxin. It encodes a mitochondrial protein required for iron homeostasis and is evolutionarily conserved from yeast to man.

How good is the experimental evidence that frataxin functions in iron-sulphur cluster synthesis?

Review the effectiveness of anti-oxidants as treatment for the disease.

powered by
Collexis

Cut-and-paste search

Search text: Friedrich ataxia is a disease characterized by neurodegeneration and cardiomyopathy. The gene responsible for the disease is frataxin. It encodes a mitochond protein required for iron homeostasis ...

Document sources:
Results are merged into one list

- Medline 2001
- Medline 2000 UMLS2001
- Medline 1999 UMLS2001
- Nature 2001 UMLS 2001 V2
- CAMBIA samples
- Patents 2

Related sources:
Results are shown in separate panels

set selection

- Medline 2001 experts
- Medline 2000 Authors
- Medline 1999 Authors

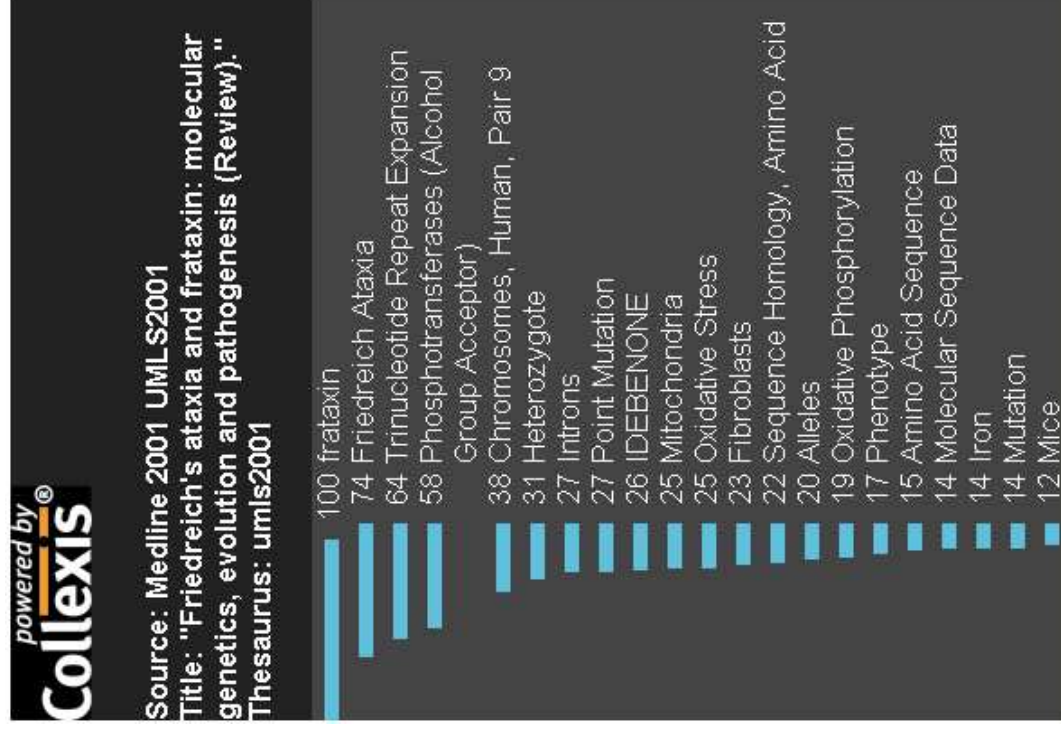
Collexis fingerprint:

All:	0	1	2	3	concept:
4					
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	frataxin
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Disease
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Iron
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Nerve Degeneration
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Homeostasis
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Oxidants
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sulfur
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Friedreich Ataxia
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Myocardial Diseases
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Review [publication type]
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	therapeutic aspects
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Therapeutic procedure
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	physiological aspects
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Male gender
0 1 2 3 4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Male population group

1 2 3 4 5 6 7 8 9 10


found: 856

- **Human frataxin maintains mitochondrial iron homeostasis in Saccharomyces cerevisiae.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Antioxidant treatment improves in vivo cardiac and skeletal muscle bioenergetics in patients with Friedreich's ataxia.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Crystal structure of human frataxin.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Frataxin: its role in iron metabolism and the pathogenesis of Friedreich's ataxia.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Cardiac energetics are abnormal in Friedreich ataxia patients in the absence of cardiac dysfunction and hypertrophy. An in vivo 31P magnetic resonance spectroscopy study.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Friedreich's ataxia and frataxin: molecular genetics, evolution and pathogenesis (Review).**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Alleviating transcript insufficiency caused by Friedreich's ataxia triplet repeats.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **Frataxin activates mitochondrial energy conversion and oxidative phosphorylation.**
Source: *Medline* 2007
Use for search | [Full Text](#) | [Collexis Fingerprint](#)
- **[The best in 2000 on pediatric cardiology]**



Collexis fingerprint:

All:	0	1	2	3	4	Concept:
					4	
	0	1	2	3	4	frataxin
	0	1	2	3	4	Friedreich Ataxia
	0	1	2	3	4	Trinucleotide Repeat Expansion
	0	1	2	3	4	Phosphotransferases (Alcohol Group Acceptor)
	0	1	2	3	4	Chromosomes, Human, Pair 9
	0	1	2	3	4	Heterozygote
	0	1	2	3	4	Introns
	0	1	2	3	4	Point Mutation
	0	1	2	3	4	IDEBENONE
	0	1	2	3	4	Mitochondria
	0	1	2	3	4	Oxidative Stress
	0	1	2	3	4	Fibroblasts
	0	1	2	3	4	Sequence Homology, Amino Acid
	0	1	2	3	4	Alleles
	0	1	2	3	4	Oxidative Phosphorylation
	0	1	2	3	4	Phenotype
	0	1	2	3	4	Amino Acid Sequence
	0	1	2	3	4	Molecular Sequence Data
	0	1	2	3	4	Iron
	0	1	2	3	4	Mutation
	0	1	2	3	4	Mice



SIMILAR SEARCH
Friedreich's ataxia and frataxin: molecular genetics, evolution and pathogenesis (Review).
Medline 2001

Document sources:
Results are merged into one list

- Medline 2001
- Medline 2000 UMLS2001
- Medline 1999 UMLS2001
- Nature 2001 UMLS 2001 V2
- CAMBIA samples
- Patents 2

Related sources:
Results are shown in separate panels

- Medline 2001 experts
- Medline 2000 Authors
- Medline 1999 Authors

1 2 3 4 5 6 7 8 9 10
found: 392

- **Friedreich's ataxia and frataxin: molecular genetics, evolution and pathogenesis (Review).**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **Friedreich ataxia: from GAA triplet-repeat expansion to frataxin deficiency.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **Frataxin: its role in iron metabolism and the pathogenesis of Friedreich's ataxia.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **Human frataxin maintains mitochondrial iron homeostasis in *Saccharomyces cerevisiae*.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **Mitochondrial dysfunction in Friedreich's ataxia.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **Frataxin activates mitochondrial energy conversion and oxidative phosphorylation.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **The GAA repeat expansion in intron 1 of the frataxin gene is related to the severity of cardiac manifestation in patients with Friedreich's ataxia.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **dfh is a Drosophila homolog of the Friedreich's ataxia disease gene.**
Source: *Medline 2001*
Use for search | Full Text | Collexis Fingerprint
- **Crystal structure of human frataxin.**

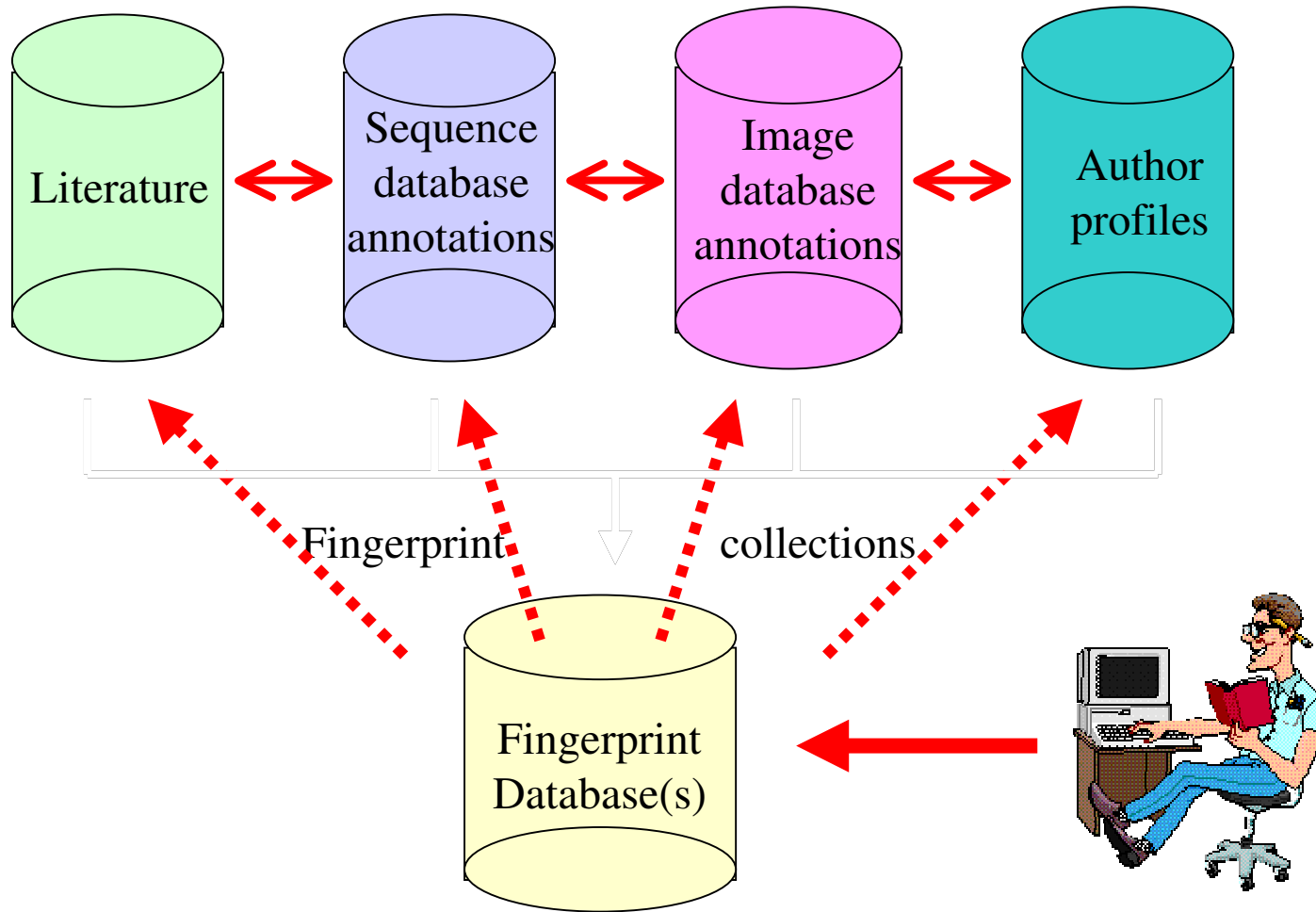
1 2 3 4 5 6 7 8 9 10
found: 443

- **Schapira A.**
Source: *Medline 2001 experts*
- **Isava G.**
Source: *Medline 2001 experts*
- **Harit C.**
Source: *Medline 2001 experts*
- **Palau F.**
Source: *Medline 2001 experts*
- **Lodi R.**
Source: *Medline 2001 experts*
- **Gellera C.**
Source: *Medline 2001 experts*
- **Cavatini P.**
Source: *Medline 2001 experts*
- **Pandolfo M.**
Source: *Medline 2001 experts*
- **Ristow M.**
Source: *Medline 2001 experts*
- **Becker E.**
Source: *Medline 2001 experts*
- **Taroni F.**

Collexis fingerprint:

All:	0	1	2	3	4	Concept:
	0	1	2	3	4	frataxin
	0	1	2	3	4	Friedreich Ataxia
	0	1	2	3	4	Trimucleotide Repeat Expansion
	0	1	2	3	4	phosphotransferases (Alcohol Group Acceptor)
	0	1	2	3	4	IDEBENONE
	0	1	2	3	4	Chromosomes, Human, Pair 9
	0	1	2	3	4	Heterozygote
	0	1	2	3	4	Oxidative Phosphorylation
	0	1	2	3	4	Genetic Counselling
	0	1	2	3	4	Introns
	0	1	2	3	4	point Mutation
	0	1	2	3	4	Mitochondria
	0	1	2	3	4	Oxidative Stress
	0	1	2	3	4	Fibroblasts
	0	1	2	3	4	Glucose Intolerance

Interconnecting searchable resources





The prototype platform:

Currently under construction,
pre-testing, evaluation



See <http://www.e-biosci.org> for further information

- Frank Gannon, Executive Director EMBO
- ... and many others who contributed ideas to the concept of E-BioSci
- The E-BioSci partners
- European Commission
(contract no QLRI-2001-30266)

