

Your SciFinder<sup>n</sup> team

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**SCIFINDER<sup>n</sup>**  
A CAS SOLUTION

## Biosearching in SciFinder<sup>n</sup>

## Search Question

The protection mechanism of the Monarch Butterfly against parasites when raised on Milkweed plants

- Which substance in Milkweed (their caterpillar host plant) protects the Monarch Butterfly against parasites?
- Do proteins play a role in this defense mechanism?
- What is known about these proteins?

# Which substances from Milkweed protect the Monarch Butterfly against parasites? – The Start I

The Monarch Butterfly is indexed with his genus in CAS data:

- Danaus, more precise Danaus Plexippus – how to know that?

The screenshot shows the SciFinder interface. At the top, the search bar contains the query "Monarch Butterfly". A callout box points to the search bar with the text "Search for „Monarch Butterfly“". Below the search bar, the page displays "References (752)". On the left, there is a filter section titled "Filter by" with "Document Type" expanded, showing options like Journal (701), Patent (11), Review (49), Commentary (5), and Conference (15). The main content area shows a single result titled "The Monarch butterfly genome yields insights into long-distance migration" by Zhan, Shuai; Merlin, Christine; Boore, Jeffrey L.; Reppert, Steven M. The abstract text is partially visible, mentioning the draft 273-Mb genome of the migratory monarch butterfly (Danaus plexippus) and a set of 16,866 protein-coding genes. At the bottom of the result, there are buttons for "Full Text", "Substances (0)", "Reactions (0)", "Cited By (358)", and "Citation Map".

# Which substances from Milkweed protect the Monarch Butterfly against parasites? – The Start II

**Reference Detail** (1 of 2,525) ← Prev Next →

Substances (0) Reactions (0) Cited By (358) Citation Map 📄 📧 ★ Save

**Journal**

Source  
Cell (Cambridge, MA, United States)  
Volume: 147  
Issue: 5  
Pages: 1171-1185  
Journal  
2011  
DOI:  
[10.1016/j.cell.2011.09.052](https://doi.org/10.1016/j.cell.2011.09.052)

**Database Information**  
AN: 2011:1531071  
CAN: 155:675930  
CAplus

The **Monarch butterfly** genome yields insights into long-distance migration

By: Zhan, Shuai; Merlin, Christine; Boore, Jeffrey L.; Reppert, Steven M.

**Abstract:** This report presents the draft 273-Mb genome of the migratory **monarch butterfly** (*Danaus plexippus*) and a set of 16,866 protein-coding genes. Orthol. properties suggest that the Lepidoptera are the fastest evolving insect order yet examined. Compared to the silkworm *Bombyx mori*, the **monarch** genome shares prominent similarity in orthol. content, microsytenty, and protein family sizes. The **monarch** genome reveals a vertebrate-like opsin whose existence in insects is widespread; a full repertoire of mol. components for the **monarch** circadian clockwork; all members of the juvenile hormone biosynthetic pathway whose regulation shows unexpected sexual dimorphism; addnl. mol. signatures of oriented flight behavior; microRNAs that are differentially expressed between summer and migratory **butterflies**; **monarch**-specific expansions of chemoreceptors potentially important for long-distance migration; and a variant of the sodium/potassium pump that underlies a valuable chem. defense mechanism. The **monarch** genome enhances our ability to better understand the genetic and mol. basis of long-distance migration. A host of factors contribute to the amazing migration behavior of the **monarch butterfly**, including sensory perception, a time-compensated compass mechanism, and seasonally regulated gene expression. The full genome sequence of this organism yields tantalizing mol. insights into the processes that likely underlie migration. The draft genome sequence is deposited in GenBank/EMBL/DBJ with project accession numbers AGBW01000001-AGBW01014067 and JH379599-JH392916 (WGS contigs).

Full Text ▾ Expand All | Collapse All

**Concepts**

<b>Chemoreceptors</b> Modifier: genes assocd. with Role: Biological Study, Unclassified	<b>Molecular evolution</b>
<b>Circadian rhythm</b> Modifier: genes assocd. with	<b>Olfactory receptors</b> Modifier: genes assocd. with Role: Biological Study, Unclassified
<b>Danaus plexippus</b>	<b>Protein sequences</b>

Open the indexed concepts – review the highlighted terms

Open the first reference, ranked as the most relevant one by the SciFinder<sup>n</sup> algorithm



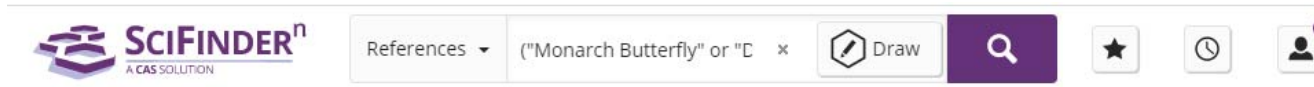
## Which substances from Milkweed protect the Monarch Butterfly against parasites? – The Start III

- In CAS data the Monarch Butterfly is linked to Danaus Plexippus - for Medline data that may not be the case
- To collect all documents in both SciFinder<sup>n</sup> databases use:



- Use „ “ for connected words
- Results in Detail:
  - 752 „Monarch Butterfly“
  - 459 „Danaus Plexippus“
  - 771 = („Monarch Butterfly“ or „Danaus Plexippus“)

# Which substances from Milkweed protect the Monarch Butterfly against parasites?



Search as: („Monarch Butterfly“ or „Danaus Plexippus“) and Milkweed  
-> 179 references

[Return to Home](#)

Based on your query, we've returned the most relevant results. Would you like to load the entire result set?  
[Learn about result relevance.](#)

[Load More Results](#)

Filter by

Document Type

- Journal (215)
- Patent (2)
- Review (9)
- Conference (7)
- Dissertation (4)
- Letter (1)

References (228)

Sort: Relevance View: Partial Abstract

Substances  Reactions  Cited By  Save

1

**Milkweeds, monarch butterflies and the ecological significance of cardenolides**

By: Malcolm, Stephen B.

Chemoecology (1995), 5/6(3/4), 101-117 | Language: English, Database: CAplus

A review with 139 references The contribution of Miriam Rothschild to the "monarch cardenolide story" is reviewed in the light of the 1914 challenge by the evolutionary biologist, E. B. Poulton for North American chemists to explain the chem. basis of unpalatability in monarch butterflies and their milkweed host plants. This challenge had lain unaccepted for nearly 50 yr until Miriam Rothschild took up the gauntlet and showed with the help of many able colleagues that monarchs are aposematically colored because they sequester toxic cardenolides from milkweed host plants for use as a defense a...

[View More](#)

Search as: („Monarch Butterfly“ or „Danaus Plexippus“) and (Milkweed or Asclepias) -> 228 references



# Which substances from Milkweed protect the Monarch Butterfly against parasites?



Substances ▾ Enter a query...



← Return to Home

Filter by

Commercial Availability

- Available (162)
- Not Available (91)

Reaction Role

- Product (144)
- Reactant (115)
- Reagent (75)
- Catalyst (56)
- Solvent (39)

Reference Role

- Adverse Effect (140)
- Analytical Study (161)

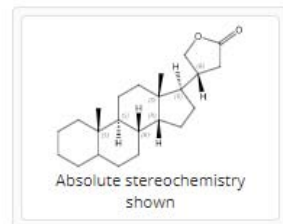
## Substances (253)

Sort: Relevance ▾ View Partial ▾

References ▾  Reactions ▾  Suppliers ▾

1

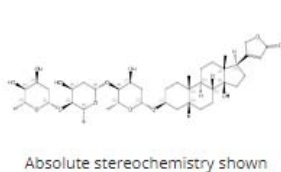
29565-36-4



$C_{23}H_{34}O_2$   
Cardenolide

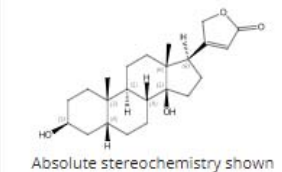
2

71-63-6



3

143-62-4



Substances are ranked according to the relevance of the references – in this case, **Cardenolide** is displayed first





# Do proteins play a role in the defense mechanism? I

The screenshot displays the SciFinder search results page. The search query is "Monarch Butterfly" or "Danaus Plexippus" and "Milkweed". The left sidebar contains filters for Document Type, Language, and Publication Year. The main content area shows three search results, each with a title, author information, and a brief abstract. The first result is "Milkweeds, monarch butterflies and the ecological significance of cardenolides" by Malcolm, Stephen B. The second is "Cardenolide fingerprint of monarch butterflies reared on common milkweed, *Asclepias syriaca* L." by Malcolm, Stephen B.; Cockrell, Barbara J.; Brower, Lincoln P. The third is "Plant-determined variation in the cardenolide content, thin-layer chromatography profiles, and emetic potency of monarch butterflies, *Danaus plexippus* reared on the milkweed, *Asclepias eriocarpa* in California" by Brower, L. P.; Seiber, J. N.; Nelson, C. J.; Lynch, S. P.; Tuskes, P. M.

Filter by

- Document Type
  - Journal (215)
  - Patent (2)
  - Review (9)
  - Conference (7)
  - Dissertation (4)
  - Letter (1)
- Language
  - English (227)
  - Japanese (1)
- Publication Year
  - 1968 to 2020
  - No Min to No Max Apply
  - View Larger
- Available at My Institution
- Author
- Organization
- Publication Name
- Concept
- CAS Solutions

**Milkweeds, monarch butterflies and the ecological significance of cardenolides**  
By: Malcolm, Stephen B.  
Chemoeology (1995), 5/6(3/4), 101-117 | Language: English, Database: CPlus

A review with 139 references The contribution of Miriam Rothschild to the "monarch cardenolide story" is reviewed in the light of the 1914 challenge by the evolutionary biologist, E. B. Poulton for North American chemists to explain the chem. basis of unpalatability in monarch butterflies and their milkweed host plants. This challenge had lain unaccepted for nearly 50 yr until Miriam Rothschild took up the gauntlet and showed with the help of many able colleagues that monarchs are aposematically colored because they sequester toxic cardenolides from milkweed host plants for use as a defense.

View More

Full Text Substance (1) Reactions (0) Cited By (19) Citation Map

**Cardenolide fingerprint of monarch butterflies reared on common milkweed, *Asclepias syriaca* L.**  
By: Malcolm, Stephen B.; Cockrell, Barbara J.; Brower, Lincoln P.  
Journal of Chemical Ecology (1989), 15(3), 819-53 | Language: English, Database: CPlus

Monarch butterfly, *Danaus plexippus*, larvae were collected during August 1983 from the common milkweed, *A. syriaca*, across its extensive North American range from North Dakota, east to Vermont, and south to Virginia. This confirms that the late summer distribution of breeding monarchs in eastern North America coincides with the range of this extremely abundant milkweed resource. Plant cardenolide concentrations, assayed by spectrophotometry in 158 samples from 27 collection sites, were biased towards plants with low cardenolide, and ranged from 4 to 229 µg/0.1 g dry weight, with a mean of 50 µg.

View More

Full Text Substances (11) Reactions (0) Cited By (42) Citation Map

**Plant-determined variation in the cardenolide content, thin-layer chromatography profiles, and emetic potency of monarch butterflies, *Danaus plexippus* reared on the milkweed, *Asclepias eriocarpa* in California**  
By: Brower, L. P.; Seiber, J. N.; Nelson, C. J.; Lynch, S. P.; Tuskes, P. M.  
Journal of Chemical Ecology (1982), 8(3), 579-633 | Language: English, Database: CPlus

TLC profiles of cardenolides were analyzed for individual plant-butterfly pairs. total cardenolide content was determined by

Review the Concepts to find relevant Substance Classes.



# Do proteins play a role in the defense mechanism? II

The screenshot displays the SciFinder interface with three overlapping windows. The top window shows a list of concepts with 'Search' selected. The middle window shows 'Protein' entered in the search field, with 7 concepts selected. The bottom window shows 'Peptides' entered, with 8 concepts selected. Red lines connect callout boxes to the 'Search' button and the selected items in the middle and bottom windows.

Use the „Search“ option to find relevant concepts quickly.

SciFinder<sup>n</sup> remembers what was selected

Concept Name: Protein

7 Selected

- Bacterial proteins (4)
- CLOCK Proteins (1)
- Hemolysin Proteins (4)
- insecticidal crystal protein, Bacillus Thuringiensis (4)
- Insect Proteins (2)
- Proteins (3)
- Protein sequences (4)

Concept Name: Peptides

8 Selected

- Peptide Hydrolases (1)

# Do proteins play a role in the defense mechanism? III

The screenshot shows the SciFinder interface with a search query: "Monarch Butterfly" or "Danaus Plexippus) and (Milkwe...". The results are sorted by Relevance and shown as Partial Abstracts. Two references are visible:

**Reference 1:**  
**Stepwise evolution of resistance to toxic cardenolides via genetic substitutions in the Na<sup>+</sup>/K<sup>+</sup>-ATPase of milkweed butterflies (Lepidoptera: Danaini)**  
By: Petschenka, Georg; Fandrich, Steffi; Sander, Nils; Wagschal, Vera; Boppre, Michael; Dobler, Susanne. Evolution (Hoboken, NJ, United States) (2013), 67(9), 2753-2761 | Language: English, Database: CAlplus  
Despite the monarch butterfly (*Danaus plexippus*) being famous for its adaptations to the defensive traits of its milkweed host plants, little is known about the macroevolution of these traits. Unlike most other animal species, monarchs are largely insensitive to cardenolides, because their target site, the sodium pump (Na<sup>+</sup>/K<sup>+</sup>-ATPase), has evolved amino acid substitutions that reduce cardenolide binding (so-called target site insensitivity, TSI). Because many, but not all, species of milkweed butterflies (Danaini) are associated with cardenolide-containing host plants, we analyzed 16 species of...

**Reference 2:**  
**Community-wide convergent evolution in insect adaptation to toxic cardenolides by substitutions in the Na,K-ATPase**  
By: Dobler, Susanne; Dalia, Safaa; Wagschal, Vera; Agrawal, Anurag A. Proceedings of the National Academy of Sciences of the United States of America (2012), 109(32), 13040-13045, S13040/1-S13040/3 | Language: English, Database: CAlplus  
The extent of convergent mol. evolution is largely unknown, yet is critical to understanding the genetics of adaptation. Target site insensitivity to cardenolides is a prime candidate for studying mol. convergence because herbivores in 6 orders of insects have specialized on these plant poisons, which gain their toxicity by blocking an essential transmembrane carrier, the sodium pump (Na,K-ATPase). We investigated gene sequences of the Na,K-ATPase  $\alpha$ -subunit in 18 insects feeding on cardenolide-containing plants (spanning 15 genera and 4 orders) to screen for amino acid substitutions that might...

Unlike most other animal species, monarchs are largely insensitive to cardenolides, because their target site, the sodium pump (Na<sup>+</sup>/K<sup>+</sup>-ATPase), has evolved amino acid substitutions, that reduce cardenolide binding (so-called target site insensitivity, TSI)

# What is known about the sodium-potassium pump (Na<sup>+</sup>/K<sup>+</sup>-ATPase) of *Danaus Plexippus*

Retrieve the substances to find the protein

Note: Limiting the search to this exact phrase („“) will be very specific, but not comprehensive

The screenshot shows the SciFinder search results page. At the top, the search bar contains the query "sodium pump (Na+/K+-ATPase) of Danaus Plexippus". Below the search bar, there are filters for "Substances", "Reactions", and "Cited By". The results are sorted by "Relevance" and shown in "Partial Abstract" view. Two results are visible:

- Result 1:** "Community-wide convergent evolution in insect adaptation to toxic cardenolides by substitutions in the Na,K-ATPase". By: Dobler, Susanne; Dalla, Safaa; Wagschal, Vera; Agrawal, Anurag A. Proceedings of the National Academy of Sciences of the United States of America (2012), 109(32), 13040-13045, S13040/1-S13040/3 | Language: English, Database: CAplus. The abstract mentions "sodium pump (Na, K-ATPase)".
- Result 2:** "Stepwise evolution of resistance to toxic cardenolides via genetic substitutions in the Na<sup>+</sup>/K<sup>+</sup>-ATPase of milkweed butterflies (Lepidoptera: Danaini)". By: Petschenka, Georg; Fandrich, Steffi; Sander, Nils; Wagschal, Vera; Boppre, Michael; Dobler, Susanne. Evolution (Hoboken, NJ, United States) (2013), 67(9), 2753-2761 | Language: English, Database: CAplus. The abstract mentions "monarch butterfly (Danaus plexippus)".

On the left side of the interface, there are filters for "Language" (English (7)), "Publication Year" (with a bar chart showing results from 2010 to 2020), and "Available at My Institution".

# What is known about the sodium-potassium pump (Na<sup>+</sup>/K<sup>+</sup>-ATPase) of *Danaus Plexippus*

The screenshot shows the SciFinder search results page for a query. The interface includes a search bar at the top with the SciFinder logo and a search button. Below the search bar, there are navigation options like 'Return to Home' and a 'Substances (84)' section. The results are displayed in a grid of cards, each representing a substance. The first card shows L-Glutamine (56-85-9) with its chemical structure and statistics (76K References, 1,386 Reactions, 169 Suppliers). The second card shows (-)-Asparagine (70-47-3) with its chemical structure and statistics (36K References, 1,316 Reactions, 95 Suppliers). The third card shows Unspecified Adenosine triphosphatase (9000-83-3) with statistics (93K References, 23 Reactions, 11 Suppliers). The fourth, fifth, and sixth cards show Unspecified Cytochrome oxidase (Liriomyza SD-2012 mitochondria gene COI subunit 1) with statistics (1418079-56-7, 1418079-55-6, and 1418079-54-5 respectively). A filter sidebar on the left lists various categories, with 'Substance Class' highlighted by a red arrow. The 'Substance Class' filter shows 'Manual Registration (81)', 'Nucleic Acid Sequence (40)', 'Protein/Peptide Sequence (40)', and 'Organic/Inorganic Small Molecule (3)'. The 'Substance Class' filter is currently expanded, and a red arrow points to it from the left.

# What is known about the sodium-potassium pump (Na<sup>+</sup>/K<sup>+</sup>-ATPase) of *Danaus Plexippus*

Click on the CAS Registry Number to display detailed substance information

9

1418079-28-3

Image Not Available

Unspecified  
Sodium-potassium pump (Danaus plexippus gene Na<sup>+</sup>/K<sup>+</sup> ATPase  $\alpha$ -subunit)

Protein/Peptide Sequence  
Sequence Length: 717

1 Reference 0 Reactions 0 Suppliers

Click on the „References“ button to retrieve references mentioning the substance.

Substance Detail (9)

Reference (1)

CAS Registry Number  
1418079-28-3

Image Not Available

Unspecified  
Sodium-potassium pump (Danaus plexippus gene Na<sup>+</sup>/K<sup>+</sup> ATPase  $\alpha$ -subunit)

Protein/Peptide Sequence  
Sequence Length: 717

Other Names

3 Other Names for this Substance

GenBank CQ05450  
GenBank CQ05450 (Translated from: GenBank HE956755)  
Na<sup>+</sup>/K<sup>+</sup> ATPase (Danaus plexippus gene Na<sup>+</sup>/K<sup>+</sup> ATPase  $\alpha$ -subunit)

Sequence Details

Sequence: linear

1	LFGGFALLLW	IGATLCFTIAY	GIVASTVEEP	SDOHLVYGIV	LAADVIVTGI
51	FSYVQESKSS	KIHESFKNMV	PQFATVIREG	EKLTLRAEDL	VLGDVVEVKF
101	GDRIPADIRI	IEARGFKVDN	SSLTGESEPO	SRGPEFTNEN	PLETKNLAFF
151	STNAVEGTAK	GIVICCGDNT	VNGRIAGLAS	GLDTGETPIA	KEIHFZIHIL
201	TGVAVFLQVT	FFIIFAFILGY	HMLDAVIFLI	GIIVANVPEG	LLATVTVCLT
251	LTAKRMASKN	CLVKNLEAVE	TLGSTSTICS	DKTGTLTQNR	MTVAHMFQDN

351	EVAGDASEAA	LLKCMELALG	DVLSIRKRNK	KVCEIPFNST	MKYQVSIHES
401	DDPSDRPHLL	VMKGAPERIL	ERCSTIFIGG	KEKVLDEEMK	EAFNNAYLEL
451	GGLGERVLGF	CDLQLPSDKY	PIGYKFNDD	PNFPLDNLRF	VGLMSMIDPP
501	RAAVPDAVAK	CRSAGIKVIH	VTGDHPITAK	AIKASVGIIS	EGNETVEDIA
551	ARLNIPVSEV	NPREAKAAVV	HGTELRLNS	DQLDEILKFH	TEIVFARTSP
601	QQKLIIVEGC	QRLGATVAVT	GDGVNDSPAL	KKADIGVAMG	IAGSDVSKQA

Additional Details

Document Types  
Journal

Source of Registration  
GenBank

Substance Classes  
Manual Registration, Protein Peptide Sequence

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# One reference and its landscape – Citation Map I

**References** (1) View: Partial Abstract ▾

Substances ▾  Reactions ▾  Cited By ▾    Save

1

**Community-wide convergent evolution in insect adaptation to toxic cardenolides by substitutions in the Na,K-ATPase**  
By: Dobler, Susanne; Dalla, Safaa; Wagschal, Vera; Agrawal, Anurag A.  
Proceedings of the National Academy of Sciences of the United States of America (2012), 109(32), 13040-13045, S13040/1-S13040/3 | Language: English, Database: CAplus

The extent of convergent mol. evolution is largely unknown, yet is critical to understanding the genetics of adaptation. Target site insensitivity to cardenolides is a prime candidate for studying mol. convergence because herbivores in 6 orders of insects have specialized on these plant poisons, which gain their toxicity by blocking an essential transmembrane carrier, the sodium pump (Na,K-ATPase). We investigated gene sequences of the Na,K-ATPase  $\alpha$ -subunit in 18 insects feeding on cardenolide-containing plants (spanning 15 genera and 4 orders) to screen for amino acid substitutions that might...

[View More ▾](#)

Full Text ▾  Substances (51)  Reactions (0)  Cited By (105)  Citation Map

Click on the „Citation Map“ button to review Cited and Citing References

# One reference and its landscape – Citation Map II

## Citation Map

Community-wide convergent evolution in insect adaptation to toxic cardenolides by substitutions in the Na,K-ATPase

By: Dobler, Susanne; Dalla, Safaa; Wagschal, Vera; Agrawal, Anurag A.

Proceedings of the National Academy of Sciences of the United States of America (2012), 109(32), 13040-13045, S13040/1-S13040/3 | Language: English, Database: CPlus

**Abstract:** The extent of convergent mol. evolution is largely unknown, yet is critical to understanding the genetics of adaptation. Target site insensitivity to cardenolides is a prime candidate for studying mol. convergence because herbivores in 6 orders of insects have specialized on these plant poisons, which gain their toxicity by blocking an essential transmembrane carrier, the sodium pump (Na,K-ATPase). We investigated gene sequences of the Na,K-ATPase  $\alpha$ -subunit in 18 insects feeding on cardenolide-containing plants (spanning 15 genera and 4 orders) to screen for amino acid substitutions that might...

[View More >](#)

Full Text ▾

Filter by

Document Type

- Journal (127)
- Review (23)
- Commentary (1)
- Conference (1)
- Editorial (1)
- Preprint (1)

Author

Concept

Filter Citations  
by Concepts

References This Document Cites

MEGA5: Molecular Evolutionary Genetics Analysis Using Maximum Likelihood, Evolutionary Distance, and Maximum Parsimony Methods  
Molecular Biology and Evolution (2011)

Cited By 30K

[Map](#)

Insecticide resistance in insect vectors of human disease  
Annual Review of Entomology (2000)

Cited By 757

[Map](#)

A Single Amino Acid Mutation Contributes to Adaptive Beach Mouse Color Pattern  
Science (Washington, DC, United States) (2006)

Cited By 423

[Map](#)

Structure-function relationships in the sodium-potassium ATPase  $\alpha$  subunit: site-directed mutagenesis of glutamine 111 to asparagine and asparagine 122

References Citing This Document

The genetic causes of convergent evolution

Nature Reviews Genetics (2013)

Citing 307

[Map](#)

Causes of molecular convergence and parallelism in protein evolution

Nature Reviews Genetics (2016)

Citing 91

[Map](#)

Experimental interrogation of the path dependence and stochasticity of protein evolution using phage-assisted continuous evolution.

Proceedings of the National Academy of Sciences of the United States of America (2013)

Citing 81

[Map](#)

Mechanisms and ecological consequences of plant defence induction and suppression in herbivore communities.



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# One reference and its landscape – Citation Map III

## Citation Map

Community-wide convergent evolution in insect adaptation to toxic cardenolides by substitutions in the Na,K-ATPase

By: Dobler, Susanne; Dalla, Safaa; Wagschal, Vera; Agrawal, Anurag A.  
Proceedings of the National Academy of Sciences of the United States of America (2012), 109(32), 13040-13045, S13040/1-S13040/3 | Language: English, Database: CApius

Full Text ▾

Abstract: The extent of convergent mol. evolution is largely unknown, yet is critical to understanding the genetics of adaptation. Target site insensitivity to cardenolides is a prime candidate for studying mol. convergence because herbivores in 6 orders of insects have specialized on these plant poisons, which gain their toxicity by blocking an essential transmembrane carrier, the sodium pump (Na,K-ATPase). We investigated gene sequences of the Na,K-ATPase  $\alpha$ -subunit in 18 insects feeding on cardenolide-containing plants (spanning 15 genera and 4 orders) to screen for amino acid substitutions that might...

View More ▾

### Concept

Top Count

Alphanumeric

1 Selected

- Molecular evolution (16)
- Animal gene (14)
- Adaptation, animal (12)
- Protein sequences (12)
- Mutation (11)
- Danaus plexippus (10)
- Drosophila melanogaster (10)
- Animals (9)
- Cardenolides (9)
- Sodium-potassium pumps (9)
- Evolution (8)
- Toxins (8)
- Cardiac glycosides (7)
- cDNA sequences (7)
- Genomics (7)
- Larva (7)

- Amino acids (4)
- Asclepias incarnata (4)
- Asclepias syriaca (4)
- Cell membrane (4)
- Convergent evolution (4)
- Evolution, Molecular (4)
- Heart (4)
- Hemolymph (4)
- Herbivory (4)
- Leaf (4)
- Nervous system (4)
- Plants (4)
- Sodium-Potassium-Exchanging ATPase (4)
- Amino Acid Sequence (3)
- Asclepias perennis (3)
- Bufadienolides (3)

Apply
Cancel

### Filter by

Document Type

- Journal (11)
- Review (3)

Author

Concept

- Molecular evolution (16)
- Animal gene (14)
- Adaptation, animal (12)
- Protein sequences (12)
- Mutation (11)

View All

### References This Document Cites

- A Single Amino Acid Mutation Contributes to Adaptive Beach Mouse Color Pattern

Science (Washington, DC, United States) (2006)

Cited By 423 Map
- The molecular and population genetics of cyclodiene insecticide resistance

Insect Biochemistry and Molecular Biology (1994)

Cited By 74 Map
- Kinetic analysis of ouabain binding to native and mutated forms of sodium-potassium-ATPase and identification of a new region involved in cardiac glycoside interactions

Journal of Biological Chemistry (1993)

Cited By 50 Map
- Molecular adaptation of Chrysochus leaf beetles to toxic compounds in their food plants

Molecular Biology and Evolution (2004)

Cited By 30 Map

### References Citing This Document

- The genetic causes of convergent evolution

Nature Reviews Genetics (2013)

Citing 307 Map
- Causes of molecular convergence and parallelism in protein evolution

Nature Reviews Genetics (2016)

Citing 91 Map
- Toxin-resistant isoforms of Na<sup>+</sup>/K<sup>+</sup>-ATPase in snakes do not closely track dietary specialization on toads

Proceedings of the Royal Society B: Biological Sciences (2016)

Citing 6 Map
- Mutations to the cardiotonic steroid binding site of Na<sup>+</sup>/K<sup>+</sup>-ATPase are associated with high level of resistance to gambufutalin in a natricone snake

Toxicon (2016)


Citing 6 Map
- Contingency in the convergent evolution of a regulatory network: dosage compensation in Drosophila

PLoS Biology (2019)

Citing 3 Map
- Mechanism of Resistance to Camptothecin, a Cytotoxic Plant Secondary Metabolite, by *Lymantria* sp. Larvae

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## Search Question

The protection mechanism of the Monarch Butterfly against parasites when raised on Milkweed plants

- Which substance in Milkweed (their caterpillar host plant) protects the Monarch Butterfly against parasites? - **Cardenolide**
  - SciFinder<sup>n</sup> offers more information about the compound of interest: see substance searching for related compounds
  - see substance details for physical properties
- Do proteins play a role in this defense mechanism? – **yes – the sodium pump-potassium (Na<sup>+</sup>/K<sup>+</sup>-ATPase) (of the Monarch Butterfly)**
  - SciFinder<sup>n</sup> offers more information about many proteins of interest: see substance details and related references
  - SciFinder<sup>n</sup> offers a structure search for sequences with less than 248 non-H atoms
- What is known about these proteins? – **A specific mutation of the enzyme enables the process**

## Your SciFinder<sup>n</sup> team

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# Biosearching in SciFinder<sup>n</sup>