



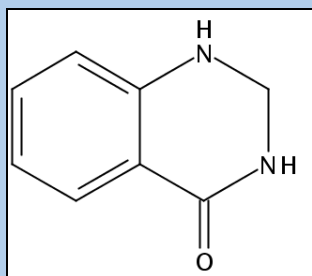
# The OPCW Science & Technology Monitor

A sampling of Science & Technology  
relevant to the Chemical Weapons Convention

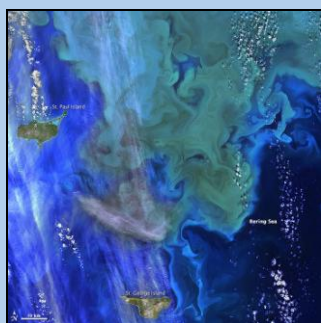
23 January 2015

Volume 2, Number 1

## Featured Content:



Derivatives of 2,3-dihydroquinazolin-4(1H) for blocking the toxic effects of ricin.



Satellite image of a phytoplankton bloom near Alaska's Pribilof Islands (image from [NASA](#)). Algae blooms are a potential source of saxitoxin!

## Welcome

Welcome to our first *OPCW Science and Technology Monitor* of 2015, an occasional bulletin to provide updates on developments in science and technology across a broad spectrum of topics relevant to the CWC. Past issues are available from the Office of Strategy and Policy (on our portal or by request).

Friday 23 January 2015 marks the 119<sup>th</sup> the anniversary of the x-ray image of [the hand of Albert von Köllikers](#), obtained as part of the presentation of [Wilhelm Conrad Röntgen](#) to the Wurzburg Physical Medical Society. Today x-rays are [an important tool for understanding bimolecular structure](#). We mark the day with an S&T contribution to the OPCW digital diplomacy initiative by going live on Twitter, follow us @OPCW\_ST!

## The S&T Puzzle

Congratulations to Arjan Louter (once again from VER) for finding all the pictures (with face hidden and visible) of Amir Imani (of both OSP and IVB) in the Port Annual Report. Puzzle stats now stand at VER 3, OCS 1.

For our next challenge, we are looking for the total number of patent grants that include examples and/or claims related to Schedule 1 chemicals from 1946 - 2014. Closest estimate wins the prize of choosing our next featured topic, designing the next puzzle or a gift of a special beverage hand selected by the Science Policy Adviser. Good luck!

In addition to the puzzle, we offer one more chance at the prize. With our foray into social media, we are in need of an avatar that creatively ties Science and Technology to the OPCW. Got any good doodles, catchy phrases or flashy graphics that you would like to see starring in future newsletters? Send it to us at [SciTech@OPCW.org](mailto:SciTech@OPCW.org). Best submission (as chosen by our staff) wins!

## In this issue:

### News and Updates

### Schedule 1 Chemicals in 2014 Patent Grants

### Saxitoxin, Paralytic Shellfish Poisoning and Algae Blooms

## Science Fun:

How are you keeping up with your 2015 New Year's resolutions? How do your resolutions compare to those of [world-renown scientists?](#)

Fans of the Back to the Future movies should find 2015, the year in which the 2<sup>nd</sup> film of the series took place, to be quite special. [Take a look at how well the 1989 film predicted the future.](#)

Other attempts at predicating 2015 came from [the world of think tanks](#) (see how well they did in the complete [report](#)).

Of course, both the movie and the think tank report neglected to mention that [2015 will be one second longer](#) than previous years. [No need to panic, there is a mitigation strategy in place.](#)

As the year unfolds, you may want to see how good these science [predictions for 2015 \(based on the best data available from 2014\)](#) turn out.

For a bit of inspiration, take a look at some of the [cool science we might expect to see in 2015 and beyond!](#)

One thing we do know will hold true in 2015 is our love of gadgets! Yet, some fear these same gadgets may be

## News and Updates

### Recently Published Reports:

Dstl scientists have edited and contributed to an issue of [Best Synthetic Methods devoted to organophosphorus \(V\) chemistry](#).

2015 Chemical Outlook by [Region](#) and by [Market](#) from *Chemical and Engineering News*.

A User's Guide for [Evaluating Learning Outcomes from Citizen Science](#).

### Mobile Apps

A mobile app for [biodetection technology information](#) from PNNL.

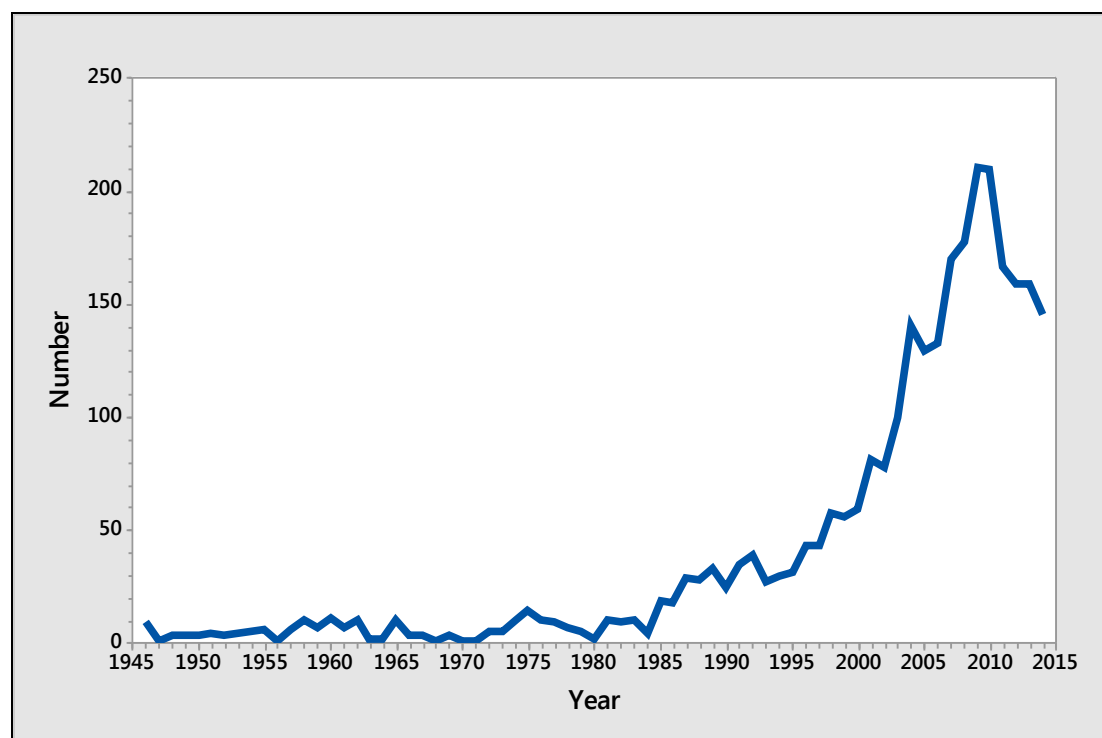
[Mobile apps for science](#) from AAAS.

### Making News in Chemistry:

From [28 December 2014 - 3 January 2015](#); from [4-10 January 2015](#); and from [11-17 January 2015](#).

## Schedule 1 Chemicals in 2014 Patent Grants

The references to patents containing examples and claims related to [Schedule 1 chemicals](#) in previous issues of the *S&T Monitor* generated significant interest (even surprise) from our readers. Yet, these types of patents are not unusual; see for example, the chart below showing the number of patent grants related to Schedule 1 chemicals from 1946 - 2014 (data was collected using [SciFinder](#)<sup>®</sup>).



Number of world-wide patent grants that contain examples and claims related to Schedule 1 chemicals from 1946 - 2014.

[infringing on our privacy](#) or even [compromising our security](#)! Not to mention that our own [possessions may be spying on us](#)!

Leave it to technology to save us from technology! For example, worried about the security of data transfer between devices? Technologies now exist that allow [data transfer through your body to reduce the risk](#)! Privacy can also be protected by means of [biometrics, some which you may not have yet heard of](#).

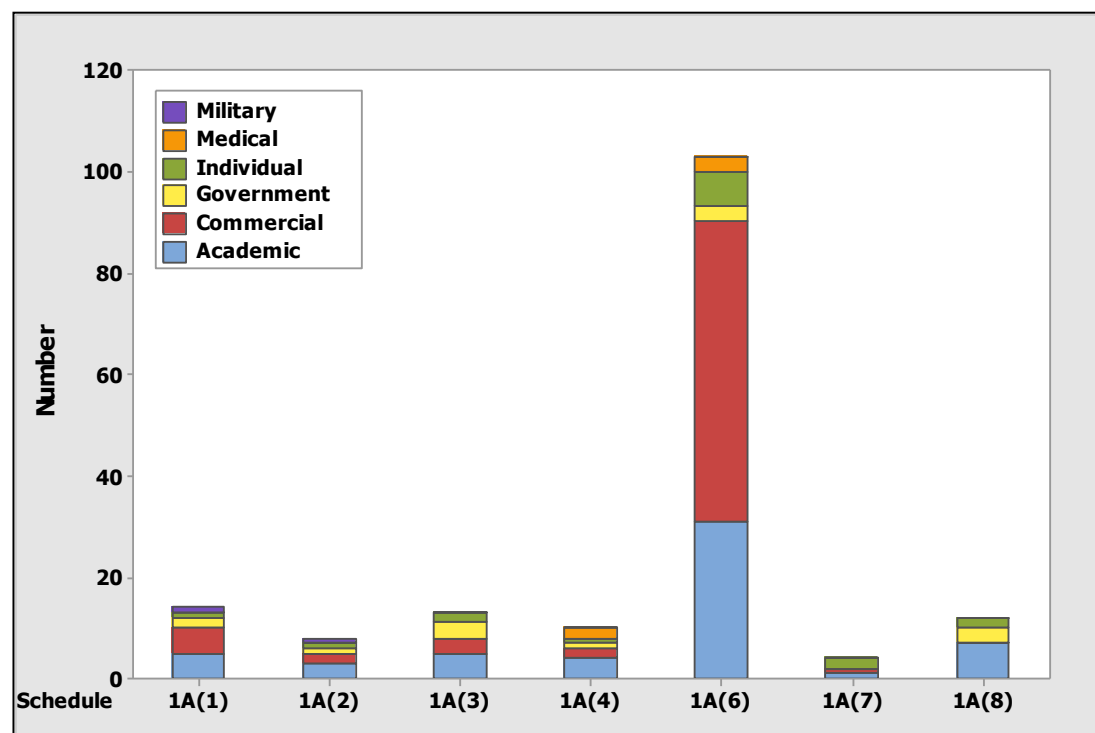
A simple solution to the privacy issues could be to just not use gadgets, but don't be so sure... Even your own biology can give you away, as [demonstrated by a chewing gum collecting artist](#)! On the bright side, the artist sells a perfume to allow you to cover your genetic tracks! One can even learn the [details of your diet, centuries after your last meal](#)!

It appears that 2015 is off to a very good start, we may not be flying on hoverboards ([well most of us that is](#)), but there are all kinds of enabling and fun technologies available to us. Of particular interest to those of you living in The Netherlands, we offer [wheels](#) and [handlebars](#) for your bicycle.

As observed in the figure, the majority of these patents were actually granted after the entry into force of the Chemical Weapons Convention in 1997! Of course, these patents fall under section titles (scientific areas of inquiry as defined by [SciFinder](#)<sup>®</sup>) not prohibited by the Convention. For patents represented in the chart, > 50% are related to nitrogen mustard, Schedule 1A(6), and > 60% have a medical or toxicological context.

As of 21 January 2015, we were able to identify 146 patents granted during calendar year 2014 with examples and/or claims related to Schedule 1 chemicals (there may be still more as the final publications from 2014 are updated into searchable databases). The patented inventions include many examples of [sensors](#) and [analytical equipment](#) that can detect chemical warfare agents, along with health care related methodology (such as [identifying biomarkers for disease diagnosis and therapy](#)).

The Schedules covered by the patents and the types of organisations to which the patent grants have been assigned are provided in the chart below. For those readers interested in more specific information on individual patents, a detailed summary table is available upon [request](#).



Number of patents granted in calendar year 2014 shown by Schedule (columns) and the type of organisation represented by the patent grant assignee (stacked colours). Note that many patents cover chemicals from multiple schedules (there is some overlap of the individual patents described in the chart between the plotted categories).

### 2014 Patents Containing Examples and/or Claims from Schedules 1A(1), 1A(2), and/or 1A(3)

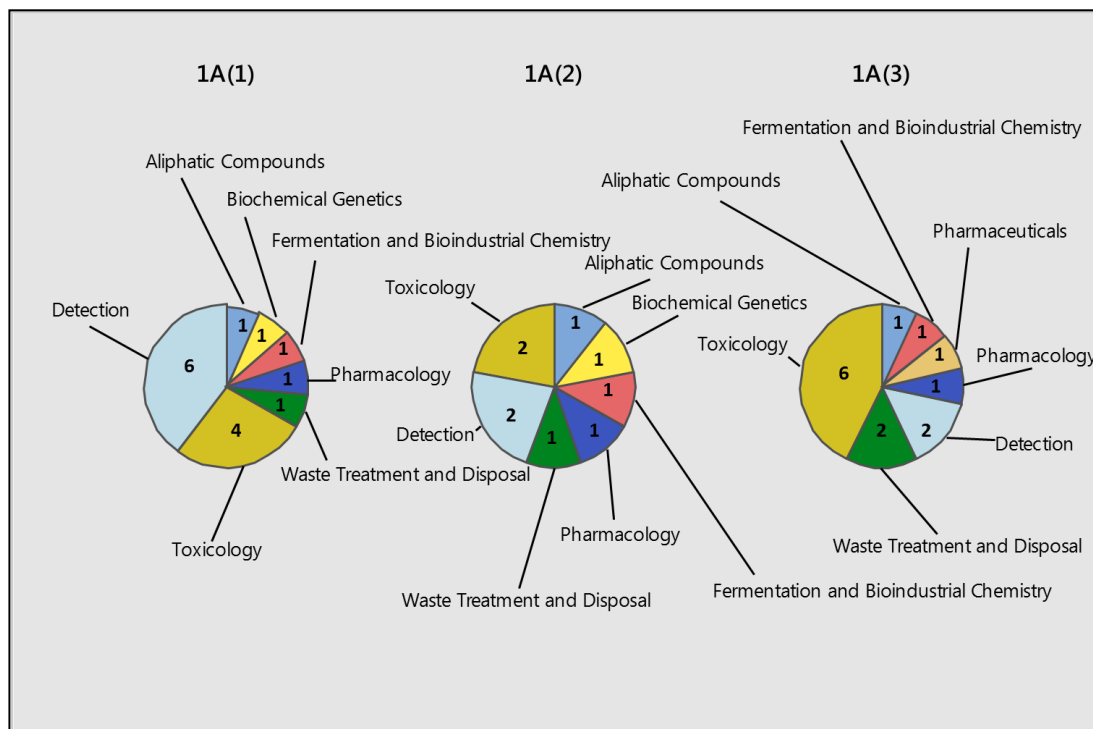
Individual patents encompassing work on organophosphorus nerve agents generally include all three of the Schedules 1A(1), 1A(2) and 1A(3) in the examples and claims. To reflect this, the following word cloud and pie charts summarise the text of the combined abstracts and section titles of the relevant 2014 patents.

## Crowdsourcing:

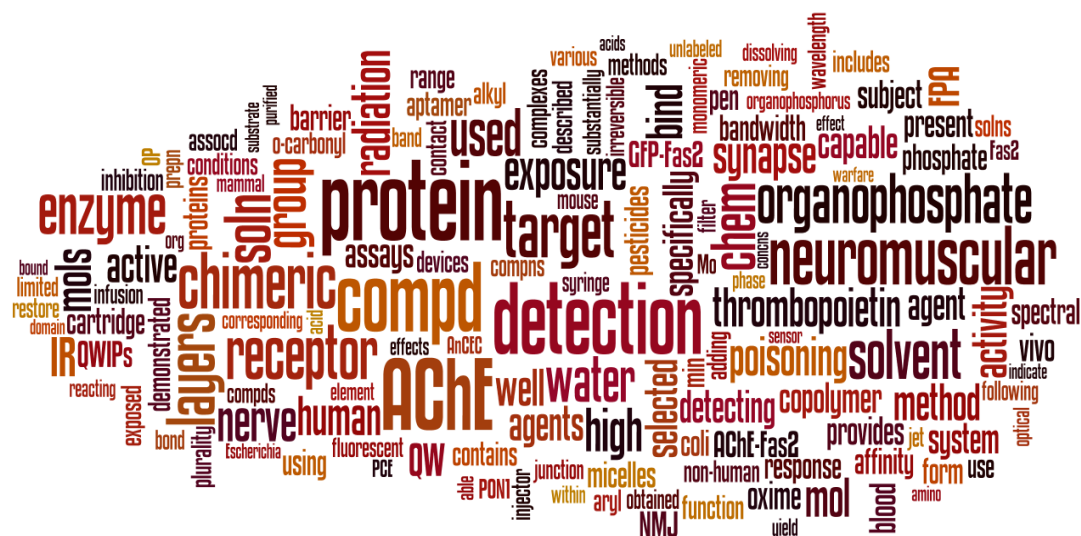
Call for contributions to an [African Moon Mission](#). (details [here](#)).

Have you taken any nice wildlife photographs recently? Interested in using them to [help scientists understand animal migration](#)?

And one final crowd source for today, this time for the *S&T Monitor*. Have a hidden photographer or artist within you? Here's a chance to showcase your talent! We are looking for photos we can use for our (in progress) OPCW S&T webpage and in conjunction with our S&T social media activities. If you have pictures relevant to S&T and OPCW that you can share, please send them (with photo credits and caption) to [SciTech@OPCW.org](mailto:SciTech@OPCW.org).



Classification by section title for 2014 patent grants relevant to 1A(1) (left), 1A(2) (centre), and 1A(3) (right) chemicals.



Word cloud derived from abstracts of 2014 patent grants relevant to Schedule 1A(1), 1A(2), and 1A(3) chemicals.

As nerve agents disrupt neurological function by targeting the enzyme [Acetylcholinesterase](#), much of the terminology in the word cloud relates to such processes. Patents were also found to contain examples and claims involving [thrombopoietin](#) (a regulator of platelet production) and [Thrombopoietin mimetics](#). These substances can [increase platelet production to treat bone marrow injury induced by exposure to chemical agents or radiation](#). Thrombopoietin also appears in many of the patents related to sulphur mustards as illustrated below for 1A(4) chemicals.

### 2014 Patents Containing Examples and/or Claims from Schedule 1A(4) (Sulphur Mustards)

Relevant inventions related to sulphur mustard include methods of [detecting aerosolised agents](#) and [detoxification](#).



**Upcoming S&T Related Events:**

28 - 29 January 2015  
5<sup>th</sup> Meeting of the Scientific Advisory Board's Temporary Working Group on Verification. The Hague

4 - 6 February 2015  
[The Unmanned Systems Expo 2015](#). The Hague

12 - 16 February 2015  
[AAAS Annual Meeting 2015: Innovations, Information, and Imaging](#). San Jose, California, USA.

21 - 26 March 2015  
[249<sup>th</sup> American Chemical Society \(ACS\) National Meeting & Exposition](#). Denver, Colorado, USA.

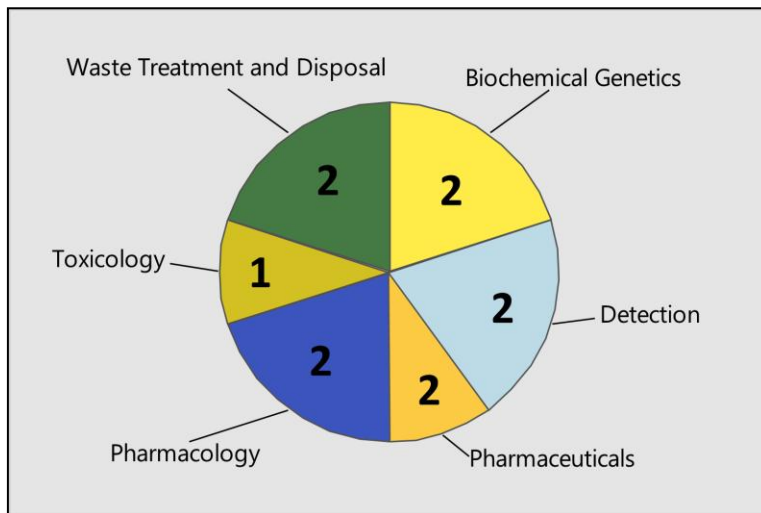
During the open session of the ACS Board of Directors meeting, the 2013 Nobel Peace Prize recipient, the OPCW will be honoured for its work in finding peaceful applications of chemical sciences worldwide.

6 - 7 May 2015  
6<sup>th</sup> Meeting of the Scientific Advisory Board's Temporary Working Group on Verification. The Hague

22 - 26 June 2015  
[CTBT Science and Technology Conference \(SnT2015\)](#)  
Vienna, Austria

14 - 26 July 2015  
[19<sup>th</sup> Annual Green Chemistry and Engineering Conference](#). Bethesda, ML, USA.

19 - 22 July 2015  
[12<sup>th</sup> World Congress on Industrial Biotechnology](#). Montreal, Canada.



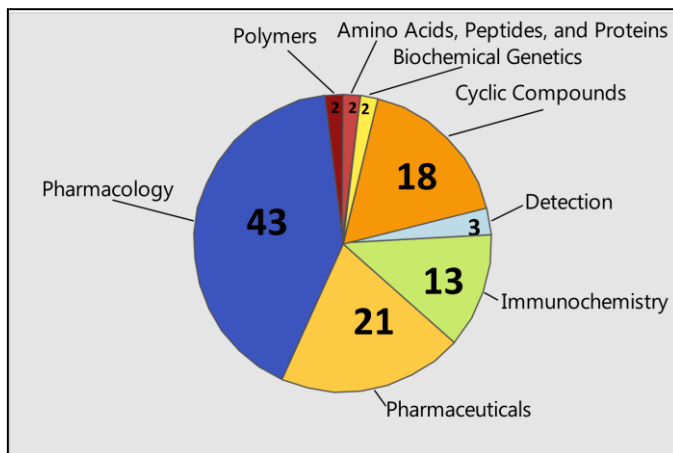
Classification by section title for 2014 patent grants related to 1A(4) chemicals.



Word cloud derived from abstracts of 2014 patent grants relevant to Schedule 1A(4) chemicals.

**2014 Patents Containing Examples and/or Claims from Schedule 1A(6) (Nitrogen Mustards)**

Nitrogen mustard itself is very familiar for use in chemotherapy; mustard agents were actually the first drugs used in chemotherapy. Inventions included claims related to anti-body drug conjugates and the use of 1A(6) chemicals as linkers for polymers. Other inventions were methods for the early detection and treatment of cancer.



Classification by section title for 2014 patent grants related to 1A(6) chemicals.

6 - 13 August 2015

[IUPAC 2015](#)

48<sup>th</sup> General Assembly  
45<sup>th</sup> World Chemistry  
Congress. Busan,  
Republic of Korea

10 - 14 August 2015

[Biological Weapons  
Convention Meeting of  
Experts.](#)

Geneva, Switzerland.

27 September - 1  
October 2015

[ECCE10 \(10th European  
Congress of Chemical  
Engineering\)](#)

[ECAB3 \(3rd European  
Congress of Applied  
Biotechnology\)](#)

[EPIC5 \(5<sup>th</sup> European  
Process Intensification  
Conference\)](#)

Nice, France.

5 - 8 October 2015

[SOLVE.](#)

Cambridge, MA, USA.

16 - 19 November 2015

[Malta Conference.](#)

Rabat, Morocco.

18 - 21 November 2015

[16th Asian Chemical  
Congress.](#) Dhaka,  
Bangladesh.

15 - 20 December 2015

[Pacifichem 2015.](#)

Honolulu, Hawaii, USA.



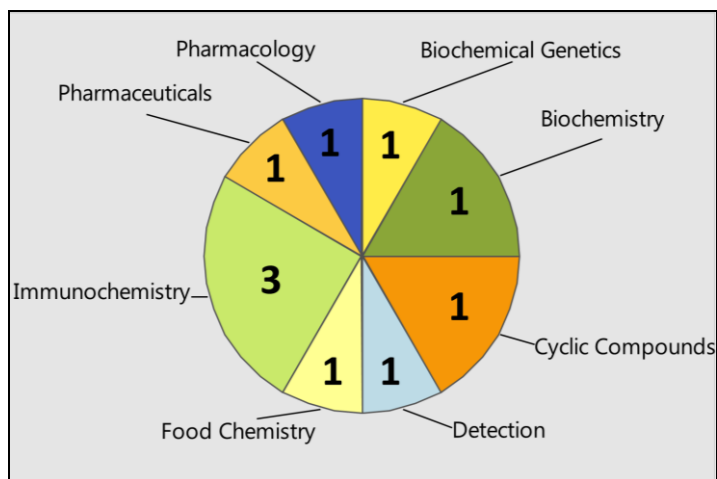
Word cloud derived from abstracts of 2014 patent grants relevant to Schedule 1A(6) chemicals.

### 2014 Patents Containing Examples and/or Claims from Schedule 1A(7) (Saxitoxin)

There were a total of six patent grants mentioning saxitoxin. The inventions included [disease detecting diagnostic devices](#) and even the [treatment of neuropathies](#). We are not including a word cloud summary here as not all the patents actually included saxitoxin in the claims and several were only available without abstracts (the publications are included in our 2014 patent report for those interested).

### 2014 Patents Containing Examples and/or Claims from Schedule 1A(8) (Ricin)

The naturally occurring toxin ricin comes from the seeds of the [castor plant](#). As with many toxins, the biological activity provides a way to understand important intra-cellular mechanisms effecting life processes that may lead to discoveries with [medicinal value](#). Inventions from 2014 include compounds such as [derivatives of 2,3-dihydroquinazolin-4\(1H\)](#) which can block the intracellular route of the toxin.



Classification by section title for 2014 patent grants related to 1A(8) (Ricin).

