Phytosterol and phytostanols

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Objective

To create a technology landscape report on **Phytosterols and Phytostanols**

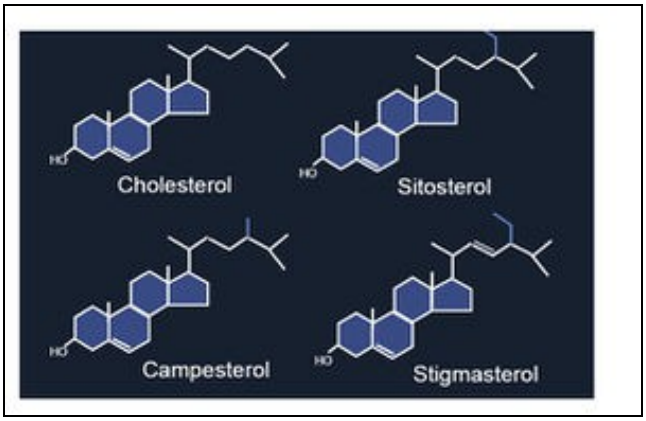
- Identify market players with prolific IP activity in the technology area
- Segment the players by the industry they belong to

Note: *This report is just a template and gives an indication of what the paid report contains.*

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Background

Phytosterols (plant sterols) are triterpenes that are important structural components of plant membranes. Phytosterols (PS) are similar to cholesterol both in structure (but have different side chain configurations) and in function (Fernandes & Cabral, 2007).PS exist in free or esterified forms: free sterols form part of the cellular wall, where they play important structural functions, whereas sterol esters represent storage products within the cell. The most commonly encountered PS in higher plants is ?-sitosterol, campesterol and stigmasterol. Saturated plant sterol derivatives are termed as plant stanols or phytostanols. They are produced by the hydrogenation of sterols and are not abundant in nature. Saturation of phytosterols by commercial hydrogenation processes, including the saturation of sitosterol and campesterol to produce phytostanol compounds such as sitostanol and campestanol (Clifton, 2002).



Dietary sources

S.No	Food Total Phytosterols	Content (mg/100g)
1	**Oils and fats**	39-919
	Wheat germ oil	919
	Palm oil	39
2	**Nuts and seeds**	104-360
	Sesame seeds	360
	Pea nuts	104
3	**Cereals**	20-344
	Wheat germ	344
	Puffed rice	20

4	**Fruits**	1-44
	Passion fruits	44
	Watermelons	1
4	**Vegetables**	4-50
	Black olives	50
	Boiled potatoes	4

Plant fats and oils contain phytosterols as naturally occurring constituents. The most important natural sources of plant sterols in human diets are oils and margarines, although they are also found in a range of seeds, legumes, vegetables and unrefined vegetable oils. Sterols make up the largest proportion of the unsaponifiable fraction of lipids. Other significant source of plant sterols are nuts, grains, and grain derived products; also sprouts, cabbages, cauliflowers, green and black olives (Marangoni & Poli,2010). The important sources of phytosterols in shown in Table 1.

The major sources of plant sterols used for incorporation into commercial products are tall oil and the by-products of edible oil production. Sterol and stanol esters can be obtained from tall oil, a phytosterol-rich by-product from pulping of pine and other trees.In such process, tall oil phytosterols are refined, purified, and then esterified with food-grade fatty acids. Phytosterols can also derive from vegetable oil refining, especially during the deodorizing process; a short-path distillation technique (molecular distillation) can lead to the extraction of large amounts of phytosterols.

Both sterols and stanols are frequently used in esterified forms, as fatty acid esters: this increases their solubility and allows their incorporation into lipid-based foods.

Health benefits

The consumption of both free and saturated plant sterols and their ester derivatives has the potential for reducing cholesterol absorption and improving circulation of lipids. The suppression of cholesterol absorption was the chief mechanism responsible for lowering plasma cholesterol levels, and the partial suppression of the resulting increase in cholesterol biosynthesis was a secondary action. Epidemiological data suggest that the PS content of the diet is associated with a reduction in the incidence of common cancers including cancers of the lung, stomach, colon, breast, and prostate (A. de Jong et al., 2003).

The development of food technology has created some foods enriched with phytostanols and phytosterols. At present, several functional food product types such as yoghurts and milk with added plant sterols and stanols are available on the market.

Concept Table

S.No	English Keywords			German Keywords			French Keywords		
	Phytosterols	**Extraction**	**Food**	**Phytosterols**	**Extraction**	**Food**	**Phytosterols**	**Extraction**	**Food**
1	Sterol	Extraction	Functional Foods	Sterole	Extrakt	Funktionale Food	stérols	extractives	des aliments fonctionnels
2	Stanol	Purification	Functional lipids	Stanol	Reinigung	Funktionale lipide	stanol	dépuration	lipides fonctionnels
3	***	***	***	***	***	***	***	***	

- *An indicative list of terms to show how a concept table is generated. View paid report for complete list.*
- *Concept Table was enriched by searches related to phytosterols and phytostanols, relevant patents, scientific articles and various thesauri*

Relevant class codes and definition

IPC/ ECLA

IPC/ ECLA Class code	Description	Concept
A61K 31/56	Compounds containing cyclopenta[a]hydrophenanthrene ring systems; Derivatives, e.g. steroids [C0303]	PHYTOSTEROL
**	**	
***	**	
**	**	
C11B 13/00	Recovery of fats, fatty oils, or fatty acids from waste materials (mechanical separation from waste water C02F, E03F)	EXTRACTION
***	***	
A23D 09/013	Other fatty acid esters, e.g. phosphatides	PRODUCTS
**	**	
***	**	

US Class

US Class code	Description
552540	

	Carbon bonded directly at the 17 beta-position of the cyclopentanohydrophenanthrene ring system is a member of an acyclic chain of six or more uninterrupted carbons (e.g., sterols, etc.)
*****	*******

F-Terms

F-term	Definition	FI COVERAGE
4C086	PHARMACEUTICALS CONTAINING OTHER ORGANIC AND INORGANIC COMPOUNDS	A61K31/33-33/44
******	*******	

Search strategy

Thomson innovation

- **Time line: 1991 to September 23,2011**
- **Databases: US Grant, GB App, US App, FR App, WO App, DE Util, EP Grant, DE Grant, EP App, DE App, JP Util, JP Grant, JP App, CN Util, CN App, KR Util , KR Grant, KR App, DWPI**

S.No				ENGLISH	(Title, Abst.,Claims)
	Concept	Scope		Search String	Total Records
1	ALL KEYWORDS		PHYTOSTEROL	((sterol*6) or ****))	#
2			EXTRACTION	((extract*4) or or ****))	##
3			PRODUCTS	((functional adj2 lipid*1) or ****))	##
4	Keywords of phytosterol and class of extraction or products	1 and	IPC /ECLA	(C11B001300) or ****)	#
			US	552545 or ****)	
5	Keywords of extraction and class of products and phytosterols	2 and	IPC /ECLA	(A61K0031575 or ****)	##
			US	552****	
6	Keywords of products and class of phytosterols or extraction	3 and	IPC /ECLA	(A61K0031575 or ****)	#
			US	552540 or ****)	
7	combined query			4 or 5 or 6	##
8	Control patent			US7833994B2 or ****)	
9				8 and 9	
10	Not keywords			((soybean adj2 variety) or ****)	###
11				8 NOT 10	## (No Relevant hits)
S.No				GERMAN	(Title, Abst.,Claims)
	Concept	Scope		Search String	Total Records
1			PHYTOSTEROL	(Sterol or****)	###
2			EXTRACTION	(Extrakt oor ****)	##
3			PRODUCTS	(funktionale Lipid or ****)	##
4	Keywords of phytosterol and class of extraction or products	1 and	IPC /ECLA	(C11B001300) or ****)	#
5	Keywords of extraction and class of products and phytosterols	2 and	IPC /ECLA	(A61K0031575 or ****)	#
6	Keywords of products and class of phytosterols or extraction	3 and	IPC /ECLA	(A61K0031575 or ****)	#
7	combined query			4 or 5 or 6	##
8	Not keywords			(Östrogen or ****)	###
9				7 NOT 8	### (No relavant hits)

S.No				FRENCH	(Title, Abst.,Claims)
	Concept	Scope		Search String	Total Records
1	ALL KEYWORDS		PHYTOSTEROL	(stérols or ****)	###
2			EXTRACTION	(extraire or or ****)	###
3			PRODUCTS	(lipides fonctionnels or ****)	###
4	Keywords of phytosterol and class of extraction or products	1 and	IPC /ECLA	(C11B001300) or ****)	#
5	Keywords of extraction and class of products and phytosterols	2 and	IPC /ECLA	(A61K0031575or ****)	#
6	Keywords of products and class of phytosterols or extraction	3 and	IPC /ECLA	(A61K0031575 or ****)	#
7	combined query			4 or 5 or 6	#
8	Not keywords			(oestrogène or ****)	
9				7 NOT 8	### (No relevant hits)
S.No				JAPANESE	(Title, Abst.,Claims)
	Concept	Scope		Search String	Total Records
1	Keywords of phytosterol and JP F TERM of extraction or products	Phytosterol English KW and	JP F TERM	(C11B001300) or ****)	
			JP F TERM	(4H059BB57 or ****)	###
2	Keywords of extraction and JP F TERM of products and phytosterols	Extraction English KW and	JP F TERM	(4C086DA11or ****)	###
3	Keywords of products and JP F TERM of phytosterols or extraction	Produccts English KW and	JP F TERM	((4C086DA11 or ****)	###
4	combined query			1 or 2 or 3	###
5				4 NOT (english not KW)	# (No relavent hits)
	FINAL COMBINED QUERY			English or German or French or Japan	### (No relevant hits) (. %relevancy)

Taxonomy

```
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.markmap-node-circle {
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    stroke-width: 1.5px;
}

.markmap-node-text {
    fill:  #000;
    font: 10px sans-serif;
}

.markmap-link {
    fill: none;
}

pre, .mw-code{
  background-color: transparent;
}
d3.xml("https://www.dolcera.com/wiki/images/PHYTOSTEROLS_AND_PHYTOSTANOLS.mm", function(error, data) {
    if (error) throw error;

    markmap("svg#mindmap_e1e7d4c48a7b671396c8fa5e44516aea", data, {
        preset: "colorful",
        linkShape: "diagonal"
    }, "xml");
  });
```

Relevant patents

S.No.	Patent/Publication No.	Assignee / Applicant	Year	Title	Focus	Dolcera Summary
1	US20050100619	N.V. NUTRICIA P.O. BOX 1 NL-2700 MA ZOETERMEER,	2005	Cholesterol lowering supplement	Cholesterol lowering composition containing	The cholesterol lowering formulation have bioactives such as phytosterols, soluble fiber, plant extract for HMG Co A inhibitors from natural source.

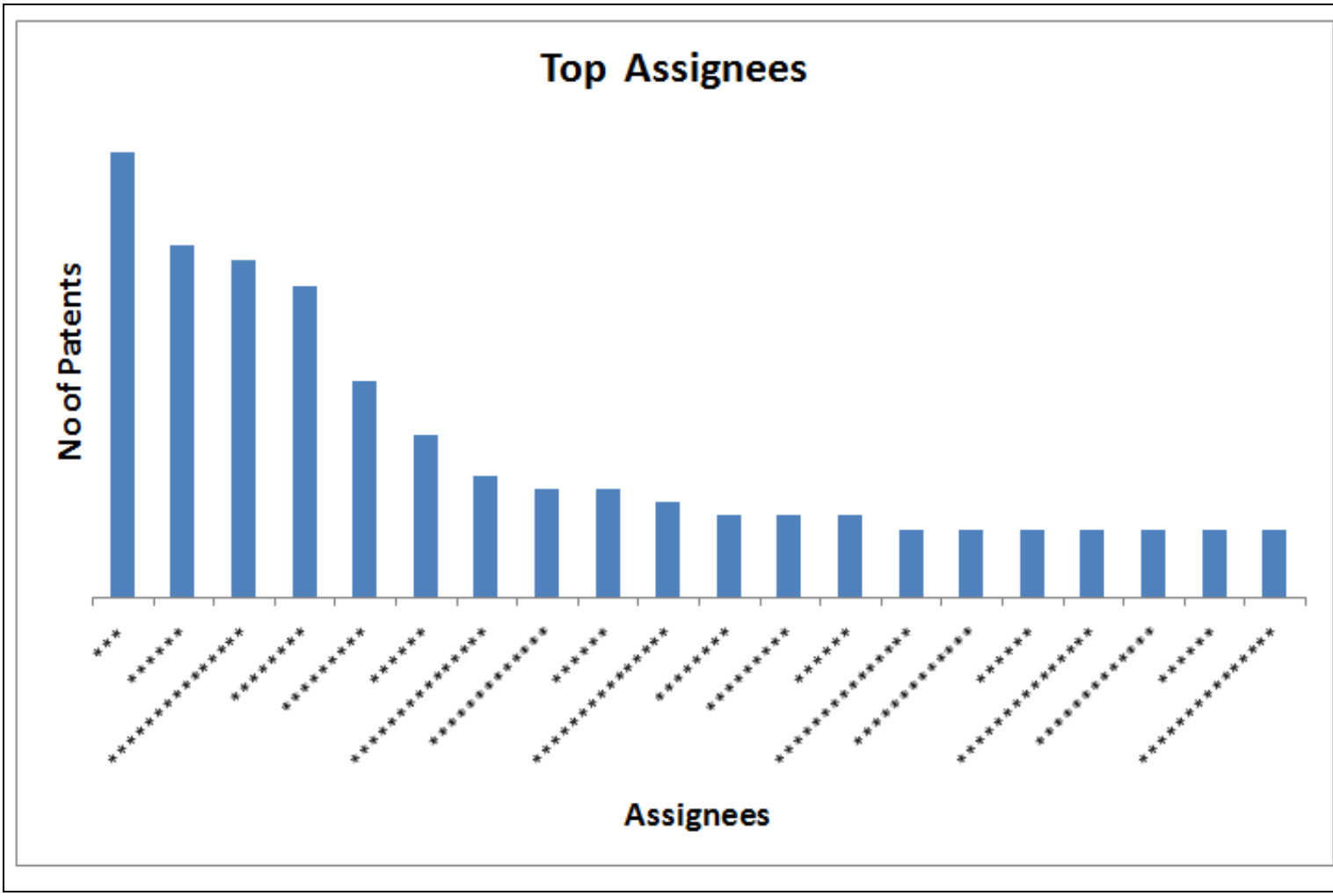
		NETHERLANDS			phytosterol and fiber	These active have synergistic effect in cholesterol lowering. This can be used for long term with any harmful health effects occur from synthetic drug use.
2	US7718817B2	San-Ei Kagaku Co. Ltd.,Tokyo,JP	2010	Vegetable sterol ester-containing composition and additive that increases the feeling effects from a hair cosmetic	Use of vegetable sterol ester in hair cosmetics	Hair cosmetic with good feeling effect was formulated with less costly additive using vegetable sterol wax as lanolin substitute. The prepared formulation has good feeling effect on application.

Sample patent analysis sheet

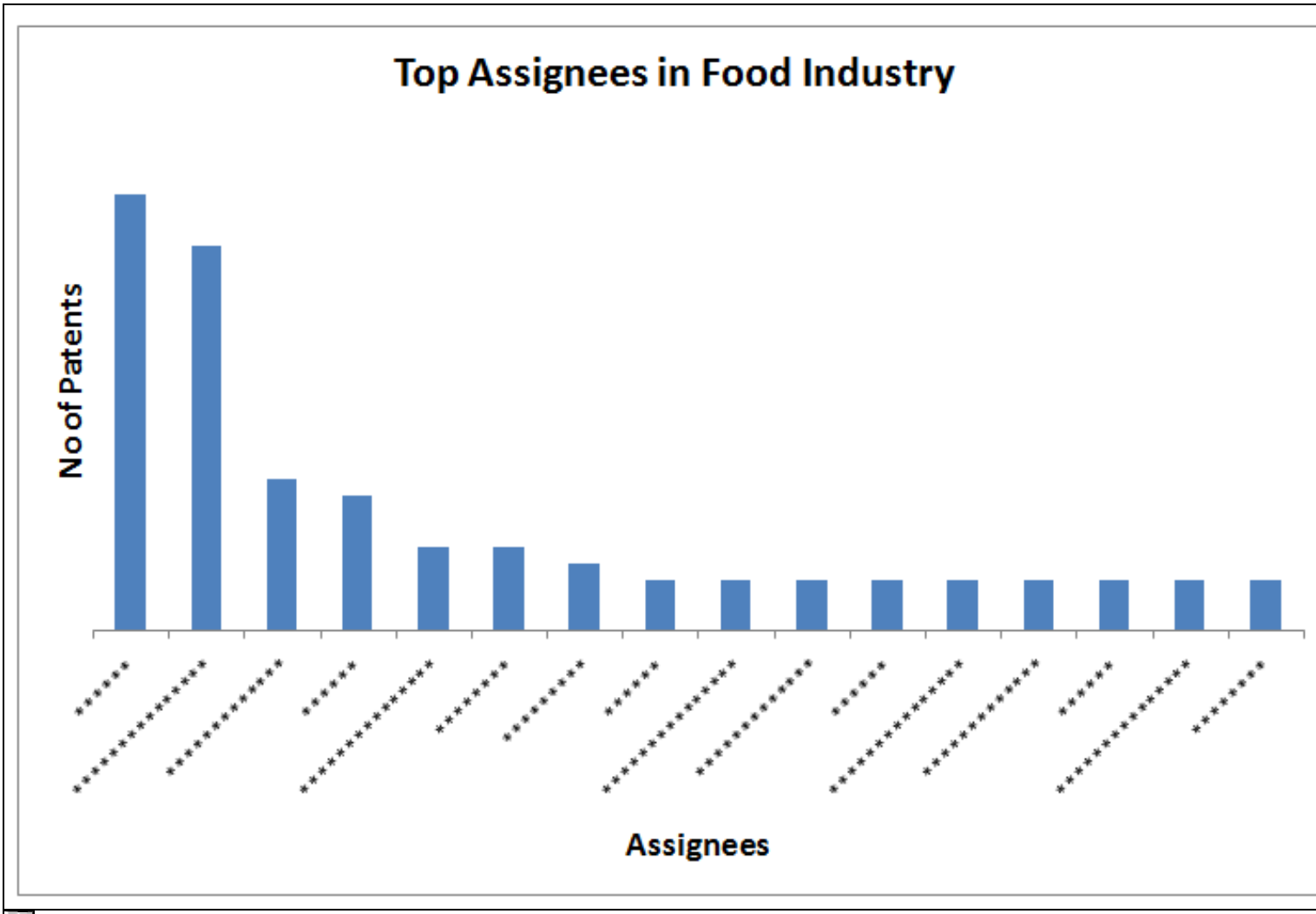
Click here to download the sample patents analysis sheet

Assignee analysis and IP activity

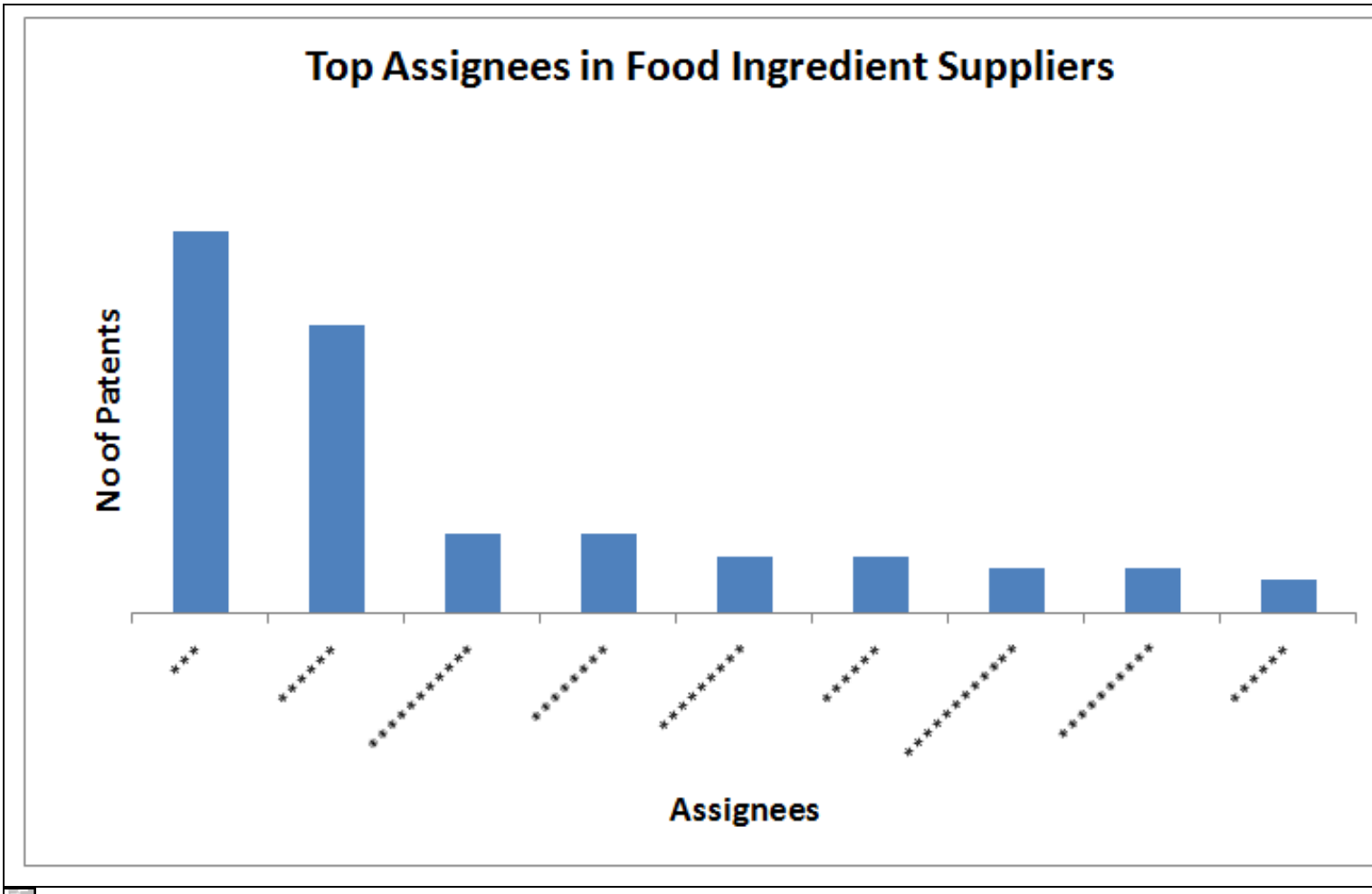
Top Assignees



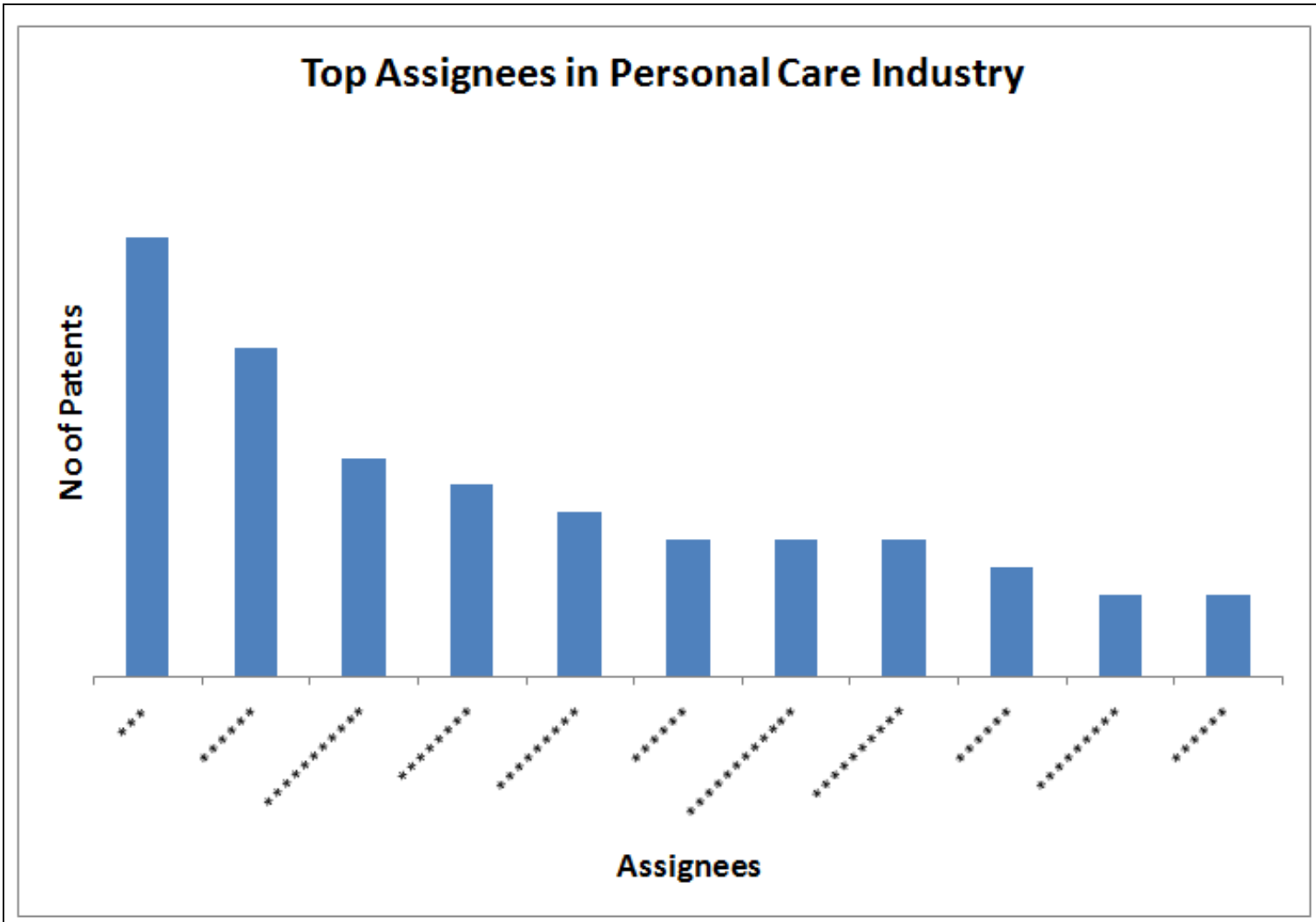
Top Assignees



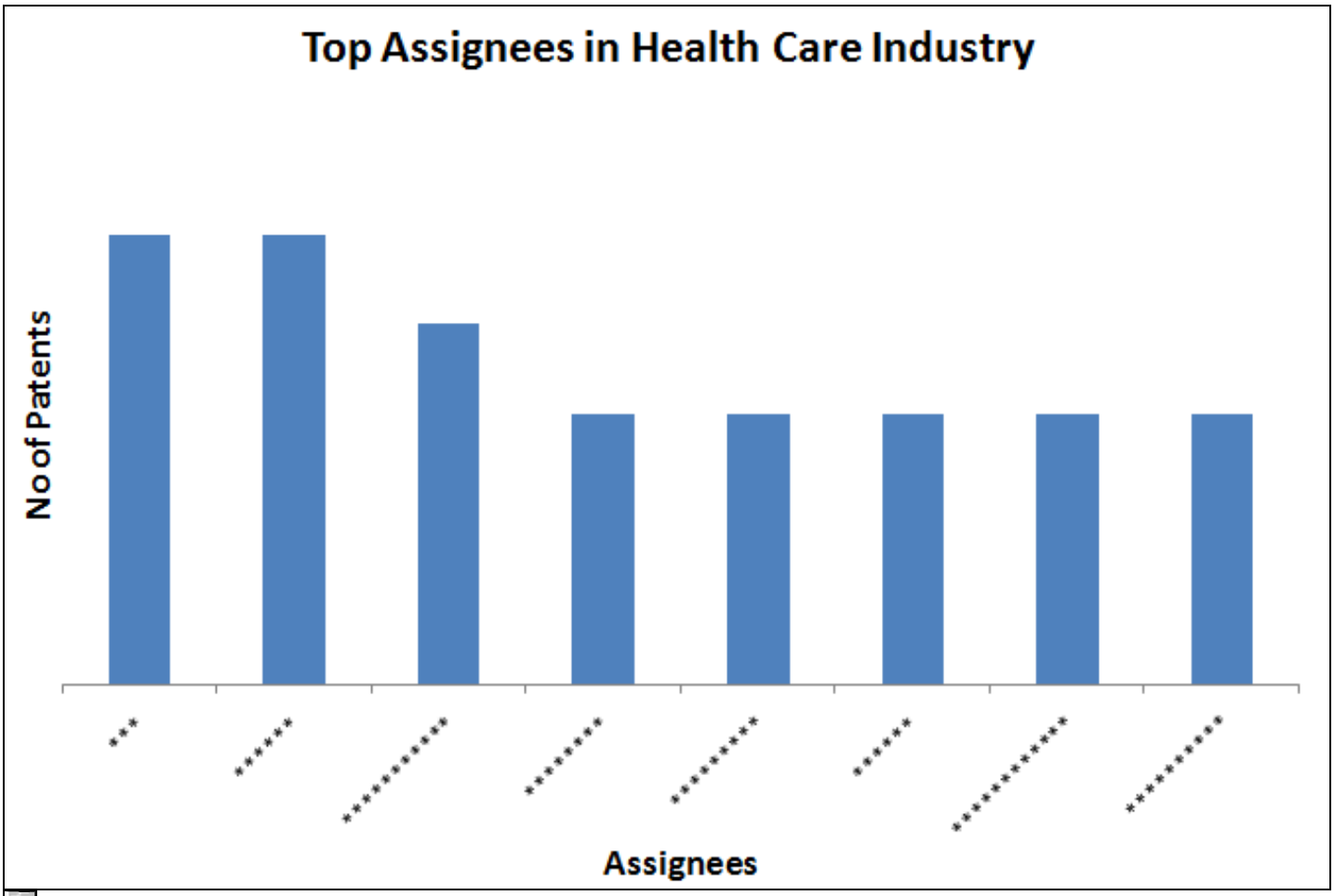
Top Assignees in the Food Industry



Top Assignees in the Food Ingredient Suppliers

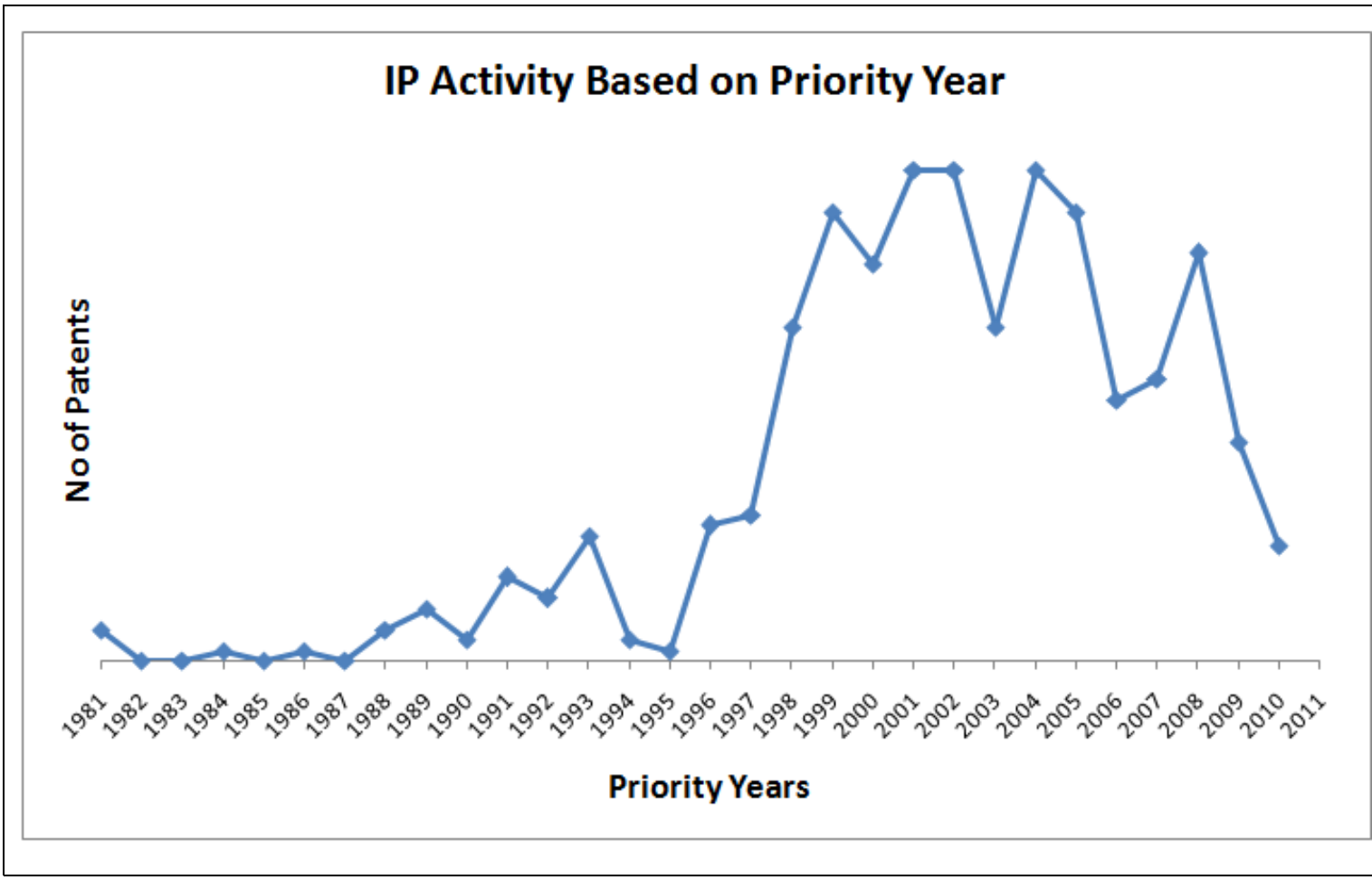


Top Assignees in the Personal Care Industry

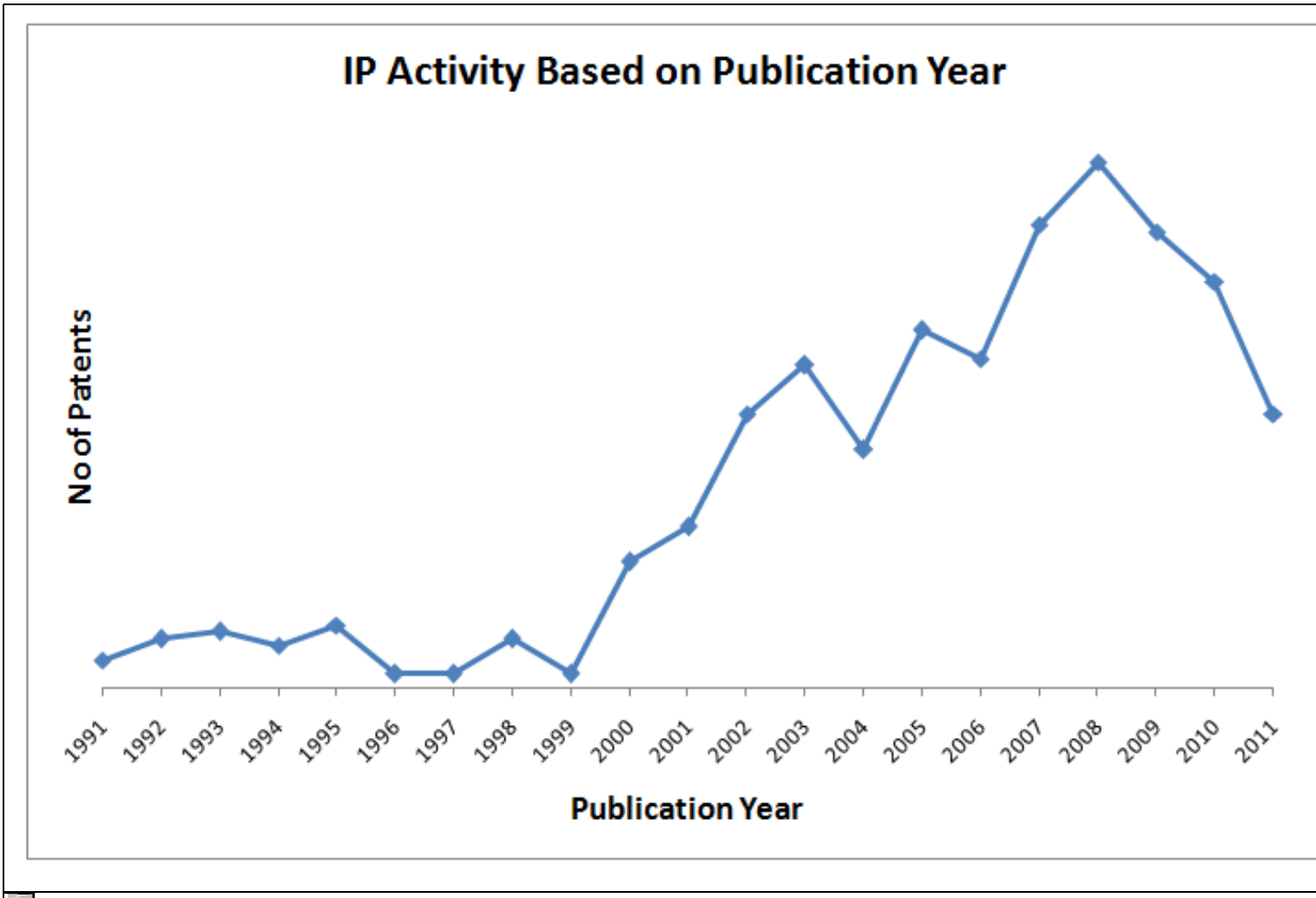


Top Assignees in the Health Care Industry

IP Activity

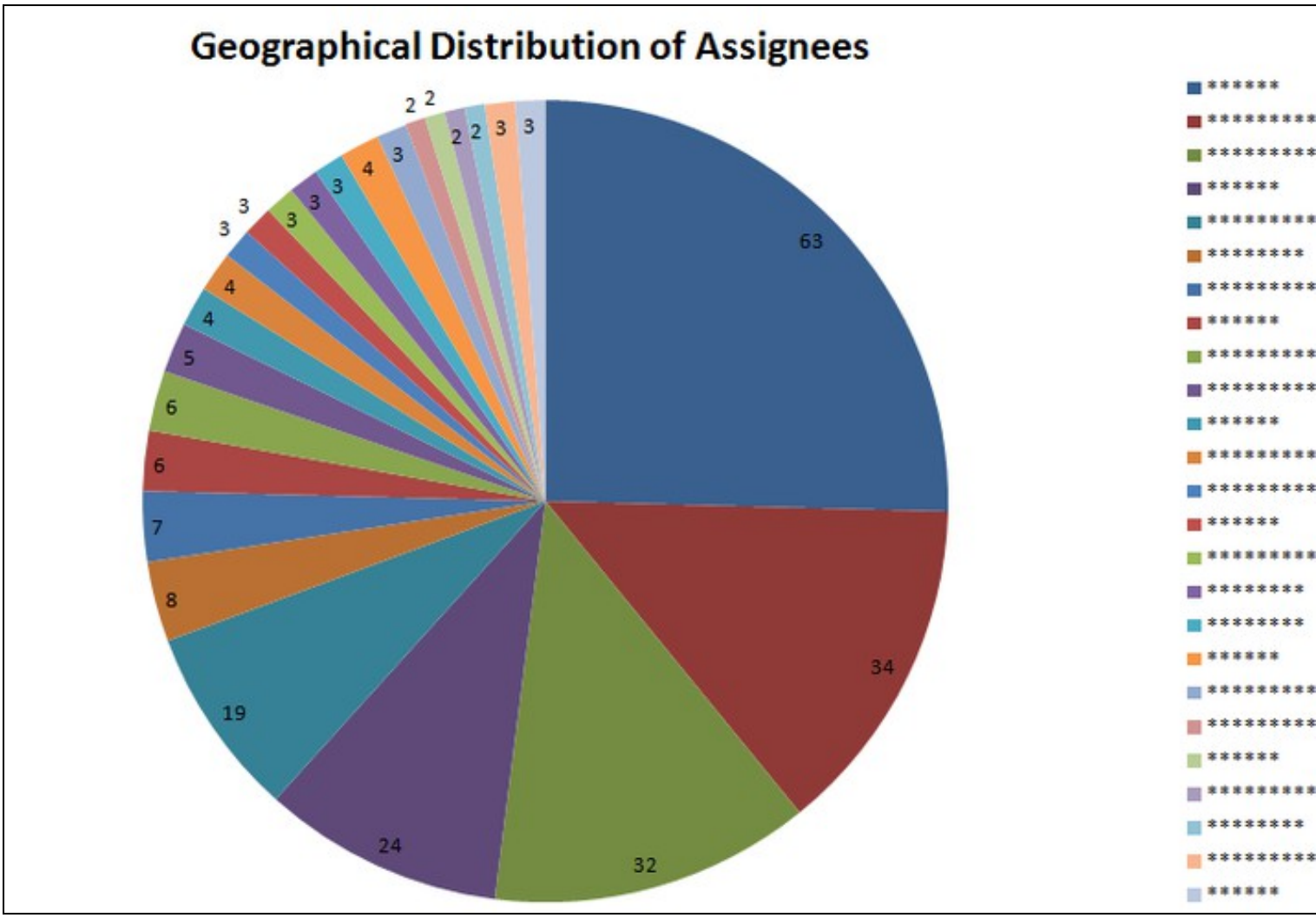


IP activity based on priority year

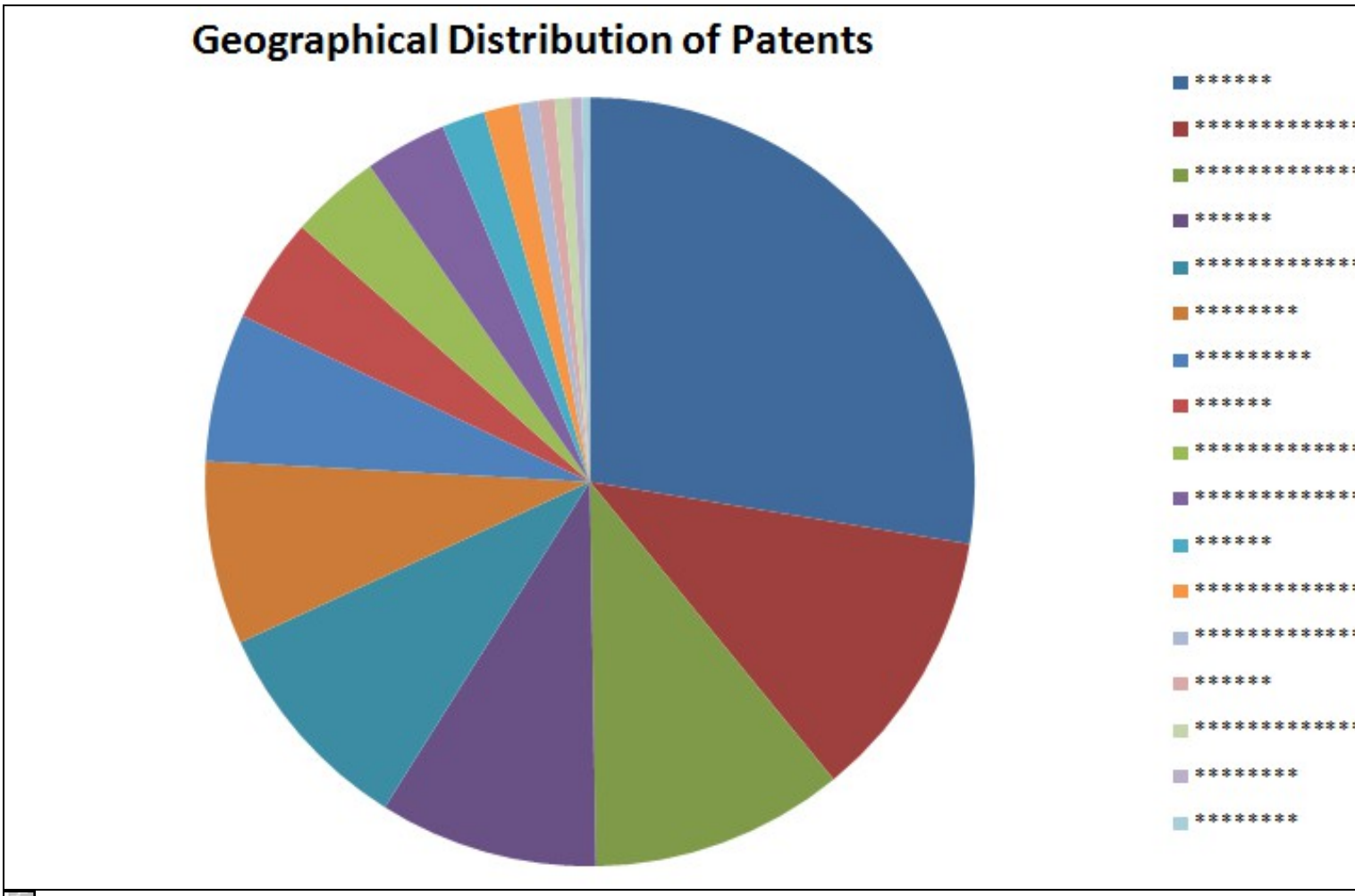


IP activity based on publication year

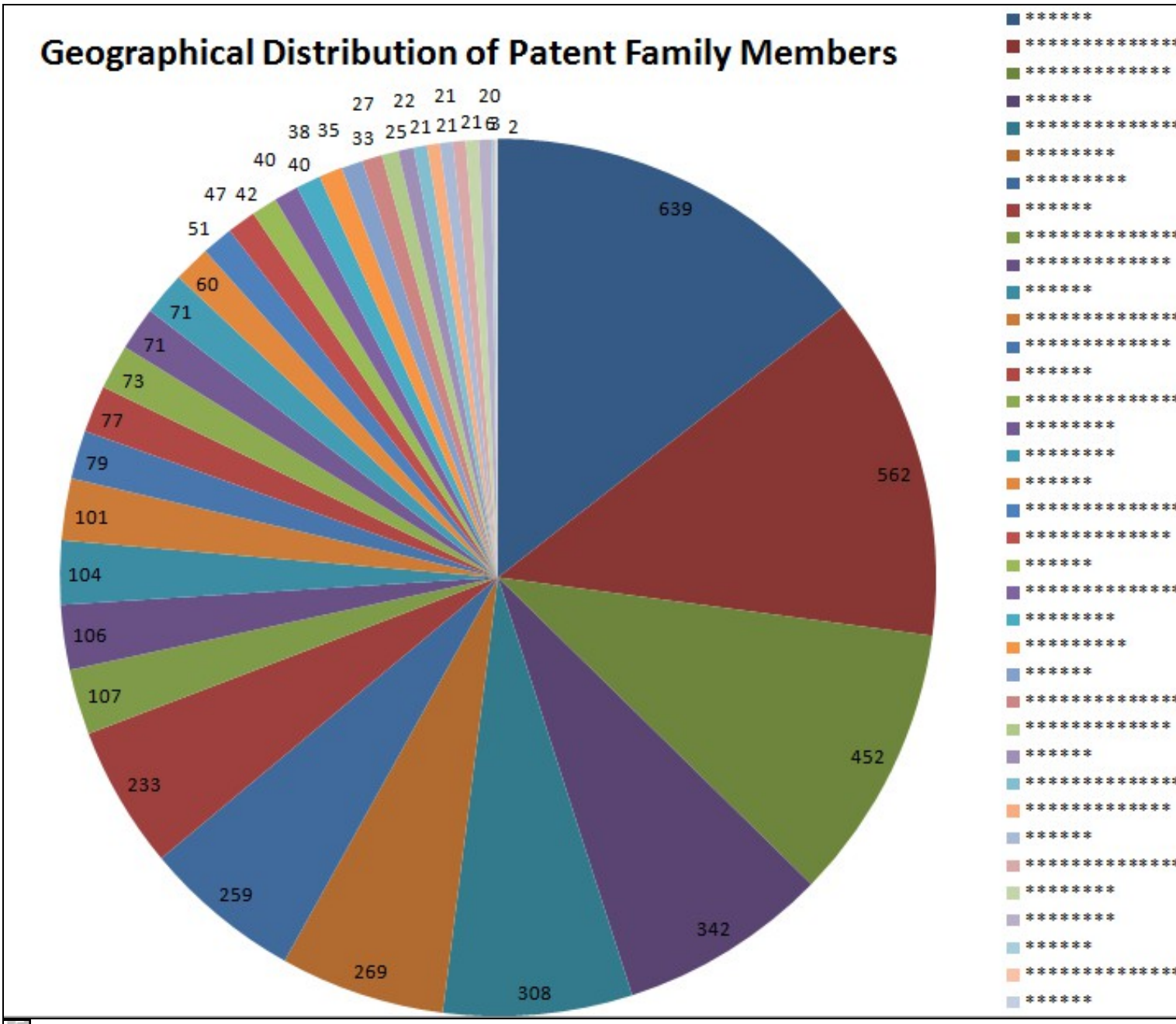
Geographical Distribution



Geographical distribution of assignees



Geographical distribution of patents

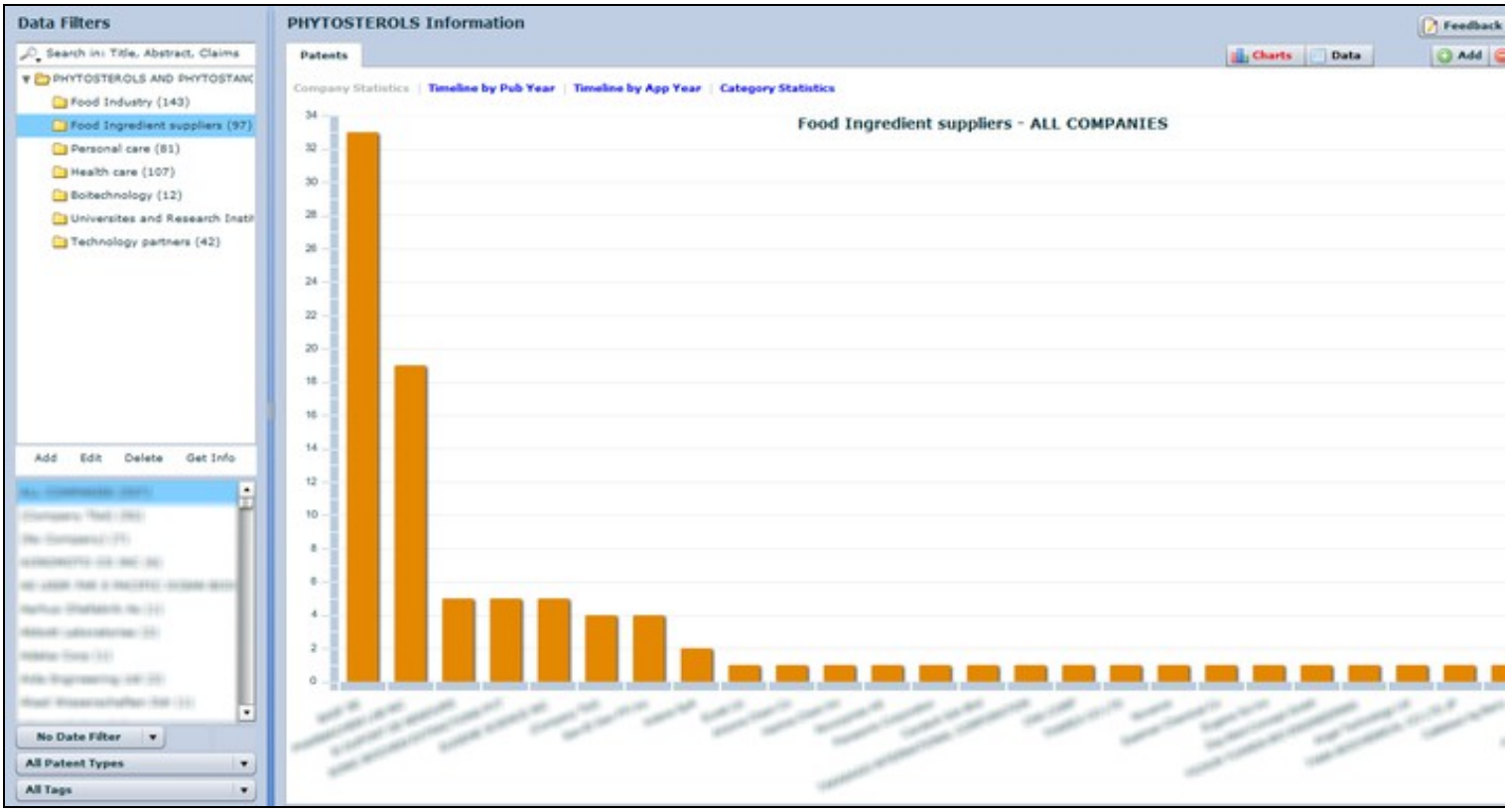


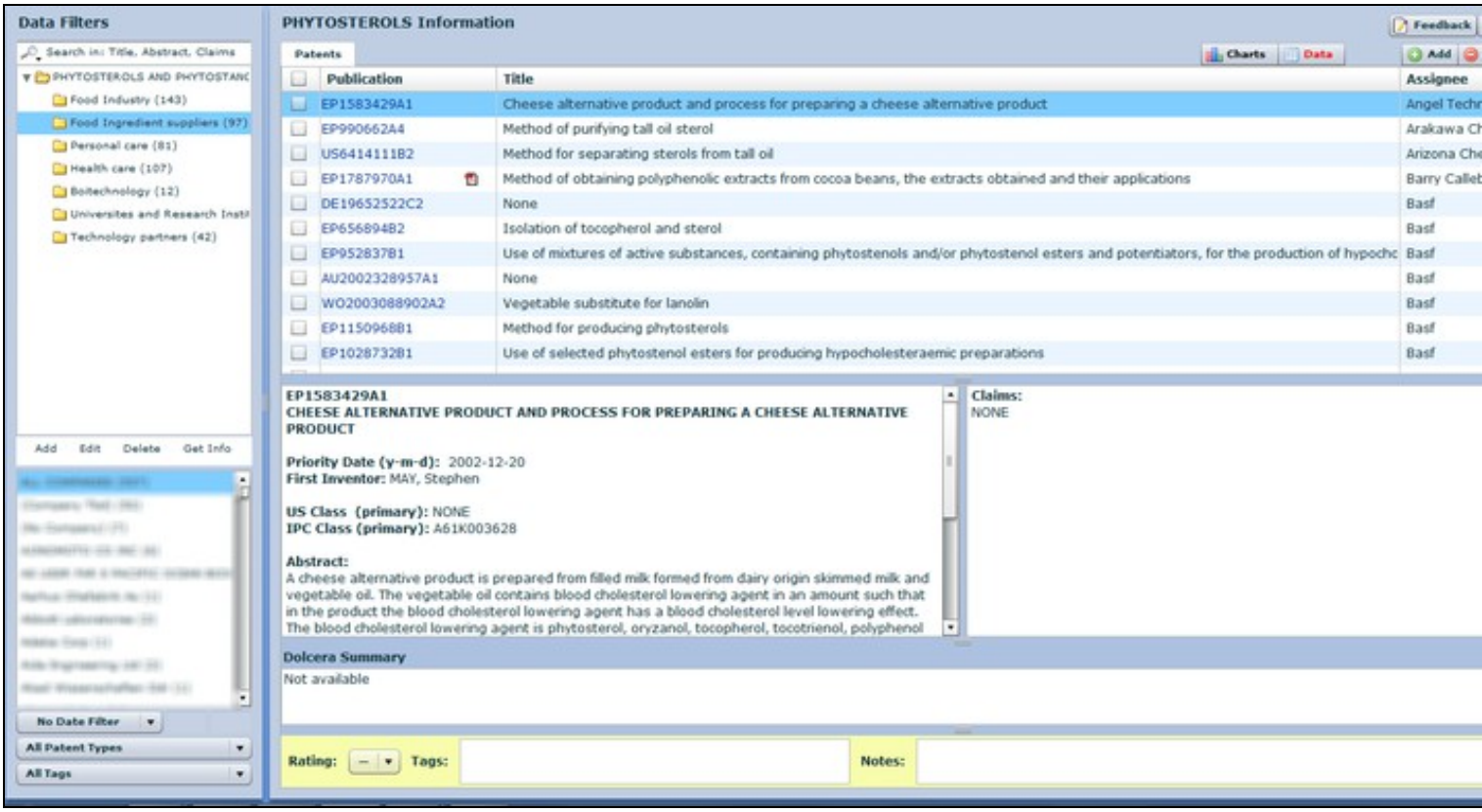
Geographical Distribution of Patent Family Members

Dolcera Dashboard

Assignees were categorized based on the type of their products viz. food,food ingredients, Personal care, Health care,other industries, research and educational institutions etc and their patents have been shown in the Dolcera Interactive Dashboard.

A data preview of the dashboard is shown below:





Patent Product Mapping

Some products with respect to this technology area were identified and mapped to the patents from their respective assignees.

S.No	Patent no.	Title	Assignee	Products	Product description by Company
1	WO2008125380A1		Unilever		Becal, Flora

		EDIBLE FAT CONTINUOUS SPREADS		Becal dressing, Becal proactive milk, Becal proactive yoghurt, Becal proactive spreads, Flora light spread, Flora omega 3 plus, Flora buttery spread, Flora pro-active yoghurt drink light.	
2	****	*****			
3	***	****			

- Please click here for detailed Patent-Product highlight

Scientific articles

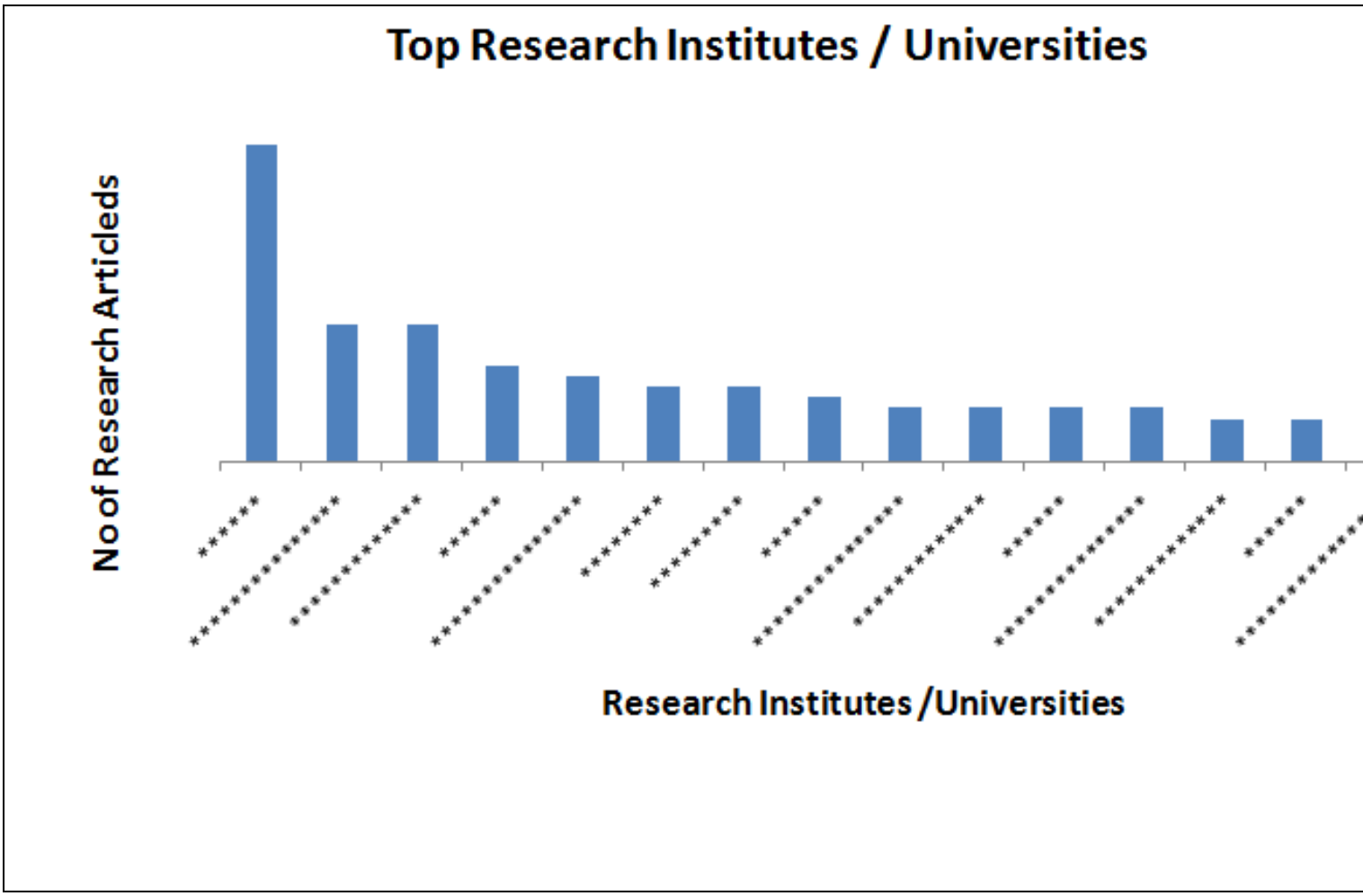
- **Database** : Scirus
- **Timeline** : 1991 - 2011
- **Subject Areas** : Agricultural and Biological Sciences; Chemistry and Chemical Engineering; Engineering, Energy and Technology; Life Sciences; Medicine and Pharmacology.
- **Information Types** : Abstracts, Articles, Articles in Press, Books, Conferences and Reviews.

S.No	Scope	Concept	Search String	Total Hits
1	KEYWORDS	PHYTOSTEROL	(sterol* or ******)	###### (No Relevant Articles)
	AND			
	Complete document	Extraction	(extract* oor ******)	
	AND			
	Complete document	Products	(lipid* or ******)	

Relevant Scientific Articles

◊ Click here to download relevant Scientific Articles Sheet

- **The following graphs explain the placement of different Research Institutes and Universities in this technological area.**



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