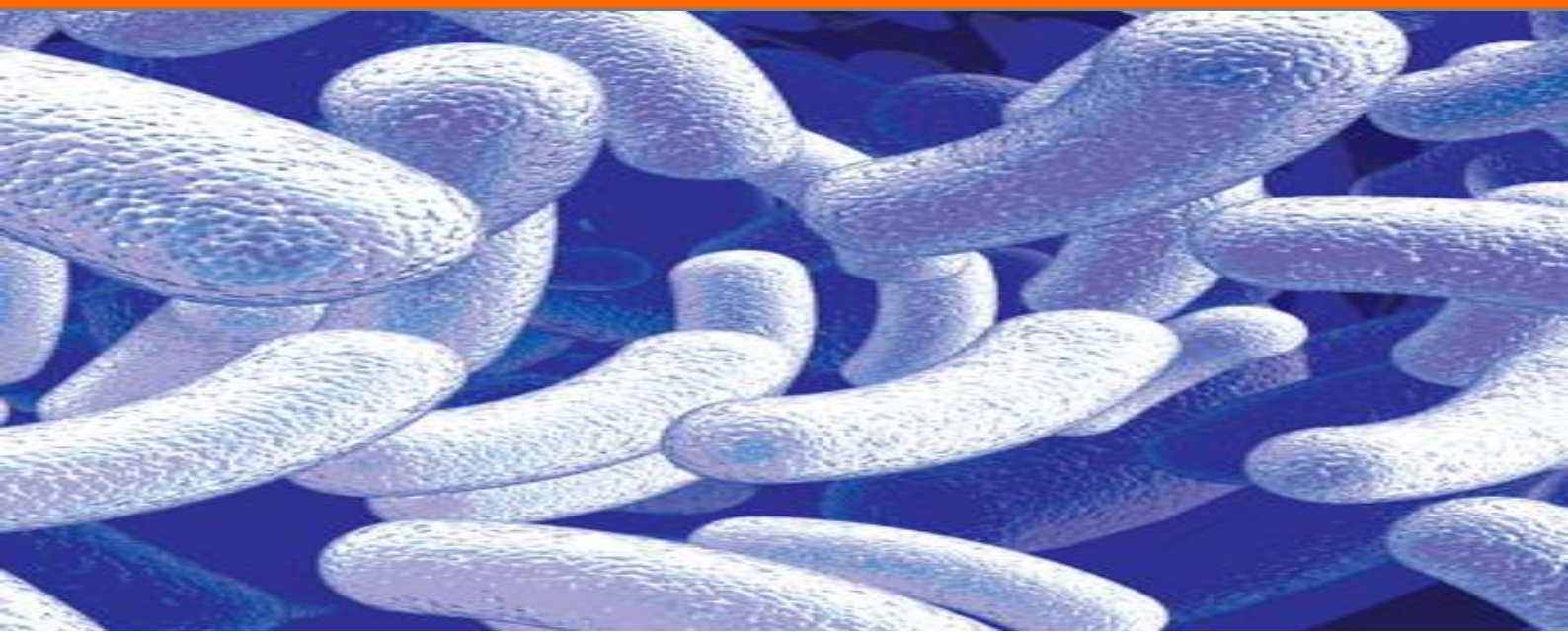


Food Safety Testing

Technology Insight Report

Patent iNSIGHT Pro

Transform Patents to Intelligence

Table of Contents

Introduction

Food supply worldwide is under constant threat and effective test products that can ensure food safety are in demand. Microbial pathogens such as bacteria, viruses, environmental toxins, food allergens and adulterants, residues of drugs and agricultural chemicals can harm consumers if unchecked. In some countries, testing for Genetically Modified Organisms (GMOs) is also conducted to ensure food authenticity

Although pathogen testing is still the most dominant segment of food testing, Genetically Modified Organism (GMO) testing is the fastest growing food testing segment worldwide.

The purpose of this report on Food Safety Testing is to provide insights into the large and ever growing food testing market and also covers the different testing technologies adopted worldwide. With outbreaks and contamination like salmonella, E. coli, listeria, and many more the food testing market has grown at a rapid pace. Testing concerns as well as this rapidly growing international trade in food has stimulated the demand for more food safety testing all over the world and has led to technological innovation in areas such as rapid testing and new test technologies such as PCR, Biosensors, Chromatography. Etc.

Points covered:

- Overview of the top companies involved in food testing and their publication trend
- Focus on the contaminants spoiling foodstuffs
- Trends for Current & emerging technologies in use for food testing and their patent activity
- New and upcoming players involved in testing

Patent Search Results

Using the commercial patent database PatSeer as our data source we used the following search query to create our patent set.

TAC- Title, Abstract, Claims
TACD – Full Text
IC– International Class

TACD: (food* or beverage*)

AND

TAC: ((test* or analy* or monitor* or safety) w5 (food* or beverage* or confectionar* or meat* or poultry or seafood* or sea food* or snack* or egg* or seasoning* or dough* or doughnut* or softdrink* or soft drink* or dryfruit* or fruit or fruits or vegetable* or sausage* or milk or ice cream or icecream or bakery or crisp* or bread or juice* or comestible or biscuit* or snack* or cookie* or tea or coffee or sauce* or fish or pork or beef or poultry or pulses or ketchup or beer or wine or whiskey or whisky or petfood* or pet food* or salad* or cola or sandwich* or burger or nut* or cheese or yoghurt* or yogurt* or yogourt* or curd or cereal* or pickle* or grain* or foodgrain* or rice or wheat or maize or barley or jam or jellies or soup or cake* or noodle* or pastr* or spirit* or bean* or dairy or gelato or gelatin* or cheese or butter* or grape* or noodle* or soy or flour or chocolate* or toffee or candy or candies or ((potato or banana or baked or roasted or fried) wd1 chip*) or chewing gum or peppermint or sweetener* or tofu or spice* or condiment* or pasta* or margarine* or vinegar or dessert* or bacon or ham))

AND

IC: (G01N* OR C12Q*)

AND NOT

IC: ("G01N33/15" OR "G01N33/18" OR "G01N33/20" OR "G01N33/22" OR "G01N33/24" OR "G01N33/26" OR "G01N33/28" OR "G01N33/30" OR "G01N33/32" OR "G01N33/34" OR "G01N33/36" OR "G01N33/38" OR "G01N33/40" OR "G01N33/42" OR "G01N33/44" OR "G01N33/46" OR "G01N33/48" OR "G01N33/483" OR "G01N33/487" OR "G01N33/49" OR "G01N33/493" OR "G01N33/497" OR (G01N33 5*))

AND NOT

TACD: ((Testing wd2 (apparatus or devi?e* or equipment*)) or screw sleeve or superscript or liver softening or admittance spectroscop* or labeling element* or dishwashing detergent* or (Smell wd2 system))

Class Description:

G01N: Investigating or analysing materials by determining their chemical or physical properties.

C12Q: Measuring or testing processes involving enzymes or micro-organisms.

G01N33: Investigating or analysing materials by specific methods.

- The query was directed to search through the title, abstract and claims and a patent set of 2719 records with one publication per family was generated and imported in Patent iNSIGHT Pro.
- After reviewing few results esp. from older publications, we came across some similar but irrelevant terms which we then excluded from full text and irrelevant class were also excluded using NOT operator.
- The publications included in the report are updated as of 26th July, 2013.

Technical Segmentation (Patent Categories)

To get deeper insights Food Safety Testing record set was classified as follows:

By Testing Technologies

- Chromatography
    a) Liquid Chromatography
    b) Gas Chromatography
    c) Thin Layer Chromatography
    d) Column Chromatography
    e) Paper Chromatography
- Polymerase Chain Reaction(PCR)
- Immunoassay
- Mass Spectrometry
- Biochip/Biosensors
- Enzyme Linked Immunosorbent Assay (ELISA)
- Microarrays
- Phages
- Hybridization
- Nuclear Magnetic Resonance(NMR)
- Irradation
- Isothermal Amplification
- Radioimmunoassay
- Rapid Assay
- Flow Cytometry
- Agglutination
- Immunomagnetic Seperation
- Cantilever
- Soxhlet Extraction

By Foods Tested

- Beverages
- Dairy Products
- Desserts
- Food Grains
- Fruits & Vegetables
- Meat
- Seafood

By Food Classifications

- Beef
- Beer
- Bread
- Barley
- Butter
- Carrot
- Cheese
- Chicken
- Coffee
- Egg
- Fish
- Ham
- Maize/Corn
- Margarine
- Milk
- Pork
- Rice
- Salami
- Sausage
- Shrimps
- Soybean
- Spinach
- Tomato
- Turkey

- Ice Cream
- Lettuce
- Lobsters
- Crab
- Wheat
- Wine
- Yogurt

By Contaminants

- Acinetobacter
- Bacillus
- Campylobacter
- Clostridium
- Cronobacter
- Escherichia Coli
- Fusarium
- Genetically Modified Organisms
- Klebsiella
- Listeria
- Micrococcus
- Moraxella
- Moulds
- Mycotoxins
- Novovirus
- Pseudomonas
- Psychrophiles
- Salmonella
- Shigella
- Staphylococci
- Toxoplasma Gondii
- Vibrio Parahaemolyticus
- Yersinia

Image source:
http://minnesota.publicradio.org/display/web/2013/05/24/business/labeling-meat-rules
http://trivista.com/news/supply-chain-outbreaks-integrity/

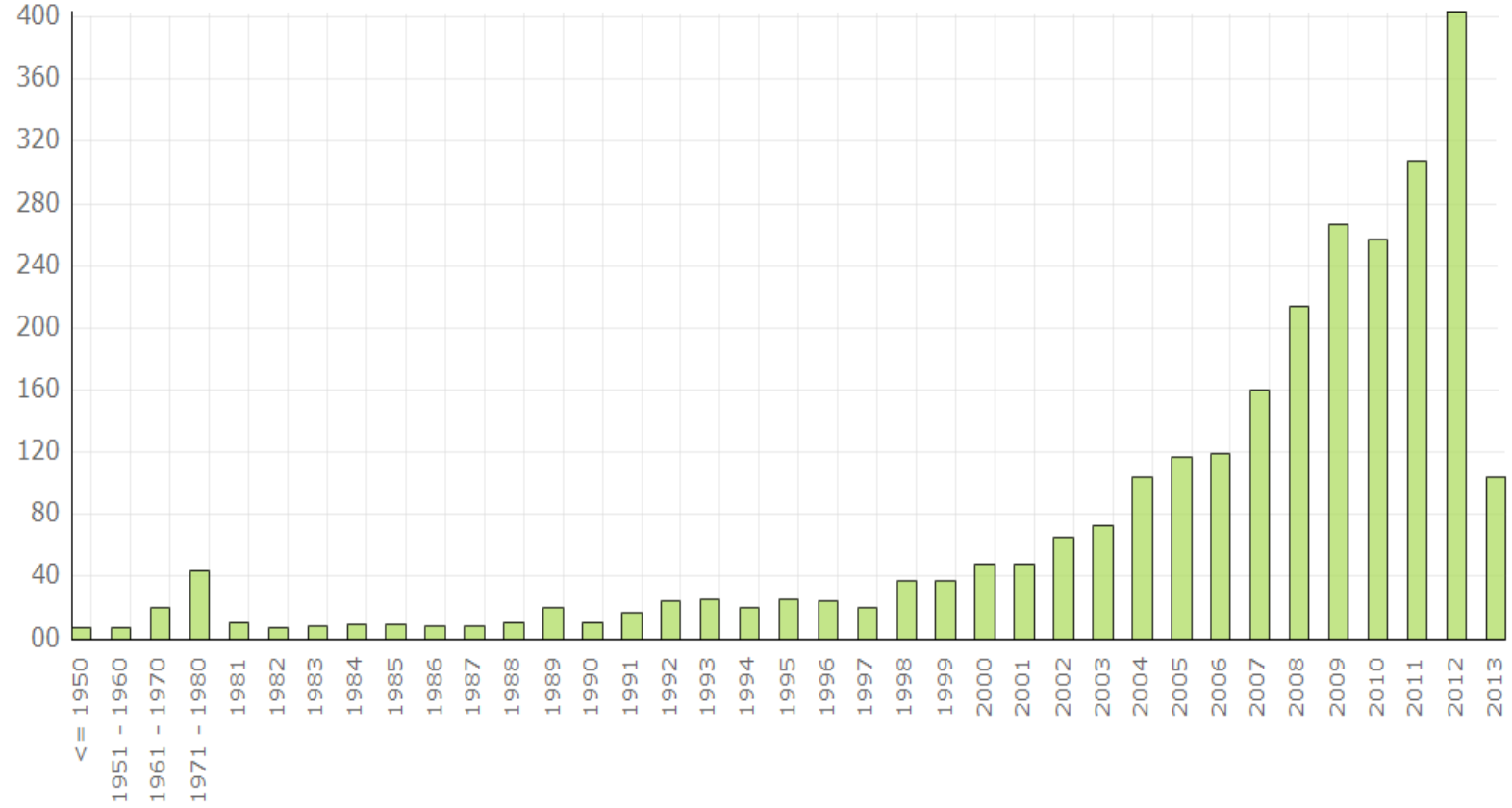
IP Analysis

Publication Trend

What has been the publication trend for food testing?

Patents related to food testing can be traced back to before 1950 and the real surge in the activity around this technology has happened in the last 5 years.

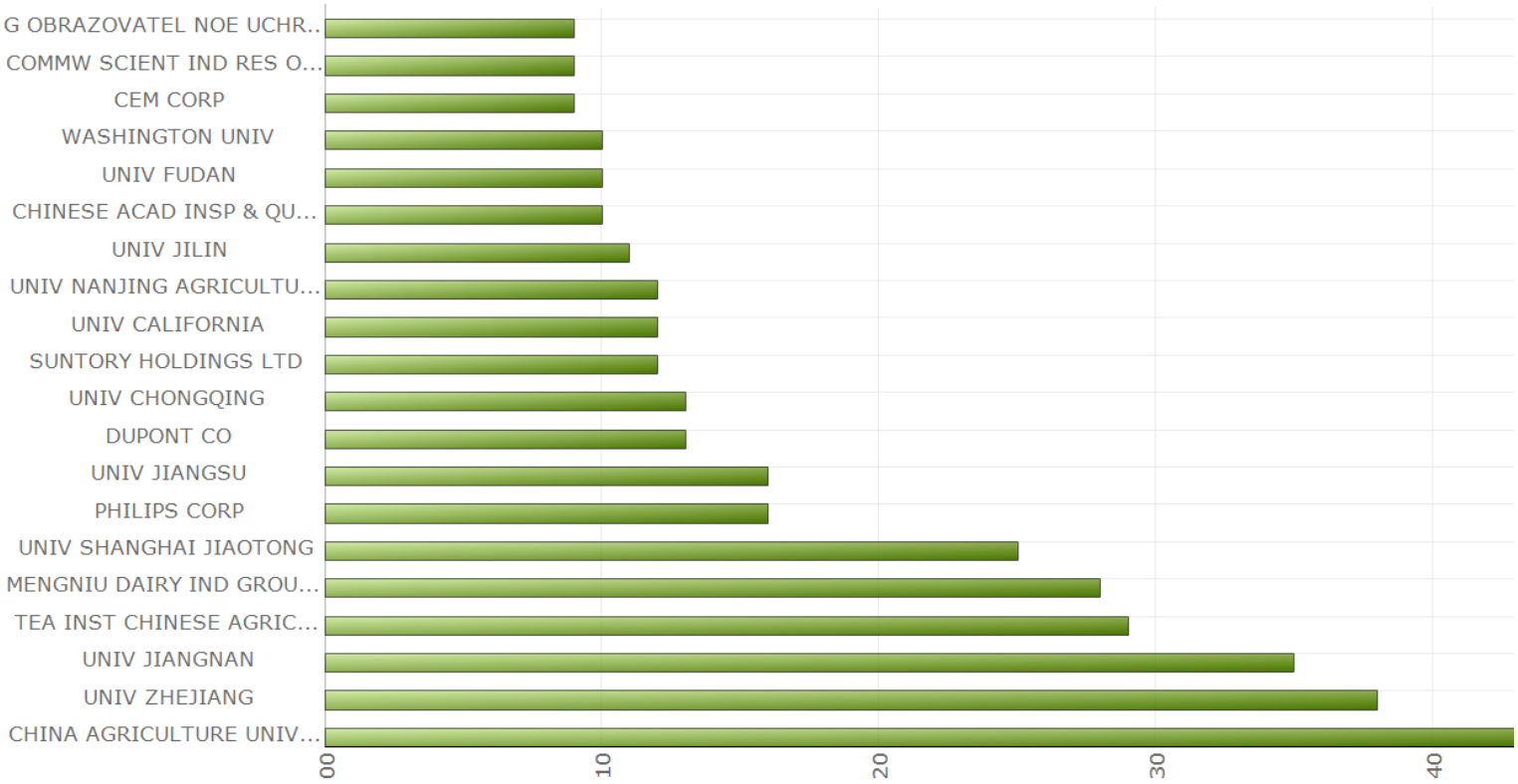
It's clear the current activity around these technologies is likely to continue seeing more innovation in the near future.



How we did it?

Once the patents were populated in Patent iNSIGHT Pro, the publication trend chart was generated on a single click using the dashboard tool.

Top Players



The top organizations are:

1. CHINA AGRICULTURE UNIV
2. UNIV ZHEJIANG
3. UNIV JIANGNAN
4. TEA INST CHINESE AGRICULTURE
5. MENGNIU DAIRY IND GROUP CO LTD
6. UNIV SHANGHAI JIAOTONG
7. PHILIPS CORP
8. UNIV JIANGSU
9. DUPONT CO
10. UNIV CHONGQING
11. SUNTORY HOLDINGS LTD
12. UNIV CALIFORNIA
13. UNIV NANJING AGRICULTURE
14. UNIV JILIN
15. CHINESE ACAD INSP & QURANTINE
16. UNIV FUDAN
17. WASHINGTON UNIV
18. CEM CORP
19. COMMW SCIENT IND RES ORG
20. GOBRAZOVATEL NOE UCHREZHDENIE

How we did it?

Once the patents were populated in Patent iNSIGHT Pro, the assignee clean- up tools were used to normalize the names. Different cleanup tools were leveraged:

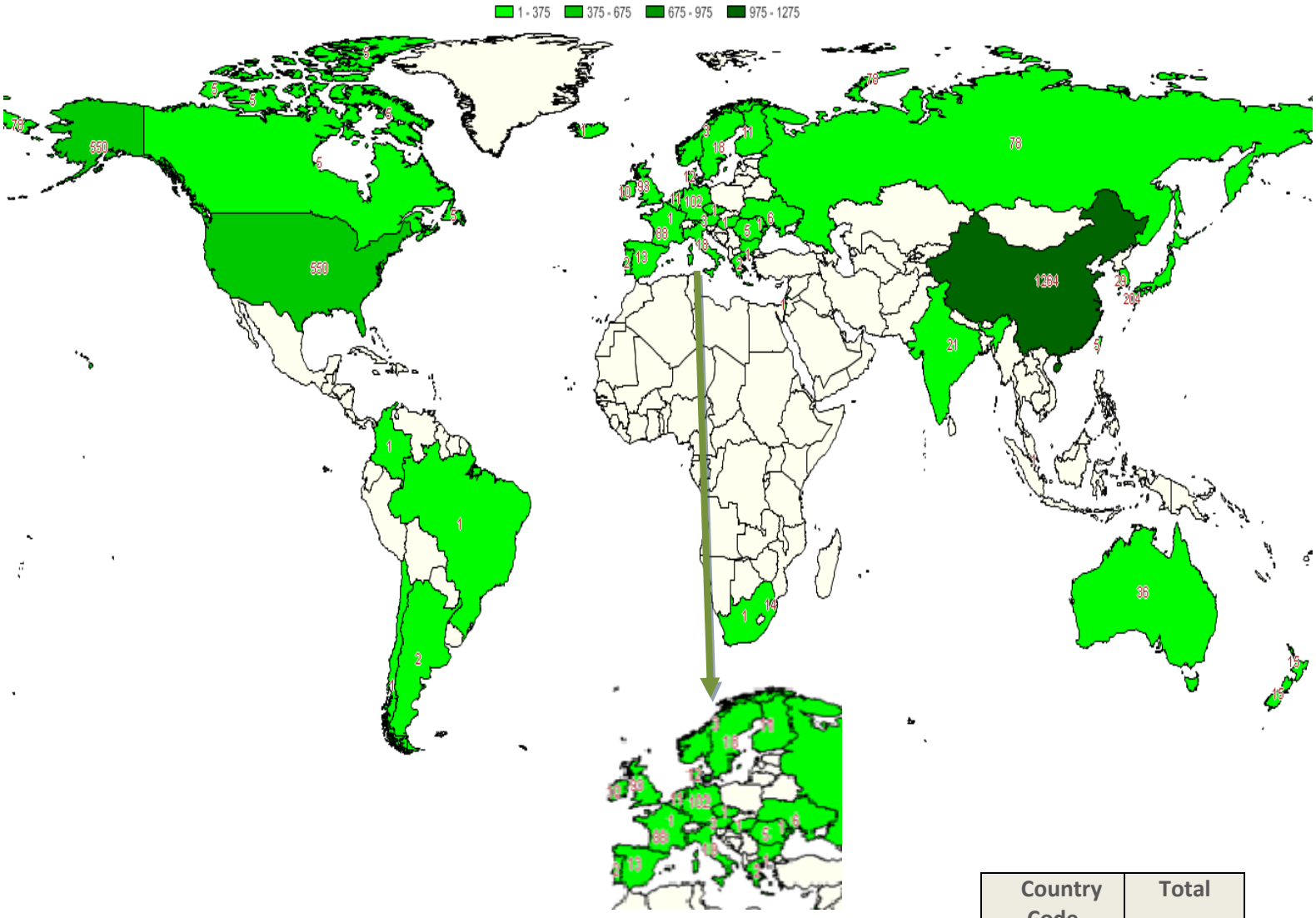
- To locate assignees for unassigned records
- To clean up records having multiple assignees
- To locate the correct assignee names for US records using the US assignments database
- To merge assignees that resulted from a merger or acquisition or name change.

The dashboard tool within Patent iNSIGHT Pro was used to find the top 20 assignees within the given patent set. A visual graph was created based on the results of the top assignees with the number of patents alongside each one.The complete Assignee table in available in the following Excel file: http://www.patentinsightpro.com/techreports/0813/List%20of%20Assignees.xls

Global Research activity

How is research around food safety testing spread across different countries?

In terms of regional pockets where patent protection is being sought most frequently for these technologies, CN leads the count, followed by the US and JP. The table below ranks top priority countries and helps provide an indication of where innovation in this area is originating:



Country Code	Total
CN	1264
US	550
JP	204
DE	102
GB	93

How we did it?

The map was generated using the Priority country coverage map option provided in the dashboard tool within Patent iNSIGHT Pro.

Companies - Key Statistics

Here we summarize key parameters of Top 15 companies such as filing trend, Top inventors in each company and Coverage of underlying patent families

Companies	Total No. of Records	Avg. No. of Fwd Cites per Patents	Filing Trend (Absolute)	Filing Year Range	Key Inventor (Top 5)	Coverage (Includes families)								
						US	EP	WO	JP	DE	CN	AU	GB	IN
CHINA AGRICULTURE UNIVERSITY	43 (1.6%)	0		2003-2012	YANKUN PENG(7) CAIYUN HOU(6) WEI WANG(5) ZETIAN FU(4) JIAN ZHANG(4)	0	0	0	0	0	43	0	0	0
UNIV ZHEJIANG	38 (1.4%)	0		2001-2012	YIBIN YING(3) DONGHONG LIU(3) JIANCHU CHEN(3) XINGQIAN YE(3) JUNJIE FU(2)	0	0	0	0	0	38	0	0	0
UNIV JIANGNAN	35 (1.3%)	0		2000-2012	YAN XU(6) CHUANLAI XU(4) WEI CHEN(3) LIBING WANG(3) XIULAN SUN(3)	2	1	2	0	1	35	1	1	0
TEA INST CHINESE AGRICULTURAL	29 (1.1%)	0		2003	CHEN LIANG(29) GAO QIKANG(23) ZHAO LIPING(22) YANG YAJUN(4) YAO MINGZHE(2)	0	0	0	0	0	29	0	0	0
MENGNIU DAIRY IND GROUP CO LTD	28 (1%)	0		2007-2010	WEIXING LIU(18) XUE BAI(10) JIANJUN CHANG(10) QIHUI GUO(10) XINYU HU(7)	0	0	0	0	0	28	0	0	0
UNIV SHANGHAI JIAOTONG	25 (0.9%)	0		1999-2012	XIANMING SHI(11) CHUNLEI SHI(10) BIN LIU(6) FEI LONG(4) CHUNYAN CHAI(4)	1	1	0	0	1	25	0	0	0
PHILIPS CORP	16 (0.6%)	0		2000-2012	NEIJZEN JACOBUS HERMANUS MARIA(5) SCHLEIPEN JOHANNES JOSEPH HUBERTINA BARBARA(4) VAN ZON JOANNES BAPTIST ADRIANUS DIONISIUS(4)	8	9	15	4	1	8	1	0	1

					VAN DEN EERENBEEMD JACOBUS MARIA ANTONIUS(2) EVERS TOON HENDRIK(2)									
UNIV JIANGSU	16 (0.6%)	0		2006-2012	JIEWEN ZHAO(10) QUANSHENG CHEN(7) XIAOFENG REN(5) JIANRONG CAI(4) SONG JIANG(3)	0	0	0	0	0	16	0	0	0
DUPONT CO	13 (0.5%)	2.54		1987-2010	BURNS FRANK R(3) MORRIS PATRICIA A(2) Morris Patricia A.(2) LUCK STANLEY(1) KANE JAMES P JR(1)	10	10	9	7	0	6	6	0	2
UNIV CHONGQING	13 (0.5%)	0		2001-2012	DANQUN HUO(6) SHANGLIAN HUANG(3) WEI WEI(3) YONG ZHU(3) ZHANGJUN HOU(3)	0	0	0	0	0	13	0	0	0
SUNTORY HOLDINGS LTD	12 (0.4%)	1.08		1995-2007	KODAMA YUKIKO(8) NAKAO YOSHIHIRO(6) ASHIKARI TOSHIHIKO(4) FUJIMURA TOMOKO(4) NAKAMURA NORIHISA(4)	11	10	9	8	1	9	8	0	0
UNIV CALIFORNIA	12 (0.4%)	8.5		1997-2010	LEWIS NATHAN S(7) SEVERIN ERIK(3) MATZGER ADAM J(2) AUGUSTINE MATTHEW P(2) GRUBBS ROBERT H(2)	8	5	10	4	3	0	6	0	0
UNIV NANJING AGRICULTURAL	12 (0.4%)	0		2006-2012	WEI WANG(3) KAIJIE QI(3) SHAOLING ZHANG(3) SHUTIAN TAO(3) WU JUN(3)	0	0	0	0	0	12	0	0	0
UNIV JILIN	11 (0.4%)	0		1988-2011	AIMIN YU(2) DAQIAN SONG(2) QIANG FEI(2) XINGHUA WANG(2) YANBO CAO(2)	0	0	0	0	0	11	0	0	0

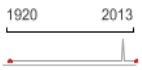
CHINESE ACAD INSP & QUARANTINE	10 (0.4%)	0		2005-2012	JIANXUN HAN(3) WENSHENG HUANG(3) YING CHEN(3) SHUIFANG ZHU(2) XIN HUANG(2)	0	0	0	0	0	10	0	0	0

How we did it?

From the Assignee 360° report options, we selected Top 15 Assignees and the different pieces of information we wanted to include in the singular display and then ran the report. The generated report was then exported to Excel using the option provided for the same.

Inventor - Key Statistics

Here we summarize key parameters of Top 15 Inventors such as filing trend, key associated companies and top 5 co-inventors.

Inventor	Total No. of Records	Avg. No. of Fwd Cites per Patents	Filing Trend (Absolute)	Filing Year Range	Key Companies (Top 5)	Co-Inventors
CHEN LIANG	29 (1.1%)	0		2003	TEA INST CHINESE AGRICULTURAL(29)	GAO QIKANG(23) ZHAO LIPING(22) YANG YAJUN(4) WANG XINCHAO(2) WU BINGHUA(2)
GAO QIKANG	23 (0.8%)	0		2003	TEA INST CHINESE AGRICULTURAL(23)	CHEN LIANG(23) ZHAO LIPING(17) YANG YAJUN(2) YAO MINGZHE(2) MAO WEIHUA(1)
ZHAO LIPING	22 (0.8%)	0		2003	TEA INST CHINESE AGRICULTURAL(22)	CHEN LIANG(22) GAO QIKANG(17) XU YOUPING(2) YANG YAJUN(2) WANG XINCHAO(1)
WEIXING LIU	21 (0.8%)	0		2007-2011	MENGNIU DAIRY IND GROUP CO LTD(18) INNER MONGOLIA MENGNIU DAIRY GROUP CO LTD(3)	QIHUI GUO(10) XUE BAI(10) MEI LI(8) XINYU HU(7) JIANJUN CHANG(5)

MEI LI	13 (0.5%)	0		2008-2012	MENGNIU DAIRY IND GROUP CO LTD(6) INNER MONGOLIA MENGNIU DAIRY GROUP CO LTD(4) TSINGTAO BREWERY CO LTD(2) BEIJING AGRICULTURAL COLLEGE(1)	WEIXING LIU(8) JIANJUN CHANG(4) YUAN ZHAO(4) DONGWEI YU(3) GUILIN HU(3)
YAN ZHANG	13 (0.5%)	0		2004-2012	GUANGDONG BOSUN HEALTH FOOD RES DEV CT(3) HEBEI INST OF FOOD QUALITY SUPERVISION INSPECTION AND RES(2) SERICULTURE & AGRI FOOD RES INST GAAS(2) GUANGZHOU DA YUAN FOOD SAFETY TECHNOLOGY CO LTD(2) GUANGDONG ACADEMY OF AGRICULTU(2)	CHUNWEI LIU(2) GUOJUN LI(2) HUIJUN ZHANG(2) JIANQIONG GUO(2) JIANWEI CHI(2)
JIANJUN CHANG	12 (0.4%)	0		2007-2010	MENGNIU DAIRY IND GROUP CO LTD(10) INNER MONGOLIA MENGNIU DAIRY GROUP CO LTD(2)	WEIXING LIU(5) MEI LI(4) NIER WU(4) GUILIN HU(3) CHEN JUN(2)
WANG JUN	12 (0.4%)	0		2008-2011	UNIV XINJIANG AGRICULTURAL(7) ANIMAL SCIENCE ACADEMY OF XINJIANG UYGUR AUTONOMOUS REGION(4) ANIMAL HUSBANDRY SCIENCE INST OF XINJIANG ANIMAL HUSBANDRY ACADEMY OF	TIENAN WANG(9) ZHENGFEN XUE(9) ZHIQIN WANG(9) XIAOHONG ZHANG(7) BIN PENG(6)

					SCIENCES(3) ACADEMY OF FARMING SCIENCES XI(2) UNIV ZHEJIANG(1)	
XIANMING SHI	11 (0.4%)	0		2007-2012	UNIV SHANGHAI JIAOTONG(11) SHANGHAI ENTRY EXIT INSPECTION(1)	CHUNLEI SHI(10) BIN LIU(6) FEI LONG(4) XIAOHUA HE(4) ZHONGMING ZHANG(3)
XUE BAI	11 (0.4%)	0		2007-2009	MENGNIU DAIRY IND GROUP CO LTD(10) UNIV KUNMING SCIENCE & TECH(1)	QIHUI GUO(10) WEIXING LIU(10) XINYU HU(6) SHAOHUI ZHANG(4) XIAOHONG KANG(2)
CHUNLEI SHI	10 (0.4%)	0		2007-2010	UNIV SHANGHAI JIAOTONG(10)	XIANMING SHI(10) BIN LIU(6) FEI LONG(4) XIAOHUA HE(4) ZHONGMING ZHANG(3)
JIANG ZHIHUA	10 (0.4%)	0.4		2006-2008	WASHINGTON UNIV(10) JIANG ZHIHUA(4) MICHAL JENNIFER J(3) KUNEJ TANJA(1) GARCIA MATTHEW D(1)	MICHAL JENNIFER J(9) KUNEJ TANJA(2) WIBOWO TITO A(2) XIAO QIANJUN(2) GARCIA MATTHEW D(1)
JIEWEN ZHAO	10 (0.4%)	0		2006-2012	UNIV JIANGSU(10)	QUANSHENG CHEN(6) JIANRONG CAI(4) XIAOFENG REN(4) HAO LIN(3) LI SUN(3)

QIHUI GUO	10 (0.4%)	0		2007-2009	MENGNIU DAIRY IND GROUP CO LTD(10)	WEIXING LIU(10) XUE BAI(10) XINYU HU(6) SHAOHUI ZHANG(4) XIAOHONG KANG(2)
ERZHONG WANG	9 (0.3%)	0		2006-2009	SUZHOU ANJ BIOTECH CO LTD(9)	No Co-Inventor Present

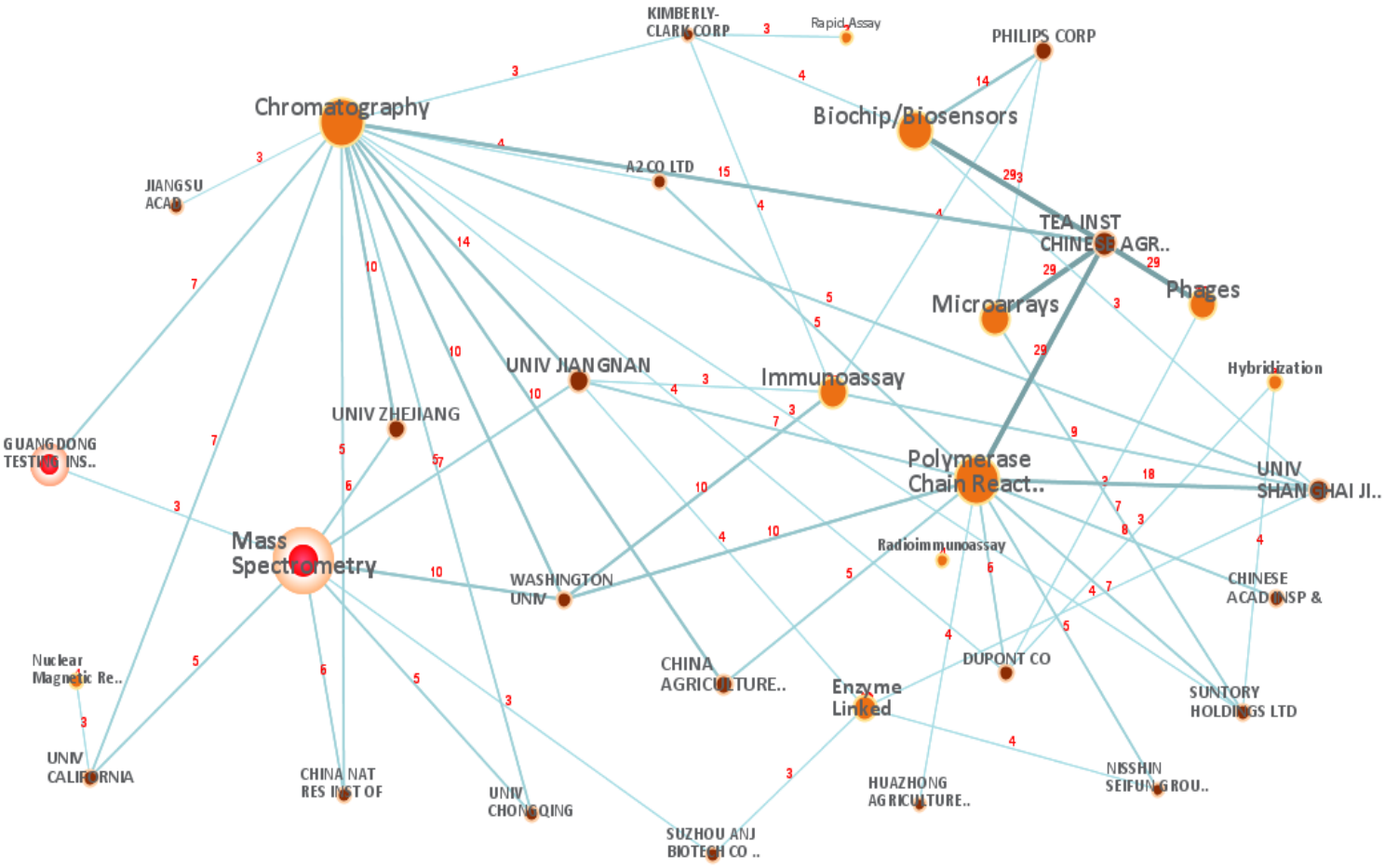
How we did it?

From the Inventor 360° report options, we selected the different pieces of information we wanted to include in the singular display and then ran the report. The generated report was then exported to Excel using the option provided for the same.

Company activity across different food testing technologies

Which companies hold the maximum inventions across different types of technologies used in food safety testing?

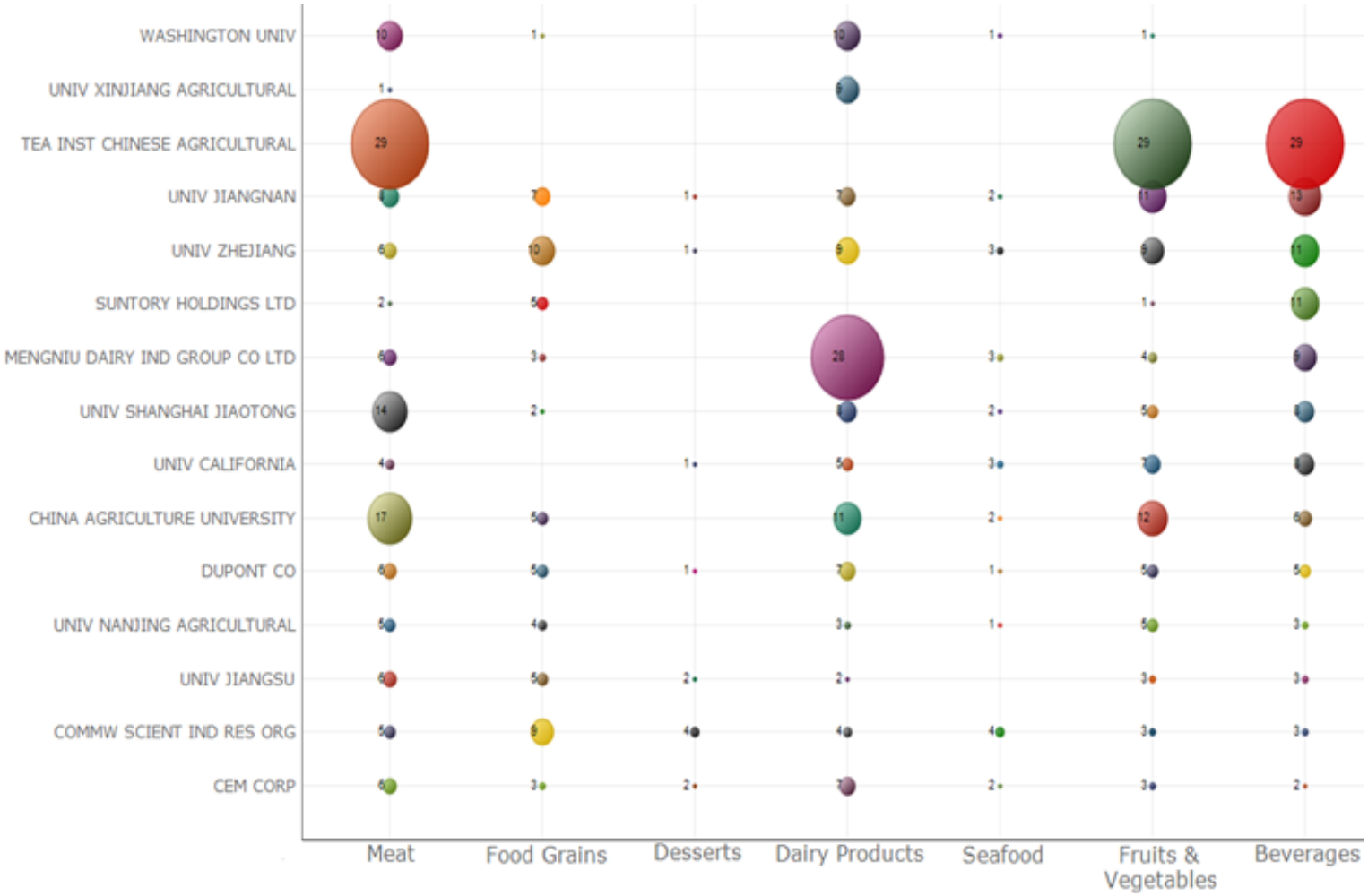
In the map, each company is connected to particular technology through links whose thickness and color intensity is directly proportional to the number of records relating them. The number (in red) next to each line represents the number of records held by company present in a particular technology.



How we did it?

First various testing technologies were identified by manual research. Then by using a combination of semantic analysis tools such as clustering tools and searching tools available in Patent iNSIGHT Pro, patents were categorized under different testing types. The map for companies and different technology areas was generated using the co-occurrence analyzer and resulting matrix was represented as Correlation Map

Company wise analysis across different food types

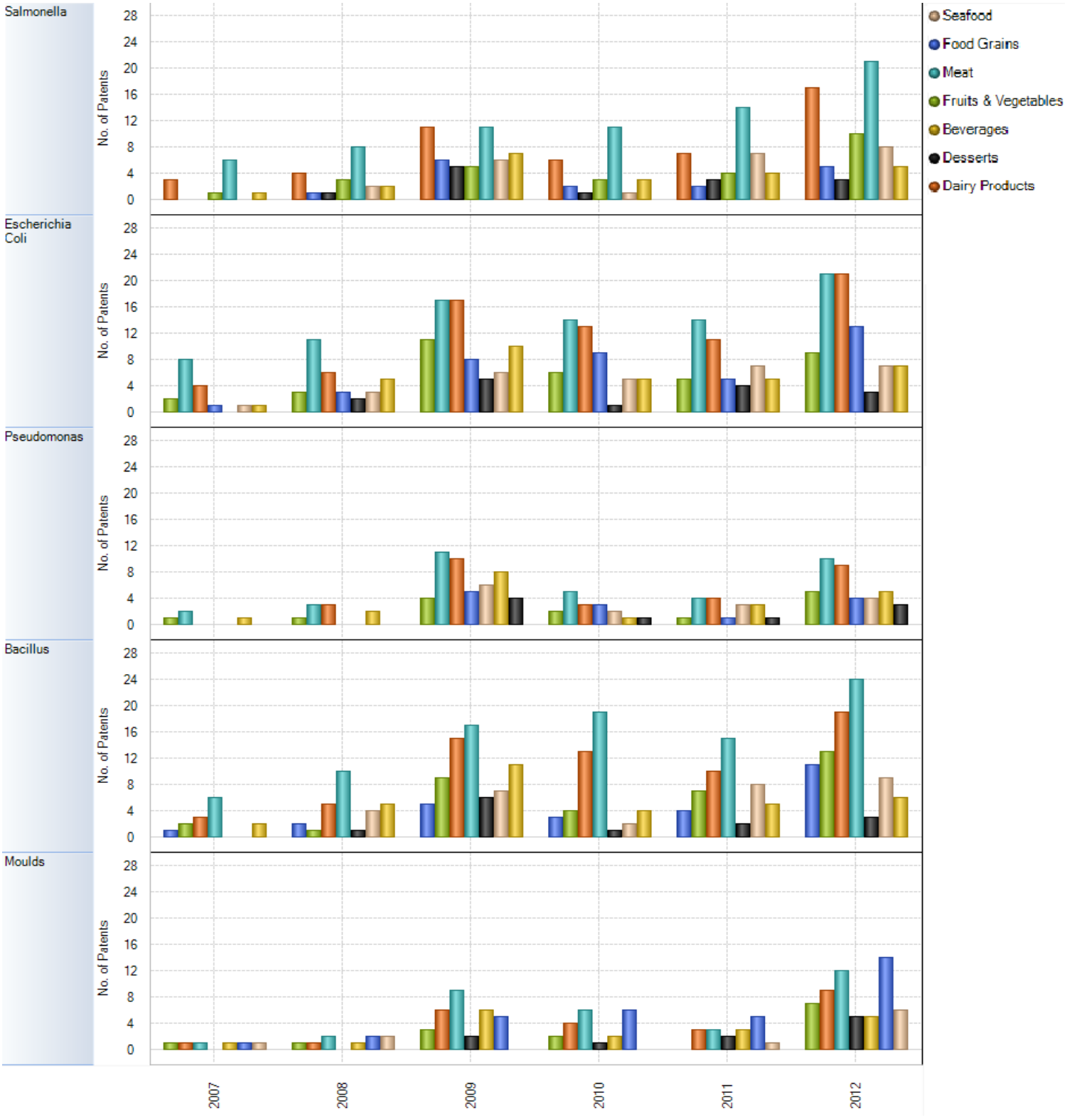


How we did it?

First various foods tested were identified by manual research. Then by using a combination of semantic analysis tools such as clustering tools and searching tools available in Patent iNSIGHT Pro, patents were categorized under different food types. A co-occurrence matrix was generated and the resulting matrix was converted into a bubble chart.

Food Safety Testing: Food Types vs Contaminants

The chart represents key contaminants spoiling different food types.



How we did it?

First various contaminants were identified by manual research. Then by using a combination of semantic analysis tools such as clustering tools and searching tools available in Patent iNSIGHT Pro, patents were categorized under different contaminants. A co-occurrence matrix was generated and the resulting matrix was converted into a 4-D Matrix containing food types, contaminants, publication year. The results were restricted to last 5 years.

Food Safety Testing: Food Classifications vs Companies

The table below shows research activity of companies across various sub categories of food types.

Food Classifications / Companies	Total	Egg	Milk	Rice	Wheat	Margarine	Bread	Fish	Barley	Chicken	Beef	Turkey	Coffee	Maize	Wine	Beer	Tomato	Shrimps	Butter	Cheese	Soybean	Ham	Lettuce	Spinach	Pork	Sausage	Carrot	Crab	Ice Cream	Yogurt	Salami
CHINA AGRICULTURE UNIV	39	3	9	3	2			2		5	7		1	3	2			1			1			2	5						
UNIV ZHEJIANG	30	1	8	8	2		3	2					1	1	3		1	1				1			1						
UNIV JIANGNAN	30	3	6	3	4			2	3	1	4		1	1	10	5				3	2				1	1	1				
MENGNIU DAIRY IND GROUP CO LTD	28	2	28	1	2			3			2				7					6	2						1		1		
UNIV SHANGHAI JIAOTONG	23	2	7	2	1			2	1	5			5	1			1	1		1					3	1		1			
UNIV JIANGSU	15	4	1	5	2					2			1	2	1	1			1		2		1		2						
PHILIPS CORP	15																														
UNIV NANJING AGRICULTURAL	12		3	3	3			1		2	4			1							1	1			1	1					
UNIV CALIFORNIA	11	1	2					3					1		2	4	1														
SUNTORY HOLDINGS LTD	11			3	2		2	4							7	9															
DUPONT CO	11	3	4	3	4			1	3	2	4		2	5	1	1			1	1	3	1	3	1	1					1	
WASHINGTON UNIV	10	9	10	1				1		3	10														1						
UNIV JILIN	10	1	4				1												1		1				1						
UNIV XINJIANG AGRICULTURAL	9		9																												
COMMW SCIENT IND RES ORG	9	5	4	2	6	2	6	4	4	3	1		3	6	1	2	2	2		2	4	1	1			1			1	2	1
CHINESE ACAD INSP & QUARANTINE	9	1	2	6	1					1	1			5			6				1										

JIANGSU ACAD AGRICULTURAL SCI	8	2	1	4	6		2	1	2					5		1														
CHINA NAT RES INST OF FOOD & FERMENTATION IND	8													1	6	1														
CEM CORP	8	3	6		3	2		2			2	2	1	3					2	6					1			5		
A2 CO LTD	7		7											1				4		1									1	

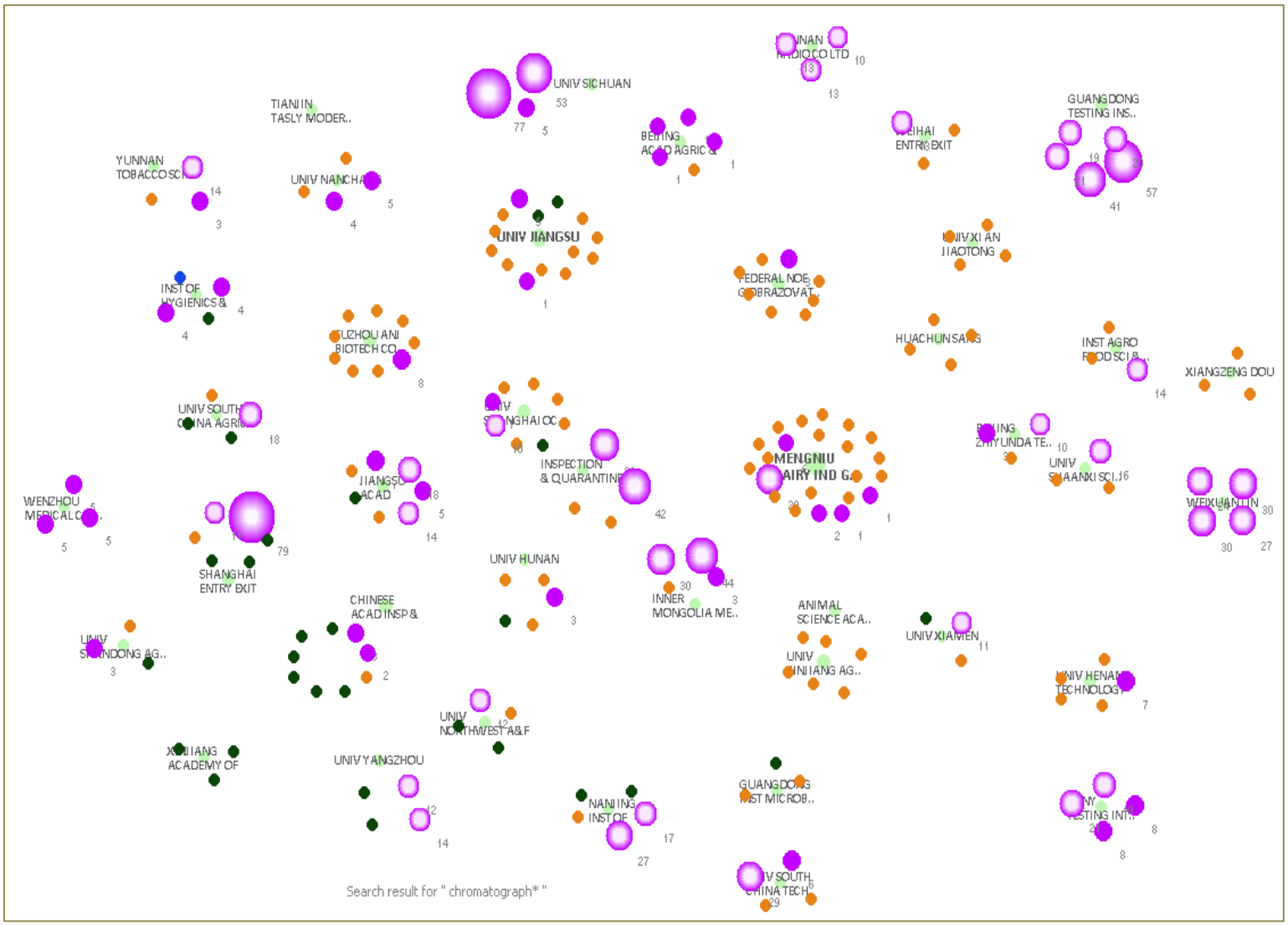
How we did it?

First various sub level food types were identified by manual research. Then by using a combination of semantic analysis tools such as clustering tools and searching tools available in Patent iNSIGHT Pro, patents were categorized under different food types. A co-occurrence matrix was generated using the co-occurrence analyzer and the resulting matrix was exported to Excel using the option provided for the same.

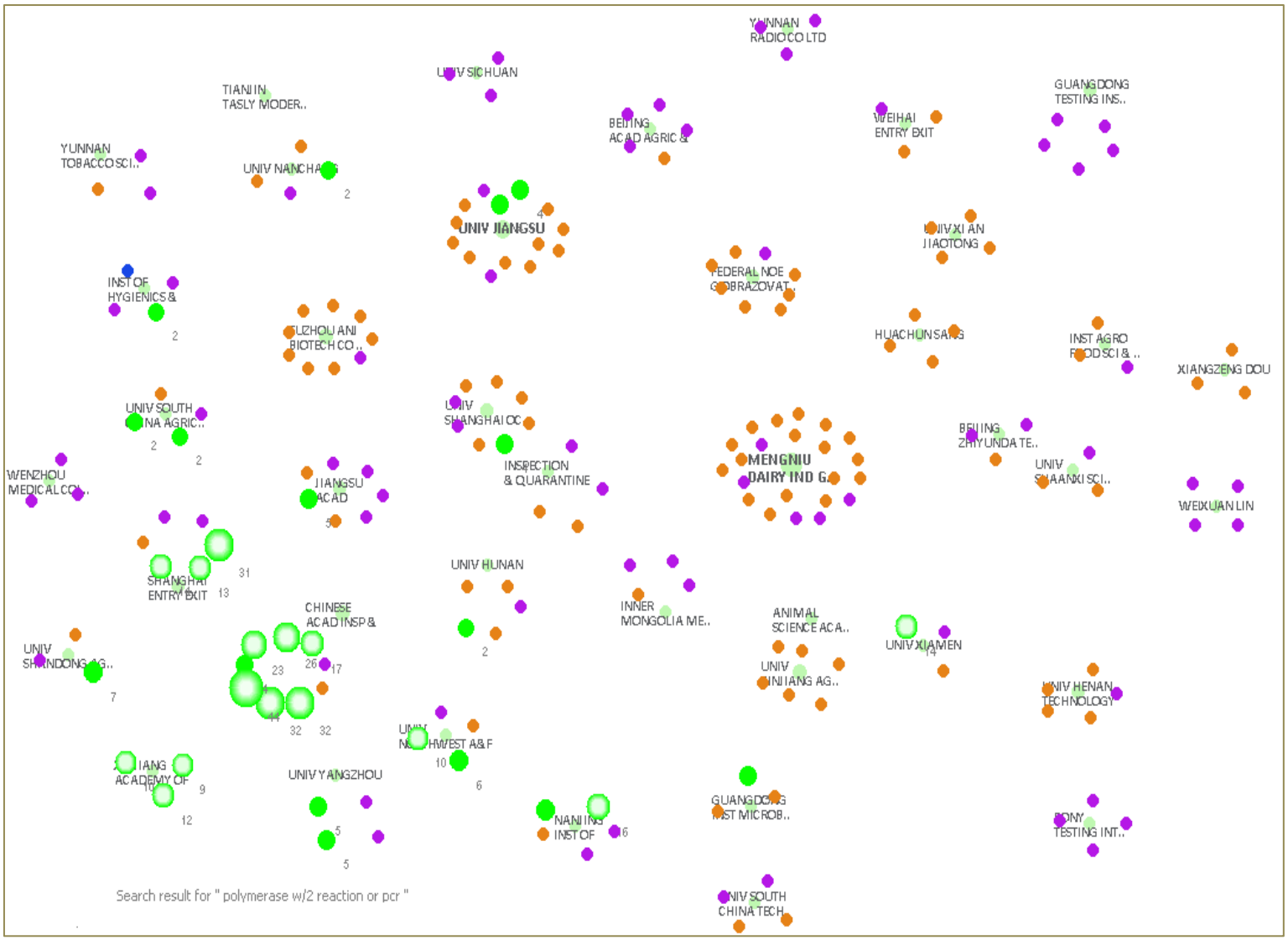
Research activity of new companies emerging in the last 5 years across top testing technologies

The map shows new assignees in the last five years. The different nodes depict the testing technologies which are used by these assignees and the count besides the coloured nodes represents the hit count of occurrences for the respective queries.

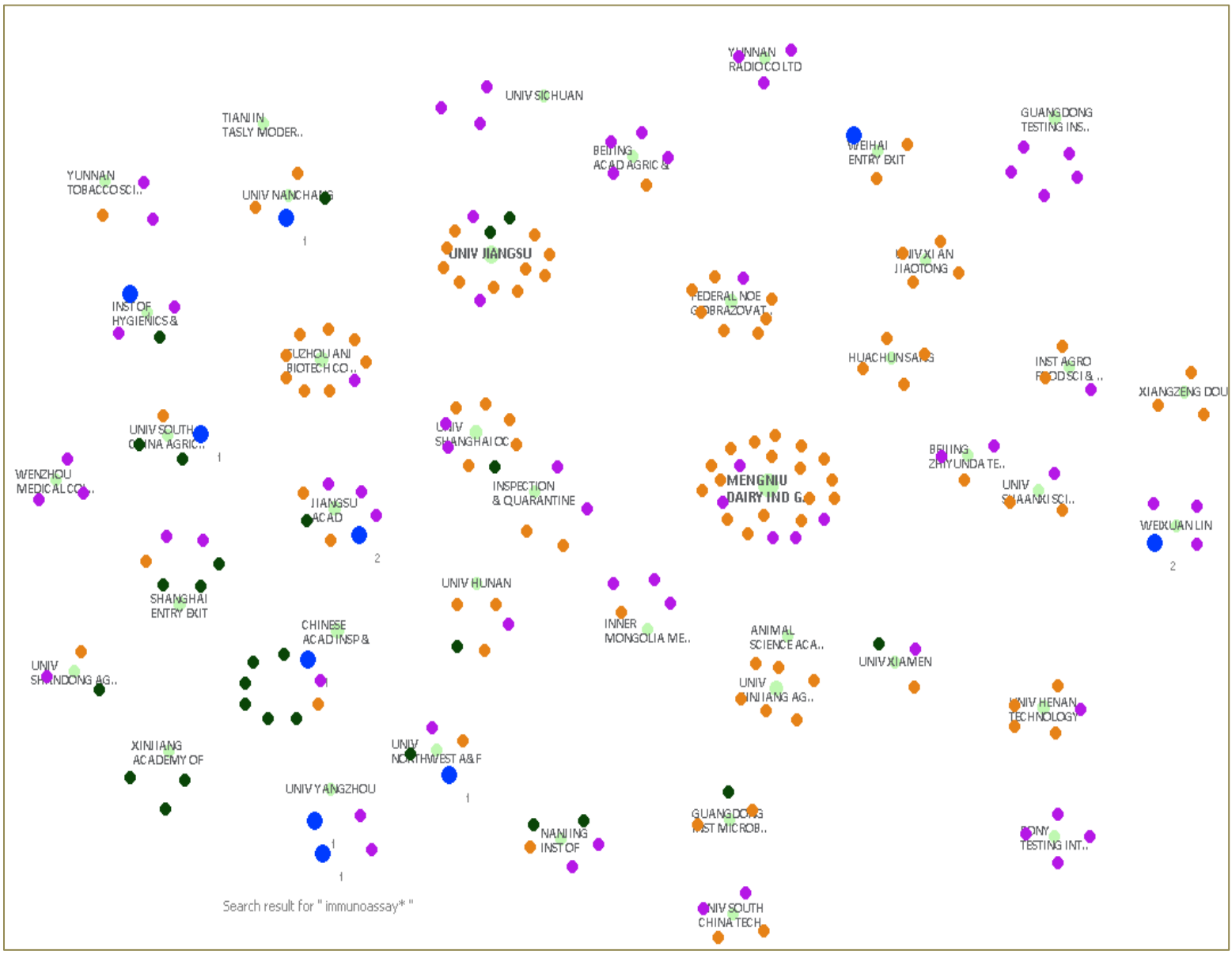
Nodes in purple represent records for query: FT contains (chromatograph*)



Nodes in green represent records for query: FT contains ((polymerase w/2 reaction) or PCR)



Nodes in violet represent records for query: FT contains (Immunoassay*)

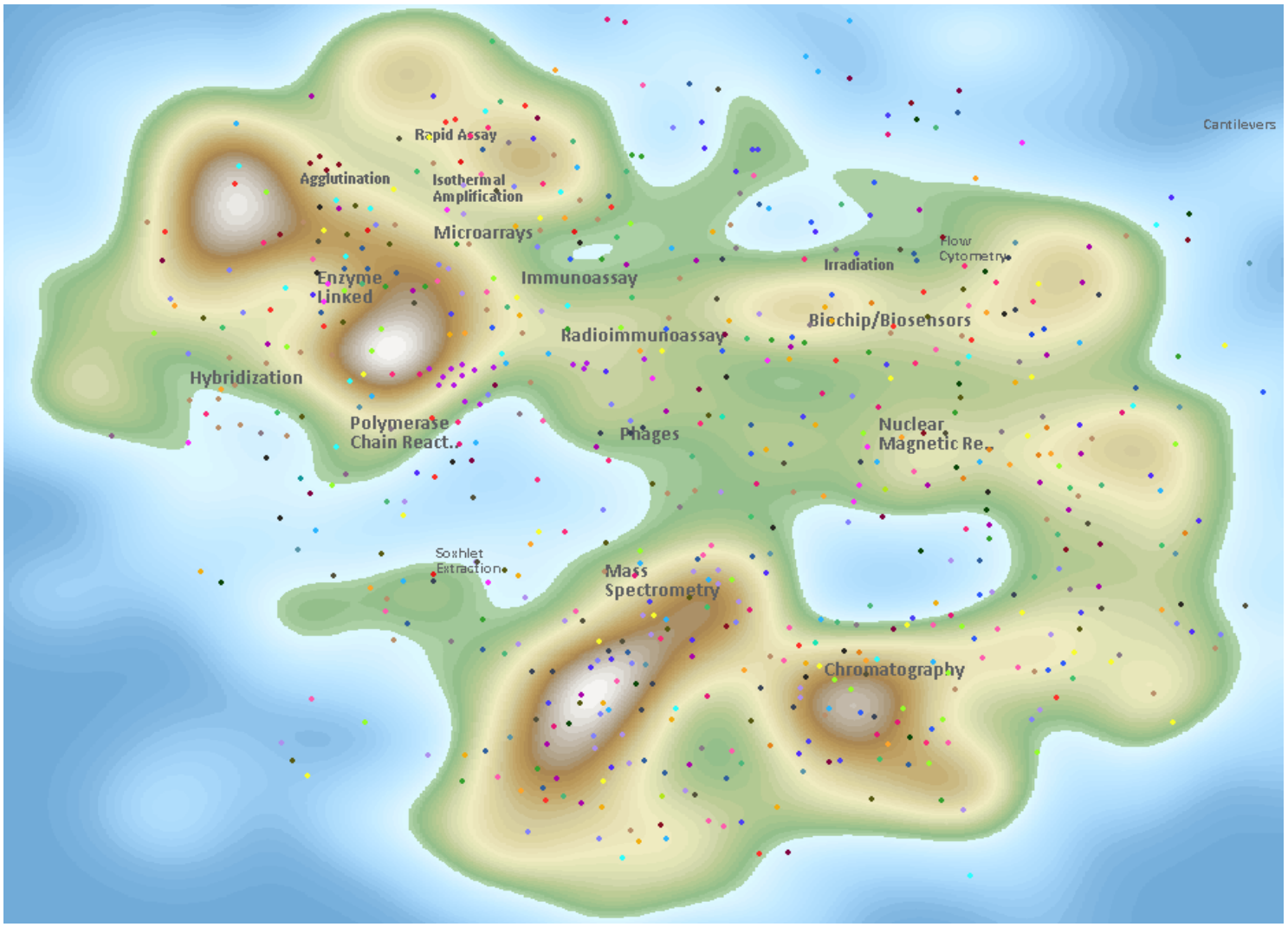


How we did it?

Records for new assignees in the last 5 years were loaded using the options within Vizmap. Then advance search option was used to search for some of the top testing technologies these companies are using to test different food items.

Testing Technology Landscape for Food Safety Testing

The contour map below represents different technologies used for testing food items with respect to complete patent portfolio. The nodes were coloured by companies.

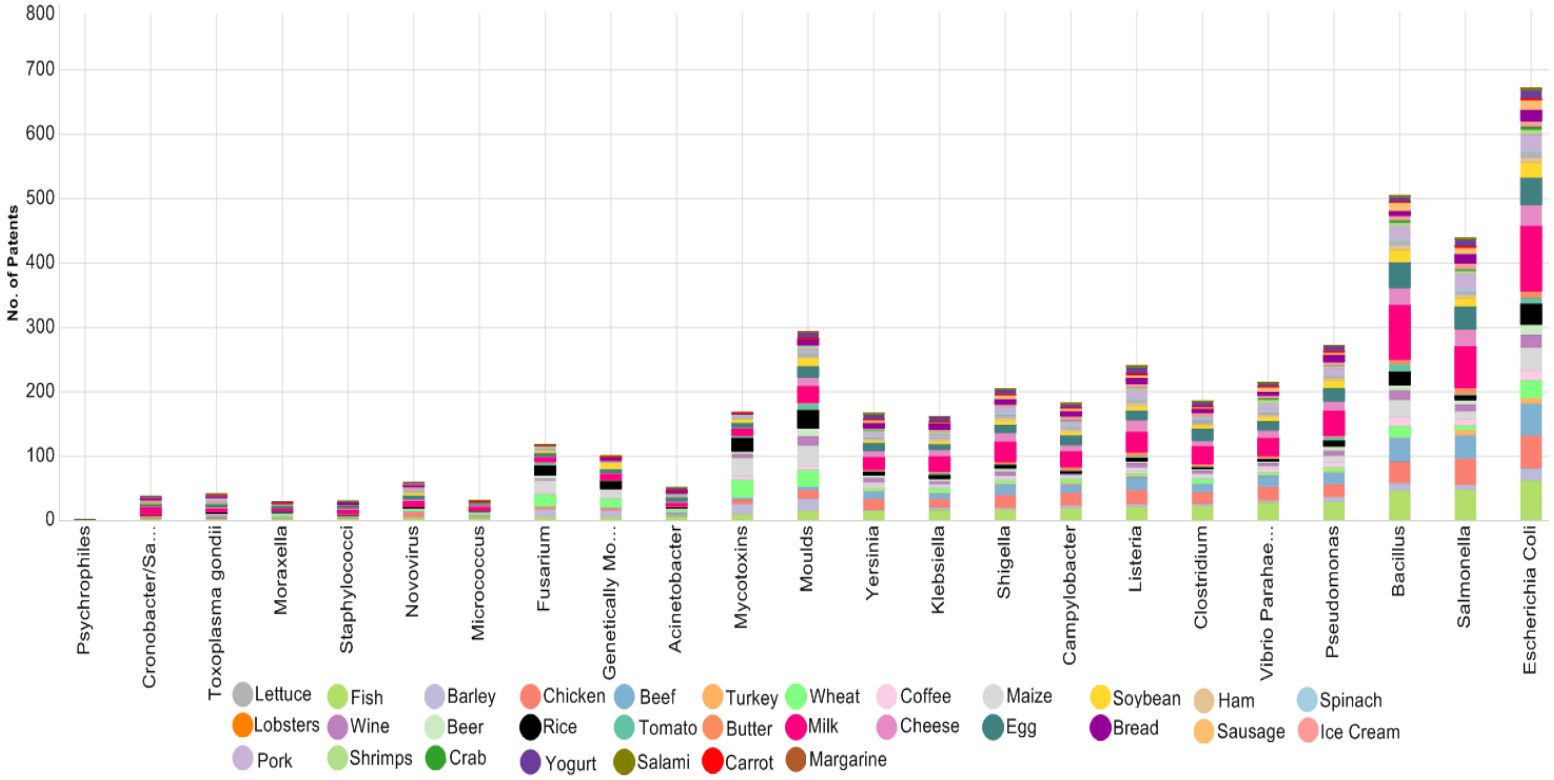


How we did it?

The VizMAP tool in Patent iNSIGHT Pro was used for this analysis. First the clusters for different testing technologies were loaded on the map. They were analyzed on basis of their contextual similarity based on title, abstract and claims. We removed unrelated patents using the "Hide Unrelated records" option and one patent assignee using the options available in VizMAP.

Food Safety Testing: Food Classification Vs Contaminants

- The below chart shows different contaminants spoiling various food items.

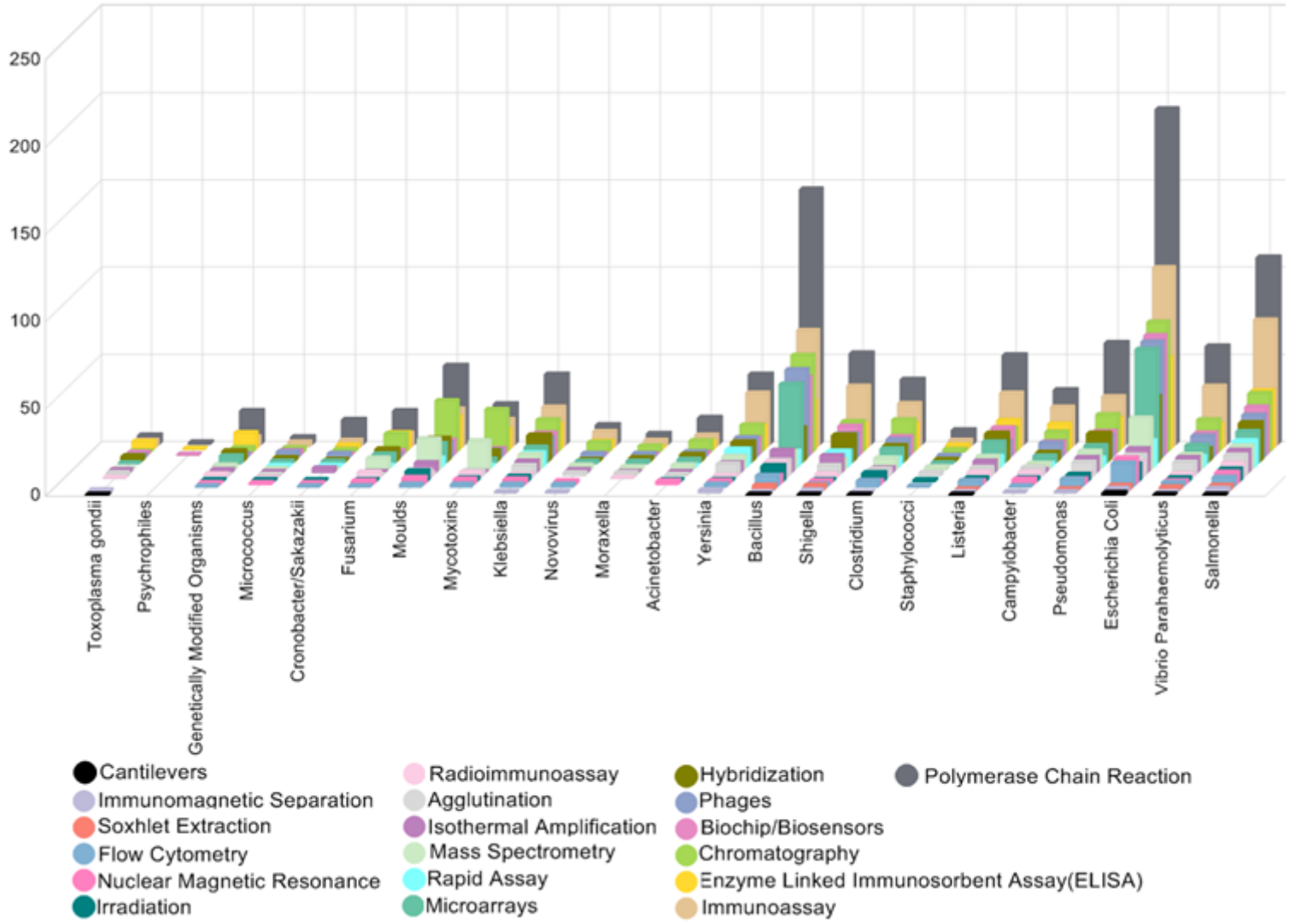


How we did it?

The clusters that were created for the analysis were correlated using the co-occurrence analyzer and the resulting matrix was converted to a Clustered column chart.

Food Safety Testing: Technologies vs Contaminants

- Chart shows the different testing technologies used to detect various contaminants.



How we did it?

The clusters that were created for the analysis were correlated using the co-occurrence analyzer and the resulting matrix was converted to a 3-d column chart.

Food Safety Testing: Chromatography Vs Contaminants

- Chart below shows different types of chromatography's used to identify different contaminants

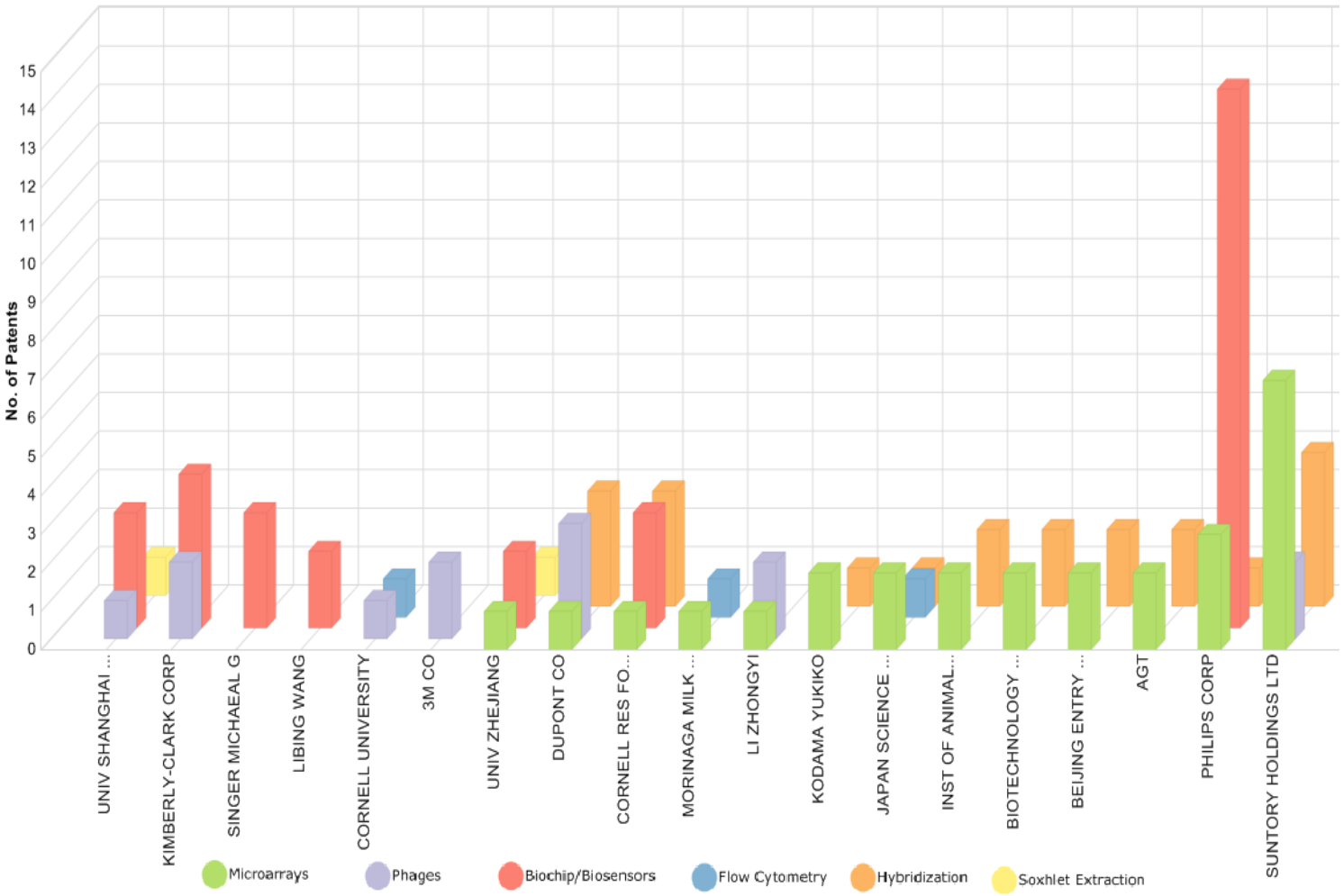
Chromatography / Contaminants	Total	Liquid	Gas	Thin Layer	Paper	Column
Total	116	82	38	23	8	29
Escherichia Coli	75	47	21	7	4	25
Bacillus	56	31	14	5	4	22
Salmonella	34	24	12	4	1	5
Moulds	30	25	8	9	5	3
Mycotoxins	25	20	11	12	1	4
Pseudomonas	22	17	9	2	1	2
Vibrio Parahaemolyticus	19	11	7	1	1	3
Klebsiella	19	13	6	2	3	5
Clostridium	19	11	9	1	1	3
Shigella	18	12	6		1	3
Yersinia	16	9	5		1	3
Listeria	14	10	8	1		3
Campylobacter	12	8	5	2		1
Fusarium	11	10	4	4	2	1
Acinetobacter	7	5	3			
Novovirus	6	3	3	2		
Moraxella	4	2	2			
Micrococcus	3	3	1	1		1
Genetically Modified Organisms	3	2	1	1		1
Staphylococci	2		2			
Cronobacter/Sakazakii	2	2	1			
Toxoplasma gondii	1		1			

How we did it?

The clusters that were created for the analysis were correlated using the co-occurrence analyzer and the resulting matrix was exported to Excel using the option provided for the same.

Company Research for emerging technologies for diagnostic purpose

- Philips Corp has research activity across biochip/biosensors as compared to other companies.
- 3M Co has filings in Phages.



How we did it?

First emerging technologies were identified by manual research. We selected emerging technologies from the already created clusters using the co-occurrence analyzer and the resulting matrix was converted to a 3-d column chart.

Appendix: Search Strings Used for Categorization

Categorization: Testing Technologies

1. Chromatography

    a) Liquid Chromatography

Liquid Chromatography	
(FT) contains (((liquid* or "high-pressure" or Hydrophilic or "Normal–phase" or Reversed* or "Reversed-phase" or "ion-exchange" or "Size-exclusion" or Bioaffinity) w/3 chromatograph*) or HPLC)	376 results

    b) Gas Chromatography

Gas Chromatography	
(FT) contains ((gas* or "vapor-phase" or "gas–liquid") w/3 chromatograph*) or VPC or GLPC))	229 results

    c) Thin Layer Chromatography

Thin Layer Chromatography	
(FT) contains (((layer* or Thin-layer) w/3 chromatograph*) or TLC*)	90 results

    d) Column Chromatography

Column Chromatography	
FT contains (column w/2chromatograph*)	72 results

    e) Paper Chromatography

Paper Chromatography	
(FT) contains (paper* w/2 chromatograph*)	24 results

2. Polymerase Chain Reaction

Polymerase Chain Reaction	
(FT) contains ((Polymerase w/3 Reaction) or PCR)	425 results

3. Immunoassay

Immunoassay	
(FT) contains (Immunoassay* or antigen* or epitope* or (enzyme w/2 immunoassay*) or EIA)	287 results

4. Mass Spectrometry

Mass Spectrometry	
(FT) contains (mass spectromet* or "LC-MS/MS" or "MS/MS" or "GC/MS" or "GC-MS" or "IMS/MS" or "IMMS")	224 results

5. Biochip/Biosensors

Biochip/Biosensors	
(FT) contains (biochip* or biosensor*)	153 results

6. Enzyme Linked Immunosorbent Assay (ELISA)

Enzyme Linked Immunosorbent Assay (ELISA)	
(FT) contains (ELISA or "enzyme w/5 assay")	152 results

7. Microarrays

Microarrays	
(FT) contains ("DNA* Microarrays" or microarray* or "lab-on-a-chip" or "microbial diagnostic microarrays" or MDM or (oligonucleotide* microarray*))	109 results

8. Phages

Phages	
(FT) contains (Phages or bacteriophage*)	79 results

9. Hybridization

Hybridization	
(FT) contains ((Hybridization w/3 DNA) or "DNA w/2 melting")	67 results

10. Nuclear Magnetic Resonance

Nuclear Magnetic Resonance	
(FT) contains ("Nuclear magnetic resonance" or NMR)	67 results

11. Irradation

Irradation	
(FT) contains ((food w/3 (irradiat* or radiat*)) or (ioniz* w/3 radiat*) or ((Electron* or gamma or xray or x-ray) w/3 irradiat*))	50 results

12. Isothermal Amplification

Isothermal Amplification	
(FT) contains (isothermal w/3 amplificat*)	39results

13. Radioimmunoassay

Radioimmunoassay	
(FT) Contains (Radioimmunoassay or RIA or RAST or radioallergosorbent)	35 results

14. Rapid Assay

Rapid Assay	
(FT) contains (rapid w/3 assay*)	26 results

15. Flow Cytometry

Flow Cytometry	
(FT) contains (flow w/3 cytometry)	26 results

16. Agglutination

Agglutination	
(FT) contains (agglutination or hemagglutination or Leukoagglutination)	24 results

17. Immunomagnetic Separation

Immunomagnetic Separation	
(FT) contains (Immunomagnetic w/3 Separat* or "IMS")	6 results

18. Cantilever

Cantilever	
(FT) contains (cantilever* w/3 (sensor* or biosense* or "bio w/2 sensor")))	6 results

19. Soxhlet Extraction

Soxhlet Extraction	
(FT) contains (Soxhlet or micro-soxhlet)	18 results

Categorization: Foods Tested

1. Beverages

Beverages	
(FT) contains (coffee or beer or wine or whiskey or softdrink* or whisky or "soft* drink*" or tea or juice)	530 results

2. Dairy Products

Dairy Products	
(FT) contains (Cheese* or Cream or sorbet* or Milkshake* or milk or yogurt* or butter*)	653 results

3. Desserts

Desserts	
(FT) contains (Cake* or pastrie* or dessert* or Cookie* or Chocolate* or Cheesecake* or "fruit w/2 salad" or Tart or tarts or flan or flans or custard* or "fruit w/2 pie*" pudding* or brownie* or cupcake* or icecream* or ice-cream* or muffin* or bagel* pie or pies)	121 results

4. Food Grains

Food Grains	
(FT) contains (cereal* or rice or "food* grain*" or foodgrain* or wheat or maize or barley)	485 results

5. Fruits & Vegetables

Fruits & Vegetables	
(FT) contains (vegetable* or fruit* or pear* or apricot* or peache* or coleslaw or salad* or lettuce* or Onion*or Apple* or Lemon* or Pear* or Kiwifruit or Potato* or carrot* or cauliflower or broccoli or "Brussels sprout*" or eggplant* or "Kimchior Chicoryor Asparagus" or cabbage or Tomato*) and not (vegetable oil*)	580 results

6. Meat

Meat	
(FT) contains (Brawn or meat* or poultry or Kebab* or Turkey or pattie* or frankfurters or saveloys or ham or "corned silverside" or salami* or "Smoked meat*" or pastrami or pork or chicken* or beef or egg* or livestock or mutton or sausage*)	735 results

7. Seafood

Seafood	
(FT) contains (shrimps or prawns or Crustaceans or molluscs or Crawfish or Crayfish or fish or seafood or Herrings or shellfish or Surimi* or crab* or mussels or oysters or winkles or scallops or lobster*)	299 results

Categorization: Contaminants

1. Acinetobacter

Acinetobacter	
(FT) contains (Acinetobacter* or "A. baumannii" or "A. lwoffii")	18 results

2. Bacillus

Bacillus	
(FT) contains (Bacillus or cereus or "B. anthracis" or "B. thuringiensis" or "B. subtilis" or "B. coagulans" or "Bacillus coahuilensis" or "Bacillus pumilus" or weihenstephanensis or "Bacillus halodurans" or "Bacillus clausii" or enterotoxins)	231 results

3. Campilobacter

Campilobacter	
(FT) contains (Campylobacter* or "twisted bacteria" or "C. coli" or "C.fetus")	46 results

4. Clostridium

Clostridium	
(FT) contains (clostridium* or Firmicutes or "C. botulinum" or "C. difficile" or "C. perfringens" or "C. tetani" or "C. sordellii")	65 results

5. Cronobacter/Sakazakii

Cronobacter/Sakazakii	
(FT) contains (Cronobacter or "Enterobacter sakazakii" or "E. sakazakii" or "C. turicensis" or "C. muytjensii" or "C. dublinensis" or "C. malonaticus")	16 results

6. Escherichia Coli

Escherichia Coli	
(FT) contains (Escherichia Coli or "e. coli" or albertii or fergusonii or Verocytotoxin)	304 results

7. Fusarium

Fusarium	
(FT) contains (Fusarium or "F. avenaceum" or "F. culmorum" or "F. graminearum" or "F. oxysporum" or "F. sporotrichioides"" or F. tricinctum" or "F. verticillioides")	25 results

8. Genetically Modified Organisms

Genetically Modified Organisms	
(FT) contains ((Genetically w/2 organisms) or GMO)	21 results

9. Klebsiella

Klebsiella	
(FT) contains (Klebsiella or "K. granulomatis" or "K. oxytoca" or "K. pneumoniae" or "K. terrigena" or "K. planticola")	62 results

10. Listeria

Listeria	
(FT) contains (listeria*)	74 results

11. Micrococcus

Micrococcus	
(FT) contains (Micrococcus or "M. luteus" or "M. roseus")	10 results

12. Moraxella

Moraxella	
(FT) contains (Moraxella*)	6 results

13. Moulds

Moulds	
(FT) contains ((moulds or Alternaria or Aspergillus or Botrytis or Cladosporium or Fusarium or Geotrichum or Monilia or Manoscus or Mortierella or Mucor or Neurospora or Oidium or Oosproa or Penicillium or Rhizopus or Thamnidium)	88 results

14. Mycotoxins

Mycotoxins	
(FT) contains (mycotoxins or Aflatoxins or Ochratoxin A or Patulin or Deoxynivalenol or Zearalenone or Fumonisins or Citrininor T-2 or HT-2)	48 results

15. Novovirus

Novovirus	
(FT) contains (Norovirus* or ((Norwalk or Hawaii or Snow Mountain or Mexico or Desert Shield or Southampton or Lordsdale or Wilkinson) w/2 virus))	13 results

16. Pseudomonas

Pseudomonas	
(FT) contains (Pseudomonas or "P. syringae" or "P. putida" or "P. fluorescens" or "P. aeruginosa" or "P. oryzihabitans" or "P. plecoglossicida" or "Ps. fragi")	92 results

17. Psychrophiles

Psychrophiles	
(FT) contains (Psychrophiles or cryophiles)	1 results

18. Salmonella

Salmonella	
(FT) contains (Salmonella*)	182 results

19. Shigella

Shigella	
(FT) contains (Shigella or dysenteriae or flexneri or boydii or sonnei)	78 results

20. Staphylococci

Staphylococci	
(FT) contains staphylococci*	10results

21. Toxoplasma gondii

Toxoplasma gondii	
(FT) contains ("Toxoplasma gondii" or tachyzoites or merozoites or bradyzoites or cysts or sporozoite*)	8 results

22. Vibrio Parahaemolyticus

Vibrio Parahaemolyticus	
(FT) contains (Vibrio or cholerae or parahaemolyticus or vulnificus)	84 results

23. Yersinia

Yersinia	
(FT) contains ("Yersinia enterocolitica" or "Y. enterocolitica" or Yersinia)	53 results

Summary

This report categorizes and graphically analyzes food testing technologies, types of foodstuff tested and different contaminants spoiling foodstuffs from various perspectives and highlights the key companies involved.

While growth slowed in 2008 and 2009, related to economic downturn in European countries, the pace for increased market stability has increased in Asia. United States use to be the largest market for food testing. However, the Asia-Pacific region (which includes China and India) is the fastest growing region for food safety testing.

A similar report "Food Safety Testing Market By Contaminants (Pathogen, GMO, Toxin, Pesticide, Others), Technology (Traditional & Rapid), Food Types (Meat & Poultry, Dairy, Fruit & Vegetable, Processed Food, Others) & Geography - Global Trends Forecast to 2018," analyzes the global food safety testing market with respect to global revenue and volume for food safety testing. Trends, opportunities and challenges for global food safety are also described.

The global food safety testing market has grown in large part to increased numbers of outbreaks of foodborne illness caused by consumption of contaminated food. Worldwide, various regulations and standards have been implemented to assure the safety of manufactured food. Food safety testing is performed at every stage of the food supply chain. In 2012, this market was dominated by pathogen testing, as most of the food recalls in the U.S. during this time were due to Salmonella contamination. Vendors of testing services have focused on the application of rapid testing methods that provide quick and accurate results.

The global food safety testing market is projected to grow from $9,262.3 million in 2012 to $14,030.2 million by 2018. In 2012, North America was the largest food safety testing market with 40% of market share, and meat and poultry accounted for 28% of the global food safety testing market. Additionally, rapid testing methods were dominated by PCR-based methods, followed by immunoassay-based methods. The major vendors plan to focus on new products and services, as well as expanding of their business segments to maintain a prime position in the market.

Research reveals that factory animal farms are breeding grounds for drug-resistant bacteria which are then passed on to humans through the food supply. This happens because factory farm animals are routinely dosed with both antibiotics and vaccines, causing serious imbalances in their own intestinal flora and immune function. This makes these factory farm animals the

perfect hosts for breeding drug-resistant superbugs such as S. aureus, a particularly nasty strain that can be fatal if ingested.

(Ref: http://www.foodsafetymagazine.com/news/food-safety-testing-market-worth-140302-million-by-2018/
http://www.naturalnews.com/032111_fresh_meat_superbugs.html)

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Sources & References

http://en.wikipedia.org/wiki/Polymerase_chain_reaction
http://www.sterigenics.com/services/food_safety/food_irradiation__questions_answers.pdf
http://en.wikipedia.org/wiki/Food_irradiation
http://en.wikipedia.org/wiki/Immunoassay
http://www.rapidmicrobiology.com/test-methods/Molecular-Methods-Food-Pathogens.php
http://www.foodsafetynews.com/2010/05/phages-a-new-means-of-food-safety/#.UfDiRtJHLMw
https://en.wikipedia.org/wiki/Chromatography
http://en.wikipedia.org/wiki/High-performance_liquid_chromatography
http://www.foodandwaterwatch.org/factsheet/bacteriophages/
http://www.kaloramainformation.com/about/release.asp?id=1329
http://en.wikipedia.org/wiki/Phage_therapy
http://www.ars.usda.gov/is/AR/archive/jul08/food0708.pdf__
https://en.wikipedia.org/wiki/Mass_spectrometry
http://en.wikipedia.org/wiki/Nuclear_magnetic_resonance
http://www.slideshare.net/princeelackad/soxhlet-extraction
http://www.ifst.org/learninghome/helpforteachers/lessonplantopics/milkanddairyproducts/#2
http://en.wikipedia.org/wiki/Listeria
http://en.wikipedia.org/wiki/Salmonella
http://en.wikipedia.org/wiki/Gram-negative_bacteria
http://en.wikipedia.org/wiki/Campylobacter
http://en.wikipedia.org/wiki/Clostridium
http://en.wikipedia.org/wiki/Vibrio
https://en.wikipedia.org/wiki/Escherichia_coli
http://en.wikipedia.org/wiki/Bacillus
http://en.wikipedia.org/wiki/Pseudomonas#Taxonomy
http://en.wikipedia.org/wiki/Acinetobacter
http://faculty.weber.edu/coberg/class/3853/3853%20MOs%20and%20Food%20Spoilage%20notes.htm
http://en.wikipedia.org/wiki/Foodborne_illness
http://en.wikipedia.org/wiki/Toxoplasma_gondii
http://en.wikipedia.org/wiki/Mycotoxin
http://en.wikipedia.org/wiki/Klebsiella