

Patent Insights Infant Health

Report dated 10 June 2020

Author: Peter Brown, IPSynergy

CONTENTS

1.INTRODUCTION	4
1.1.Executive Summary	5
1.2.Purpose and Outputs of this Report.....	6
1.3.Subject Matter Focus of our Patent Landscape	6
2.PATENT TRENDS IN INFANT HEALTH.....	7
2.1.Overall Patent Application Trend in Infant Health Landscape (past 20 years)	8
2.2.Ranking of Players in Infant Health Patent Landscape (past 20 years).....	9
2.3.Countries Generating the Most Patent Filings (past 20 years)	10
2.4.Chinese Patent Applicants by Province (past 20 years).....	11
2.5.Values of Infant Health Patents (past 20 years).....	12
2.6.Top Applicants and Regions (past 12 months)	13
2.7.Health Outcomes Linked to Infant Health (past 12 months)	14
2.8.Functional Actives Linked to Infant Health (past 12 months)	15
2.9.Health outcomes vs Primary Actives (past 12 months).....	16
2.10.Patent Word Clouds of Chinese Patents (past 12 months).....	17
2.11.Relevance of NZ Foods in the Chinese Patents (past 12 months)	18
3.SPOTLIGHT ON SELECTED PATENTS	19
4.CASE STUDIES	21
4.1.Case Study 1: Chinese Patents on Infant Nutrition.....	22

4.2.Emergence of OPO as Hot Bioactive in Infant Health Patent Landscape.....	23
4.3.Case study 3: New Start-Up Analysis: Evolve Biosystems	24
5.BULL’S EYE PATENTS	25
6.HALO PATENTS.....	28
7.BACKGROUND PATENTS.....	32
8.THE EXTRA STUFF	39
8.1.Searching and Refinement Process.....	39
8.2.Author of this Report	39

1.INTRODUCTION



1.1. Executive Summary

1

We identify 84 newly published patents since our last report in March 2019 that we consider are relevant to infant health. This continues a healthy but flat patent filing trend over the past five years.

2

We see an increasing dominance of Chinese filers in 2019 with about 60% of the filings coming from Chinese applicants, led by the Jiangsu province. Just over 50% of the Chinese patent filings are based on Western nutrients/foods and science, not traditional herbal medicine (THM).

3

Even though the majority of 2019 filings were from Chinese companies, we do not see any “heavy hitter” filers. Instead, each Chinese applicant has 1 or 2 filings, and most are new to patents. Regardless, looking historically over the last 20 years, the infant nutrition patent landscape is still largely controlled by large multinationals like Nestle, Nutricia, Mead Johnson and Abbott Laboratories. Nestle and Nutricia still led the charge this year.

9

We will be hosting webinars through Tranche 2 to dig deeper into areas of interest in this patent landscape, so keep an eye out for the announcements!

8

We provide [three Case Studies](#). One towards Chinese approach to infant nutrition. Another towards OPO triglycerides as a hot new bioactive. And third, we take an in-depth look of US based start up Evolve Biosystem.



4

In [Sections 2.7 to 2.9](#), we compare patents between Western nutrients /food to THM based approaches, both in terms of target health outcomes and the identified bioactive(s) used. For instance, THMs overriding focus is on transit time (e.g. constipation) and immunity in infants, whereas Western based approaches strongly focus on the microbiome, immunity and allergies.

6

Other than kumara, we see no patents centred on, or even mentioning indigenous NZ plants for infant nutrition. This is encouraging because it supports a “white space opportunity” for differentiation.

5

7

We [Spotlight 9 patents](#) that are of particular interest to the HVN community, and to help guide approaches to our NZ based projects.

We are pleased to see a healthy spread of NZ Inc / HVN target foods at play in Chinese patents, including dairy, kumara (or other similar root vegetables), berries, bananas, kiwifruit, feijoa, cereals and marine derived nutrients.



1.2. Purpose and Outputs of this Report

Provided by [HVN's Science of Food Platform](#), the purpose of this report is to provide HVN members with an update outlining patent insights and trends in food based approaches to immune health since the March 2019 report. The outputs of this report are:

- an executive summary;
- patent trends and insights over the past year, and in comparison to the landscape over the past 20 years;
- spotlight on key patents and case studies with take-home messages for HVN; and
- details and access (through web-links) to each new patent in this review period.

This report should not be taken as specific advice relating to your intellectual property strategy, freedom to operate, commercial or legal matters. You should always seek your own independent advice relating to your situation. IPSynergy is happy to help.

1.3. Subject Matter Focus of our Patent Landscape

Relevant patents included in this report are those published after 13 March 2019, providing infant health outcomes through oral interventions, with specific emphasis on the weaning period. We excluded patents if they were focused on pharmaceutical drugs, therapeutic treatments of disease states (opposed to preventative approaches of interest), synthetic compounds / molecules, recombinant technology or genetically engineered material, non-human animal treatments, non-oral routes of intervention, and diagnostics.

Bull's Eye patents support infant nutrition with an immunity focus through prebiotics targeting the gut microbiome. Bull's Eye patents will typically also be those utilising foods, nutrients or bioactives that have links to New Zealand's food industry.

Halo patents are close to that defined as Bull's Eye, but for one reason or another are not deemed of key relevance (e.g. utilising a probiotic rather than a prebiotic, poor scientific data, or the patent is not focused primarily on infant health).

Background patents refer generally to infant health but not aligned on HVN focus.

2. PATENT TRENDS IN INFANT HEALTH

Quick tip: We can interrogate the data generated for this report to answer any specific questions for HVN members beyond the insights shown here. Please get in touch with Peter at IPSynergy (peter.brown@ipsynergy.co.nz) to discuss any burning questions.

IPSynergy has generated the analytics in this report using its access to:

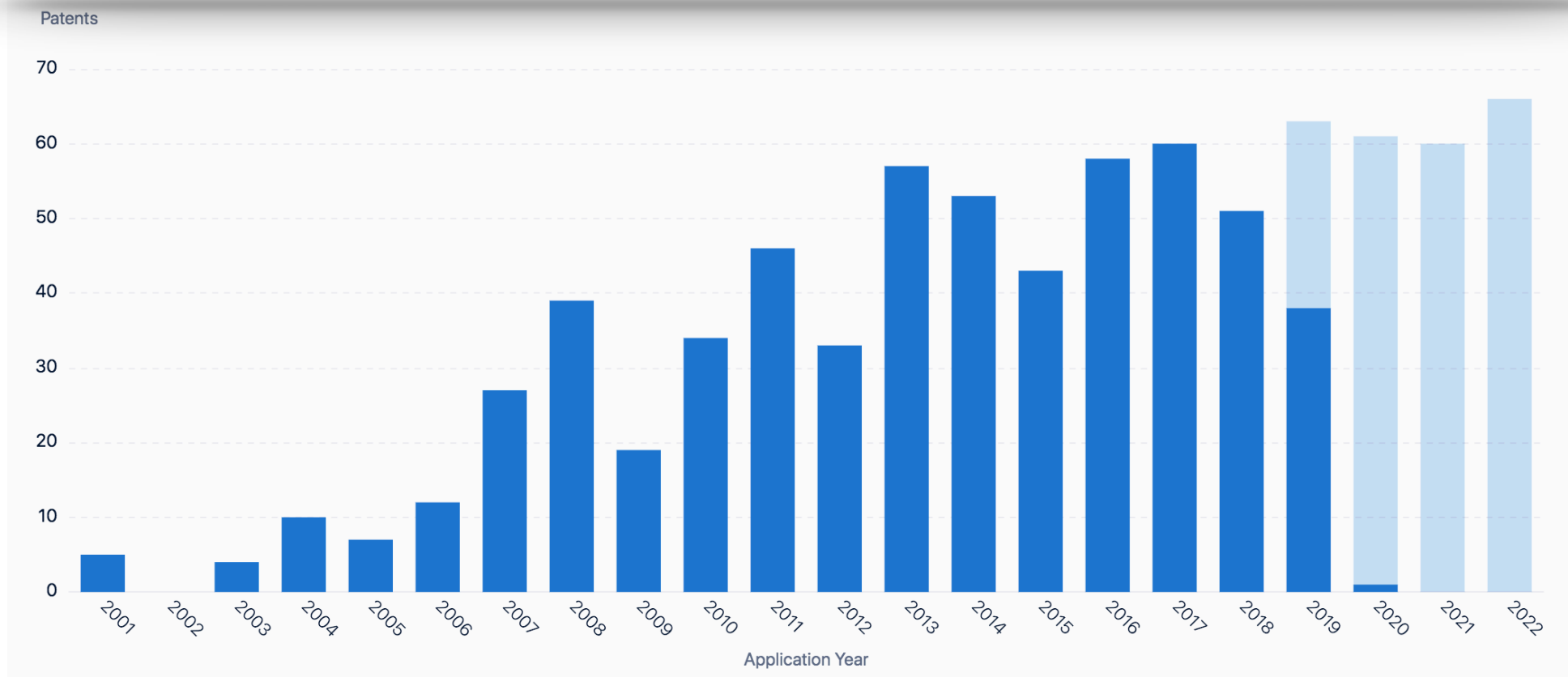
patsnap



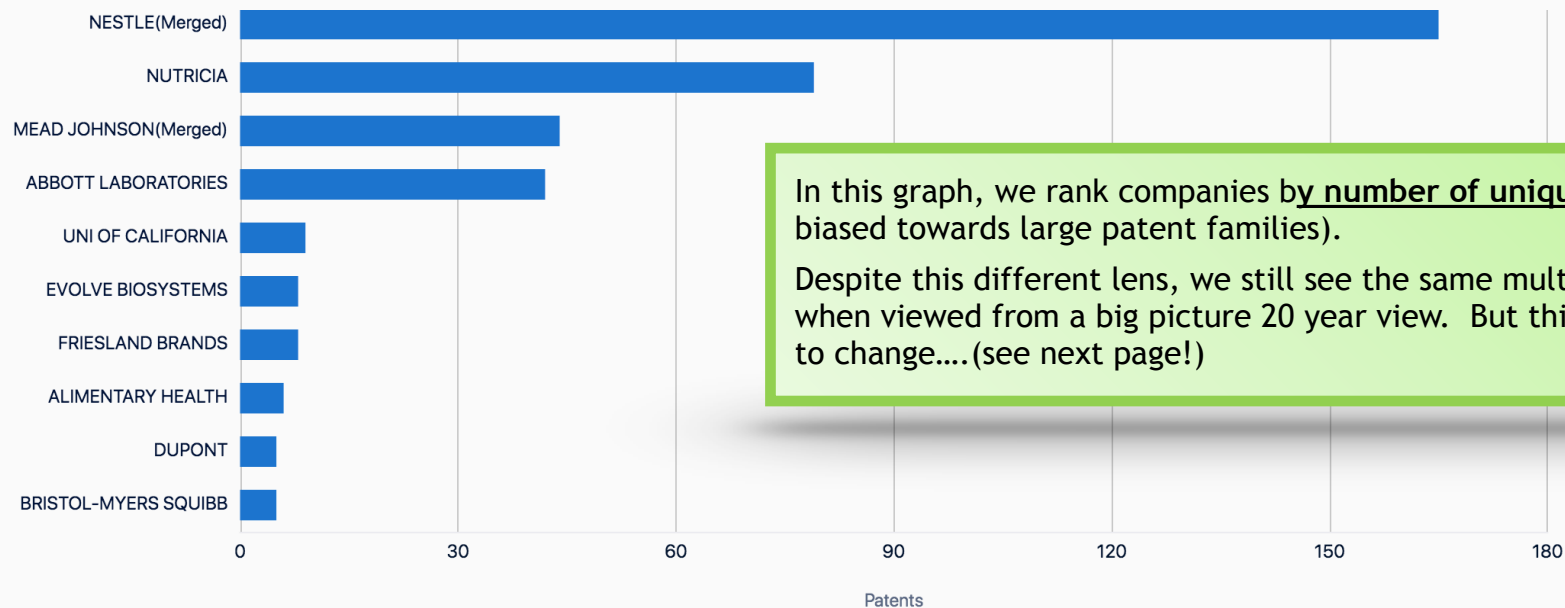
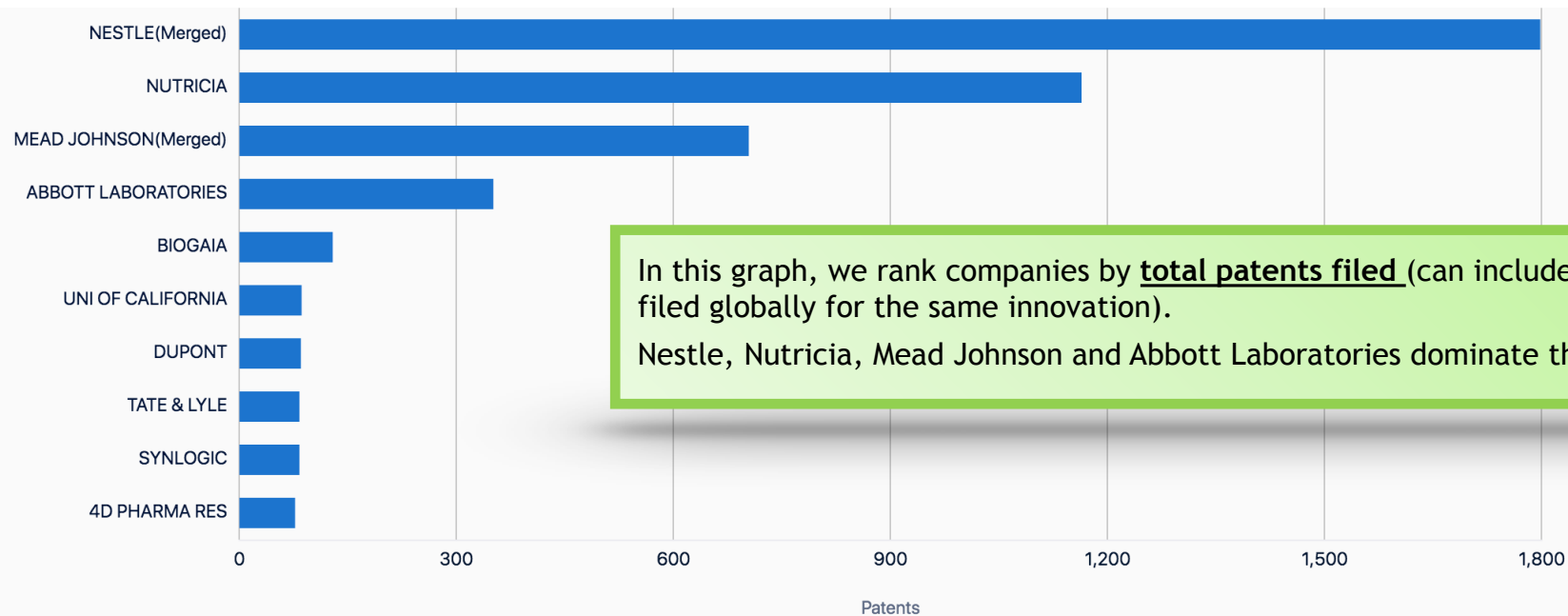
discovery

2.1.Overall Patent Application Trend in Infant Health Landscape (past 20 years)

In this latest review period, we have found 84 new relevant patent applications relating to infant nutrition. This continues a modest upward trend of new patent filings since about 2013, although 2018 (data fully completed) is down. Therefore we have not seen the same incline as HVN's other health platforms which have each seen strong growth in recent years. Currently, there are only about 600 unique patent families in our Infant Health landscape, totalling 6662 patent rights globally. Note the light blue bars indicate PatSnap's predicted trend for the next few years, and the data for 2019 will only be fully complete in next year's review.

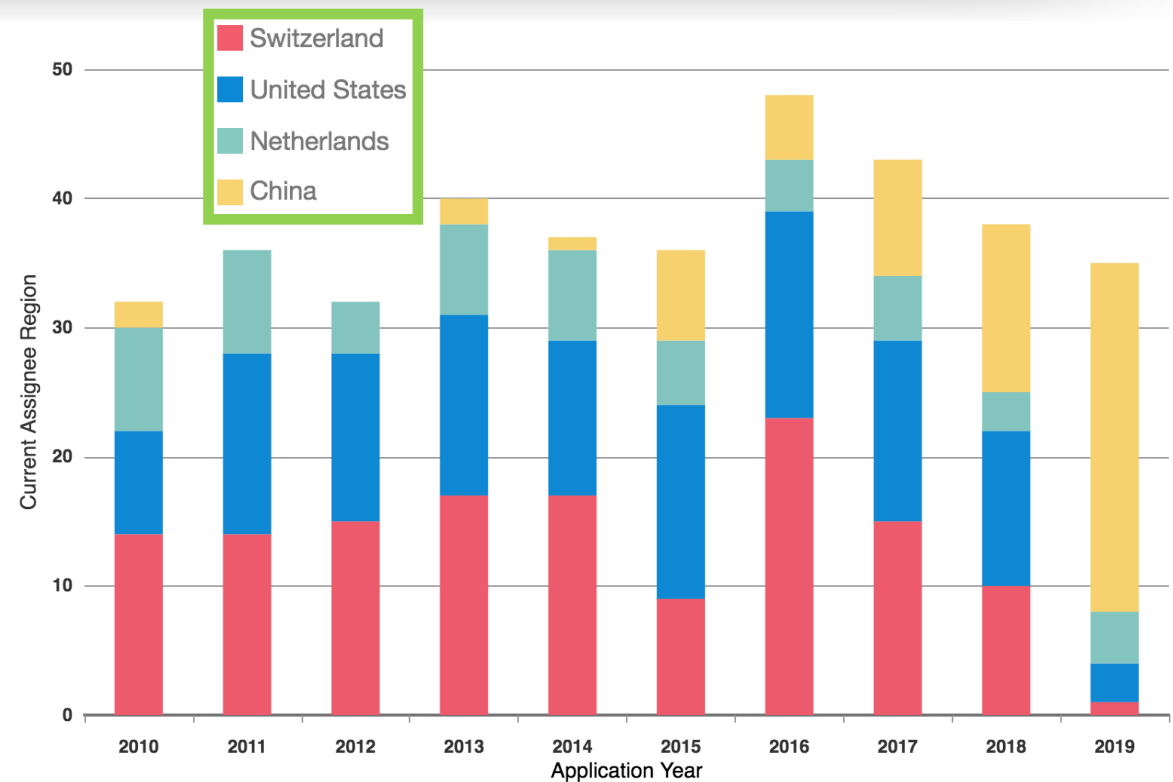
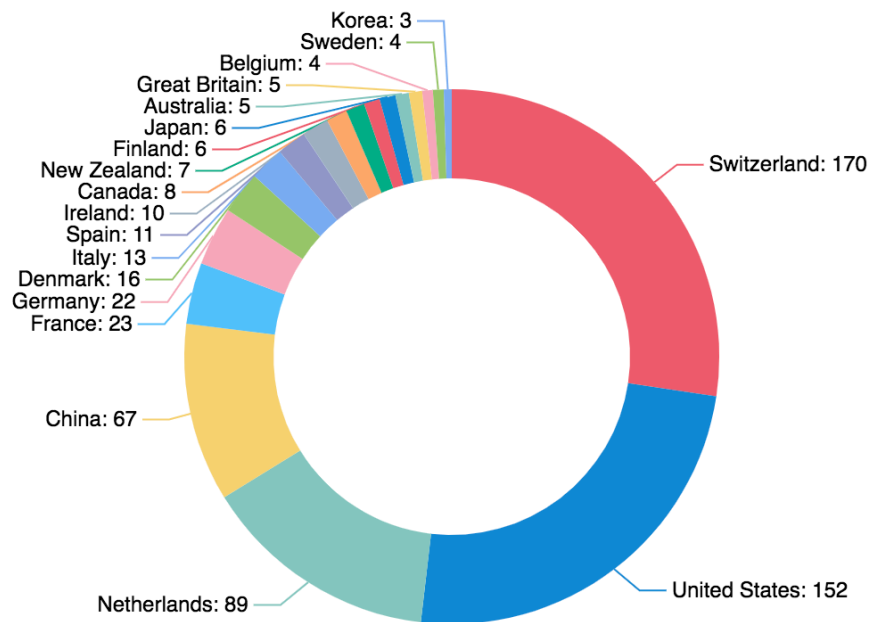


2.2. Ranking of Players in Infant Health Patent Landscape (past 20 years)

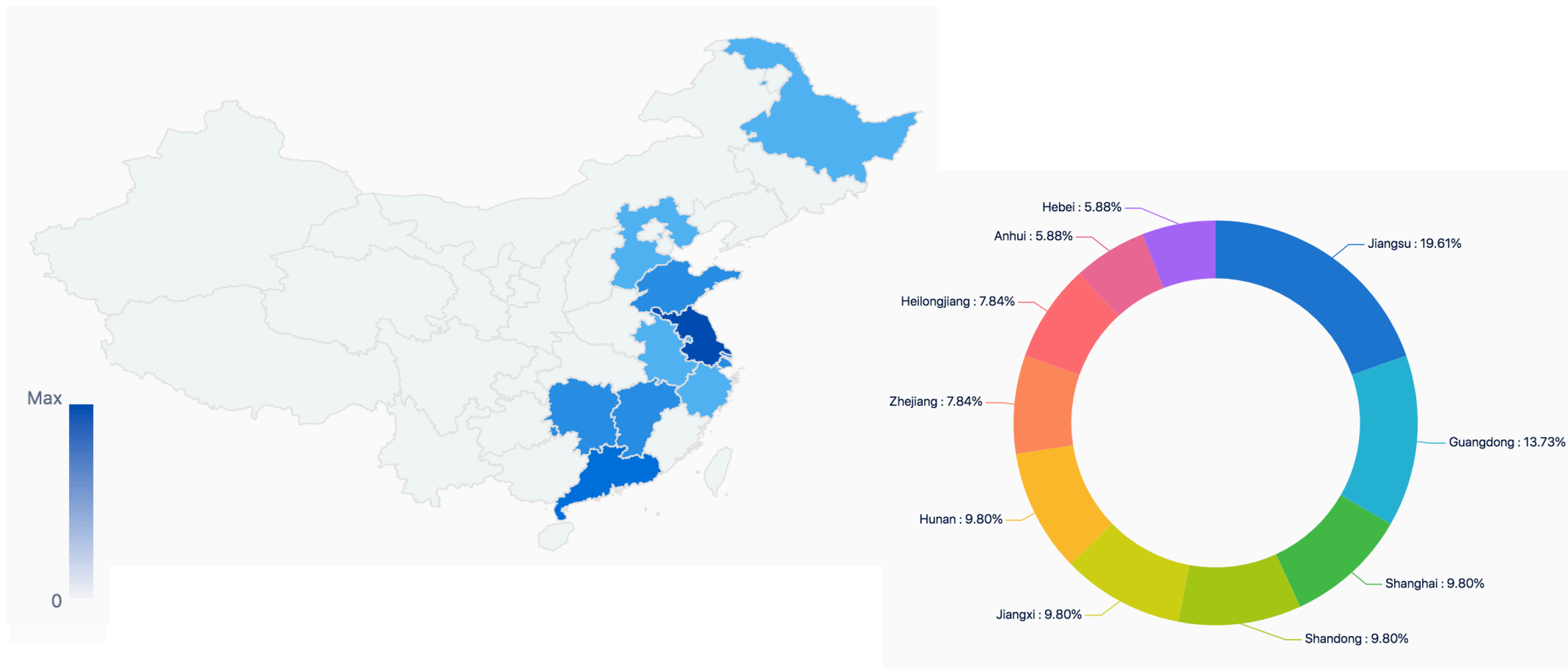


2.3. Countries Generating the Most Patent Filings (past 20 years)

These graphs speak a 1000 words. As seen on the left, Switzerland (primarily Nestle) and USA have dominated the infant nutrition patent landscape over the past 20 years. However, as shown on the right, we are now seeing a dramatic rise in the number of Chinese patent filings in recent years, with a significant reduction in US and Swiss patents. If not for the Chinese activity, we would see an even greater reduction in overall patent applications related to infant nutrition in 2018/2019.

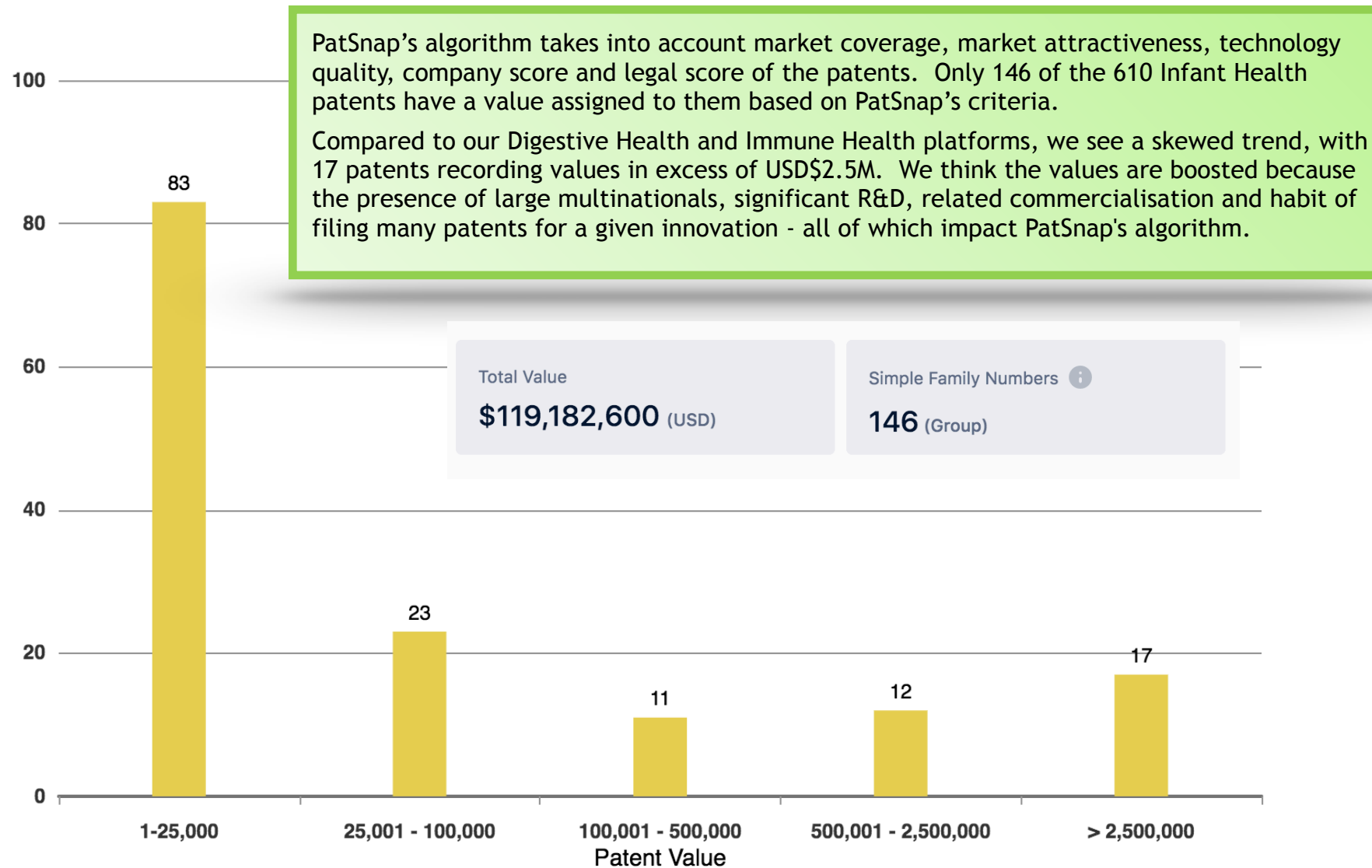


2.4.Chinese Patent Applicants by Province (past 20 years)

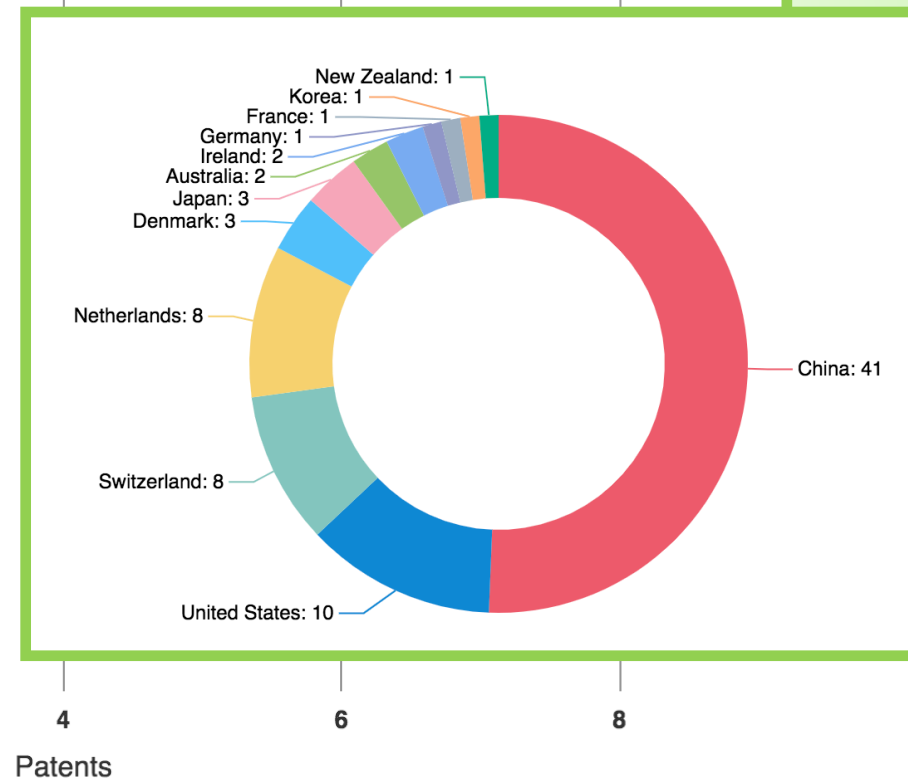
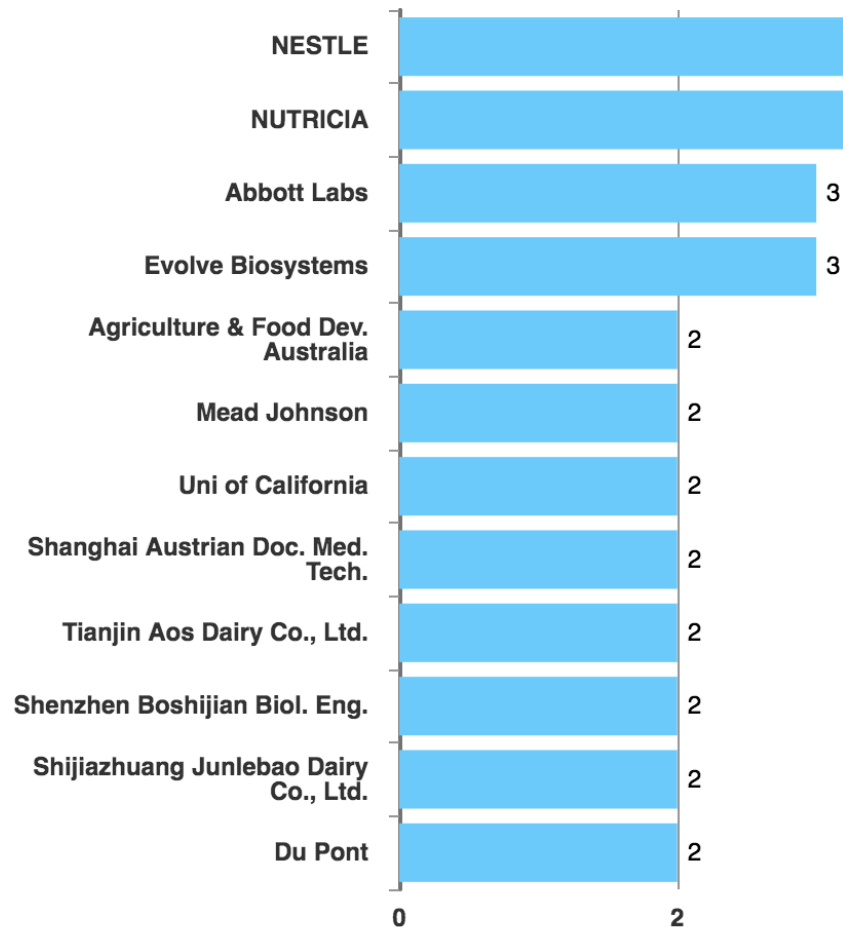


When we scan across all the Chinese applications in our Infant Nutrition landscape over the past 20 years, we see that Jiangsu province contributes the most innovation based on the number of patent filings. This is a similar result to our Immune Health patent landscape (NB: over the past 12 months).

2.5. Values of Infant Health Patents (past 20 years)



2.6. Top Applicants and Regions (past 12 months)

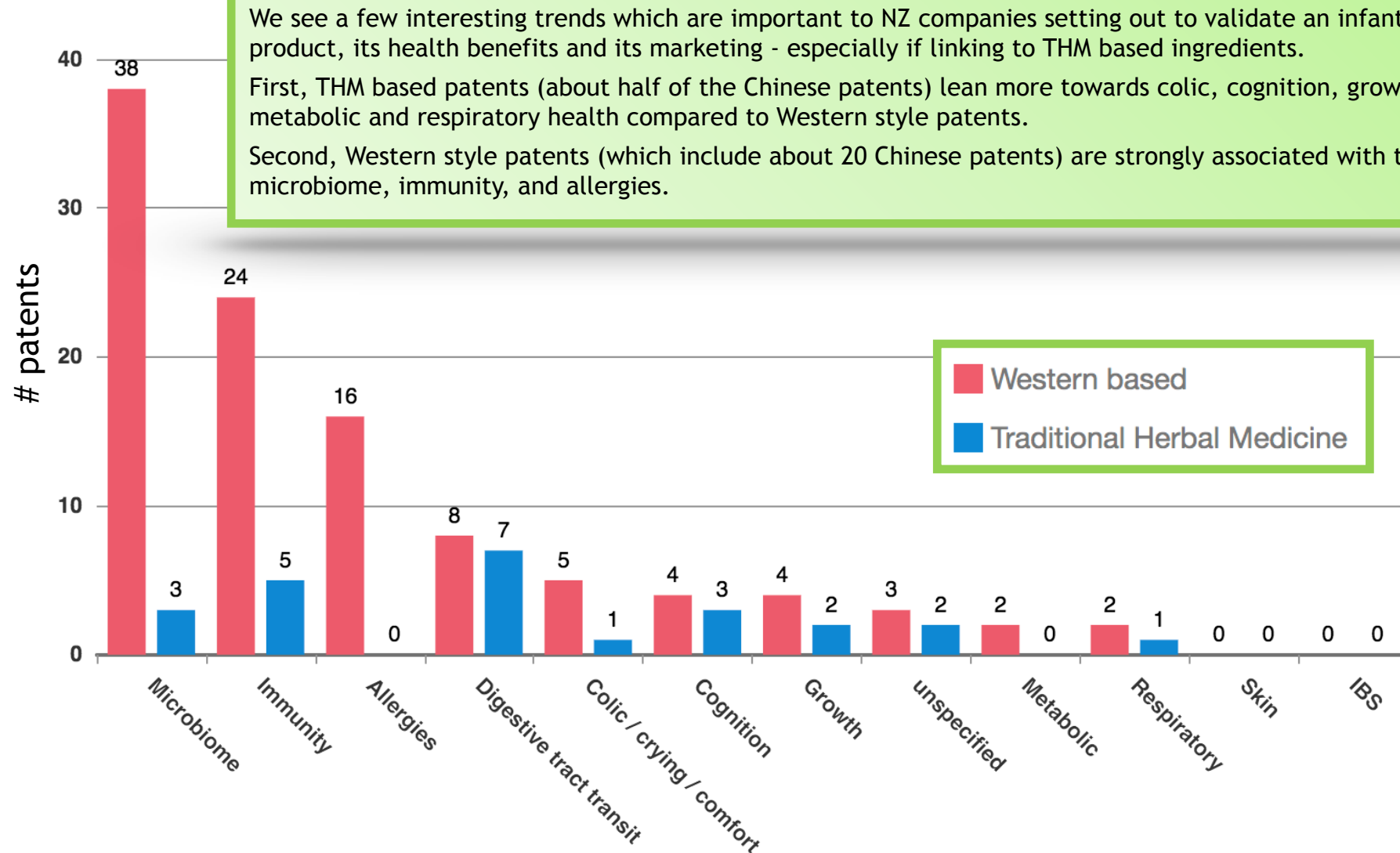


In this year's review, about 50% of the new infant health patents came from China, but remarkably still only four Chinese companies feature in the top 10 filers (equal to DuPont).

This has arisen because there is a multitude of new Chinese companies filing, often just one patent.

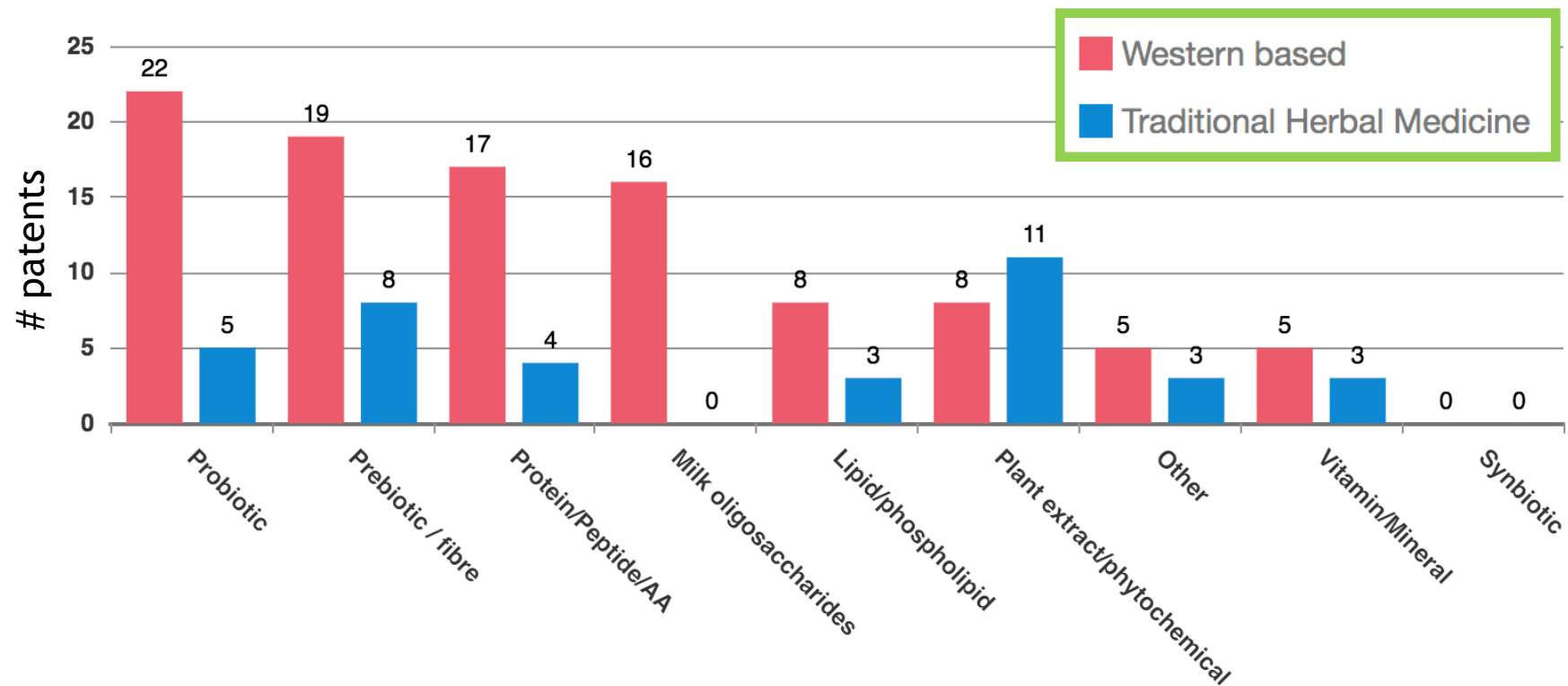
It will be fascinating to see what next year's review has in store.

2.7. Health Outcomes Linked to Infant Health (past 12 months)

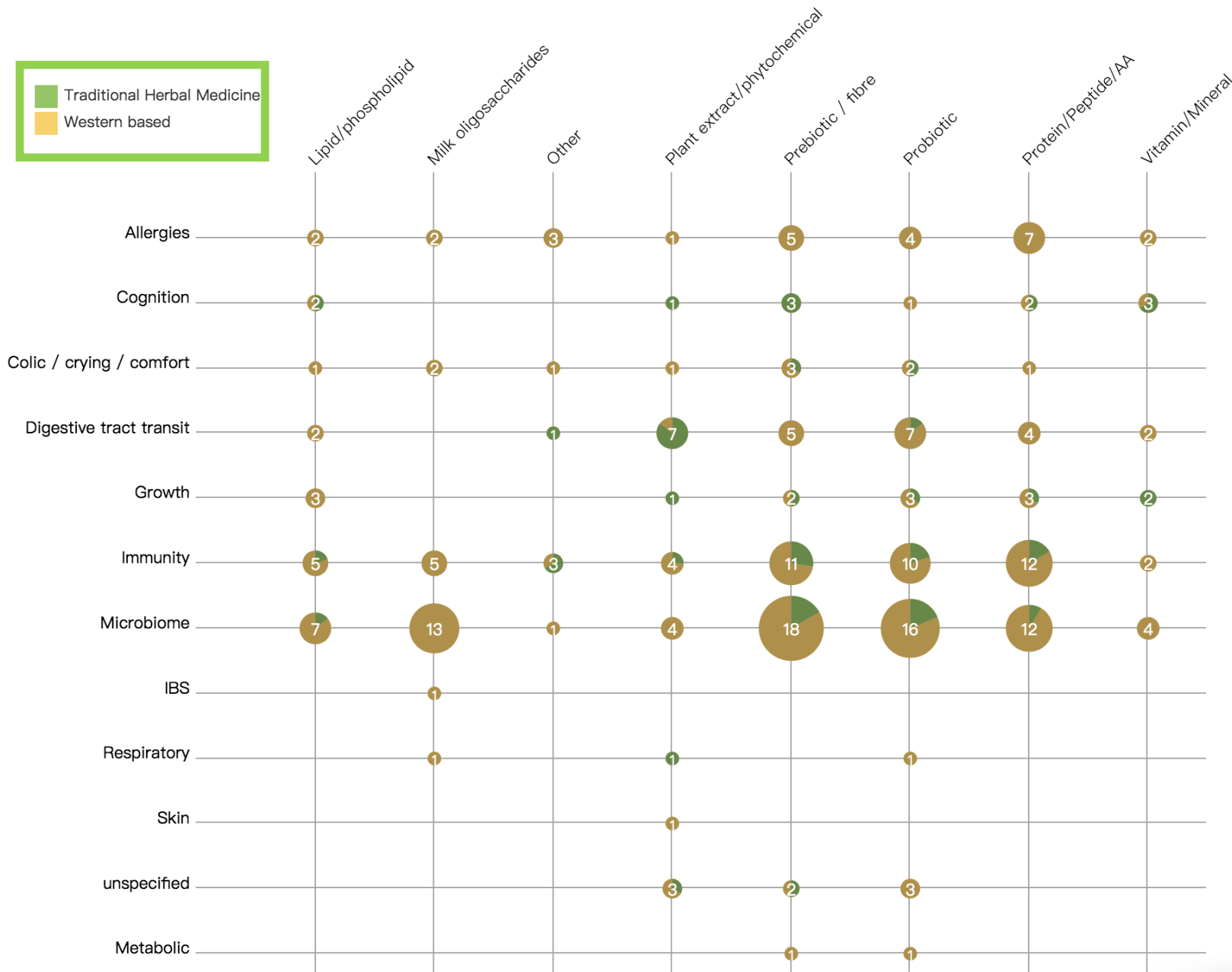


2.8.Functional Actives Linked to Infant Health (past 12 months)

As expected, THM based patents rely mainly on natural extracts, although we see an increasing mention of probiotics and prebiotics. Western based approaches to infant nutrition lean heavily towards probiotics, prebiotics, proteins, and milk oligosaccharides.



2.9. Health outcomes vs Primary Actives (past 12 months)



This graph provides good insights into the nutrient-health relationships in Western based and THM based patents.

The key take-home messages are that:

- 1) the microbiome remains the central point to infant nutrition primarily through prebiotics & probiotics,
- 2) we are starting to see a significant number of THM patents also targeting this area,
- 3) immunity is also closely linked with the gut microbiome and a major health focus of patents, and
- 4) concepts like HMOs remain very Western based, and don't feature in THM patents whereas, digestive transit (e.g. constipation) is a big theme for THMs.

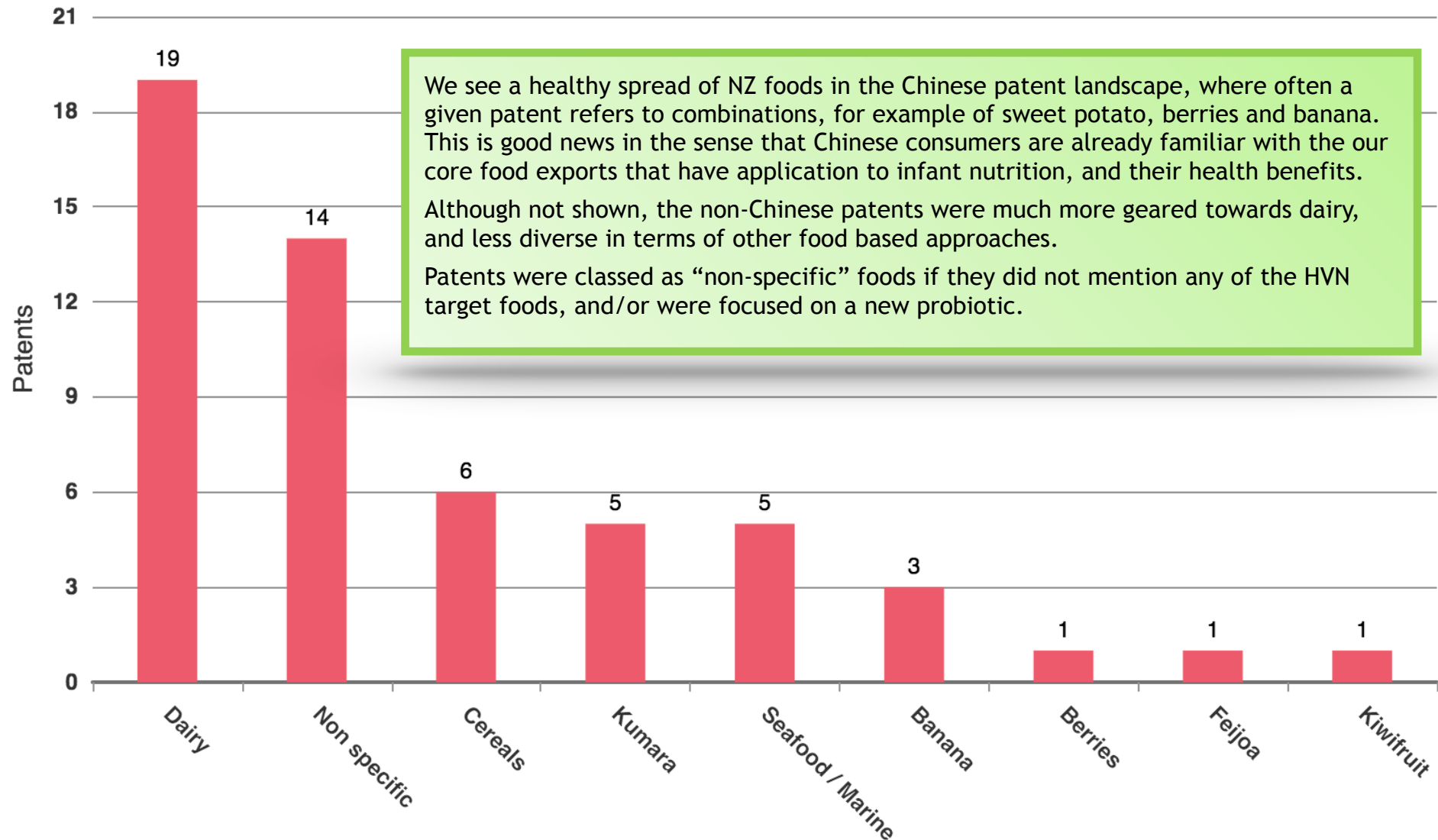
2.10. Patent Word Clouds of Chinese Patents (past 12 months)



When we select only the patents arising from China (41 of the 84 patents in this report), we can see some of the key themes based on the number of times the terms are mentioned across the patents.

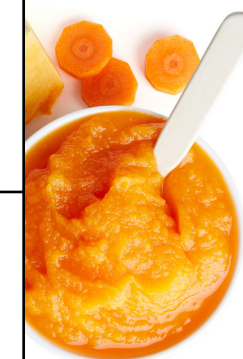
Somewhat unexpectedly, we don't see a plethora of THM based herbal ingredients, but instead terminology more aligned with typical Western based multi-nationals, such as human milk oligosaccharides, intestinal flora, whey protein and allergic diseases. We see it as good for NZ's food industry that the approach to infant health in China is moving towards Western approaches. In fact, only 19 of the 41 Chinese patents relied on THM.

2.11. Relevance of NZ Foods in the Chinese Patents (past 12 months)



3.SPOTLIGHT ON SELECTED PATENTS

Title	IPSYNERGY ® INSIGHTS	Owner	Link
Complexes of high isoelectric point proteins with casein	Nestle has developed a micellar casein complex (from milk) which binds and protect proteins like lactoferrin to avoid breakdown during processing, to allow the bioactives to provide immunity enhancing effects, benefiting the gut microbiota, softening stool, and improving cognitive effects in infants. The technology is said to be viable for infant formula, infant cereals, follow-up formula and growing-up milks. We haven't yet seen any press-release or commercial product in the market relating to this new technology.	Nestec S.A.	WO2019115507A1
Bovine milk oligosaccharides	This patent highlights the difficulties in commercial production of HMOs, and how newly identified bovine milk polysaccharides can be isolated and used as suitable prebiotics for infant health. The data in the patent showed strong growth of <i>B. infantis</i> , and no growth of pathogenic bacteria. As of yet, there does not appear to be any move to commercialise this technology, nor any start-up company developed through the university, despite a number of research papers published in this area over the past 5 or so years. Regardless, we should keep a close eye on this, and even consider potential partnerships with this university group to accelerate R&D and commercialisation.	The Regents Of The University Of California	HK1260295A
Composition for preventing or relieving respiratory disease	This patent doesn't relate specifically to complementary feeding, yet it is still an interesting approach taken by a large dairy company. Morinaga Milk Industry's Japanese patent describes a probiotic for pregnant women to protect its child from respiratory disease when mother exposed to air pollution. Although we know Morinaga is strongly focused on functional probiotics and infant nutrition, we have yet to see any PR mention of this new technology. However, its flagship probiotic strain Bifidobacterium long BB536 has just been GRAS approved for infant formula.	Morinaga Milk Industry Co., Ltd.	WO2019163257A1
Methods and compositions for treating or preventing gut barrier dysfunction	A recent press release announced DuPont highlighting that its patented HMO (2FL) selectively upregulates <i>Bifidobacterium longum</i> ssp. <i>infantis</i> in the infant gut. Here, we now see a related DuPont patent claiming the combination of 2FL with this probiotic to improve intestinal barrier dysfunction. This follows DuPont's R&D focus on 2FL, and innovation relating to its CARE4U commercial ingredient .	Dupont Nutrition Biosciences Aps	WO2019217275A1



Title	IPSYNERGY [®] INSIGHTS	Owner	Link
Infant lactoferrin-modulated milk powder and preparation method thereof	Little Umbrella Ltd is a NZ entity, although we cannot find any details on this company to understand the context better. Regardless, the patent seems vaguely similar to Nestle's patent (see first in this table) in that it describes a composition that advantageously encapsulates and protects lactoferrin to allow sustained slow release.	Little Umbrella Limited	AU2019100542A4
Compositions for use in the reduction of nociception in infants and young children	An interesting Nestle patent using a combination of HMOs to reduce colic, crying, sleep, IBS and abdominal pain.	Societe Des Produits Nestle S.A.	WO2019121929A1
Infant formula goat milk powder and production method thereof	This is one of four patents in this report that focused on the use of goat milk as part of an infant formula, often supplemented with other prebiotics, omega 3, triglyceride OPO, probiotics and the like to improve microbiota of infants, and improve immunity. Goat milk was also strongly associated with avoidance of food allergies.	Tianjin Aos Dairy Co., Ltd.	CN110063371A
Application of probiotics in preparation of children health care product or drink for enhancing immunity	This is one example of the 18 Chinese patents using probiotics alone or as part of a multi-active composition for infant nutrition. This specific patent focuses on the use of conventional probiotics in combination with walnut peptide, konjac, mulberry fruit powder, blueberry and cranberry juice concentrate to achieve immunity outcomes in infant nutrition. Like a number of Chinese patents in the landscape, there is no clinical data or evidence to support efficacy of the product, but it is still valuable for us to read these to understand both the types and combinations of ingredients used, and the key target health outcomes in China.	Shandong Weiweiduo Biological Technology Co., Ltd.	CN110074291A
Bifidogenic hypoallergenic gos compositions and methods for providing the same involving beta-galactosidase from a strain of lactobacillus delbrueckii ssp bulgaricus	The owner, FrieslandCampina is pushing hard on its R&D platform relating to prebiotics and recently signed up to the Global Prebiotics Association . Their primary GOS product, Vivinal , is focused towards growth of bifidobacteria in the gut, and immunity enhancement. This latest patent focuses on new low allergenic versions of the GOS prebiotic, a solution to the problem of GOS allergies particularly in South East Asia. The new GOS is developed through application of beta-galactosidase from specific Lactobacillus delbrueckii strain in the manufacturing process. In May 2020, the company also announced the launch of Biotis GOS , focused on on-the-go solutions to gut health, immunity, sleep and maternal health. They commented this new launch will leverage the strong science and innovation from its GOS ingredient from its infant nutrition platform.	Frieslandcampina Nederland B.V.	WO2020049016A1

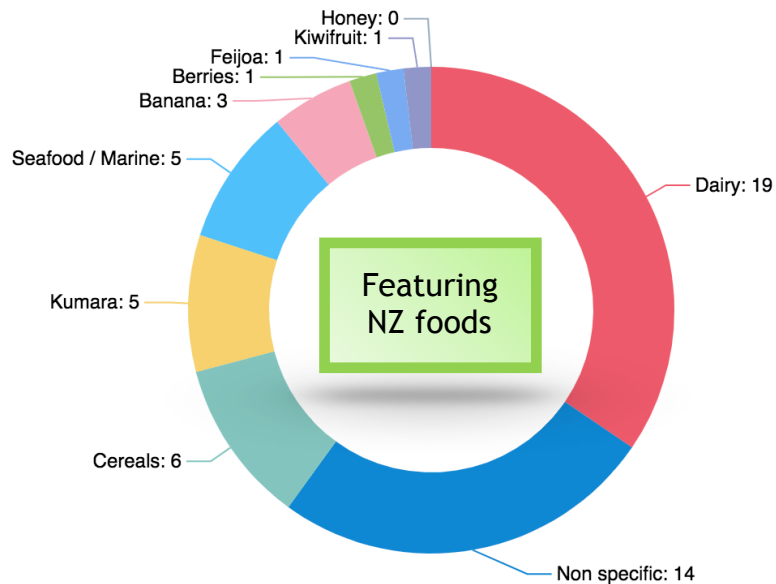


4.CASE STUDIES





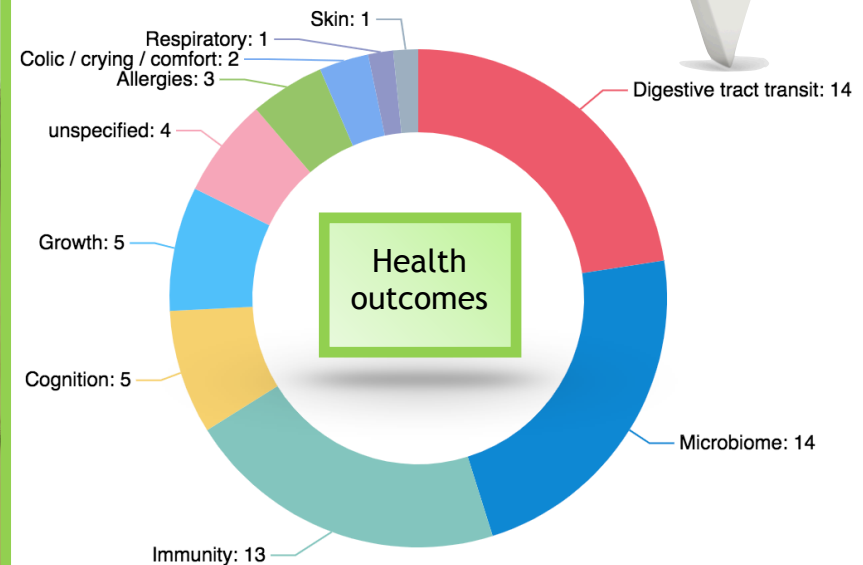
4.1.Case Study 1: Chinese Patents on Infant Nutrition



Example 1: [CN110150651A](#), owned by Shenzhen Porsheath Bioengineering, describes the use of a fermented seaweed extract combined with a resistant starch (e.g. from banana), and corn seed powder. It is said to have high levels of probiotics and oligosaccharides for intestinal regulation / motility and boosting the infant microbiota.

Example 2: [CN110063371A](#), owned by Tianjin Aumix Dairy Co, describes a goat milk formula, with additives including OPO, DHA, arachidonic acid, lactoferrin, and probiotics. The patent describes three related formulas for the growing child, from ages 0-6 months, 6-12 months and 12-36 months. The health benefits include microbiome modulation & immuno-regulation.

Interesting fact: In each of the four cases, the Chinese companies appear to be small operations, often without a website or any online presence.



Example 3: [CN110179059A](#), owned by Shanghai Jingyuan Food Co, is a good example of the THM style patents we see in the landscape. The infant foods is formulated as noodles, and includes wheat, sorghum, soybean, walnut, jujube, yam, and THM ingredients such as ganoderma luciderm. The composition is said to boost infant immunity and digestion.

Example 4: [CN109497538A](#), owned by Hangzhou Tianlong Group, describes an infant food rich in alpha-linolenic acid (ALA) which includes flax, oats, corn, probiotics and antioxidants. The composition is said to regulate the intestinal function via the probiotics and ALA, and improve intestinal barrier function.

4.2. Emergence of OPO as Hot Bioactive in Infant Health Patent Landscape

WHAT and WHY?

OPO is a triglyceride found in human milk. It can be manufactured through use of vegetable fats to mimic the nutrient from breastmilk.

Over the past 10 years, there has been significant research and innovation in this space, linking OPOs to beneficial effects including the infant's gut microbiome, reduction of colic / crying and bone growth.

We have seen an increase in the number of patent filings in this last review period, with a particular focus on China signalling this could be the next super nutrient after HMOs. Three of five new patents are highlighted here.

WHO?

Inner Mongolian Yili, Beingmate, Nestle, and Australian based [Freedom Foods](#) feature as significant food manufactures with patents referencing use of OPO, as well as numerous ingredient manufacturing companies.

WHEN and WHERE?

We found 18 new patents for OPO, all filed within the past 10 years, most within the last 3 years. Overwhelmingly the patents target China, signalling this as a growing hot nutrient for infant health in our key export market.



European based Advanced Lipids has been focused on delivering OPO ingredients for the infant nutrition market through its commercial [INFAT product](#). Based on these recent press releases, their recent [commercial](#) launches have been centred on [Chinese consumers](#).

Back in 2015, Advanced Lipids, in collaboration with Enzymotech, [patented their process and product](#), alongside a handful of other specialist ingredient manufacturers that develop similar technologies for OPO production.

Example 1: In 2019, [CN109965271A](#), owned by Shanghai Aoyi Biomedical Technology Co, relates to an infant formula food for brain development which includes OPO as part of a wider THM formulation.

Example 2: In 2019, [CN110063371A](#), owned by Tianjin Aumix Dairy Co, describes an infant formula goat milk powder with lactoferrin, prebiotics and OPO, for microbiome, immunity and allergy benefits.

Example 3: In 2018, [AU2018101868A4](#), owned by Freedom Foods (Australia), describes an A2-milk infant formula, with added OPO, prebiotics and probiotics, with digestive health, immunity and sleep benefits.



4.3. Case study 3: New Start-Up Analysis: Evolve Biosystems

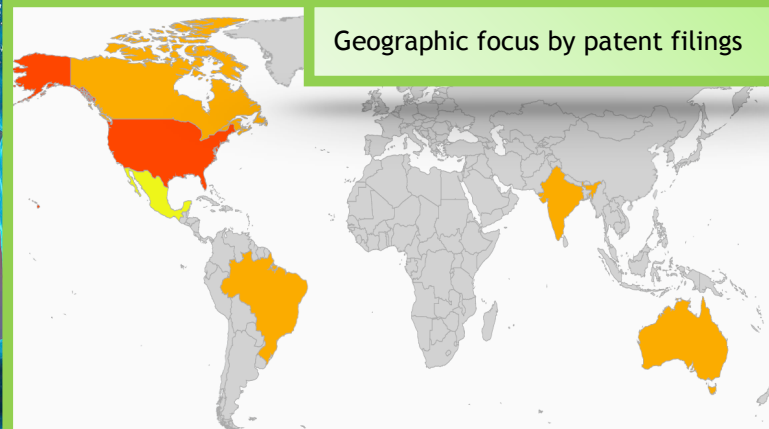
[Evolve Biosystems](#) is a US-based start-up originally spun out of University of California, Davis. Since about 2005, the group has raised significant funding, including US\$40M from the Bill and Melinda Gates Foundation & Horizon Ventures in 2018.

Evolve has a successful product on the market, [Evivo](#), a probiotic strain combined with HMOs, targeting a healthy infant gut and improvements in colic, skin and sleep.

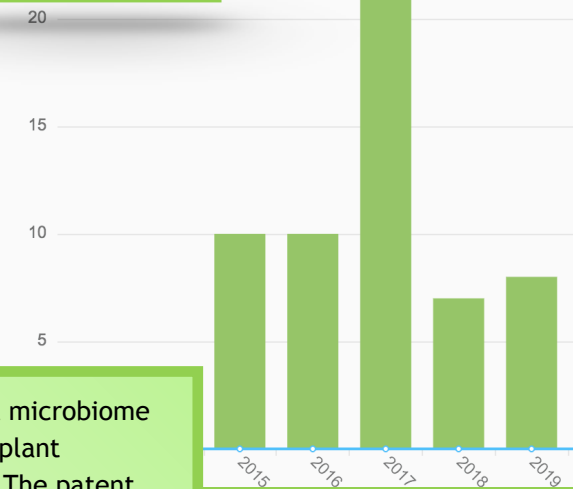
In our May 2018 report, we did a case study on the emerging company, where we highlighted an early patent litigation battle with Danone, where Evolve defended its European patent relating to GOS for infant health. We can see now that Evolve & its collaboration partner, Uni of California, has recently taken the offence on a new case, and recently [sued Abbott Labs for infringement of one of its patents in advance of expected launch of a product](#).

Evolve has an expanding patent portfolio to protect its innovation, and [many publications](#). In total, we found 66 patent filings dating back to 2015, and a focus on USA, Canada, Mexico, Brazil, India and Australia. Interestingly, Evolve has so far not filed any patent applications into S. E. Asia or China, perhaps indicating it is focusing its commercialisation strategy elsewhere.

The key concepts of their patents are: mammalian milk oligosaccharides, treatment of disbiosis in infants, food compositions for weaning, and *Bifidobacterium Longum* sp. We take a closer look at four of its latest patents in this review period.



Filing activity



[WO2019232513A1](#) is focused on promoting immunity through the gut microbiome via a combination of oligosaccharides (e.g. milk oligosaccharides or plant extract), Vitamin A (e.g. carotene), and a *Bifidobacterium* species. The patent has significant clinical trial data in infants.

[WO2019055717A1](#) relates to a range of polymerised oligosaccharides used to facilitate microbiome development and avoiding gut distress of infants during weaning. The oligosaccharides can be sourced from the likes of carrots, peas, broccoli, onions, tomato, pepper, rice, wheat or bran.

[WO2019232284A1](#) is based around a composition for immune system development in infants including a specific lineage of *Bifidobacterium Longum* and “synbiotically” matched oligosaccharides containing lacto-N-biose, wherein the oligosaccharides activates the bacterium and results in metabolism of the oligosaccharides.

[WO2019246316A1](#), represents a unique approach from Evolve (albeit leveraging its [animal health platform](#)), focused on use of oligosaccharides from mare’s milk for, as one option, developing the human infant microbiome and reduction of autoimmune diseases.

5.BULL'S EYE PATENTS

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Synergistic production of butyrate associated with the complexity of hmos blend for use in infants or young children for health purposes	WO2018206434A1	2018-11-15	Nestec Sa	Microbiome Respiratory	Milk oligosaccharides	Non specific	Western based
Milk Substitute Compositions	AU2018101868A4	2019-01-17	Freedom Foods Grp Ip Pty Ltd	Immunity Microbiome Colic / crying / comfort Digestive tract transit	Prebiotic / fibre Probiotic Lipid/phospholipid Protein/Peptide/ AA	Dairy	Western based
Complexes of high isoelectric point proteins with casein	WO2019115507A1	2019-06-20	Nestec Sa	Immunity Cognition Microbiome	Protein/Peptide/ AA	Dairy	Western based
Methods and compositions for treating or preventing gut barrier dysfunction	WO2019217275A1	2019-11-14	Dupont Nutrition Biosci	Microbiome	Probiotic Milk oligosaccharides	Dairy	Western based
Infant milk powder partner improving gastrointestinal tract and preparation method thereof	CN109479972A	2019-03-19	Shijiazhuang Junlebao Dairy	Immunity Microbiome Colic / crying / comfort	Prebiotic / fibre Probiotic	Dairy Kumara	Traditional Herbal Medicine
Special baby diet food containing rich alpha-linolenic acid and preparation method thereof	CN109497538A	2019-03-22	Hangzhou Tlong Grp	Microbiome	Prebiotic / fibre Probiotic Lipid/phospholipid	Dairy Cereals	Traditional Herbal Medicine

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Oligosaccharide compositions and their use during transitional phases of the mammalian gut microbiome	WO2019055717A1	2019-03-21	Evolve Biosyst	Microbiome	Prebiotic / fibre	Cereals	Western based
Infant formula goat milk powder and production method thereof	CN110063372A	2019-07-30	Tianjin Aos Dairy Co., Ltd.	Microbiome Allergies	Prebiotic / fibre Probiotic Lipid/phospholipid Protein/Peptide/ AA	Dairy Seafood / Marine	Western based
Infant formula containing human milk oligosaccharides and OPO structural lipid	CN110100905A	2019-08-09	Fujian Agriculture & Forestry Univ.	Immunity Growth Microbiome	Prebiotic / fibre Lipid/phospholipid	Dairy	Western based
Fermented formula with non-digestible oligosaccharides	WO2019155044A1	2019-08-15	NUTRICIA	Microbiome	Prebiotic / fibre Probiotic	Non specific	Western based
Preparation for regulating intestinal functions of infants	CN110150651A	2019-08-23	Shenzhen Boshijian Biological Engineering Co., Ltd.	Microbiome Digestive tract transit	Prebiotic / fibre Probiotic Plant extract/ phytochemical	Seafood / Marine Banana	Western based
Whey powder rich in kappa-casein and preparing method and application thereof	CN110367339A	2019-10-25	Dalian Polytechnic University Heilongjiang Feihe Dairy	Microbiome Digestive tract transit	Protein/Peptide/ AA	Dairy	Western based
Fruit and vegetable enzyme	CN110679929A	2020-01-14	Foshan Sanshui District Minjun Food Co., Ltd.	Colic / crying / comfort	Other	Kiwifruit Kumara Feijoa Banana	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Bovine milk oligosaccharides	HK1260295A	2019-12-13	The Regents Of The University Of California	Immunity Microbiome	Milk oligosaccharides	Dairy	Western based

6. HALO PATENTS

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Methods for increasing growth of beneficial bacteria in the gastrointestinal tract	IL271112D0	2020-01-30	Abbott Laboratories	Immunity Microbiome	Plant extract/ phytochemical Milk oligosaccharides	Non specific	Western based
Human milk oligosaccharide for improving immune fitness	WO2019031961A1	2019-02-14	Nutricia	Immunity	Milk oligosaccharides	Non specific	Western based
Formulations for nutritional support in subjects in need thereof	WO2019109009A1	2019-06-06	Second Sci Inc	Immunity Microbiome Allergies	Protein/Peptide/ AA	Non specific	Western based
A composition and uses thereof	EP3479699A1	2019-05-08	Agri & Food Dev Authority Teagasc	Immunity Microbiome Allergies	Prebiotic / fibre Protein/Peptide/ AA	Dairy	Western based
A composition comprising a cohort of bacteria	WO2019102018A2	2019-05-31	Univ College Cork Nat Univ Of Ireland Agri & Food Dev Authority Teagasc	Immunity Microbiome Metabolic Allergies	Probiotic	Dairy	Western based
Compositions comprising at least on n-acetylated and at least one fucosylated oligosaccharide for use in the promotion of digestive capacity in infants and young children	WO2019122178A1	2019-06-27	Soc Des Prod Chims Nestle	Microbiome	Milk oligosaccharides	Dairy	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Compositions for use in the promotion of intestinal muscle growth and development and associated intestinal motility	WO2019122190A1	2019-06-27	Soc Des Prod Chims Nestle	Microbiome	Milk oligosaccharides	Dairy	Western based
Composition comprising ferrous sulphate monohydrate and long chain polyunsaturated fatty acids	WO2019129728A1	2019-07-04	Soc Des Prod Chims Nestle	Cognition Microbiome	Lipid/phospholipid	Seafood / Marine	Western based
Compositions and methods to promote host defense and stimulate, expand, and/or reset t cell repertoires	WO2019232513A1	2019-12-05	Evolve Biosyst	Microbiome Allergies	Vitamin/Mineral Milk oligosaccharides	Dairy	Western based
Nutritional composition comprising urea and non-digestible oligosaccharides	EP3646739A1	2020-05-06	Nutricia	Microbiome Allergies	Prebiotic / fibre Vitamin/Mineral	Dairy	Western based
Infant lactoferrin-modulated milk powder and preparation method thereof	AU2019100542A4	2019-06-27	Little Umbrella Ltd	Microbiome	Prebiotic / fibre Probiotic Protein/Peptide/ AA	Dairy	Western based
Formula of oral-soluble probiotic solid beverage	CN109924380A	2019-06-25	Wu Shengwu	Immunity Digestive tract transit	Prebiotic / fibre Probiotic	Non specific	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Infant lactoferrin modified milk powder and preparation method thereof	CN110115291A	2019-08-13	Yu Jie	Immunity Microbiome Digestive tract transit	Prebiotic / fibre Probiotic Lipid/phospholipid Protein/Peptide/ AA Vitamin/Mineral	Dairy	Western based
Instant accessory food capable of regulating intestinal flora of infants during weaning period and preparation method thereof	CN110122864A	2019-08-16	Harbin Institute Of Technology	Microbiome Digestive tract transit	Prebiotic / fibre Protein/Peptide/ AA Vitamin/Mineral	Dairy	Western based
Accessory food for infants and young children and application thereof	CN110122764A	2019-08-16	Shenzhen Boshijian Biological Engineering Co., Ltd.	unspecified	Probiotic Plant extract/ phytochemical	Cereals	Western based
Grain noodles suitable for infants to eat and processing technology thereof	CN110179059A	2019-08-30	Shanghai Jingyuan Food Co Ltd	Immunity	Other	Kumara	Traditional Herbal Medicine
Synbiotic combination of probiotic and human milk oligosaccharides to promote growth of beneficial microbiota	HK1256876A	2019-10-04	Abbott Laboratories	Immunity Microbiome IBS Allergies	Milk oligosaccharides	Non specific	Western based
Compositions and method of use for h5 competent bifidobacterium longum subsp. infantis	WO2019232284A1	2019-12-05	Evolve Biosyst	Microbiome	Probiotic	Non specific	Western based
Dietary butyrate	WO2019228851A1	2019-12-05	Soc Des Prod Chims Nestle	Microbiome	Other	Non specific	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Fruit and vegetable noodles for conditioning intestines and stomachs of infants and preparation method thereof	CN110558482A	2019-12-13	Chengkou County Tuxingsheng Agricultural Technology Development Co., Ltd.	Immunity	Plant extract/ phytochemical Other	Kumara Seafood / Marine Banana Cereals	Traditional Herbal Medicine
Novel oligosaccharides for use in prebiotic applications	WO2019246316A1	2019-12-26	Evolve Biosyst	Microbiome	Milk oligosaccharides	Non specific	Western based
Improved human food product	WO2020038898A1	2020-02-27	Fermbiotics Hldg Aps	unspecified	Probiotic Plant extract/ phytochemical	Dairy Cereals	Western based

7. BACKGROUND PATENTS

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Spray-dried lacto-n-fucopentaose	EP3494806A1	2019-06-12	Jennewein Biotech	Microbiome	Milk oligosaccharides	Non specific	Western based
Native whey protein for reducing allergy	WO2019160402A1	2019-08-22	Nutricia	Allergies	Protein/Peptide/AA	Dairy	Western based
Composition for preventing or relieving respiratory disease	WO2019163257A1	2019-08-29	Morinaga Milk Industry	Respiratory	Probiotic	Non specific	Western based
Formula with specific beta-lactoglobulin peptides	WO2019212331A1	2019-11-07	Nutricia	Immunity	Protein/Peptide/AA	Dairy	Western based
Formula with a specific beta-lactoglobulin peptide	WO2019212330A1	2019-11-07	Nutricia	Immunity	Protein/Peptide/AA	Dairy	Western based
Lactobacillus rhamnosus and applications thereof	CN109536415A	2019-03-29	Hanchen's (Shenyang) Children's Products Co., Ltd.	Immunity Microbiome	Probiotic	Non specific	Western based
Application of composition consisting of lactobacillus rhamnosus and 2'-fucosyllactose	CN109528777A	2019-03-29	Northeast Agricultural University	Microbiome	Probiotic	Non specific	Western based
Chinese dwarf cherry seed and rice porridge for treating infantile constipation	CN109566986A	2019-04-05	Wang Youchun	Digestive tract transit	Plant extract/ phytochemical	Non specific	Traditional Herbal Medicine

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Chinese waxgourd seed and rice porridge for treating infantile constipation	CN109566983A	2019-04-05	Wang Youchun	Digestive tract transit	Plant extract/ phytochemical	Non specific	Traditional Herbal Medicine
Largehead atractylodes rhizome and rice porridge for treating infantile constipation	CN109566984A	2019-04-05	Wang Youchun	Digestive tract transit	Plant extract/ phytochemical	Non specific	Traditional Herbal Medicine
Tangerine peel and rice porridge for treating infantile constipation	CN109566985A	2019-04-05	Wang Youchun	Digestive tract transit	Plant extract/ phytochemical	Non specific	Traditional Herbal Medicine
Pilose asiabell root and rice porridge for treating infantile constipation	CN109566982A	2019-04-05	Wang Youchun	Digestive tract transit	Plant extract/ phytochemical	Non specific	Traditional Herbal Medicine
Nutritional infant rice flour capable of conditioning upper respiratory tract infection, and preparation method thereof	CN109717363A	2019-05-07	Jiangxi Juri Food Co., Ltd.	Respiratory	Plant extract/ phytochemical	Non specific	Traditional Herbal Medicine
Infant dried milk for simulating intestine microecology of breast feeding children	CN109845827A	2019-06-07	Shanghai Huaguan Nutrition Dairy Co., Ltd.	unspecified	Prebiotic / fibre Probiotic	Dairy	Western based
Compositions for use in the reduction of nociception in infants and young children	WO2019121929A1	2019-06-27	Soc Des Prod Chims Nestle	Colic / crying / comfort	Milk oligosaccharides	Dairy	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Food capable of promoting gastrointestinal digestion and absorption function of children and preparation method thereof	CN109953337A	2019-07-02	Shandong Guzhiteng Business Development Co., Ltd.	unspecified	Plant extract/ phytochemical	Dairy Berries	Traditional Herbal Medicine
Clinical nutrient formulation special for pediatric brain development and preparation method thereof	CN109965271A	2019-07-05	Shanghai Austrian Doctor Medicine Medical Technology Co., Ltd.	Growth Cognition	Prebiotic / fibre Vitamin/Mineral	Non specific	Traditional Herbal Medicine
Infant formula milk powder efficient in digestion and absorption properties and production method of infant formula milk powder	CN110037112A	2019-07-23	Gansu Hualing Biotechnology Research Center	Immunity Microbiome	Prebiotic / fibre Probiotic Protein/Peptide/ AA	Dairy	Traditional Herbal Medicine
Probiotics preparation for conditioning infant intestinal tract and preparation method thereof	CN110037127A	2019-07-23	Dr. Tong Health Industry Hebei Co., Ltd.	Digestive tract transit	Probiotic	Non specific	Western based
Infant formula goat milk powder and production method thereof	CN110063371A	2019-07-30	Tianjin Aos Dairy Co., Ltd.	Immunity Microbiome Allergies	Prebiotic / fibre Probiotic Lipid/phospholipid Protein/Peptide/ AA Plant extract/ phytochemical	Dairy	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Clinical nutrition formula special for growth and development of children and preparation method thereof	CN110074397A	2019-08-02	Shanghai Austrian Doctor Medicine Medical Technology Co., Ltd.	Cognition	Prebiotic / fibre Plant extract/ phytochemical Vitamin/Mineral	Non specific	Traditional Herbal Medicine
Infant and young children formula goat milk powder produced from skim goat milk powder	CN110074190A	2019-08-02	Heilongjiang Better Nutritional Food Co., Ltd.	Immunity	Prebiotic / fibre Lipid/phospholipid Protein/Peptide/ AA	Dairy	Traditional Herbal Medicine
Application of probiotics in preparation of children health care product or drink for enhancing immunity	CN110074291A	2019-08-02	Shandong Weiweiduo Biological Technology Co., Ltd.	Immunity Microbiome Digestive tract transit	Probiotic	Non specific	Western based
Health assistance food for promoting growth	KR1020190091768A	2019-08-07	Seungchan Lee	Growth	Probiotic Protein/Peptide/ AA Plant extract/ phytochemical Vitamin/Mineral	Dairy Berries	Traditional Herbal Medicine
Fermented formula with non-digestible oligosaccharides	WO2019155043A1	2019-08-15	Nutricia	Microbiome	Prebiotic / fibre	Dairy	Western based
Modified milk powder containing lactoferrin and probiotics and preparation method of modified milk powder	CN110122589A	2019-08-16	Shandong Yifeng Economic and Trade Co., Ltd.	Immunity Microbiome	Prebiotic / fibre Probiotic Plant extract/ phytochemical	Dairy	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Method for preparing infant rice complementary food through enzymolysis substrate fermentation	CN110150555A	2019-08-23	Shantou Tianyue Technology Innovation Institute Co., Ltd.	unspecified	Prebiotic / fibre	Cereals	Traditional Herbal Medicine
Instant milk powder contributing to digestion and absorption and preparation process thereof	CN110169450A	2019-08-27	Hunan Beihui Biological Technology Co., Ltd.	Growth	Lipid/phospholipid Protein/Peptide/ AA	Dairy	Western based
Infantile nutrient composition	CN110200288A	2019-09-06	Jiangnan University	Immunity Cognition	Vitamin/Mineral	Non specific	Western based
Composition containing powdered milk derived from goat milk and bifidobacterium and/or lactic acid bacteria	JP2019170245A	2019-10-10	Morinaga Milk Industry	Immunity Allergies	Protein/Peptide/ AA	Dairy	Western based
Special type clinical nutrition formula for infant allergic dermatitis and preparation method thereof	CN110432482A	2019-11-12	Shanghai Own Medic High Tech Medical Indal	Skin	Plant extract/ phytochemical	Seafood / Marine	Western based
Probiotics-containing breast milk-like formula milk powder for infants and preparation method of milk powder	CN110506793A	2019-11-29	Shijiazhuang Junlebao Dairy	Growth Cognition	Probiotic	Dairy	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Coarse cereal and lotus root noodles and preparation process thereof	CN110547399A	2019-12-10	Hangzhou Yingcai Network Technology Co., Ltd.	Digestive tract transit	Plant extract/ phytochemical	Cereals	Traditional Herbal Medicine
Infant yoghurt snacks and preparation technology thereof	CN110604178A	2019-12-24	Jiangsu Food & Pharm Sci College	Digestive tract transit	Probiotic Other	Dairy Kumara Cereals	Traditional Herbal Medicine
Nutritional formula milk powder and preparation method thereof	CN110637891A	2020-01-03	Li Zhong	Cognition	Prebiotic / fibre Lipid/phospholipid Protein/Peptide/ AA	Dairy	Traditional Herbal Medicine
Formula milk powder for promoting bone growth and preparation method of formula milk powder	CN110692741A	2020-01-17	Hunan Bain Jingle Cat Baby Products Co., Ltd.	Growth	Probiotic Lipid/phospholipid Protein/Peptide/ AA	Dairy Seafood / Marine	Western based
Clostridium tyrobutyricum and application thereof	CN110713958A	2020-01-21	Nanjing Univ Of Tech Nanjing Bei Sheng Rong Energy Tech Co Ltd	Allergies	Other	Dairy	Western based

Title	Publication Number	Publication Date	Owner	Health Focus	Primary actives	HVN Food link	THM or Western based?
Methods for increasing growth of beneficial bacteria in the gastrointestinal tract	IL271112A	2020-01-30	Abbott Laboratories Perez Alejandro Barranco Gonzalez Maria Ramirez Buck Rachael Hernandez Enrique Vazquez	Microbiome	Milk oligosaccharides	Non specific	Western based
Preparation for treatment of colic	AU2020100231A4	2020-03-26	Just Pure Hldg Pty Ltd	Colic / crying / comfort	Prebiotic / fibre Plant extract/ phytochemical	Non specific	Western based
Bifidogenic hypoallergenic gos compositions and methods for providing the same involving beta-galactosidase from a strain of lactobacillus delbrueckii ssp bulgaricus	WO2020049016A1	2020-03-12	Frieslandcampina Nederland	Immunity Microbiome Allergies	Prebiotic / fibre	Non specific	Western based
Compositions for use in the reduction of nociception in infants and young children	AU2018390181A1	2020-05-28	Soc Des Prod Chims Nestle	Colic / crying / comfort	Milk oligosaccharides	Dairy	Western based

8. THE EXTRA STUFF

8.1. Searching and Refinement Process

The search and refinement process was carried out in the following steps:

- Preparation of search criteria including key words and International Patent Classifications (IPCs) to target subject matter of interest, testing and refining to ensure relevant subject matter found. Searching using Boolean search criteria within PatSnap software accessing over 130 million published patents globally, to develop an initial raw dataset of patent families. The search and the results of this report captures new patents published between 24 April 2019 to 26 May 2020, and with a priority date after 24 October 2017.
- From a total of 847 raw search results, we filtered these down to 83 patent families that we deemed relevant to HVN's Infant Nutrition platform.
- We then further classified each “relevant” patent by the health target(s), type of active(s), relevance to HVN interest foods, and as traditional herbal medicine based or Western based patents. Each relevant patent was then classed as Bull's Eye, Halo or Background as previously defined in section 1.3. The list of all relevant patents and links to the full text are provided in Sections 5-7.

8.2. Author of this Report

This updated report was prepared by Dr. Peter Brown, Director of IPSynergy (www.IPSynergy.co.nz). Peter is a registered patent attorney in NZ and Australia, holds a PhD in protein biochemistry and has substantial commercial experience dealing with food science, innovation and IP strategies. If you have any questions regarding this report, please feel free to contact Peter (peter.brown@ipsynergy.co.nz).