REPORT SAMPLE

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Farm Animal Vaccines Market 2022-2035

Animal Health Market Analysis

Animal Health | Special Report

Animal Health

Special Report

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Cover: Getty Images

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Contents

Chapter 1: Executive Summary

Scope of the Report

The report breaks down the market[1] by species, disease target and key markets

 By species[2]	 By target disease	 By key markets
• Cattle • Sheep and Goats • Swine	• Respiratory disease • Enteric disease • Reproductive disease • Others[3]	• US • Europe • APAC • LATAM • ROW

 Years of interest	**2022** to **2035**
 Currency	The currency used in the report is **United States Dollars ($)**, with the market size indicated in terms of $ million/billion. The market size figures in the report are **ex-manufacturer sales** based on 2022 prices

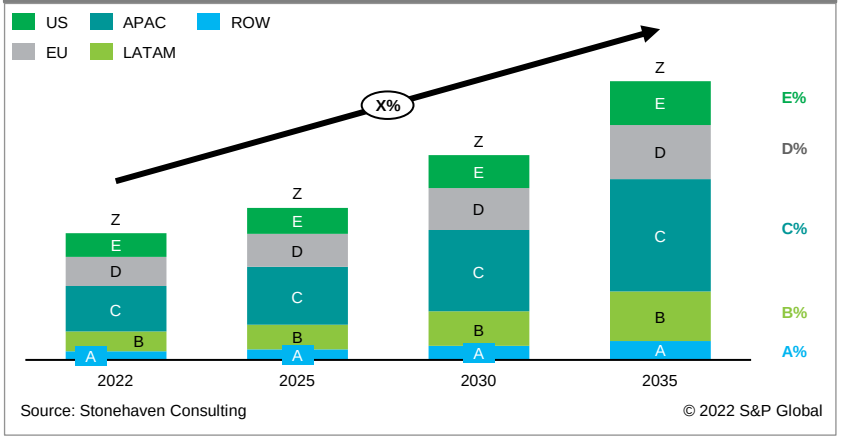
N.B.: The market figures in this report pertain to conventional vaccines only. While we acknowledge the CAGR of the total farm animal vaccines market are likely to increase significantly once innovative vaccines enter the market, we have omitted this nascent segment from the market model given high uncertainties around its potential pricing and potential to serve unmet needs. We present the implications of innovative vaccines from a qualitative perspective in this report (please refer to 'Chapter 6: Competition and Innovation' in the report). For future editions of the report, we will look to reflect the quantitative impact of innovative vaccines, hopefully, by which time, such vaccines will have been commercialized, serving as a base for market projections.

[1]The report only covers vaccine products – it does not cover diagnostics, devices or other forms of interventions involved in the delivery of vaccines. [2]The report excludes poultry and aquaculture vaccines, as both segments are covered in the scope of standalone species reports. [3]Multi-systemic disease vaccines such as foot-and-mouth disease, bovine viral diarrhea, African swine fever and clostridial vaccines are included here, also mastitis and parasite vaccines.

Livestock Vaccines Market (1/2)

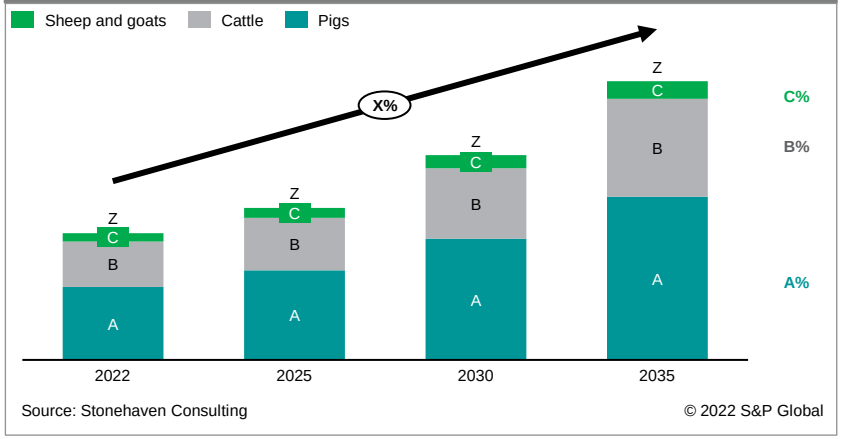
Robust growth of prevention market across species and regions despite modest growth in animal populations

Livestock vaccines market by region ($m)



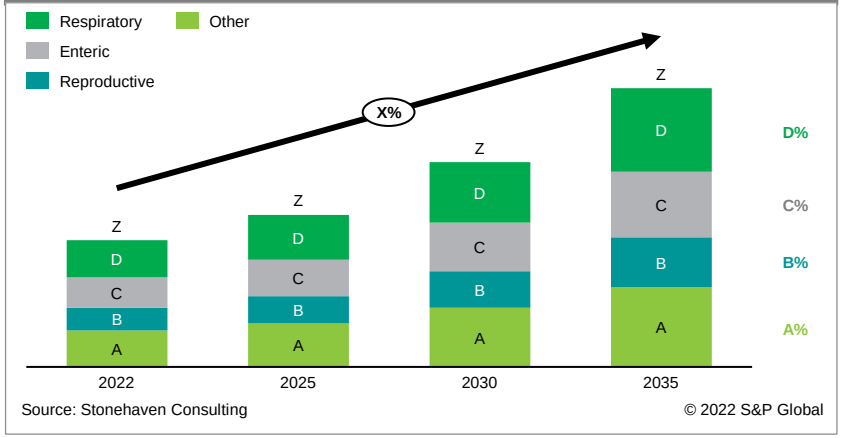
Source: Stonehaven Consulting

Livestock vaccines market by species ($m)



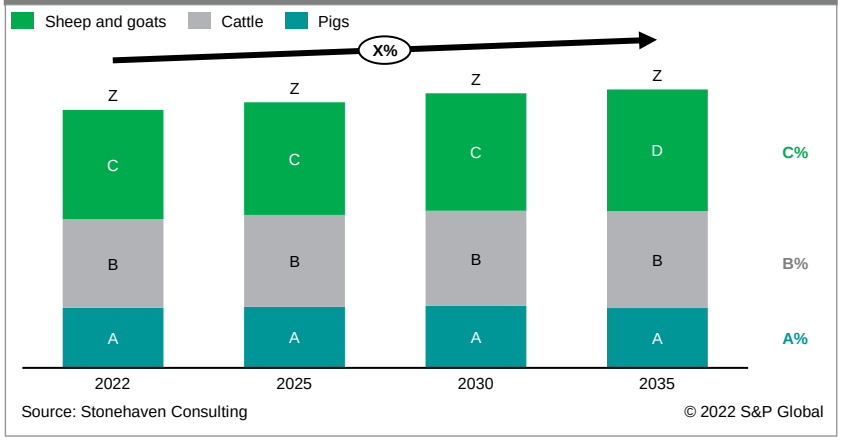
Source: Stonehaven Consulting

Livestock vaccines market by target disease ($m)



Source: Stonehaven Consulting

Total livestock population (m)



Source: Stonehaven Consulting

Livestock Vaccines Market (2/2)

Aiming for improved immunity outcomes in a complex, consolidated market

A complex product and development landscape

- The cattle vaccine market is composed of two sub-markets – beef cattle and dairy cattle. It is further differentiated by animal age and geographic variations. This results in **diverse product portfolios for each region**, all containing a large variety of (smaller volume) vaccines. The development of ruminant vaccines is complex, time-consuming and expensive, often due to the **large combinations of antigens and complex clinical studies required**.
- While the piglet and sow markets constitute two sub-segments within swine vaccines, there is a certain overlap in products. Four vaccine antigens represent the majority of vaccine sales: porcine circovirus (PCV), *Mycoplasma hyopneumoniae* (MHyo), porcine reproductive and respiratory syndrome (PRRS) and *Lawsonia*. Of these, PCV, MHyo and *Lawsonia* are antigens which are utilized globally.

Consolidation of vaccine supply and demand

- **Consolidation of vaccine providers** in ruminant species is very strong, with the two leading companies having more than 65% combined market share.
- Market concentration in the industrialized grower pig sector continues with the increasing impact of **large, often multinational, integrator companies**.
- There is also strong consolidation of (global) swine vaccine providers, with the top three representing more than X% of the market, not taking into account local companies, of which the sales are not being consolidated in market overviews.

Livestock production under price (and other) pressure

- Ruminant vaccines represent X% of the animal health market for these species. Restriction of antibiotic usage continues to provide opportunities for growth. Although swine vaccines are X% of the animal health market for the species, further **reduction in antibiotic usage**, emerging diseases and ASF recovery continue to drive growth in vaccines.
- Increasing **opposition in the EU and US to industrial farming** and its environmental/welfare impacts will affect the profitability of animal health firms by constraining growth of animal populations in developed markets. In such markets, non-animal derived protein products and cell-cultured meat might take up to X% of the protein market by 2035.

Where opportunities lie

- Early onset of immunity, **duration of immunity (DOI),** safety and the ability to provide large combinations of antigens are core market drivers. Innovation is focused on ease of administration (e.g., needle-free devices) and **lowering the number of vaccination touch points** by providing combinations and longer DOI. Improved bacterial vaccines and new technologies are additional growth drivers. The search for effective parasite vaccines will continue.
- The swine industry has regularly been confronted with **emerging diseases** approximately every 10-15 years – the latest being ASF. The ability to monitor and respond to such situations has significantly improved in recent years. An effective ASF vaccine is likely to be available before 2035.
- In Africa and developing countries, disease outbreaks in sheep/goats (sometimes cattle) are serious emergencies.

Chapter 2: Regulatory Landscape

Regulations for Vaccine Use (1/5)

Authorization of livestock vaccines entails additional development and manufacturing considerations

Overall

Numerous regional and international organizations govern the technical requirements and standards for vaccine registration. The registration of vaccines for veterinary use is generally overseen by a country's animal health pharmaceutical regulatory authority, and by a supra-regional regulatory authority only in some cases.

« More information on overall regulations for vaccine use »

« Information on overall regulations for vaccine use continued »

Regulations for Vaccine Use (2/5)

Authorization of livestock vaccines entails additional development and manufacturing considerations

Additional considerations for livestock vaccines

Although the cost and time of developing veterinary vaccines are still significantly lower and shorter when compared to veterinary pharmaceuticals, topline returns are also generally lower per product, given the geographic variety of products and pricing ranges required to serve the market.

« More information on additional consideration for livestock vaccines »

« Information on additional consideration for livestock vaccines continued »

Regulations for Vaccine Use (3/5)

Regional Regulatory Landscape

US

The CVB, operating under the USDA, is responsible for the regulation of animal health vaccines, including immunotherapeutics.

« More information on regulations for vaccine use in the US »

Europe

The Committee for Veterinary Medicinal Products (CVMP), operating under the European Medicines Agency (EMA), regulates veterinary pharmaceuticals and vaccines.

« More information on regulations for vaccine use in Europe »

« Information on regulations for vaccine use in Europe continued »

APAC

In China, the Ministry of Agriculture (MOA) is the national authority responsible for veterinary vaccines.

« More information on regulations for vaccine use in APAC »

Regulations for Vaccine Use (4/5)

Regional Regulatory Landscape

« Information on regulations for vaccine use in APAC continued »

LATAM

The requirements are different for each country in the region, but in general, the regulatory authorities will accept dossiers from the major markets – the EU and US.

« More information on regulations for vaccine use in LATAM »

Differences between US and Europe

Compared to the US, the approval pathway in the EU is more prescriptive and restrictive.

« More information on difference between the US and Europe vaccine use »

Regulations for Vaccine Use (5/5)

A global standard for livestock vaccine approval is still not on the horizon

« Information on difference between the US and Europe vaccine use continued »

Differences between Japan and Europe/US

Japan’s regulatory framework tends to follow VICH guidance closely.

« More information on difference between Japan and Europe/US vaccine use »

Chapter 3: Market Overview

Global Trends in the Animal Protein Market* (1/2)

Meat supply growth is slowing down globally with growth supported by low- and middle-income countries, while a long-term shift in meat consumption toward poultry continues to strengthen

- Uncertainty remains significant after a period of **challenges to animal protein supply and demand**, including the COVID-19 pandemic, ASF and avian influenza outbreaks, Russia's invasion of Ukraine, and the shift to an inflationary environment

« More information on global trends in animal protein market »

« Information on global trends in animal protein market continued »

Poultry meat and eggs

- **Consumption of poultry** meat is projected to increase globally to X Mt by 2031, accounting for nearly half the additional meat consumed

« More information on global poultry meat and eggs market »

* XXXXX. 2022. Analysis includes extracts from the XXXXX forecast from 2022 to 2031

Global Trends in the Animal Protein Market* (2/2)

Consumption of dairy products is forecast to grow, especially in low- and middle-income countries, while global per-capita pork consumption stagnates and beef declines slightly

Global pork market highlights

- **Global pork consumption** is projected to increase to X Mt by 2031, accounting for a third of the total increase in meat consumption. However, pork consumption is expected to **stagnate on a per capita basis**

« More information on global pork market »

Global beef and dairy market highlights

- Global beef consumption is projected to increase to X Mt by 2031. However, per capita consumption has declined since 2007 and is projected to **fall by a further X%** by 2031

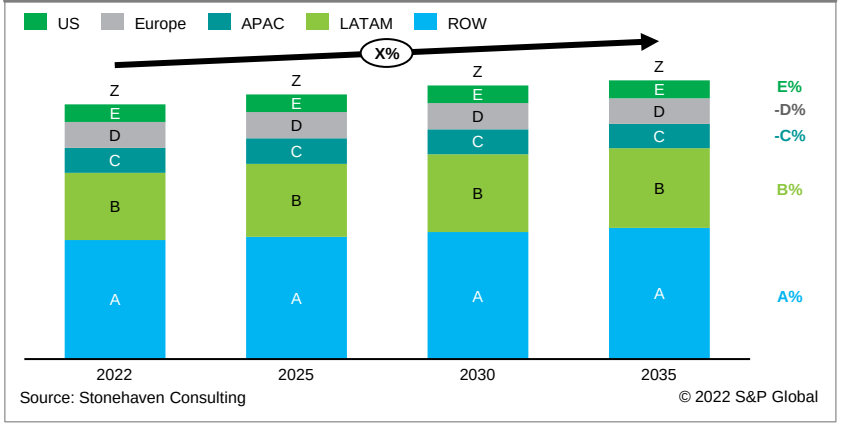
« More information on global beef and dairy market »

* XXXXX. 2022. Analysis includes extracts from the XXXXX forecast from 2022 to 2031

Livestock Populations

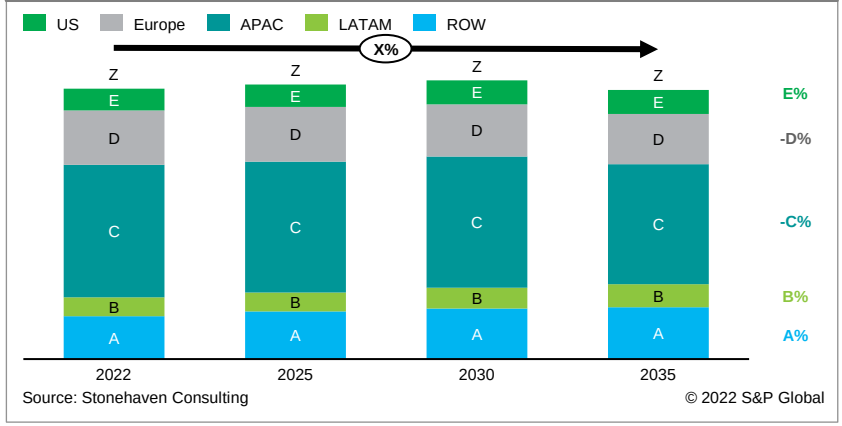
Low single-digit growth rates are forecast for animal populations across species. Overall, most of the animal protein production growth will occur outside Europe and the US

Cattle population (m)



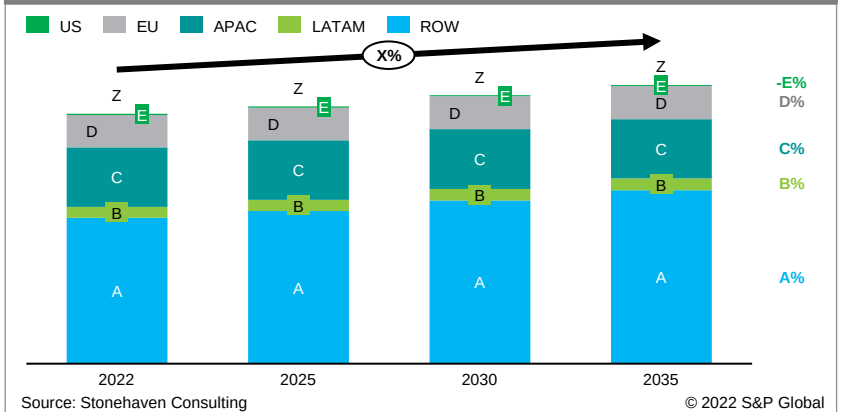
Source: Stonehaven Consulting

Swine population (m)



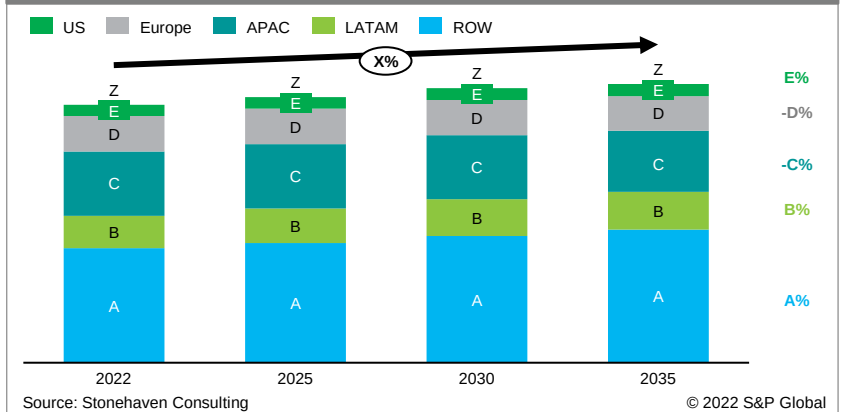
Source: Stonehaven Consulting

Sheep and goat population (m)



Source: Stonehaven Consulting

Total livestock population (m)



Source: Stonehaven Consulting

Livestock Vaccines Market (1/2)

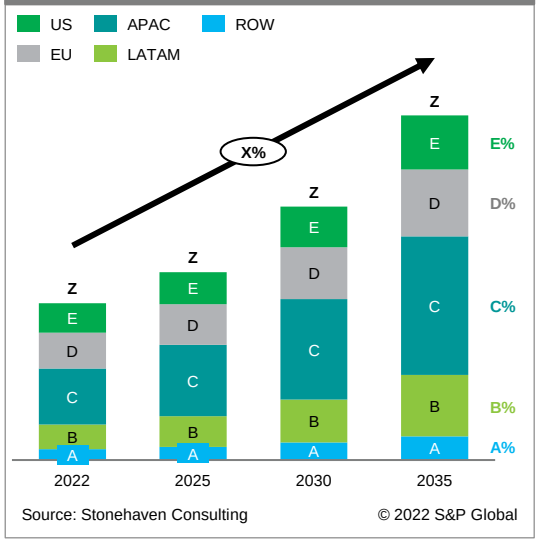
Robust growth reflects antibiotic usage reduction, improvements to vaccine ranges and innovation

Overall

The livestock vaccines market (referred to as the 'vaccines market' henceforth) will experience robust single-digit nominal growth in the outlook period, ranging from X-Y% to reach $X billion by 2035.

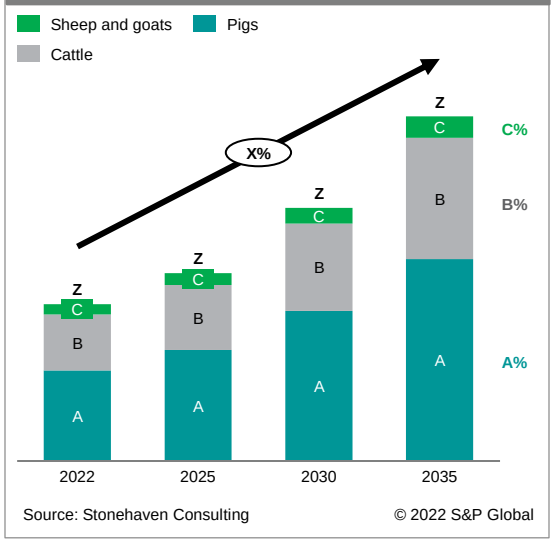
« More information on overall livestock vaccines market »

Livestock vaccines market by region ($m)



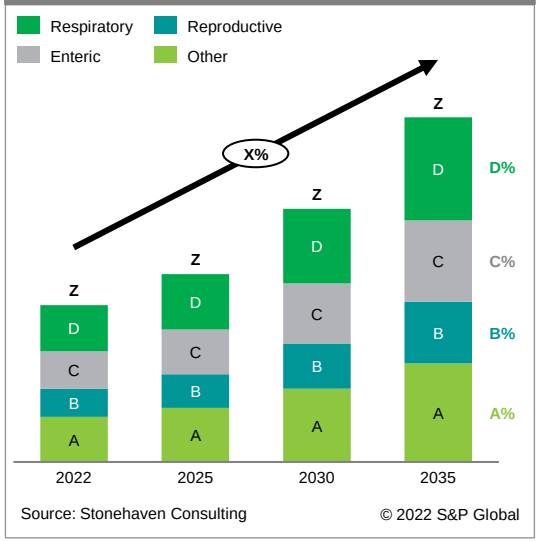
Source: Stonehaven Consulting

Livestock vaccines market by species ($m)



Source: Stonehaven Consulting

Livestock vaccines market by disease ($m)



Source: Stonehaven Consulting

Livestock Vaccines Market (2/2)

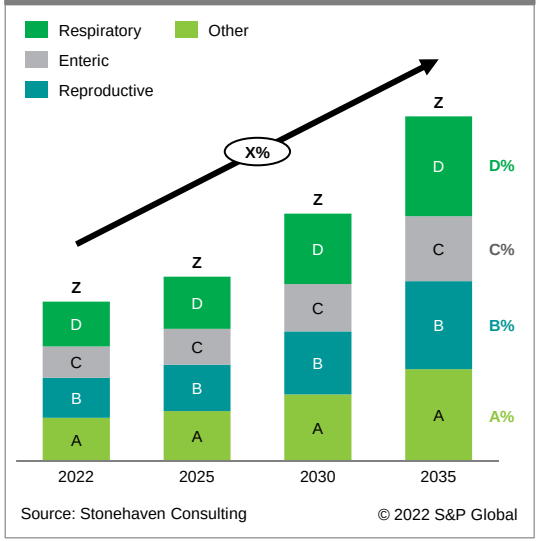
Innovations in application, bacterial vaccines and rapid response drives growth across multiple segments

Overall

Nearly all segments will experience growth above X% between 2022 and 2035. Increased focus on disease prevention as opposed to treatment is set to continue, with improvements to vaccine combinations and more bacterial vaccines likely to come to market.

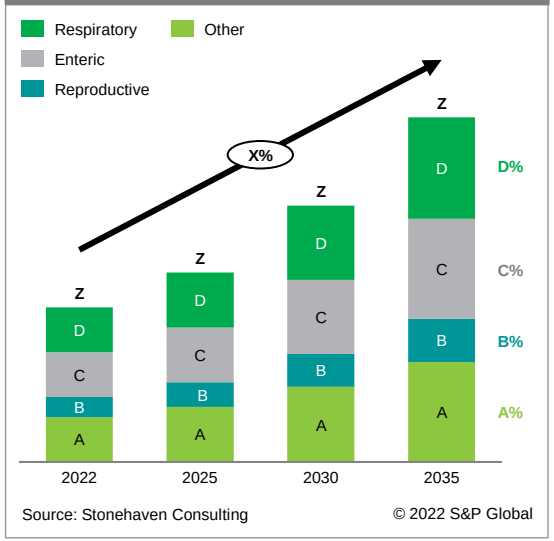
« More information on overall livestock vaccines market »

Cattle vaccines market by disease ($m)



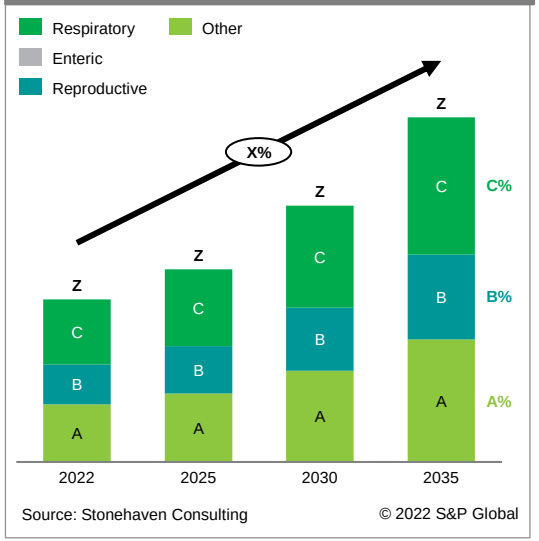
Source: Stonehaven Consulting

Pig vaccines market by disease ($m)



Source: Stonehaven Consulting

Sheep vaccines market by disease ($m)



Source: Stonehaven Consulting

Chapter 4: Market by Region

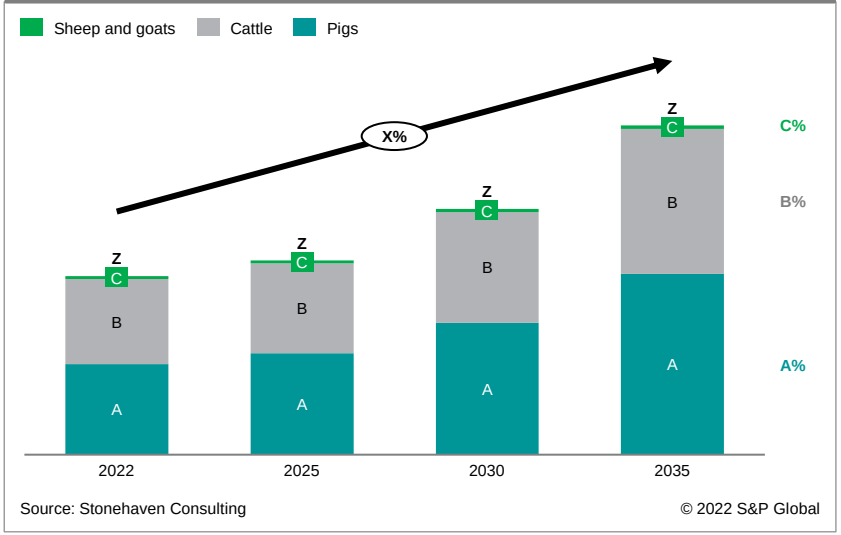
US Market Size and Growth

Despite near-flat growth of livestock populations, vaccine segment outlook remains solid

The US livestock vaccines market is expected to reach approximately $X billion by 2035, with close to $X million added by swine vaccines.

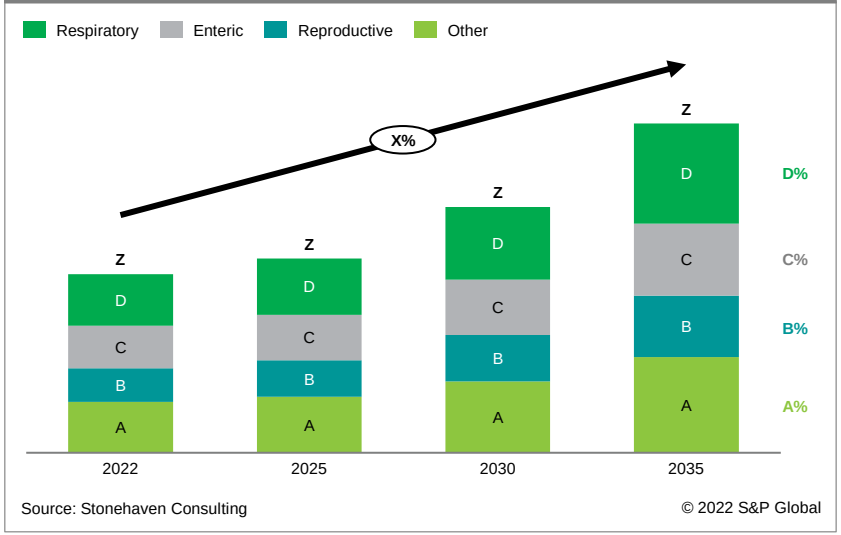
« More information on the US market size and growth »

US vaccines market by species ($m)



Source: Stonehaven Consulting

US vaccines market by disease ($m)



Source: Stonehaven Consulting

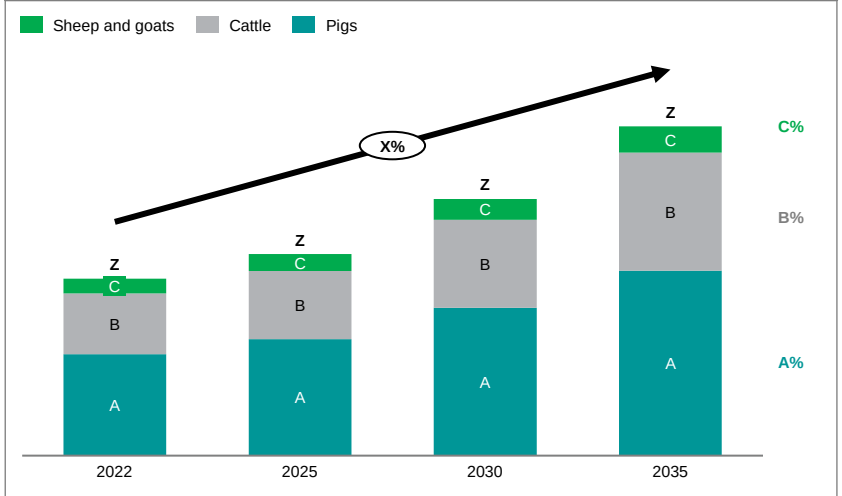
Europe Market Size and Growth

Europe remains the second-ranked market in vaccines through higher pricing backed by innovation

The Europe livestock vaccines market is expected to reach approximately $X billion by 2035, with a balanced growth distribution across all disease segments.

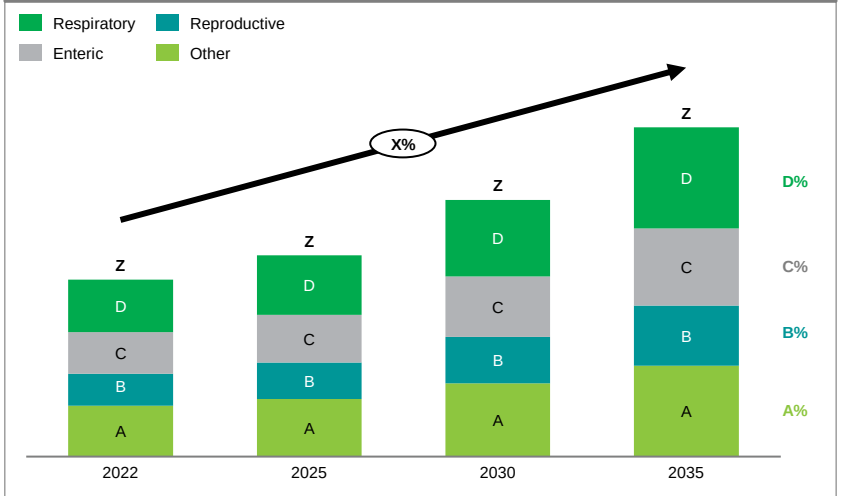
« More information on Europe market size and growth »

Europe vaccines market by species ($m)



Source: Stonehaven Consulting

Europe vaccines market by disease ($m)



Source: Stonehaven Consulting

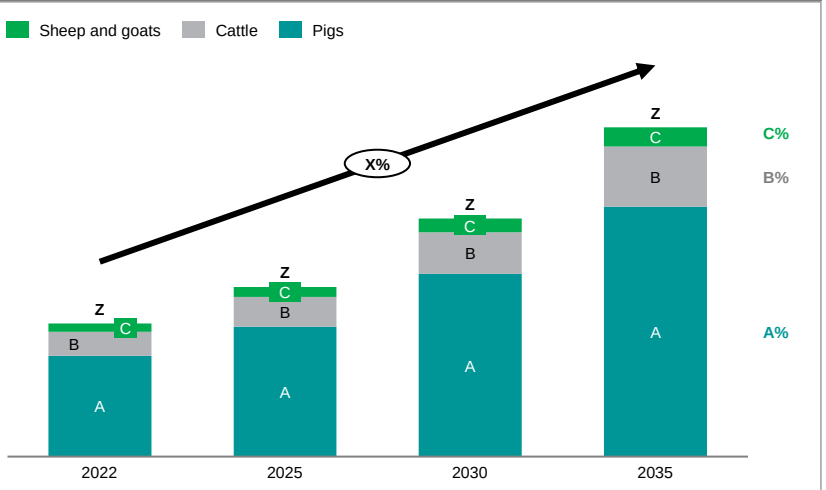
APAC Market Size and Growth

The strongest growth region in livestock vaccines by value

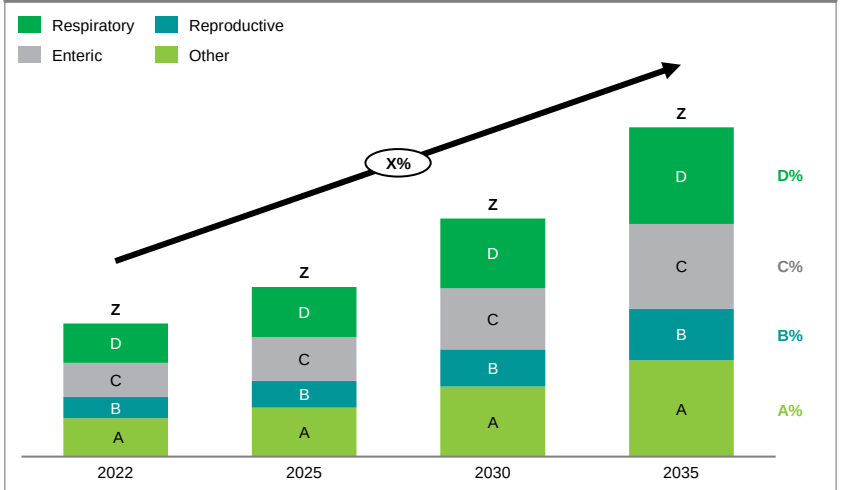
The APAC livestock vaccines market is expected to grow by approximately $X billion over the outlook period, surpassing the combined value of the EU and US market between 2025 and 2030.

« More information on APAC market size and growth »

APAC vaccines market by species ($m)



APAC vaccines market by disease ($m)



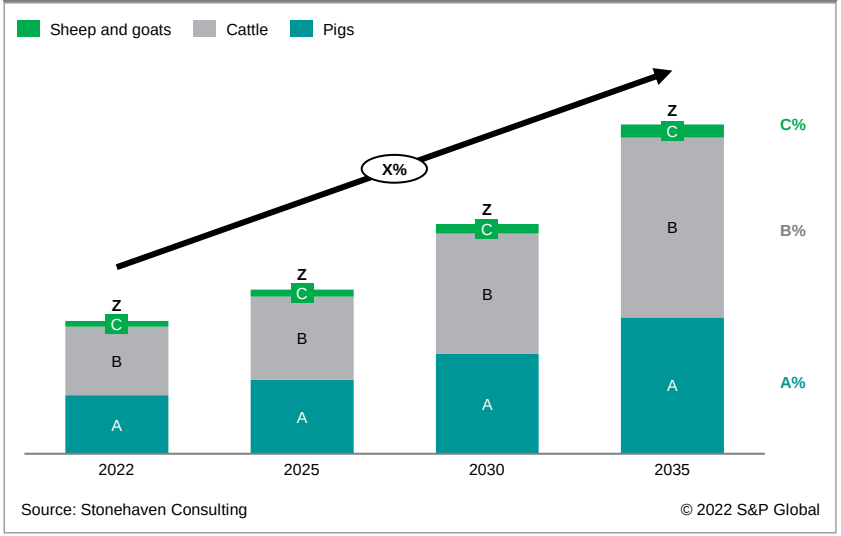
LATAM Market Size and Growth

The only market where cattle vaccines are set to grow by more than $X billion

The LATAM livestock vaccines market is expected to reach approximately $X billion by 2035, surpassing the size of the US vaccines market.

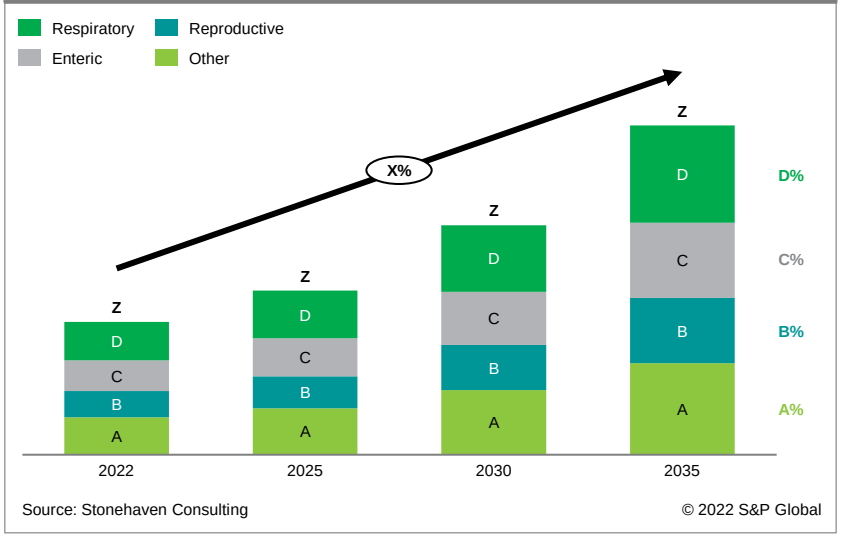
« More information on LATAM market size and growth »

LATAM vaccines market by species ($m)



Source: Stonehaven Consulting

LATAM vaccines market by disease ($m)



Source: Stonehaven Consulting

Chapter 5: Standard of Care

Key Trends in Cattle Standard of Care

1 Increased focus on preventative measures

« Information on increased focus on preventative measures »

2 Pressure to decrease antibiotic use

« Information on pressure to decrease antibiotic use »

3 Reducing carbon footprint

« Information on reducing carbon footprint »

4 Demand for supply chain traceability for meat & milk

« Information on demand for supply chain traceability for meat & milk »

5 Demand for improved vaccines

« Information on demand for improved vaccines »

Source: Timsit *et al.* (2020), Expert input, Stonehaven Consulting AG.

Cattle Vaccines Current Standard of Care

Different rearing conditions drive different cattle vaccination protocols between the US and Europe

North America

Beef cattle

Cows and bulls	Routine
Standard	
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	<< Routine >>
Optionally	
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	<< Routine >>
Disease/Vaccine Antigen 3	<< Routine >>
Disease/Vaccine Antigen 4	
Disease/Vaccine Antigen 5	

Dairy cattle

Calves and heifers	Routine
Standard	
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	<< Routine >>
Disease/Vaccine Antigen 3	<< Routine >>
Disease/Vaccine Antigen 4	<< Routine >>
Optionally	
Disease/Vaccine Antigen 4	

Europe

Cows and bulls	Routine
Disease/Vaccine Antigen 1	
Disease/Vaccine Antigen 2	
Disease/Vaccine Antigen 3	
Disease/Vaccine Antigen 4	
Disease/Vaccine Antigen 5	
Optionally	
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	

Calves and heifers	Routine
Standard	
Disease/Vaccine Antigen 1	
Disease/Vaccine Antigen 2	
Disease/Vaccine Antigen 3	
Optionally	
Disease/Vaccine Antigen 1	
Disease/Vaccine Antigen 2	
Disease/Vaccine Antigen 3	

Source: Expert input, Stonehaven Consulting AG

Cattle Vaccines Standard of Care vs Unmet Needs

Top unmet needs in cattle vaccines

Key diseases	% of Market | Vaccine antigens	Opportunities
Respiratory ***(including respiratory, enteric and/or reproductive combinations)**	X-Y% *(A-B%) << Vaccine antigens >> (multiple combinations of live and killed vaccines)	• Many vaccinated cattle still get clinically ill with BRD; i.e., there is no comprehensive protection against all BRD-causing pathogens nor long-lasting protection ***« More information on opportunities »***
Enteric	X-Y% << Vaccine antigens >>	***« Information on opportunities »***
Reproductive	X-Y% << Vaccine antigens >>	• *Neospora caninum* abortion of cattle ***« More information on opportunities »***
Other	<< Vaccine antigens >>	• An efficacious broad-spectrum mastitis vaccine remains an industry ambition ***« More information on opportunities »***

[1]This includes a developing countries lists of antigen; Source: Expert input, Stonehaven Consulting AG

Cattle Vaccines Unmet Needs

Mastitis and other opportunities

Mastitis vaccines available

XXXX is a leader in Europe and probably worldwide:

- XXXX: leading mastitis vaccine against *E. coli* and *S. aureus* (EU and ROW)
- XXXX: the first *Strep. uberis* mastitis vaccine in Europe

XXXX:

- XXXX: *E. coli* vaccine US/Canada

XXXX:

- XXXX (*E. coli*) and XXXX (*S. aureus*) US/Canada

XXXX:

- XXXX (*Mycoplasma bovis*) US

In the US, several autogenous mastitis vaccines are also being produced

Mastitis customer POV

- Mastitis vaccines are currently available, but efficacy is still considered suboptimal
- In general, the bigger the herd size, the higher the percentage of mastitis vaccination (based on US data)
- The average vaccination cost per cow is around $X

Mastitis vaccines provider POV

- The development costs of mastitis vaccines are high and the probability of success uncertain

« More information on Mastitis vaccines provider POV »

Adjacent areas of opportunity

- Integrated digital farm monitoring, diagnostics (Dx) and data solutions to diagnose BRD/mastitis early and monitor pathogens

« More information on adjacent areas of opportunity »

Key Trends in Swine Standard of Care

Fast response to emerging diseases and improving respiratory disease management remains in focus

1 Increased focus on preventative measures

« Information on increased focus on preventative measures »

4 Demand for supply chain traceability

« Information on demand for supply chain traceability »

2 Pressure to decrease antibiotic use

« Information on pressure to decrease antibiotic use »

5 Demand for fast development vaccines

« Information on demand for fast developing vaccines »

3 Reducing carbon footprint

« Information on reducing carbon footprint »

Source: Expert input, Stonehaven Consulting AG

Swine Vaccines Current Standard of Care

A more homogenous disease landscape drives similarities in protocols across regions

Overall

Sow

Standard	Routine
	<< Routine >>
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	
Disease/Vaccine Antigen 3	<< Routine >>
Disease/Vaccine Antigen 4	<< Routine >>
Disease/Vaccine Antigen 5	
Disease/Vaccine Antigen 6	<< Routine >>
Disease/Vaccine Antigen 7	

Piglet

Standard	Routine
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	<< Routine >>
Disease/Vaccine Antigen 3	<< Routine >>
Disease/Vaccine Antigen 4	
Disease/Vaccine Antigen 5	<< Routine >>
Disease/Vaccine Antigen 6	<< Routine >>
Disease/Vaccine Antigen 7	

Source: Expert input, Stonehaven Consulting AG

Current status and trends

The swine vaccine market is divided into the sow market and the piglet market. Swine vaccination rates are fairly high – over X% for Europe, the US, South Africa, Australasia and East Asia.

« More information on current status and trend »

Swine Vaccines Standard of Care vs Unmet Needs

Top unmet needs in swine vaccines

Key diseases	Vaccine antigens	Opportunities
Respiratory[1]	<< Vaccine antigens >>	• Combination vaccines for *M. hyo* and Rhinitis ***« More information on opportunities »***
Enteric[1]	<< Vaccine antigens >>	• Extended DOI and multi-serotype PRRS and parvovirus ***« More information on opportunities »***
Reproductive	<< Vaccine antigens >>	• Brachyspira Hyo. vaccines ***« More information on opportunities »***
Other	<< Vaccine antigens >>	• Need for efficacious vaccines in China and EU – ideally oral, ***« More information on opportunities »***

[1] Note XXXX.

Source: Expert input, Stonehaven Consulting AG

Key Trends in Sheep and Goat Standard of Care

Prevention continues to be a key market driver

1 Increased focus on preventative measures

« Information on increased focus on preventative measures »

4 Demand for supply chain traceability for meat & milk

« Information on demand for supply chain traceability for meat & milk »

5 Demand for improved vaccines

« Information on demand for improved vaccines »

2 Pressure to decrease antibiotic use

« Information on pressure to decrease antibiotic use »

3 Reducing carbon footprint

« Information on reducing carbon footprints »

Source: Timsit *et al.* (2020), Expert input, Stonehaven Consulting AG.

Sheep and Goat Vaccines Current Standard of Care

A protocol driven by clostridial vaccines with opportunities to support parasite resistance management

Overall

Goat / Ewe

Standard	Routine
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	<< Routine >>
Disease/Vaccine Antigen 3	<< Routine >>
Disease/Vaccine Antigen 4	<< Routine >>
Disease/Vaccine Antigen 5	<< Routine >>
Disease/Vaccine Antigen 6	<< Routine >>
Disease/Vaccine Antigen 7	

Lamb

Standard	Routine
Disease/Vaccine Antigen 1	<< Routine >>
Disease/Vaccine Antigen 2	<< Routine >>
Disease/Vaccine Antigen 3	<< Routine >>
Disease/Vaccine Antigen 4	<< Routine >>
Disease/Vaccine Antigen 5	<< Routine >>
Disease/Vaccine Antigen 6	<< Routine >>

Current status and trends

Vaccination in sheep and goats needs to fit with routine health handling occasions, e.g., deworming or application of ectoparasitics, grazing or animal management movements.

« More information on current status and trend »

Source: Expert input, Stonehaven Consulting AG

Sheep and Goat Vaccines Standard of Care vs Unmet Needs

Top unmet needs in sheep and goat vaccines

Key diseases	Vaccine antigens	Opportunities
Respiratory **(if Respiratory and Enteric combinations included)**	<< Vaccine antigens >>	• Maedi/Visna, caprine arthritis encephalitis virus and general lentiviruses vaccines, high need with limited control options and or no existing vaccines ***« More information on opportunities »***
Enteric[1]	<< Vaccine antigens >>	• *Salmonella* spp., *E. coli* (watery mouth disease in lambs) ***« More information on opportunities »***
Reproductive	<< Vaccine antigens >>	***« Information on opportunities »***
Other	<< Vaccine antigens >>	***« Information on opportunities »***

[1] Vaccines 2020, 8(3), 460; https://doi.org/10.3390/vaccines8030460; Source: Expert input, Stonehaven Consulting AG

Managing Complex Emergency Diseases in Livestock (1/3)

Foot-and-mouth disease as a case study

A complex virus

Current FMD vaccines consist of a mixture of inactivated and adjuvanted relevant FMD strains.

« More information on FMD »

Costly infrastructure setup

The FMD virus is rather fragile (although this differs in degree between serotypes and strains) meaning a well-designed and controlled vaccine production process is necessary to:

« More information on costly infrastructure setup »

Dedicated standards

The FAO closely monitors and regulates the FMD vaccine environment and has also established a set of requirements for producers.

« More information on dedicated standards »

Managing Complex Emergency Diseases in Livestock (2/3)

FMD – one disease, two species (swine and cattle) and multiple market landscapes

Tender business in non-endemic countries

In the FMD tender business, companies can subscribe to a request for vaccines (of a specific composition) put out by a country (or centrally in the EU), where an outbreak of FMD has occurred and/or needs to be controlled.

« More information on tender business in non-endemic countries »

Local/regional strains and producers for endemic areas

Countries where FMD is endemic or in the process of being eradicated can also initiate tenders for local producers.

« More information on local/regional strains and producers for endemic areas »

Managing Complex Emergency Diseases in Livestock (3/3)

Better equipped for upcoming challenges through experience with FMD

Current facilities equipped to handle other emergencies

Due to the high biosecurity standards in place for facilities handling FMD virus, these sites are also suited to handle other emerging viruses. An EU FMD facility is therefore also an entry ticket to the production of emergency vaccines

« More information on current facilities »

Next-generation FMD vaccines are still necessary

Next-generation vaccines remain a need. New variants of FMD virus emerge on a regular basis,

« More information on next generation FMD vaccines »

Companies and governmental institutions invest in next-generation vaccine platforms aiming for:

1. No need to utilize BSL-3 manufacturing (higher flexibility, lower investment)

« More information on aims of companies and governmental institutions »

The most important vaccine platforms being explored are:

- Capsid virus-like particles (VLPs) expressed by cell-culture systems or *E. coli* expression. Merck and Pirbright are researching a baculovirus expression system. LVRI in China is investigating *E. coli* expression systems

« More information on important vaccine platforms being explored »

Chapter 6: Competition and Innovation

Competitive Landscape (1/2)

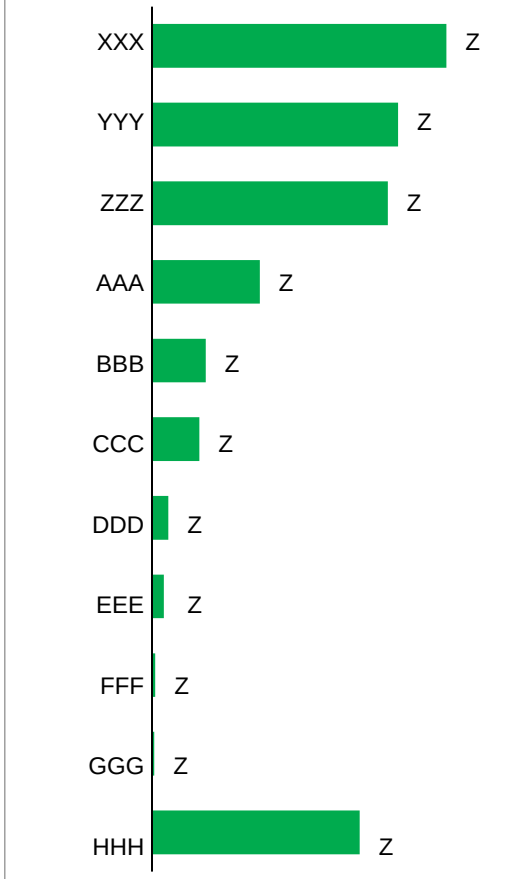
The all-species vaccine market is highly consolidated with XXX, YYY and ZZZ leading the way

Overall animal health vaccines market

XXX, YYY and ZZZ stand out as the market leaders for veterinary vaccines – **across all species** – in terms of revenues and number of vaccines available on the market.

« More information on competitive landscape »

Global vaccines sales, 2020 ($bn)



Source: XXXX,
S&P Global Commodity Insights

Competitive Landscape (2/2)

The livestock vaccine market is equally consolidated, with XXX, YYY and ZZZ leading the way

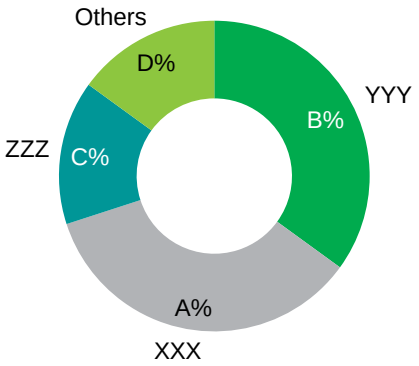
Livestock vaccines market

The livestock vaccines segment of the animal health market features highly competitive sales deal structures driven by the top players. These players carry comprehensive vaccine lines in their portfolios and have substantial marketing capabilities.

« More information on livestock vaccine market »

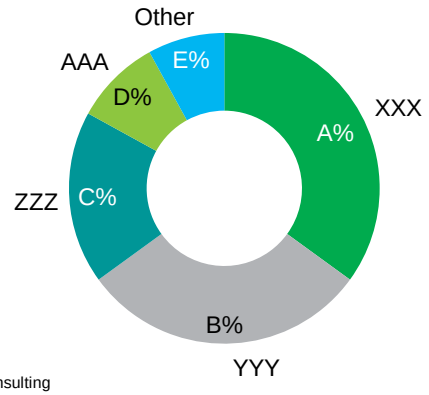
Source: Expert input, Stonehaven Consulting

Ruminant vaccines market share (%)



Source: Stonehaven Consulting

Swine vaccines market share (%)



Source: Stonehaven Consulting

Significant[1] Vaccine Lines in the US

XXX, YYY and ZZZ hold strong leadership over the livestock vaccines market

Species	Vaccine line	Main diseases	Company
 Cattle	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Swine	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Sheep and Goats	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**

Competitive landscape
Combination vaccines with BVD, IBR, PI3 and RSV antigens share the market leadership in cattle. ***« More information on competitive landscape »***

1. Vaccine lines with significant market share in the region, measured by value

Significant[1] Vaccine Lines in Europe

The same 3 multinationals lead in Europe, while XXX and YYY continue to expand their foothold

Species	Vaccine line	Main diseases	Company
 Cattle	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Swine	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Sheep and Goats	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**

Competitive landscape

Different animal rearing conditions and pathogen prevalence drive diverse vaccine combinations.

« More information on competitive landscape »

1. Vaccine lines with significant market share in the region, measured by value

Significant Vaccine Lines in LATAM

A market shaped by the impact of FMD public tenders and the absence of PRRS until 2022

Species	Vaccine line	Main disease	Company
 Cattle	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Swine	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Sheep and Goats	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**

Competitive landscape

In 2018, the WOAH declared Brazil, the world's largest beef exporter, free of FMD through vaccination.

« More information on competitive landscape »

Significant Vaccine Lines in APAC

A similar landscape of global brands belies the importance of local companies in China and Japan

Species	Vaccine line	Main disease	Company
 Cattle	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Swine	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
 Sheep and Goats	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**
	<< Vaccine line name >>	<< Disease(s) name >>	**<< Company name >>**

Competitive landscape
Slightly different antigen combinations but, overall, the same multinational players and well-known brand vaccine lines, ***« More information on competitive landscape »***

Livestock Vaccines Competitive Landscape

The current competitive landscape encompasses three types of players

Established top tier

- This established top tier with leading market shares across multiple species is comprised of XXX, YYY and ZZZ

« More information on established top tier players »

Expanding

- **XXX** and **YYY** have seen significant expansion of their swine vaccine portfolios and regional footprint in recent years, with clear accruement of competencies in innovative vaccine development

« More information on expanding players »

Local

- Local companies have built their advantage on one of two (sometimes both) factors:

« More information on local players »

Top Animal Health Players and their Portfolios (1/2)

The top three players have comprehensive portfolios with nearly all antigen combinations available

<< Company 1 >>

« Information on company 1 and its portfolio »

<< Company 2 >>

« Information on company 2 and its portfolio »

« Information on company 2 and its portfolio continued »

Top Animal Health Players and their Portfolios (2/2)

The top three players have comprehensive portfolios with nearly all antigen combinations available

<< Company 3 >>

« Information on company 3 and its portfolio »

<< Company 4 >>

« Information on company 4 and its portfolio »

<< Company 5 >>

« Information on company 5 and its portfolio »

<< Company 6 >>

« Information on company 6 and its portfolio »

Other notable vaccines players

« Information on other notable vaccines players »

Innovation (1/2)

Strategies beyond product innovation for sustainable livestock vaccine management

Improved vaccines and new antigen targets are but a fraction of the innovation necessary for better vaccine performance in the field.

1 Simplifying acceptance

« Information on simplifying acceptance »

4 More research on livestock immune response

« Information on more research on livestock immune response »

2 Improving access globally

« Information on improving access globally »

5 Improved vaccines

« Information on improved vaccines »

3 More practical tools and Dx

« Information on more practical tools and Dx »

Innovation (2/2)

Areas of innovation in livestock vaccines

Overall

The livestock vaccines market is a mature one, with core disease needs met by a few large players. A single new viral or bacterial component is usually not enough to unlock a successful competing model, with the exception of where it has a high economic impact and meets emerging disease needs – e.g., DIVA ASF vaccines or an efficacious broad spectrum mastitis vaccine.

« More information on overall innovation »

Key drivers

Expect to see developments in terms of **ease of administration, increased DOI** by providing mucosal vaccines (intranasal, oral or modular combinations) and newer adjuvants with improved safety.

« More information on key drivers »

Complementarities

Expect a spill-over effect into adjacent areas of disease prevention, such as diagnostic and device markets,

« More information on complementarities »

Longer term

« Information on longer term innovation »

Selection of Innovation Projects and Start-ups

Start-ups or projects with active livestock vaccine targets

Company	AH	HH	Current target(s)	Product technology	Description
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>
<< Company name >>	Y/N	Y/N	<< Current target(s) >>	<< Product technology >>	<< Description >>

AH: Focused on Animal Health; **HH:** Focused on Human Health

African Swine Fever (1/2)

A significant notifiable disease with no effective commercial vaccines available

A notifiable disease

ASF is a viral disease of domestic pigs and wild boar that is usually fatal. The disease was first diagnosed in Kenya and is endemic in sub-Saharan Africa, but it is also present in Europe and Asia.

« More information on ASF »

No commercial vaccines available

There are currently no viable vaccines or cures for the disease, so ASF outbreaks often lead to mass slaughter of farm-kept pigs.

« More information on ASF vaccine availability »

African Swine Fever (2/2)

A significant notifiable disease with no effective commercial vaccines available

Active partnerships and projects

Traditional vaccine development approaches to ASF have not been successful – the inactivated virus does not provide protection and use of live attenuated virus had a poor safety profile.

« More information on active partnerships and projects for ASF vaccine »

Chapter 7: Definition and Methodology

Market Definition and Scope (1/2)

Definition of vaccines and regional/species scope

Overview

The focus of this report is vaccines used for livestock animals. A definition of the vaccines and pathogens of relevance can be found later in this section. Other biologic categories with immune response benefits, such as monoclonal antibodies or recombinant therapeutic proteins, might be discussed in the innovation section but are not quantified in the market outlook at present. Due to the limitations of data available, the autogenous vaccine segment market value is not quantified.

Regional scope

- US includes the United States of America only
- EU includes all European markets plus the UK
- APAC includes all markets in Asia Pacific and Oceania, including China, Japan, Vietnam, Australia and New Zealand
- LATAM includes Argentina, Brazil, Mexico and the rest of Latin America
- ROW includes all major markets not captured above, including Canada and India, as well as markets in Africa and the Middle East

The countries chosen were based on whether data was available on the volume of vaccine sales. Data availability was particularly poor for countries categorised under ROW, hence the reliability of projections for this market segment is not as high as that of the other regions.

Species scope

- Ruminants, with a focus on cattle, sheep and goats
- Swine

Poultry and Fish were excluded from the scope of this report.

Market Definition and Scope (2/2)

Not exhaustive

Scope of target diseases

Target disease	Examples of disease targets in ruminants	Examples of disease targets in swine
Respiratory	<< Example(s) of disease targets in ruminants >>	<< Example(s) of disease targets in swine >>
Enteric	<< Example(s) of disease targets in ruminants >>	<< Example(s) of disease targets in swine >>
Reproductive	<< Example(s) of disease targets in ruminants >>	<< Example(s) of disease targets in swine >>
Other	<< Example(s) of disease targets in ruminants >>	<< Example(s) of disease targets in swine >>

Vaccines and Pathogens

Definition and classification of vaccines and pathogens

Definition of vaccine

Vaccines contain components that are designed to elicit an immune response in an animal. Vaccines may comprise four parts:

1. **Antigen** – << Definition of antigen >>
2. **Vehicle** – << Definition of vehicle >>
3. **Adjuvant** – << Definition of adjuvant >>
4. **Stabilizers** – << Definition of stabilizers >>

Vaccine manufacturers provide recommendations for how many doses are required for an optimal immune response.

« More information on vaccine definitions »

Definition of pathogen

Pathogens are microorganisms that cause diseases in animals. Vaccines are designed to provide immunity against pathogens. Viruses, bacteria, fungi and parasites can be pathogens.

- **Established pathogens** are endemic and have circulated for a long time,

  « More information on established pathogens »

- **Emerging pathogens** are those that are becoming more prevalent and are relatively new,

  « More information on emerging pathogens »

Emerging variants lead to vaccine antigens needing to be updated periodically,

« More information on emerging variants »

Zoonotic transfer is the transmission of a pathogen from animals to humans.

Categorizing vaccines by composition

Vaccines display parts of pathogens to the immune system. These are called antigens. Vaccines are classified according to which antigens they display.

- **Monovalent** << Definition of monovalent vaccine >>
- **Multivalen**t << Definition of multivalent vaccine >>
- **Therapeutic** << Definition of therapeutic vaccine >>

Conventional and Innovative Vaccines

Definition and classification of vaccines and pathogens

Conventional vaccines

For the purpose of market modelling, we have defined conventional vaccines as those that use well-established technologies. These types of vaccines have been commercialized for a long time.

- **Killed** << Definition of killed vaccine >>
- **Live attenuated** << Definition of live attenuated vaccine >>
- **Toxoid** << Definition of toxoid vaccine >>
- **Subunit** << Definition of subunit vaccine >>

Livestock vaccines are usually given as subcutaneous injections, although nasal sprays are available for certain preparations.

Innovative vaccines

For the purpose of market modelling, we have defined innovative vaccines as those that utilize new technologies to trigger an immune response. Such technologies include:

- **Recombinant protein** << Definition of recombinant protein vaccine >>
- **Viral vector** << Definition of viral vector >>
- **DNA** << Definition of DNA vaccine >>
- **mRNA** << Definition of mRNA vaccine >>
- **T cell** << Definition of T cell vaccine >>

Experimental technologies

Those currently in development include antigen-presenting cell (APC) vaccines that attempt to display antigens to the immune system in a more efficient way.

« More information on experimental technologies »

Market Sizing Assumptions (1/3)

A top-down model based upon historical sales records and Stonehaven Consulting market-sizing data

Baseline market size

Historical sales data (prior to 2021), as well as sales projections (2021-2030), were available for the farm animal vaccines market. The data was available on a regional, species and target disease basis. Baseline market size projections between 2022-2035 were projected using historical growth rates, and excluded the effects of market drivers.

Assumptions impacting baseline market size

	Projected base sales growth	Sales per disease
Description	Rate of projected year-on-year growth in the market value was based on historical annual growth. Growth varied across region and species.	Global sales figures were split by target disease type. The split between the four broad diseases types in scope was based upon historical sales data, with regional and species variations.
Regional variation	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***
Species variation	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***

Source: Stonehaven Consulting

Market Sizing Assumptions (2/3)

The effects of various macroeconomic trends on the vaccines market were taken into account when modelling the market size

Adjusted sales data

Market year-on-year changes as a result of market trends were applied based on expert inputs and Stonehaven Consulting estimates.

Market trends influencing change in market size between 2022-2035

	Innovation	Change in vaccine protocol	Emerging pathogen threat
Description	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***
Regional variation	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***
Species variation	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***

Source: Stonehaven Consulting

Market Sizing Assumptions (3/3)

The effects of various trends specific to the vaccines market were taken into account when modelling the market size

Adjusted sales data

Market year-on-year changes as a result of market trends were applied based on expert inputs and Stonehaven Consulting estimates.

Market trends influencing change in market size between 2022-2035

	Competitive environment and price	Regulatory landscape	Climate change
Description	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***
Regional variation	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***	***« Information on market sizing assumptions »***
Species variation			***« Information on market sizing assumptions »***

Source: Stonehaven Consulting

Chapter 8: Report Authors and Expert Panel

Report Authors

Mafalda Tenente
Independent Board Member
and Advisor

Mafalda Tenente is an independent board member and strategy advisor with senior leadership experience in complex, multi-stakeholder industries, from animal health vaccines, pharmaceuticals and aquaculture, to gaming and non-profit. She currently serves on the boards of Casino Interlaken AG, the Swiss INSEAD Alumni Association, and advises companies across industries, from premium consumer goods to start-ups.

She has previously served as Global Marketing Director Emerging Businesses at Elanco, and Global Marketing Director Aqua for Novartis Animal Health, as well as start-up Advisor in the Health Tech vertical for the Kickstart Innovation. She has a degree in Economics from University of Porto and an MBA and executive certificate in Corporate Governance from INSEAD.

Arthur Redpath
Senior Global Marketing Expert,
Stonehaven Consulting AG

Arthur is a senior marketing executive with over 30 years of experience in the animal health, pharmaceuticals and agricultural industries, who graduated from Edinburgh University Royal Dick Veterinary College as a veterinary surgeon in 1987.

He joined Novartis Animal Health in 2000, where he progressed to global leadership roles. In 2015, he joined Elanco, where he assumed the leadership positions of EMEA Chief Marketing Officer and leader of the Global Marketing Excellence team.

Andre Knuchel-Takano
Consultant
Stonehaven Consulting AG

Andre qualified as a veterinary surgeon from the Royal Veterinary College and later obtained an MSc in International Health Management from Imperial College London. He is also a fully qualified chartered management accountant and previously worked at a FTSE 100 Human Pharma and Vaccines company, focusing on strategic finance and accounting across consumer healthcare, respiratory franchise and Japan pharmaceuticals.

At Stonehaven, he has worked on several strategy projects for animal health companies, human health companies and start-up clients. He also has experience delivering disease burden forecasting projects in the human public health field.

Expert Panel

Rene Aerts
Senior Advisor

René holds a PhD in Pharmaco-chemistry and Bioanalytics.

He has worked in senior roles in the animal health industry for more than 30 years, of which 23 years were with Intervet and Merck Animal Health. He was Head of Antibiotics Research, Global Head Regulatory Affairs, Head of Manufacturing Operations for The Netherlands, and executive team member of Merck Animal Health responsible for global vaccine R&D.

More recently, his work has focused on advising senior management of top tier animal health companies and venture capital/private equity partners on R&D and manufacturing strategy, as well as M&A projects.

René holds a number of non-executive positions in the field of animal health, human biotech and agtech.

Tony Benitz
Senior R&D and Regulatory Advisor

Tony Benitz retired from Boehringer-Ingelheim after a 35-year career in animal health. He served in senior roles in research and development in several multinational companies, including Global Head of R&D for Pharmacia Animal Health and Novartis Animal Health. Most recently, he served as Global Head of Regulatory Affairs for Merial, and he was closely involved in the integration of R&D and regulatory affairs into Boehringer Ingelheim.

His experience includes bringing a range of new therapeutics and vaccines for animals to the market and working closely with regulatory agencies in many international markets, including the FDA's Center for Veterinary Medicine, the USDA and the EPA in the US.

Dirk Werling
Director of Centre of Vaccinology, RVC

Dirk holds a DrMedVet degree from the ETH Zuerich/University of Zuerich and a PhD in immunology from the University of London. He has worked in senior roles in academia in animal health for more than 25 years and has been adviser for top-tier animal health companies and venture capital companies on R&D projects. He also holds a non-executive position in the field of animal health biotech.

More recently, he was appointed as Director of the Centre of Vaccinology and Regenerative Medicine at the Royal Veterinary College, University of London.

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Chapter 9: Main Sources

Main Sources

Chapter 1

1. Reference 1

Chapter 2

1. Reference 1
2. Reference 2

Chapter 5

1. Reference 1
2. Reference 2
3. Reference 3
4. Reference 4
5. Reference 5

Chapter 6

1. Reference 1
2. Reference 2
3. Reference 3
4. Reference 4
5. Reference 5
6. Reference 6
7. Reference 7
8. Reference 8
9. Reference 9
10. Reference 10
11. Reference 11
12. Reference 12

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