



STAR-IDAZ
International Research
Consortium on Animal Health

STAR-IDAZ IRC update

CoVetLab '18



Outline

Background to STAR-IDAZ

International Research Consortium on Animal Health

Partners and Governance Structure

Scientific Committee

Addressing priority challenges (Working Groups)

Research Roadmaps and Systems Solution Maps

ERA-Net Co-fund on animal health

Regional Network for Africa and the Middle-East

STAR-IDAZ

(Global **S**trategic **A**lliances for the Coordination of **R**esearch on the Major **I**nfectious **D**iseases of **A**nimals and **Z**oonoses)



A global initiative to address the coordination of research programmes at international level in the area of animal health and in particular infectious animal diseases including zoonoses.



International Research Consortium on Animal Health - STAR-IDAZ IRC



Higher level of commitment for coordinated research activities through the STAR-IDAZ International Research Consortium for Animal Health (IRC)

- Agree minimum level of investment in research on priorities over a five year period (threshold \$US 10 million; group funding commitment possible)
- Agree delivery targets
- Agree to coordinate/align funding to deliver these targets (members' own funding procedures, unless agreed otherwise; governance document & policy guidelines)
- Agree to share research results (as much as necessary, without jeopardising IPR)
- 25 Partners from 16 countries including one international research organisation (ILRI), one charity (BMGF), the European Commission and three industry have signed the Letter of Intent to participate.
- Total combined research budget of \$US 2.5+ billion

IRC Objectives and Deliverables



The overall objective of STAR-IDAZ IRC is to coordinate research at international level to contribute to new and improved animal health strategies for at least 30 priority diseases/infections/issues

The deliverables include:

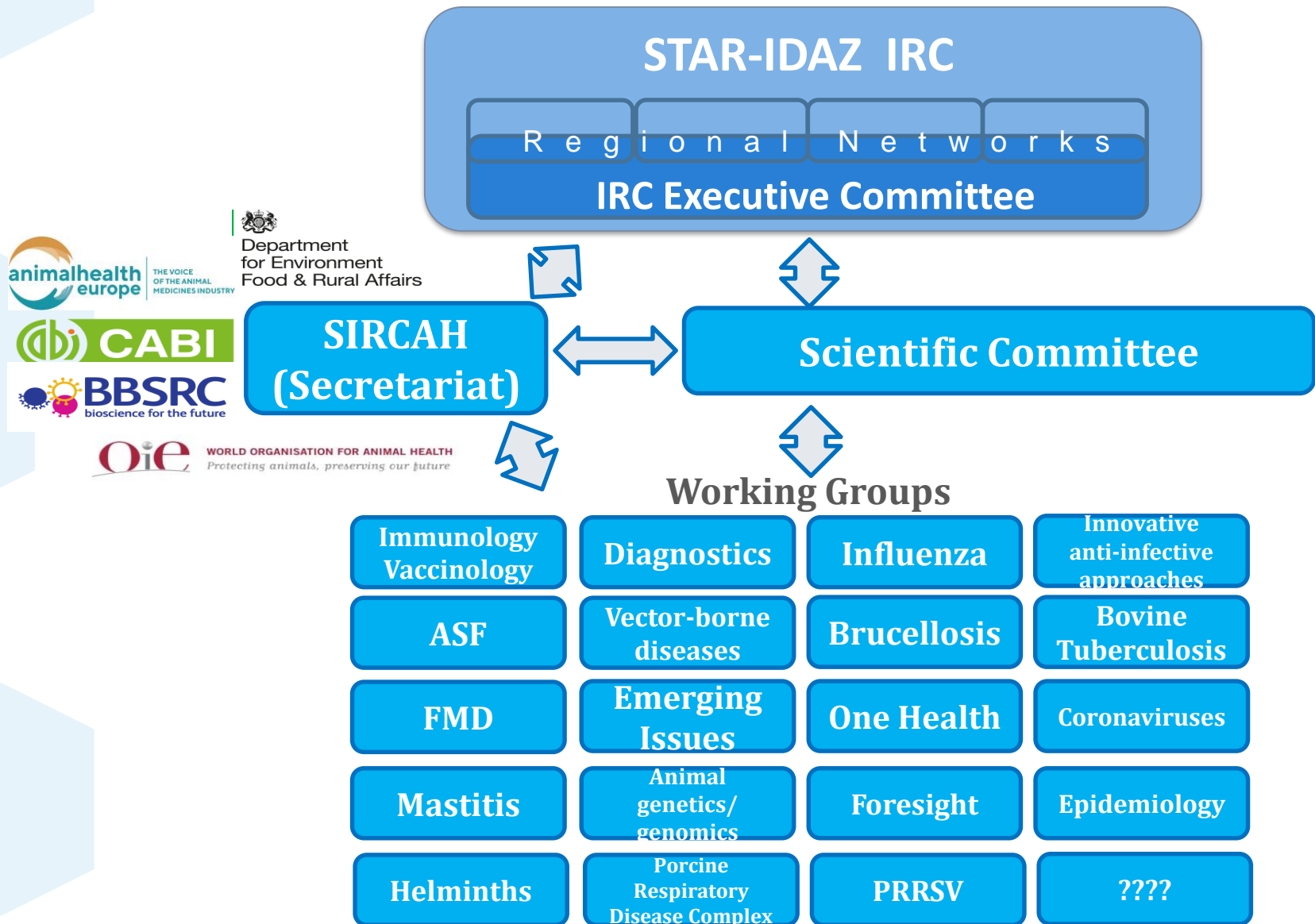
- Candidate vaccines
- Diagnostics
- Therapeutics
- Other animal health products and procedures
- Key scientific information/tools to support risk analysis and disease control

IRC ExC Partners



- 1. Danish National Veterinary Institute (DTU Vet), Denmark**
- 2. National Institute of Agricultural Research (INRA), France**
- 3. The French Agency for Food, Environmental and Occupational Health & Safety (ANSES), France**
- 4. Ministry of Health, Italy**
- 5. Ministry of Economic Affairs (MinEZ), The Netherlands**
- 6. National Institute for Agriculture and Food Research and Technology (INIA), Spain**
- 7. Department for the Environment, Food and Rural Affairs (Defra), UK**
- 8. Biotechnology and Biological Science Research Council (BBSRC), UK**
- 9. Regional Consortium; Universiteit Gent (Ghent University), Université de Liège, the Federal Public Service Health, Food Chain Safety and Environment (unit Contractual Research) and CODA-CERVA (Veterinary and Agrochemical Research centre)**
- 10. Kimron Veterinary Institute, Israel**
- 11. International Livestock Research Institute (ILRI), Kenya**
- 12. Tanzania Veterinary Laboratory Agency (TVLA), Tanzania**
- 13. National Institute of Animal Health, National Agriculture and Food Research Organisation (NIAH), Japan**
- 14. Agriculture Research services, United States Department of Agriculture (USDA ARS), US**
- 15. National Institute of Agriculture Technology (INTA), Argentina**
- 16. Ministry of Science, Technology and Productive Innovation (MINCYT), Argentina**
- 17. Canadian Food Inspection Agency (CFIA), Canada**
- 18. World Organisation for Animal Health (OIE)**
- 19. Zoetis**
- 20. Bill and Melinda Gates Foundation (BMGF)**
- 21. HealthforAnimals (Global Animal Medicines Association)**
- 22. Diagnostics for Animals (Veterinary Diagnostics Manufacturers) (formerly EMVD)**
- 23. European Commission**
- 24. Regional Consortium; Nigerian Animal Health Research Network led by National Veterinary Research Institute Vom**
- 25. National Advisory Council on Animal Health (CONASA) and the National Autonomous University of Mexico (UNAM), Faculty of Veterinary Medicine and Zootechnics (FVMZ)**

Governance Structure





Secretariat for the International Research Consortium on Animal Health (SIRCAH)

- Five year project funded by the European Commission through H2020
- Partnership including Defra (UK Department for Environment, Food and Rural Affairs), World Organisation for Animal Health (OIE), CAB International, BBSRC (Biotechnology and Biological Sciences Research Council), and AnimalhealthEurope
- Provides organisational and communication support to the IRC including ExC, SC and WGs
- Facilitates research gap analysis and roadmapping including the provision of literature reviews for working groups
- Maps funding activities against identified research needs, and helps mobilise resources to address them

SIRCAH Activities



- **Establish working groups** for priority diseases and crosscutting issues - assisting with the organisation of meetings, including helping to pull together the **gap analysis** and **mapping funding activities** against identified research needs.
- **Produce and publish gap analysis and roadmap reports from working groups.**
- Advise the Scientific Committee (SC) and ExC on **how research programmes could be aligned** and make funding recommendations based on the gap analysis, roadmap reports and current funding activities.
- **Help mobilise resources** - bringing together funding bodies and helping to identify funding opportunities
- Facilitating **knowledge transfer** to bring innovation to the market

Mandate of the Scientific Committee



- Considers the scientific merit of proposals from the Executive Committee and their possible implementation
- **Acts as a scientific coordinating body**
- **Proposes research priorities for consideration by the Executive Committee (priorities assessment)**
- Proposes policies and guidelines for adoption by the Executive Committee
- **Identifies need for and proposes establishment of new Working Groups, or the closing of existing Working Groups**
- **Defines the missions of the Working Groups**

Mandate of the Scientific Committee

continued



- **Supports Working Groups in organising gap analysis and research prioritisation activities in liaison with the IRC Secretariat.**
- **Assesses and reports to the Executive Committee on progress made by the Working Groups (i.e., projects funded)**
- Organises the scientific programme of STAR-IDAZ IRC conferences as they occur
- Encourages exchange of protocols and best practices, and agree on standard operating procedures, good research practice, roadmap to reach STAR-IDAZ IRC goals in their scientific area
- Promotes interactions between Workings Groups

Scientific Committee



Don Knowles

Dieter Schillinger

Gary Entrican

Martin Beer

Edwin Claerebout

Wim van der Poel

Denis Kolbasov

Stéphan Zientara

Bruno Goddeeris

Clara María Marín Alcalá

Gustavo Zielinski

Glen Gifford

Jeremy Salt

Anette Bøtner

Irit Davidson

Sergio Rosati



Scientific Committee Meetings

Copenhagen, June 2017

- Chair and Vice Chairs elected
- Terms of Reference developed and agreed for the Working Groups
- SC members assigned to WGs and tasked with facilitating gap analysis and roadmapping activities with support from SIRCAH

Tel Aviv, February 2018

- Agreed proposed roadmap for vaccine development and approach adopted
- Discussed roadmaps for diagnostic test development and VBD
- Agreed next steps for working groups

SC representation in WGs



| Working Group | SC Member | Deputy |
|--|--------------------------|-------------------|
| Coronaviruses | Don Knowles | |
| One Health | Dieter Schillinger | |
| Vaccinology | Gary Entrican | Bruno Goddeeris |
| Influenza | Martin Beer | |
| Helminths | Edwin Claerebout | |
| Emerging issues | Wim van der Poel | |
| ASF | Denis Kolbasov | Anette Bøtner |
| FMD | Stéphan Zientara | Jeremy Salt |
| VBD | Bruno Goddeeris | Don Knowles |
| Brucellosis | Clara María Marín Alcalá | Gustavo Zielinski |
| PRDC | Gustavo Zielinski | |
| Mastitis | Gustavo Zielinski | |
| bTB | Glen Gifford | |
| Pox viruses | Jeremy Salt | |
| PRRS | Anette Bøtner | |
| Diagnostics | Irit Davidson | Sergio Rosati |
| Innovative anti-infective approaches including ATA | | |
| Foresight | | |

Working Groups



- **Porcine Reproductive and Respiratory Syndrome**
- Influenza
- **Bovine tuberculosis**
- **Foot and Mouth Disease**
- **Brucellosis**
- **African Swine Fever**
- **Vector-borne diseases**
- **Corona viruses**
- Mastitis
- **Helminths including anthelmintic resistance**
- Porcine respiratory disease
- Pox virus infections
- Others to come

- **Vaccinology**
- Emerging issues
- One Health (including food-borne pathogens and AMR)
- Animal genetics/genomics for animal health
- Epidemiology
- Diagnostics (tools and technologies)
- Integrated pathogen control for the reduction of **resistance** (Innovative anti-infective approaches, including alternatives to antimicrobials)

Mandate of the Working Groups



- Map and report on major ongoing national, regional or international initiatives in its field of interest to maximize worldwide awareness of these projects.
- Point out the problems and difficulties in the scope of the WG that ultimately prevent or delay the development of new diagnostics, vaccines/therapies and/or key information/tools for risk analysis and disease control strategies (**gap analysis**)
- **Recommend prioritised research objectives**, actions or solutions to resolve gaps, problems and difficulties in the scope of the WG
- Cooperate to ensure synergies of all research projects within the scientific area of the working group, by exchanging results, expertise, experiences and information

Lead Roadmaps

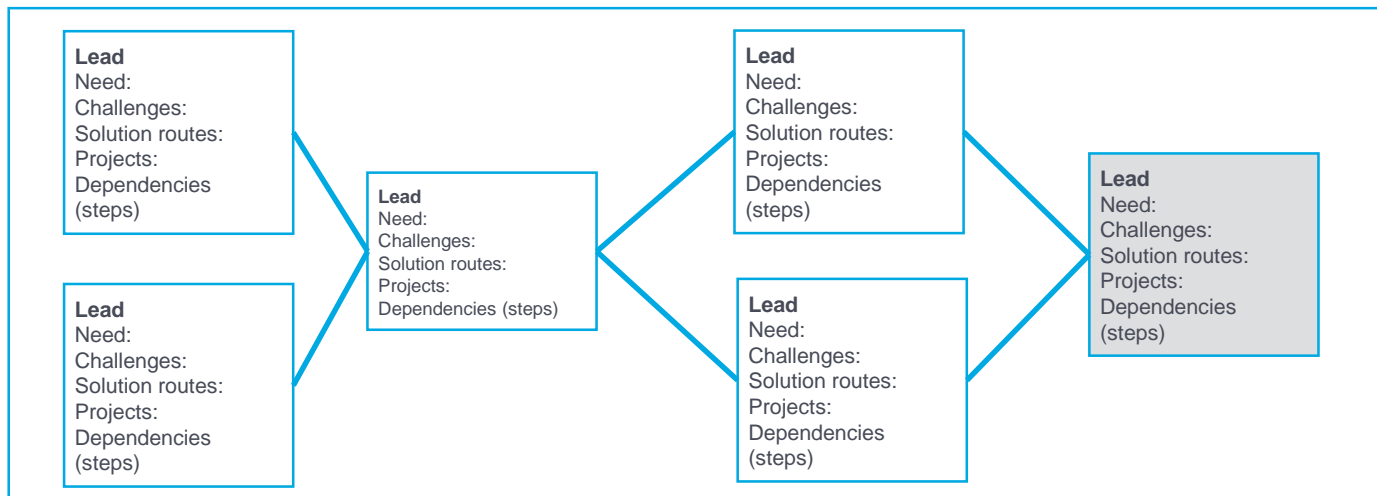
Lead Model

Lead model can be used to drive GAPs and Roadmaps

- Leads would describe Need and Challenges (the Gap)
- Leads would have dependencies or steps that build the roadmap
- Leads would be associated with Projects and possibly with Ideas
- A Roadmap would be based around a core lead
- When looking at a lead could show upstream and downstream leads

Lead Roadmap

Roadmap can be plotted by showing all the leads that are dependencies

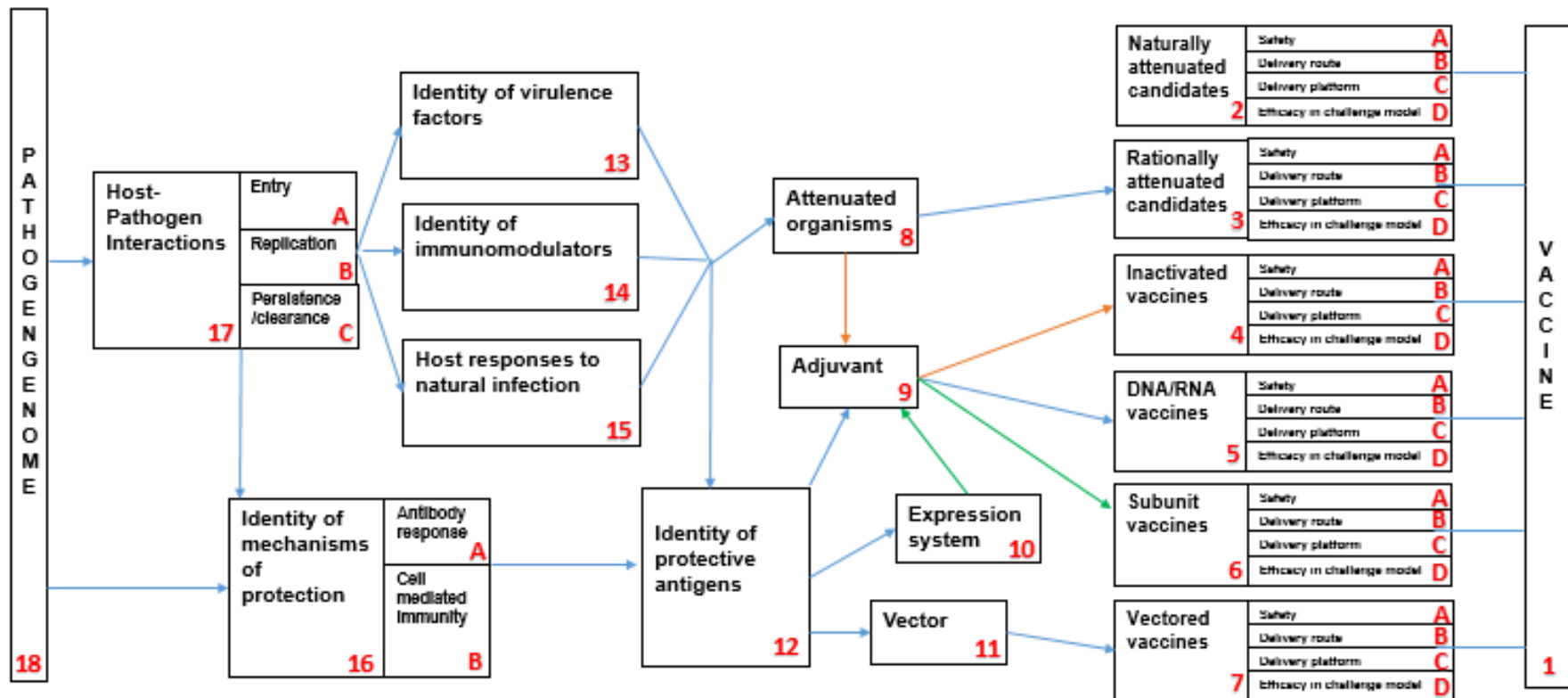


Roadmaps



- Way of visualizing a complex problem showing the gaps and helping to decide what projects need to be developed to create workable solutions.
- Available online providing a valuable tool for the research community including funders.
- The interactive vaccine candidate roadmaps will be launched shortly
 - Diagnostics, therapeutics and epidemiology and control to follow
- Current research projects from IRC partners are being mapped onto the roadmaps and linked to the challenges associated with each lead allowing users to assess the extent to which the challenges are being addressed and identifying areas requiring further attention.

Roadmap for Vaccine Development



Lead Summaries



Title:

Research Question

What are we trying to achieve and why? What is the problem we are trying to solve?

Challenge(s)

What are the scientific and technological challenges (knowledge gaps needing to be addressed)?

Solution Routes

What approaches could/should be taken to address the research question?

Dependencies

What else needs to be done before we can solve this need?

State of the Art

Existing knowledge including successes and failures

Projects

What activities are planned or underway?

Research projects



Title

Funding organisation

Research organisation

Animal and pathogen

Project objectives

(Expected) deliverables with (expected)
delivery dates and links to outputs (reports
and data)



Vaccine System Solution Map

Vaccines design & delivery System Solution Map™

Actors

Set of participants involved in the system

Pathogen
A micro-organism or other agent that causes disease

Vector / Reservoir
The carrier or means of transmission to the host

Immunisator / Host
Intended recipient of one vaccine

Immunisator
Delivery or delivery system of the vaccine

Research Community
Public and private organisations involved in vaccine discovery

Funders
Those funding research and development of vaccines

Industry
Organisations that manufacture and distribute the vaccination system

Regulators
Regulatory bodies for vaccines and host community health

Customers
Buyers of vaccine system or those economically impacted by the effect of the pathogen

Society
Those affected by the vaccine system or potentially impacted by disease

Capabilities

Growing body of knowledge, assets & resources brought to bear on the solution

Enabling technologies (fundamental & applied)
Science and technology expertise that is brought to bear on the solution

Human Factors
Research into understanding human behaviour, system barriers

Sensing & Measurement
Sensors, systems and approaches to gather data

Data Analysis & Surveillance
Interpreting/understanding and making predictions from data

Multi-Scale Modelling
Building modelling capabilities across scales

Testing, Trialling & Evaluating
Processes and platforms to evaluate solutions from lab-to-field

Failure & Root Cause Analysis
Systematically understanding failures and their causes

Economics & Impact Modelling
Understanding impacts of changes in the system

Policies, Guidelines & Standards
Defined parameters for operating within the system

Collaborative & Creative Ways of Working
Enabling ways to bring together and value leaders and members in the system work together to make value

Knowledge Repository
A common place to store and share system knowledge related to solving the problem

Actions

Activities throughout the end-to-end life cycle

Identifying opportunity
Discovering or isolating the pathogen/vaccine to be targeted and assessing potential viability (commercial, scientific, political)

Characterising pathogen
Understanding the characteristics of the pathogen and associated mechanisms

Identifying protective elements
Finding promising targets and protective immunogens

Designing Vaccine
Creating and evaluating potential vaccine candidates and associated Business Model

Testing & Trialling
Testing vaccine candidates and delivery mechanisms

Scaling-up
Scaling-up of the vaccine and delivery system

Licensing
Regulatory approval and commercial financing

Using
Distribution of and use of the vaccine and delivery system

Pathogen evolving
The continued evolution of the pathogen

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Finding promising targets and protective immunogens

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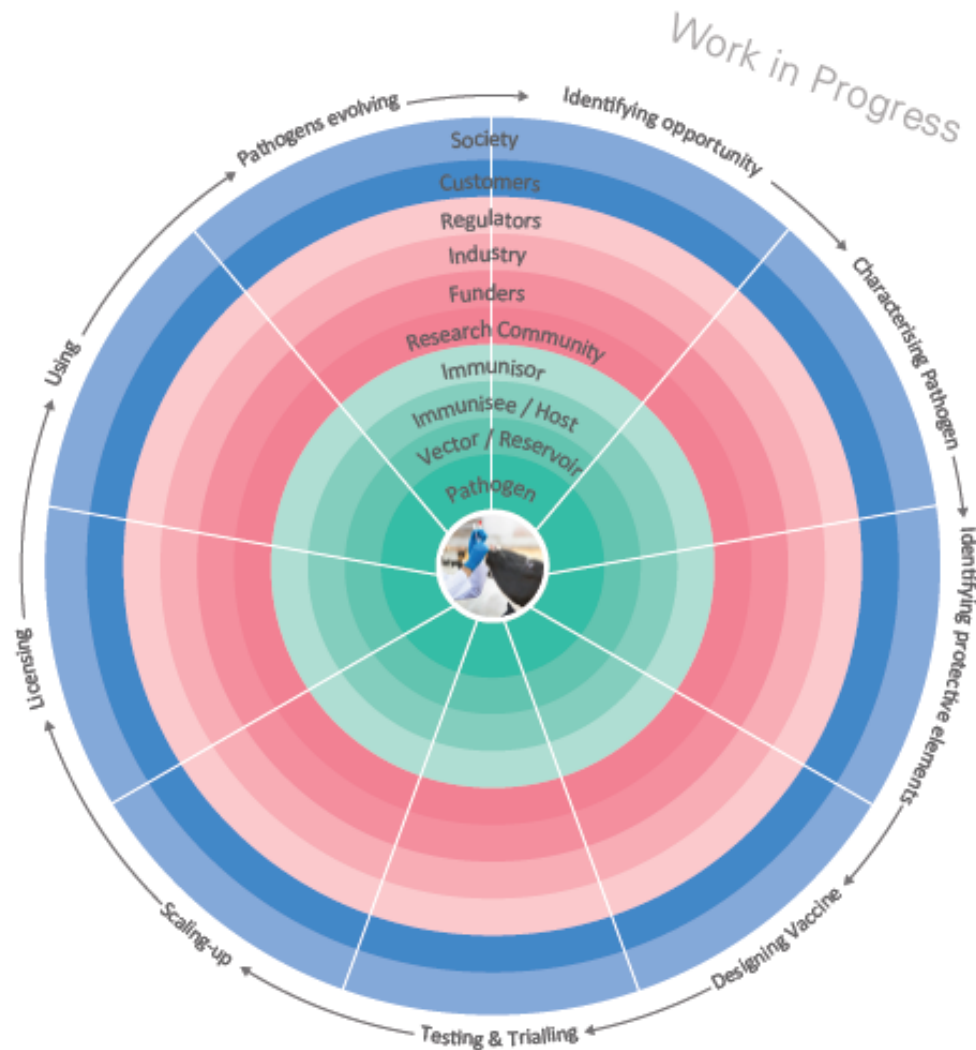
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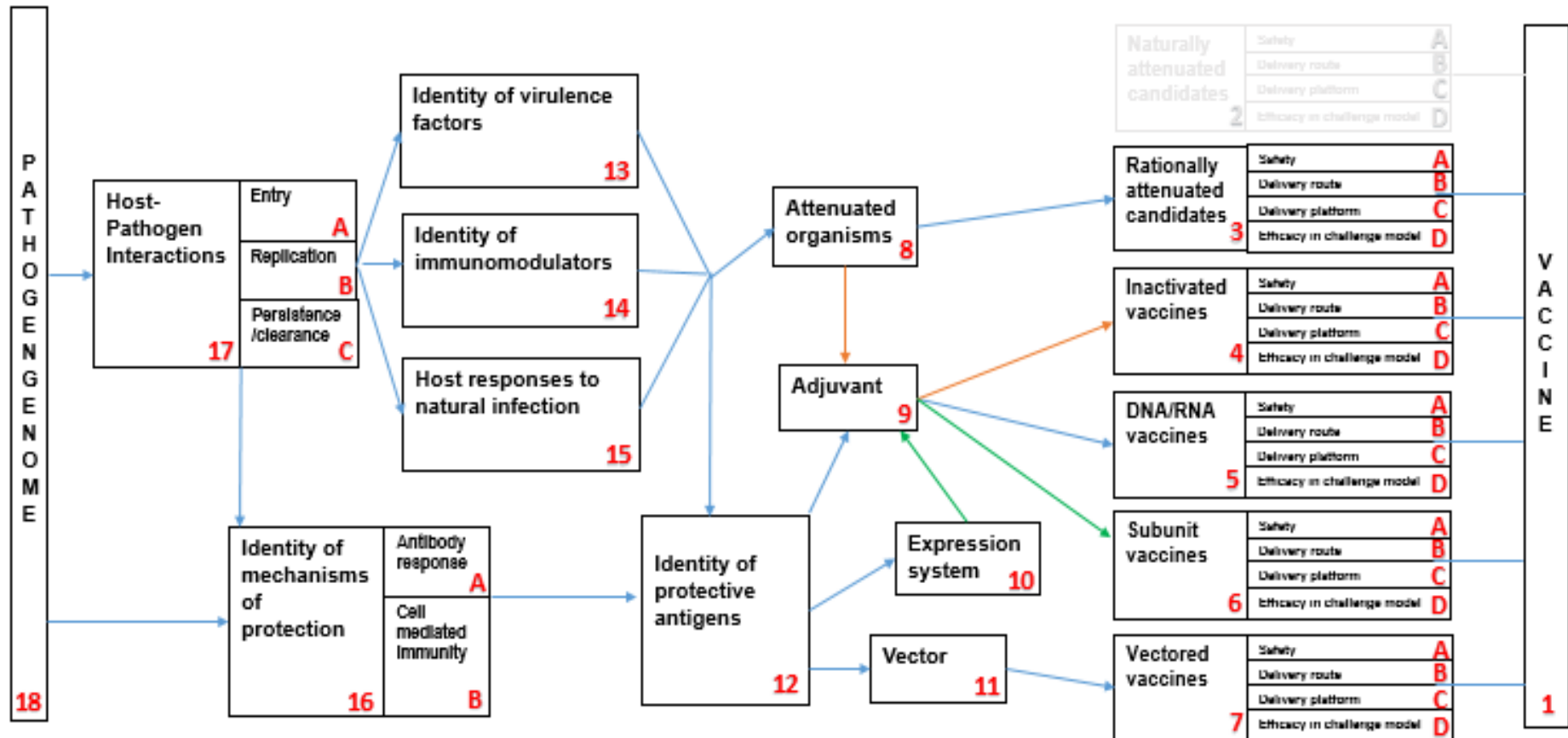


PRRS Research Gaps



| Research area Gaps | | [Organisation 1 name] | | |
|-------------------------|---|-----------------------|----------------------|------------------------|
| | | ongoing ^a | planned ^b | collabor. ^c |
| 1. | Diagnostics | | | |
| 1.1. | Serological | | | |
| 1.1a | Development of differential ELISAs to allow detection of different strains (Type 1, Type 2 and High Path) | | | |
| 1.1b | Potential and limitations of the use of oral fluids for the virological and serological diagnosis | | | |
| | Analysis of PPRV herd immune status using oral fluid samples | | | |
| 1.1c | Pen-side tests for antigen/antibody detection | | | |
| 1.1d | Strain divergence and diagnostics | | | |
| | System for the reliable and rapid detection of new strains | | | |
| 1.1e | Multiplex platforms | | | |
| 1.1f | DIVA test | | | |
| | Tests to assess immune status and protection | | | |
| 1.2. | Molecular diagnostics | | | |
| 1.2.a. | PCRs for detection of all strains. | | | |
| 2. | Vaccines | | | |
| 2.1. | Vaccine development | | | |
| 2.1a | More effective vaccines | | | |
| 2.1b | Oral/nasal vaccines that give a local immunity at the place of entry | | | |
| 2.1c | Development of marker vaccines together with differential ELISAs | | | |
| 2.1d | Development of farm-specific vaccines | | | |
| 2.1f | Safe adaptable attenuated and vector vaccines | | | |
| 2.1g | Vectors | | | |

PRRS Vaccine Research Roadmap





Lead Summary 1

Title: An improved multivalent PRRSV vaccine preventing disease, virus transmission and carrier state in vaccinated animals

Research Question

What are we trying to achieve and why? What is the problem we are trying to solve?

Protection against disease caused by the various virus strains.
Sterile immunity
Prevent vaccine virus contributing to evolution of field isolates
Virus eradication from a herd

Challenge(s)

What are the scientific and technological challenges (knowledge gaps needing to be addressed)?

Cross-protection against the various isolates
Attenuated live viruses can contribute to virus evolution
Generation of both a CTC and VN response
The dominant immunogens may not be protective

Solution Routes

What approaches could/should be taken to address the research question?

Establish protection levels with various candidate vaccine options, including priming with one vaccine and boosting with a different vaccine.
Establish if pig genetics influences responses
Incorporate the candidate vaccine in a vaccine platform covering a number of diseases
The development of farm strain-specific vaccines (autologous vaccines)

Dependencies

What else needs to be done before we can solve this need?

Development of cross protective/multivalent killed vaccine
Development of a cross protective/multivalent vectored vaccine
Development of a subunit vaccine
Development of an attenuated vaccine that doesn't persist or is excreted

State of the Art

Existing knowledge including successes and failures

Projects

What activities are planned or underway?

Lead Summary 3



Title: Development of an attenuated vaccine that doesn't persist or is excreted

Research Question

What are we trying to achieve and why? What is the problem we are trying to solve?

Replicating organisms are likely to give the most appropriate immune response but wild-type virus manipulates the host response. The aim is to reduce the virulence of the organism so that the vaccinated animal can mount a protective immune response

Challenge(s)

What are the scientific and technological challenges (knowledge gaps needing to be addressed)?

The generation of GM organisms that are viable but lack virulence and non-protective immune-dominant antigens. Identification of strains that give the greatest cross protection.

That vaccination prevents excretion of the organism – both the vaccine strain and wild type virus or any combination of the two that may have been generated

Solution Routes

What approaches could/should be taken to address the research question?

Monitoring the immune response following immunisation with the various candidates.

Challenge experiments with the various vaccine candidates, including challenge with other strains

Identity of cell lines that allow higher production of PRRSV

Dependencies

What else needs to be done before we can solve this need?

The generation of stable genetically modified organisms

Identity of virulence factors in PRRSV

Identity of ~~immunomodulators~~ in PRRSV

State of the Art

Existing knowledge including successes and failures

Projects

What activities are planned or underway?



Lead Summary 8

Title: The generation of rationally attenuated genetically modified PRRSV

Research Question

What are we trying to achieve and why? What is the problem we are trying to solve?

To generate organisms that are less virulent in terms of pathological changes that they cause and/or their ability to modulate the host's immune responses – rationally attenuated vaccine

Challenge(s)

What are the scientific and technological challenges (knowledge gaps needing to be addressed)?

That the organisms are stable and can be produced in cell culture

That they still generate a protective response

Solution Routes

What approaches could/should be taken to address the research question?

Generation of infectious cDNA clones

Generation and characterisation of a range of rationally attenuated organisms (using codon pair ~~de~~optimisation)

Immune response to the attenuated organisms

Dependencies

What else needs to be done before we can solve this need?

Identity of Virulence factors and their genes

Identity of ~~immuno~~modulators

State of the Art

Existing knowledge including successes and failures

Projects

What activities are planned or underway?



Lead Summary 14

Title: To establish the identity of the immunomodulatory factors/stealth mechanisms in PRRSV

Research Question

What are we trying to achieve and why? What is the problem we are trying to solve?

PRRSV attempts to modulate the host's immune responses so that it can survive and replicate.

The early Ab response isn't protective and VN-Abs don't appear until 6 weeks into infection

Identifying and removal of the factors contributing to the virus stealth mechanisms could contribute to the generation of improved attenuated vaccine candidates

Challenge(s)

What are the scientific and technological challenges (knowledge gaps needing to be addressed)?

Solution Routes

What approaches could/should be taken to address the research question?

Generation of a range of knock-out viruses where the genes for various immunomodulatory factors or other stealth mechanisms have been removed and their use in experimental infections.

Modulation of innate immune responses

Dependencies

What else needs to be done before we can solve this need?

Improved understanding of virus-macrophage interaction – viral and macrophage gene expression in different in vivo environments (macrophages from naïve and immune hosts)

State of the Art

Existing knowledge including successes and failures

Projects

What activities are planned or underway?

Dysregulation of NK cell function/suppression of NK Cell activity

Dysregulation of IFN α production (osp, 1, 2, 4, 11)



Lead Summary 17

Title: Host Pathogen interaction in PRRSV infection

Research Question

What are we trying to achieve and why? What is the problem we are trying to solve?

To gain an improved understanding of how PRRSV enters, replicates and survives in and is released from infected cells

Challenge(s)

What are the scientific and technological challenges (knowledge gaps needing to be addressed)?

PRRSV infects macrophages which are an important contributor to the immune response so establishing how the virus interacts with macrophages is central to identifying the protective mechanisms and how the virus evades them.

Solution Routes

What approaches could/should be taken to address the research question?

Establish the basis of virulence/pathogenicity - including in high virulence strains – is it related to inflammatory response or viral replication

Viral and macrophage gene expression in different in vivo environments (macrophages from naïve and immune hosts)

Comparative response to highly pathogenic/virulent and mild/attenuated strains of the virus

Role of GP5 and Protein M peptides and binding.

Dependencies

What else needs to be done before we can solve this need?

The genome sequence of various PRRSV isolates

State of the Art

Existing knowledge including successes and failures

Projects

What activities are planned or underway?

Role of GP3 in infectivity

miR-181 and CD163 expression

Role of GP2a and GP4 in viral attachment

ERA-Net Call – 2019 Work Programme of H2020

International coordination of research on infectious animal diseases

The focus is:

- i) To support multidisciplinary research to develop novel tools and generic technology platforms for producing novel and/or improved vaccines that are applicable to specific livestock sectors and/or diseases.
- ii) To promote applied research in order to improve surveillance and control of diseases; development of AB Alternatives/Novel anti-infectives; Biosecurity and animal hygiene.



Background to A&ME Regional Network



Met first in Addis Ababa in November 2014

Ethiopia, Kenya, Uganda, Tanzania, Nigeria, Israel, Egypt, Iran, AU-IBAR, BMGF, African Development Bank, FAO, ILRI, GALVMed (Malawi)

To identify and agree specific priority areas of the Africa and Middle East region for collaboration and methods for taking these forward.

To formalise the establishment of an Africa & Middle East Regional Network

Met in Nairobi on the 1st February, 2017

Nigeria, Kenya (KALO), Uganda, Tanzania, IRAN, Israel, Algeria (African Vaccinology Network), ILRI, GALVmed, BMGF, African Development Bank, OIE, FAO

Africa & Middle East Regional Network



STAR-IDAZ Regional Network for Africa & ME met in Abuja/Vom on 12-14 September.

Nigeria, Uganda, Tanzania, Senegal, Kenya, Israel, ILRI, (Kenya), GALVmed, OIE

- To Identify and align different epidemiological surveys and veterinary laboratory activities for the diagnosis and control of infectious diseases
- To further discuss and agree common research priorities for the Region
- To explore the opportunities for sharing resources, including access to samples/strains of organism, specialised facilities and expertise
- To identify international funding opportunities
- Supported by Zoetis African Livestock Productivity and Health Advancement (A.L.P.H.A.) which is co-funded by the BMGF

Additional Challenges identified by A&ME RN not covered by the IRC



CBPP

PPR

NCD

RVF

Tick-Borne Diseases (Babesiosis, Cowdriosis, ECF, CCHF)

Trypanosomiasis

Anthrax

Mycotoxins

Overarching challenges identified by A&ME RN



- Accredited diagnostics
- Keeping up with new equipment
- Servicing and repair of equipment
- Quality lab chemicals and reagents not readily available locally – lead to long delays in acquiring them
- Updating skills
 - Exchange of staff

Nigerian Animal Health Research Network



A meeting of the Nigerian Animal Health Research Network (NAHRN) was held on 15 September

- To Identify and align different epidemiological surveys and veterinary laboratory activities for the diagnosis and control of infectious diseases
- To establish the research interests of the various institutes in Nigeria and the level of cooperation between them
- To explore the opportunities to deepen collaboration between the various institutes.
- To examine and review funding opportunities for research and capacity building

NAHRN have signed the IRC Letter of Intent with NVRI signing the STAR-IDAZ MoU

Contact us



For further information on:

- STAR-IDAZ IRC visit www.star-idaz.net.
- CWG AH&W visit <http://www.scar-cwg-ahw.org/>

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Thank You For Your Attention

<http://www.star-idaz.net/>

