Empowering Member States to improve livestock production - the role of the Joint FAO/IAEA Programme

Animal Production and Health Sub-programme

Joint FAO/IAEA Programme
Nuclear Techniques in Food and Agriculture

Our mandate

To improve livestock production through the support of problem-orientated research that

- identifies the constraints on production and
- develops cost-effective and sustainable solutions
- uses nuclear and nuclear related technologies

→ Transfer of technologies

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Working in partnership

- IGO
  - FAO's Animal Production and Health Division (AGA)
  - World Animal Health Organization (OIE)
  - World Health Organization (WHO, PAHO)
  - CG centres - International Livestock Research Institute (ILRI)
  - Africa Union's Inter-African Bureau of Animal Resources (IBAR)
- Member States

We provide technology support in area of ...

Sustainable intensification of livestock production systems

- Technologies for integrated management of natural resources in small-scale production systems (cattle, sheep, goats, pigs, poultry, etc)
  - Optimal use of locally available nutrition whilst protecting the environment
  - Optimal birthing frequency and improved genetic stock
  - Controlling diseases (mastitis, etc)
- Technologies for reducing risks from transboundary animal diseases (TADs) and those of zoonotic nature
- Molecular techniques for improving productivity in small-holder livestock systems

Implementation

- By developing "appropriate" technologies to improve both the quantity and quality of livestock production in developing countries (through training, transfer of technology and Member State empowerment)

Coordinated Research Programme (CRP)
to develop solutions/technology
CRP: 8 -10 concurrent projects

Technical Cooperation programme (TC):
Transfer of technologies and research findings to Member States
TCP: 60 national, 5 – 10 regional and inter regional projects

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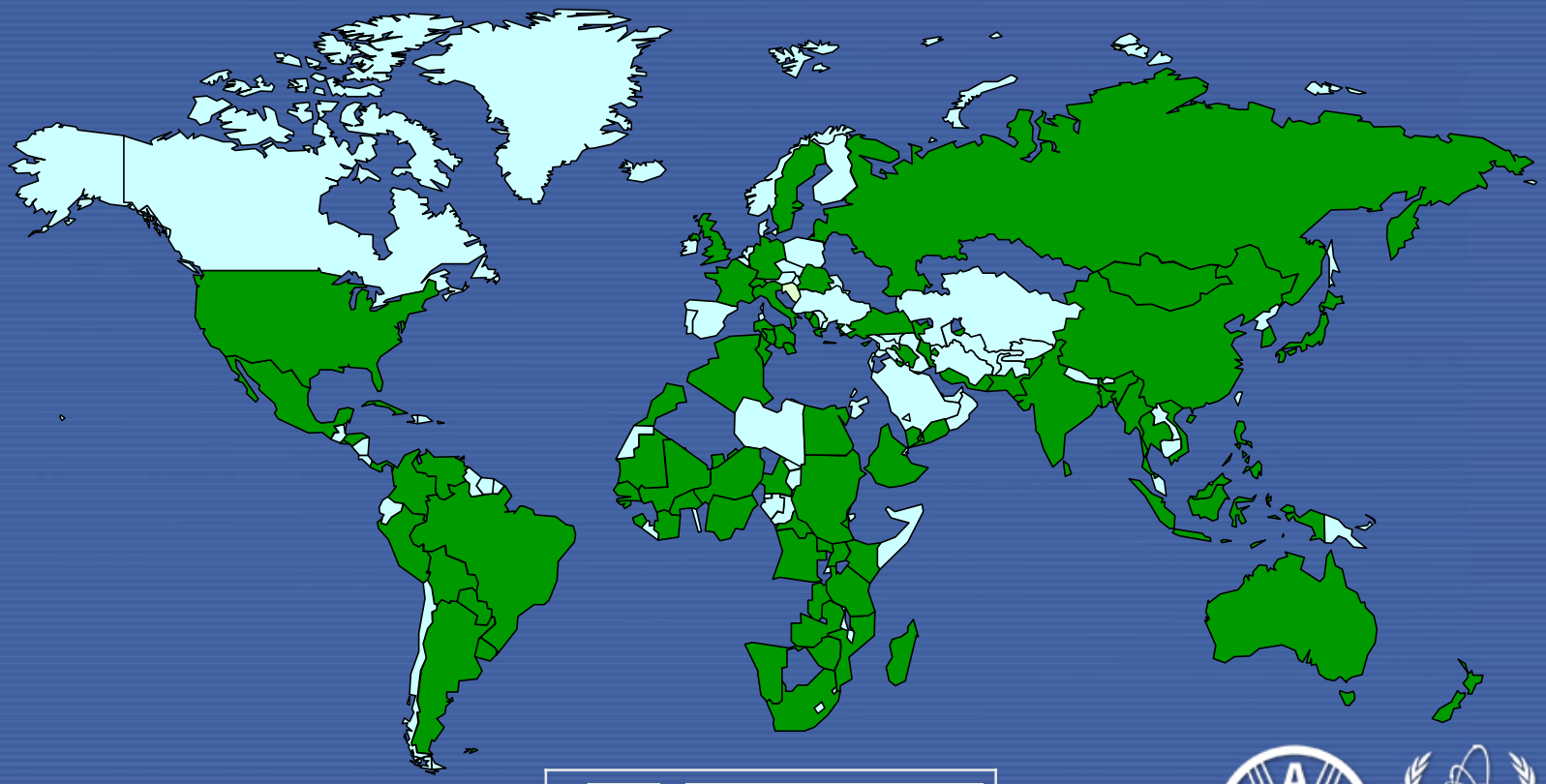
Cooperating Countries with APHS

144 IAEA Member States
190 FAO Member States



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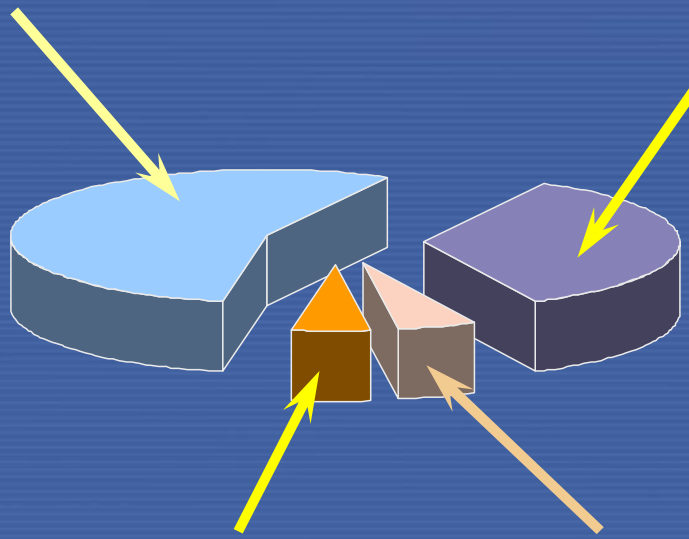
Sub-programme activity areas

Animal Health (55%)
(control & disease diagnosis)

Animal Production (35%)
(nutrition/reproduction & breeding)



Veterinary Drug Residues (5%)
(Together with Food and Environmental Protection)

Quality Assurance (5%)

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Animal production

Objective: To increase livestock production while conserving the environment

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Animal production activities

Integrated Animal Production from:

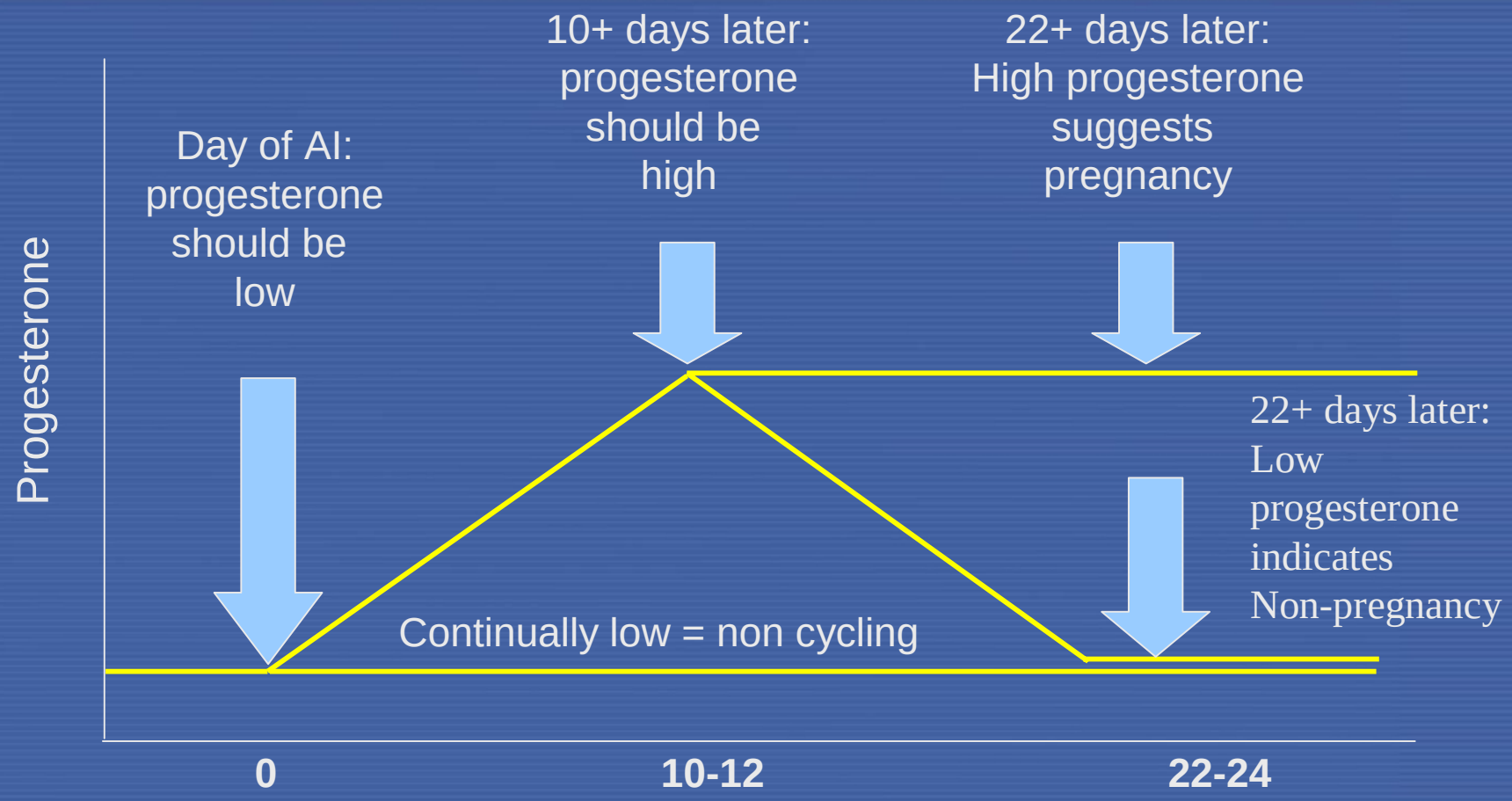
- improving animal feed supplies (locally available)
- improving on-farm breeding management
- improving artificial insemination services

the effectiveness of all three strategies was monitored and evaluated using RIA measurement of progesterone

Progesterone Assays

- Serial measurements of progesterone can be a valuable diagnostic tool
- Identify non-cycling cattle
  - Consistently low progesterone
  - Problem due to poor diets in many Member States
- Diagnose unsuccessful AI (non-pregnancy)
  - Consistently high progesterone
  - Variable progesterone indicates non-pregnancy

Example



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Artificial Insemination

- Expert advice in the establishment of AI centres
- Training in bull selection and husbandry and semen collection

- Support in management of female reproduction
  - Estrous detection
  - Non-pregnacy diagnosis
  - Nutritional supplementation

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Improving Animal Feed Supplies

Supplement blocks

- Improved incomes by 33-44%

Dairy Nutrition

- Improved by 65% returns per cow

Small ruminant nutrition

- Forage trees double productivity

Pig nutrition

- Forage tree leaves improved profitability by 337%

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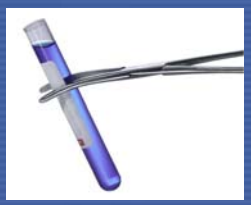
Efficient Utilization of Locally Grown Feeds

Local
plant materials

Label with isotope
e.g. ^{15}N, ^{13}C

Feed to
livestock

Nutrients dispersed
throughout body



Tissue sampling to
for isotope
distribution

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Future Animal Productivity

- Improved genotypes for production, disease and environmental benefits
- Feeding strategies to improve utilization of non-human feed stocks
- Reducing the environmental impact of animal production

Animal health

Objective: To reduce risks from transboundary animal diseases (TADs) and those of zoonotic and veterinary public health importance

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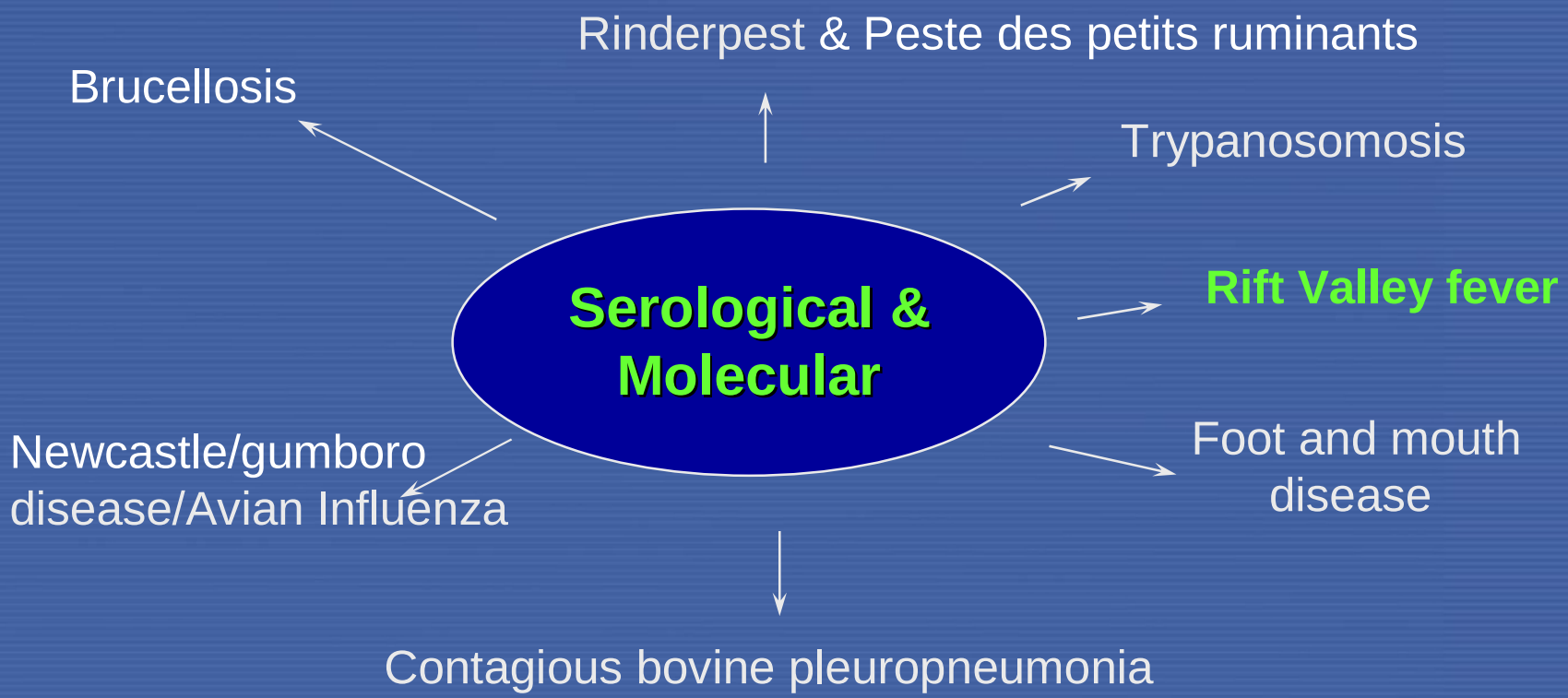
Diseases supported at present



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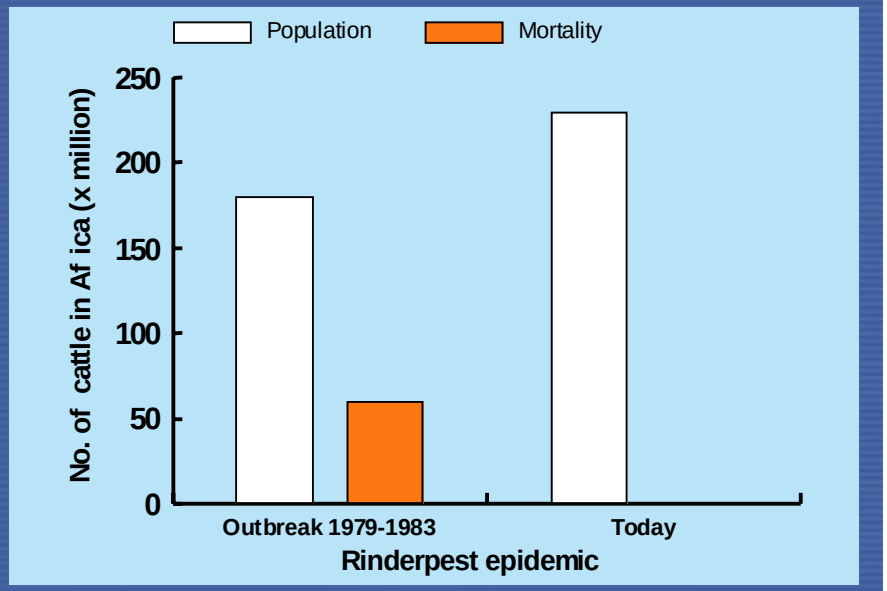
EMPRES/GREP: A Global Partnership

Working together to eradicate rinderpest and make the world a safer place for food production from livestock and for trade

Africa today is free of rinderpest

Estimated net annual economic benefit to the African region of at least US$ 1 billion per year



Combat Bird Flu

Reducing Health Risks

Through the early, rapid and sensitive serological and molecular detection of AI viruses and their characterization (ELISA and PCR)

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Nuclear Techniques in Food and Agriculture

Improving farmyard poultry production in Africa

- Thermostable ND vaccine introduced so that vaccine can reach countryside
- Village vaccinators trained to do eye inoculation
- ND vaccination is carried out regularly
- Farmers trained to improve their management practices
- Improved nutrition and feeding practices
- 80% reduction in poultry mortality

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Helping countries to declare freedom from disease or infection – OIE Pathway

- Provide country disease declaration guidelines to OIE and MS
- Guidelines for the use of DIVA or differentiation tests to demonstrate as “FMD-free” zone to the OIE
- Guidelines for quality assurance management
- Technical guidelines for laboratories (diagnostic/BSL2-BSL4) and activities

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Transfer of Technologies to Member States

- Building laboratory capacity is Member States
  - Training of laboratory personnel (both at Seibersdorf and in Member State Laboratories)
  - Technical involvement
    - Laboratory infrastructure and optimal set-up
    - Procedure support (which test, when and for which purpose)
    - Laboratory proficiency (QA)
    - Reporting to National Authorities and OIE
  - Technical support/back stopping/problem solving to improve activities and to increase laboratory proficiencies

Rift valley Fever CRP

- Coordinated research project since 2006
- Burkina Faso, Congo, Guinea, Kenya, Mali, Mauretania, Senegal, South Africa, Uganda, Yemen
- Research Agreements : Germany, France, USA
- Aim:

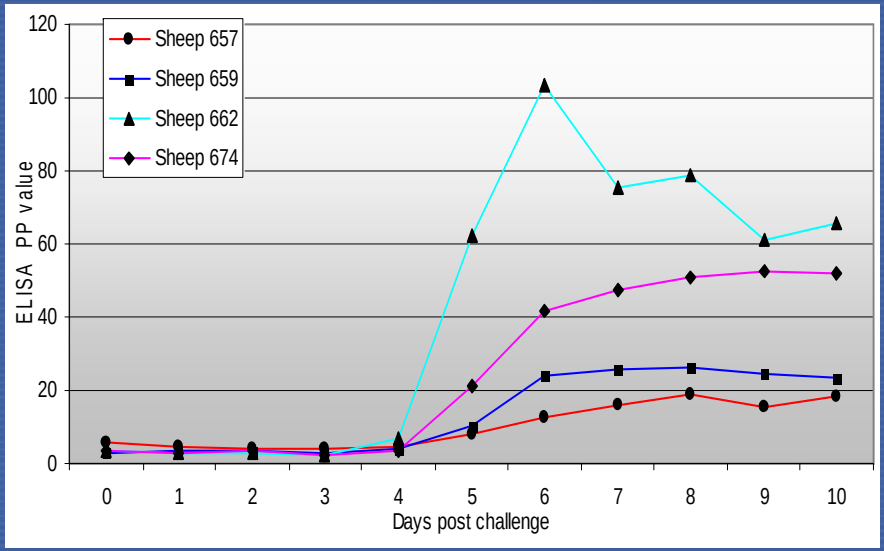
Development of rapid diagnostics for early warning

Rift valley Fever CRP

- Serology
  - Validation of existing IgG and IgM ELISA's
  - Development of recombinant antigen (N-Protein) for new ELISA
  - Setup of ELISA for wildlife testing

Rift valley Fever CRP

- Results achieved so far
  - The sandwich ELISA's are working; but cumbersome
  - The N-protein based ELISA works perfect



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Rift valley Fever CRP

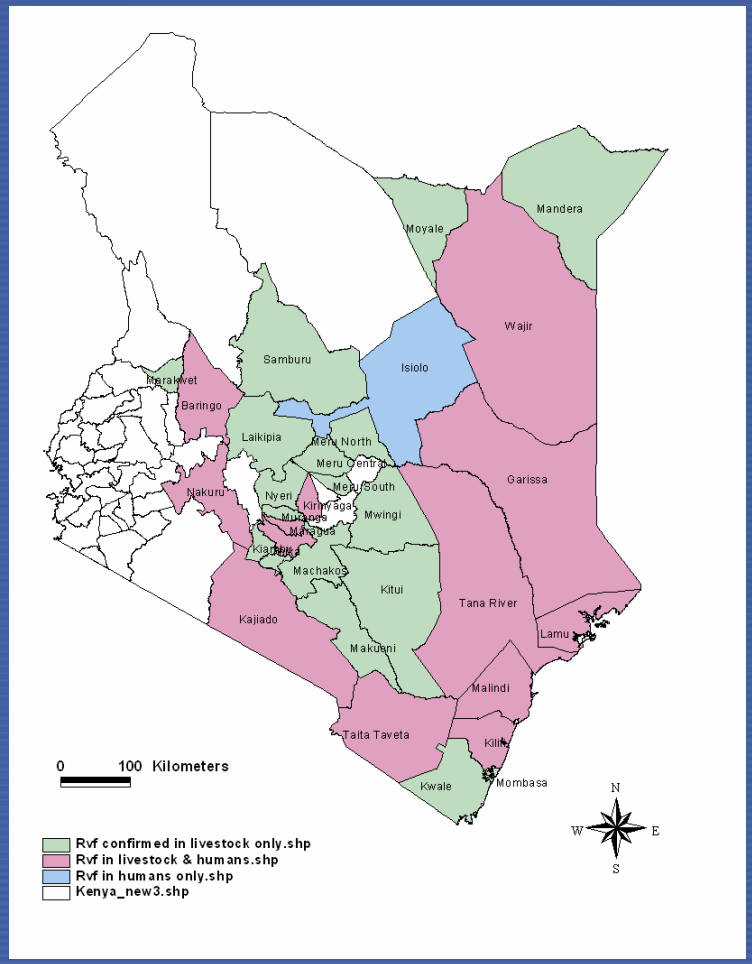
- Sero-prevalence in the member countries between 2,5% and >55%
- High sero-prevalence in wildlife (Kenya)

→ Clinical disease and abortion if SP > 15%

→ Outbreaks related to SP in Wildlife (Reservoir?)

→ Sero-monitoring to support prediction models

RVF, Kenya 2006



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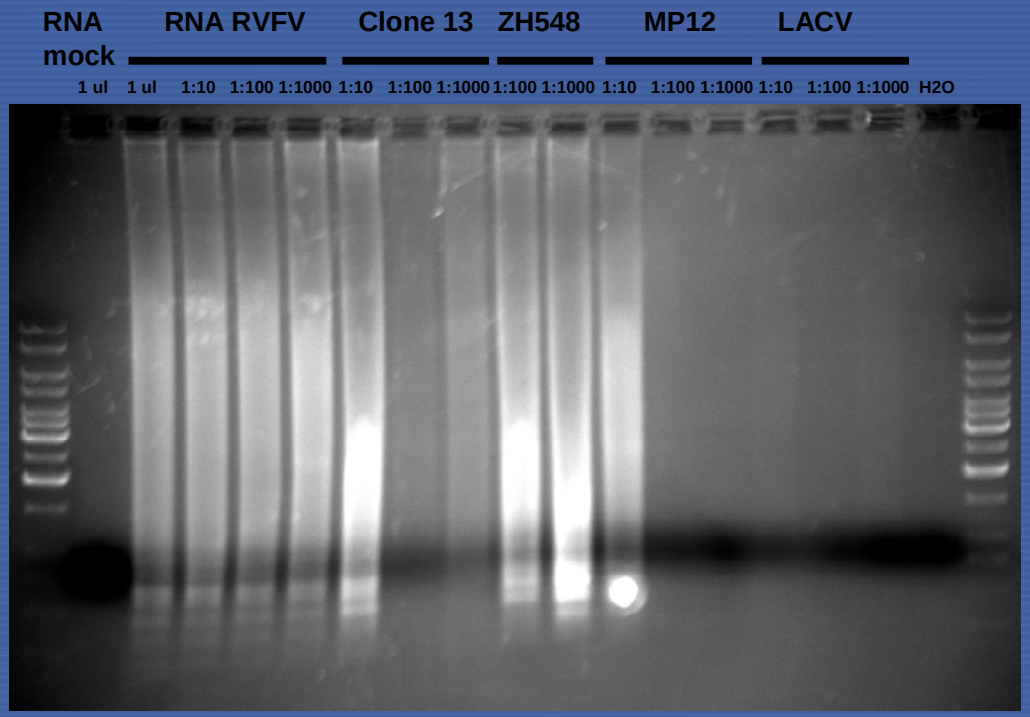
Rift valley Fever CRP

- Disease diagnosis by RT-real time PCR and RT-LAMP
  - Reduction of risk of infection for laboratory personal
  - High sensitivity and lower risk of ‘loss’ of virus during transport
  - RT-LAMP for field diagnosis
    - Reduced risk of infection for sampling veterinarian
    - Instant result => early warning
    - Sample can easily be transported without risk of infection
    - Further evaluation in the lab

Rift valley Fever CRP

- RVF RT-LAMP



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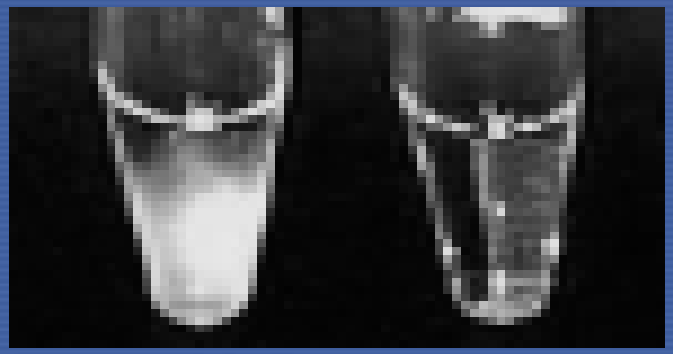
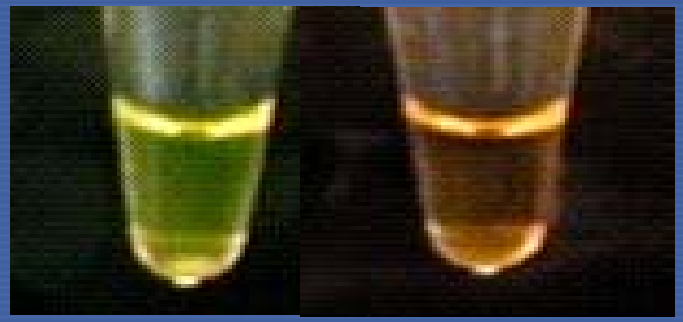
Rift valley Fever CRP



Precipitate of magnesium pyrophosphate



Add Picogreen® for colour reaction

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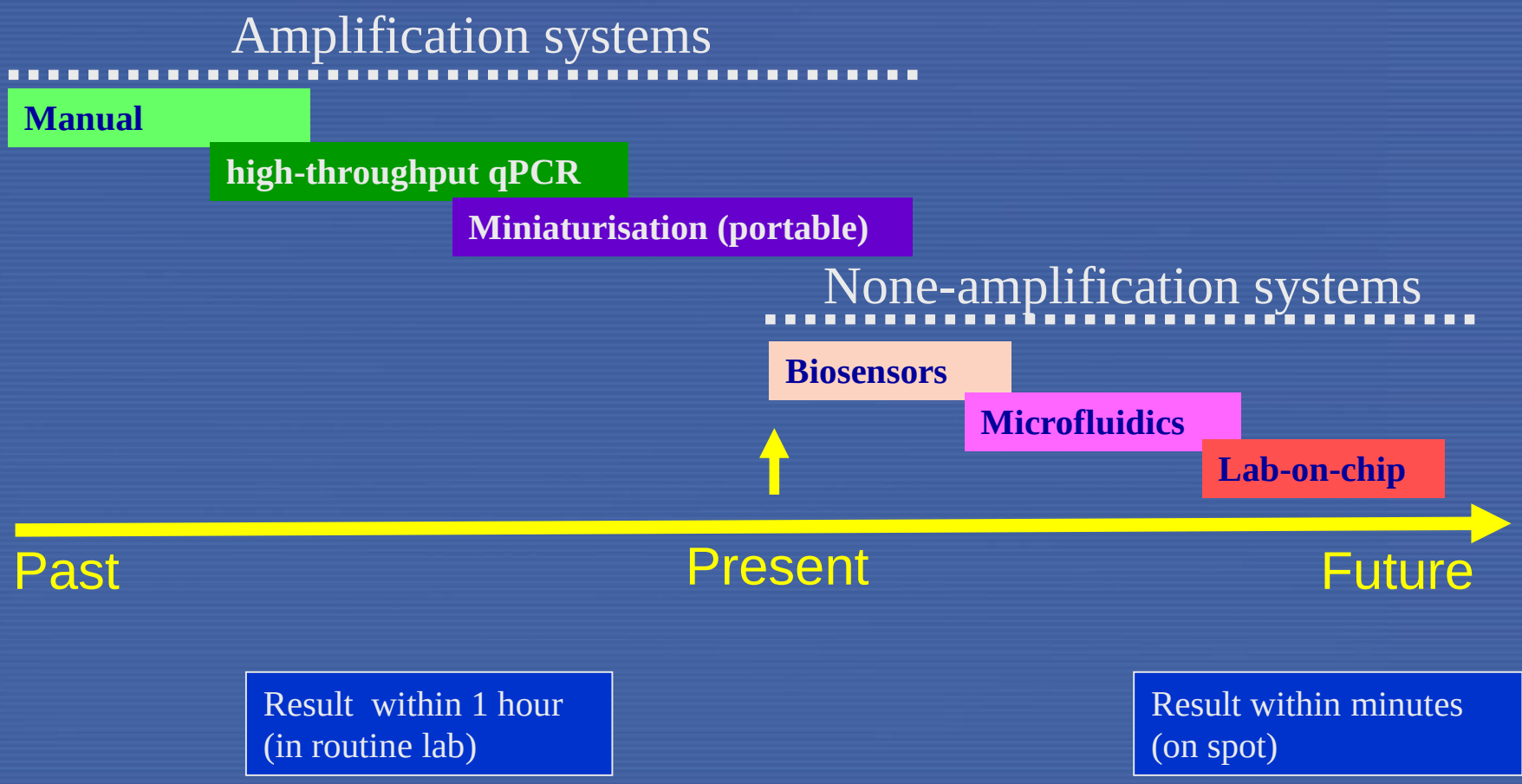
Rift valley Fever CRP

- Future work
  - Can we improve prediction of outbreaks (risk) by
    - Integrating sentinel herd data
    - Rapid diagnostics and online data transfer
    - Sero-monitoring of wildlife
    - Improved knowledge on epidemiology of RVF
  - Can we get the LAMP to the field?

Diagnostic systems: past, present and future



"*Improving animal productivity and health through nuclear and molecular technologies*"

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