



# oral vaccination of free-roaming dogs against rabies

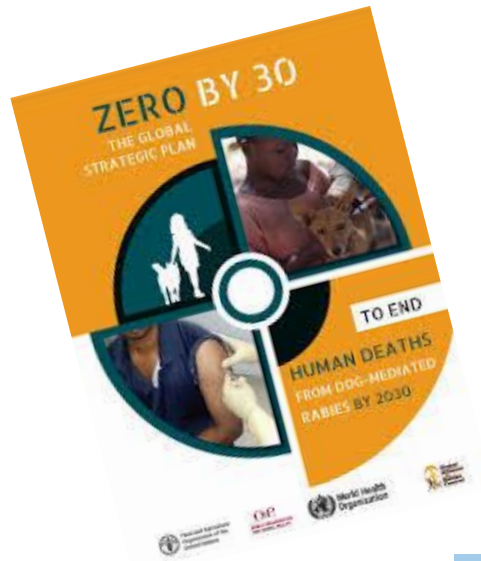


Ad Vos

OIE Webinar, World Rabies Day 2020



# Elimination of dog-mediated human rabies



„Unlike for many other zoonoses, the appropriate tools to eliminate dog-mediated human rabies already exists“.

„Dog-mediated human rabies can be eliminated at its‘ source by vaccinating dogs ...“

Mass dog vaccination is the single most cost-effective method to achieve this goal



central point or door-to-door vaccination



Proven to be successful and cost-effective

OPEN ACCESS Freely available online

PLOS NEGLECTED TROPICAL DISEASES

## The Feasibility of Canine Rabies Elimination in Africa: Dispelling Doubts with Data

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PLOS NEGLECTED TROPICAL DISEASES

RESEARCH ARTICLE

Review on Dog Rabies Vaccination Coverage in Africa: A Question of Dog Accessibility or Cost Recovery?

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Achieving a **high vaccination coverage** is the most important aim of any vaccination campaign

# Dog rabies: Parenteral Mass Dog Vaccination

## Restriction:

inaccessibility of a large fraction of the dog population (free-roaming dogs)

The tools 'vaccine' and 'syringe' are there **but how to reach the free-roaming dog with parenteral vaccines?**



"Free-roaming dogs: Key in transmission of rabies"  
(Prof Dr Be-Nazir Ahmed, Rabies Global Conference)

# Dog rabies: Parenteral Mass Dog Vaccination

How to reach the free-roaming dog with parenteral vaccines?  
Some dogs can be captured & become accessible to parenteral vaccination, but ...

## Disadvantages Capture-Vaccinate-Release (CVR):

- cost – and labour intensive
- animal welfare issues
- less effective with time (increased wariness of dogs reduces catching efficiency)

Question: is there an alternative method reaching these 'inaccessible' dogs?

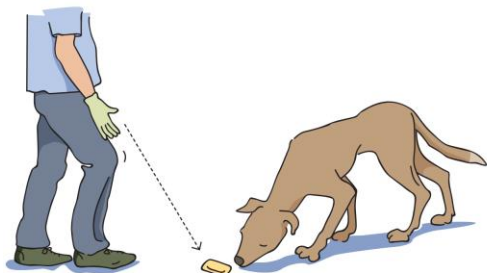


# Oral vaccination against rabies

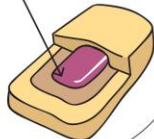


# Oral vaccination against rabies

1. Bait is offered to the dog



Bait contains liquid vaccine



2. Dog chews bait

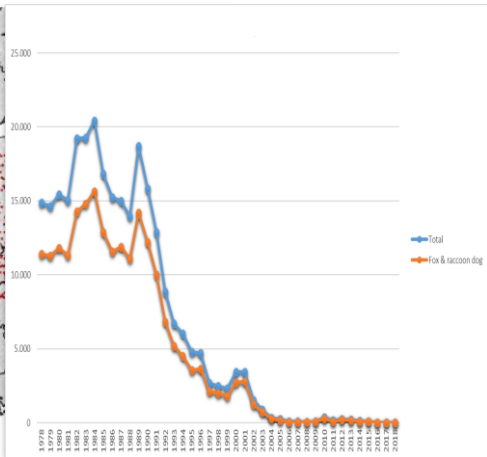


4. Vaccine is absorbed via the tonsils and mucous membrane

3. Vaccine is released into the mouth cavity



# Oral vaccination of foxes against rabies





# Oral vaccination of wildlife and free-roaming dogs against rabies

If it works for her, ...



why would it not work for him? ...



... it does!

# Oral vaccination of wildlife and free-roaming dogs against rabies

The three pillars:



## 1. Vaccine

- Safe for target and non-target species
- Efficacious



## 2. Bait

- highly attractive
- optimal release of vaccine in oral cavity



## 3. Distribution system

- Optimizing bait availability to target species
- Limit non-target species contact, incl. humans

# Oral vaccination of dogs against rabies



## Safety first:

- all oral rabies vaccines are based on live replication-competent viruses
- dogs and humans share the same environment

Annex 10. Currently available oral rabies vaccine products

Vaccine strain	Product name or brand name	Formulation	Vial size	Company	Country
SPBN-GASGAS	IDT Biologika	RABV	3rd	Reverse genetics with site-directed mutagenesis	Licensed for wildlife
ERA G333	Prokov	RABV	3rd	Reverse genetics with site-directed mutagenesis	Licensed for wildlife
SAG2*	Virbac	RABV	2nd	Monoclonal selection mutant	Licensed for wildlife
SAD B19	IDT Biologika	RABV	1st	Serial (passaged in vivo/in vitro)	Licensed for wildlife
SAD Bern	Bioveta	RABV	1st	Serial (passaged in vivo/ in vitro)	Licensed for wildlife
RB-97	FCBI "ARRAIH"	RABV	1st	Serial (passaged in vivo/ in vitro)	Licensed for wildlife
VRC-R22	No information	RABV	1st	Serial (passaged in vivo/ in vitro)	No information
KMIEV-94	No information	RABV	1st	Serial (passaged in vivo/ in vitro)	No information
V-RG*	Merial	Vaccinia virus		Recombinant, expressing rabies glycoprotein	Licensed for wildlife
AdRG1.3	Artemis Technologies	Adenovirus		Recombinant, expressing rabies glycoprotein	Licensed for wildlife



... Countries that are considering use of ORV of dogs should ensure the **safety** of the viral construct on the target and non-target species ....

## RABIES (INFECTION WITH RABIES VIRUS AND OTHER LYSSAVIRUSES)

Updated May 2018

### Minimum safety requirements

- **Target species**
  - overdose (incl. shedding)
  - reversion-to-virulence
- **Non-target species**
  - dogs
  - cats
  - rodents
  - immunocompromised hosts (SCID and/or nude mice)
  - humans (risk assessment human safety and likelihood human contacts with vaccine virus)



## Hand-out & retrieve model

Target population: free-roaming and restricted dogs not accessible for parenteral vaccination

- baits not accepted and discarded vaccine blisters can be recollected by vaccinators
- distribution system with only limited risk of human contact with vaccine virus
- no or limited wastage of vaccine baits
- easily intergrated in mass parenteral vaccination campaign



# Oral Vaccination of Dogs against Rabies: Field studies

## Field study: Turkey – Istanbul

Vaccination coverage (%)	Sarigazi district	Ferhatpasa district
Prior to campaign	18.0	15.5
Campaign at clinic (central point)	21.8	-
Door-to-door	22.8	40.5
Sub-total coverage without ORV of dogs	62.6	56.0
<b>Oral campaign</b>	<b>21.2</b>	<b>18.1</b>
<b>Total coverage inc oral</b>	<b>83.8</b>	<b>74.1</b>



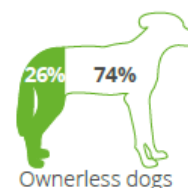
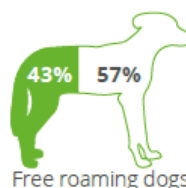
- Repeated studies show that traditional vaccination programmes do not meet the required coverage levels for herd immunity.
- The solution: an effective oral rabies vaccination programme in addition to the traditional methods can help reach the 70% coverage required

## Field study: Philippines

- a parenteral coverage of only 9%
- an oral coverage of 67% => total coverage 76%

## Accessibility of different sub-populations

■ parenteral  
□ oral



## Field study: Haiti

### Hand-out & retrieve model:

- 97% of dogs offered a bait accepted it
- 93% of dogs offered a bait punctured the sachet filled with vaccine
- 95% of sachets were swallowed by dogs or recovered by vaccinators
- 78% of dogs had evidence of rabies antibodies after bait acceptance (ELISA)
- No adverse events in dogs and humans reported

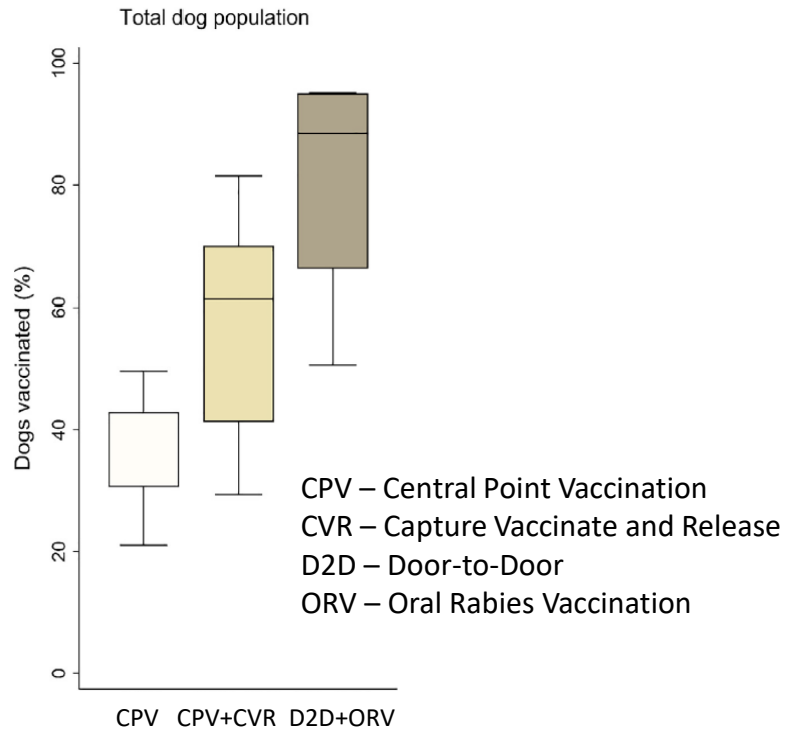


Evaluation of immune responses in dogs to oral rabies vaccine under field conditions

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## Field study: Haiti

### Rabies Vaccination Coverage by Method



Adding ORV was not only more effective in terms of vaccination coverage but D2D+ORV was also more cost-effective:

*„Despite the relative high cost of an ORV bait combining D2D and ORV was the most cost-effective strategy; largely due to increased efficiency to target less accessible dogs“*



Contents lists available at [ScienceDirect](#)

Vaccine

journal homepage: [www.elsevier.com/locate/vaccine](http://www.elsevier.com/locate/vaccine)



Costs and effectiveness of alternative dog vaccination strategies to improve dog population coverage in rural and urban settings during a rabies outbreak

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## Field studies – India (Goa State)

### Cost-effectiveness analysis ORV vs. CVR

	CVR	ORV
dogs vacc./team/day	63	69
dogs vacc./person/day	9	35
dogs vacc./team/hr	10.43	11.48
dogs vacc./person/hr	1.5	5.7
sighted dogs vacc.	63%	80%
inaccessible dogs vacc.	46%	69%
dogs vacc. /km <sup>2</sup>	75	85
costs/dog vacc. (U\$)	2.53	2.29



ORV-team: team leader, vaccinator + scooter  
 CVR-team: team leader, vaccinator, 4 catchers,  
 1 driver + truck



Oral bait handout as a method to access roaming dogs for rabies vaccination in Goa, India: A proof of principle study

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## Oral Vaccination of Dogs against Rabies: Summary

- Oral vaccination offers a possibility to reach dogs inaccessible for parenteral vaccination
- Oral vaccination increases efficiency of campaigns by reducing time (and therefore money) required to capture and restrain dogs
- Oral vaccination reduces capture stress for both dogs and humans
- Oral vaccination as a complementary tool to parenteral vaccination can increase herd immunity to levels required to interrupt the transmission cycle





# Thank You



Delivering a  
world free of  
dog-mediated  
rabies.

