

1 | **-Rural rabies prevention project: - A 'one health' experiment in India: [An overview](#)**

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17 | **ABSTRACT**

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20 | **Aim:** To assess the feasibility of implementing "one health [-approach](#)" to prevent human rabies
21 | and control animal rabies in a rural community.

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24 | **Study design:** Health services research in a rural setting.

25
26 | **Place and duration of study:** A medical college and a veterinary college along with an animal
27 | welfare organization delivered a wide array of "integrated services" in three villages' [vizi.e.](#)
28 | Kumbalagodu, Thagachikuppe and Gerupalya near Bangalore, India ~~comprising~~ [comprising a](#)
29 | [population](#) of 10,220 ~~persons~~ [population](#) for a period of two years from December, 2009 to
30 | November, 2011. The nearby three villages ~~of Ramohally~~ [of Ramohally](#), Vinayakanagara and
31 | Bhimanakuppe with a population of 6,023 [persons](#) formed the control group, with no
32 | ~~intervention~~ [project inputs](#).

33
34 | **Methodology:** This consisted of [baseline household surveys at the beginning](#) and end ~~line of~~
35 | [two years surveys](#); rabies awareness campaigns; ~~_~~clinical and laboratory surveillance [of rabies](#)
36 | [in dogs](#); rabies post-exposure prophylaxis (PEP) in humans; pre-exposure rabies prophylaxis

(PrEP) by intradermal route in school children, pet dog owners and veterinarians and others;
mass; mass dog vaccination and deworming; and sero-surveillance in both dogs and humans.

Results: The ratio of veterinary ~~:-and~~ medical manpower in study villages was 1: 11 and dog to
human ratio was; dog :- man ratio was 1: 23. The information, education and communication
materials developed and used were ~~outdoor~~ domestic outdoor wall ~~paintings-writings~~ (11), domestic
indoor annual wall calendar (2000), school book labels (1000); game charts (16); wall
~~posters~~ posters (65); flip chart (15) ~~:-~~; rabies educational DVD (1). ~~Twenty four volunteers~~
~~and 370 school children were educated about rabies and its prevention.~~ There were ~~—~~ 102 local
cable television transmissions on rabies prevention. ~~The incidence of animal bite was 3.319 per~~
~~1000 persons per year and 69 people persons~~ received rabies PEP. PrEP was given to 368
school children ~~and others, pet dog owners and -veterinarians.~~ Sixty one human serum
samples were analyzed ~~for rabies virus neutralizing antibodies~~ by rapid fluorescent focus
inhibition test for rabies antibody detection. Sixteen veterinarians ~~and others~~ were trained to use
direct rapid immunohistochemical test (dRIT) for rabies diagnosis. ~~and the same test was used~~
~~to Six ruminants were confirmed rabiesd by dRIT in 6 animals which died -deaths in the field.~~
There ~~was were~~ no cases s of human rabies ~~ss during the project period.~~ The cost of entire project
was US \$ 85,958 ~~The total economic cost of the project was 2.7 times more than the financial~~
~~cost.~~

Conclusion: A blend of ~~integrated~~ medical ~~-and-~~ veterinary ~~services including and~~ animal
welfare ~~activities-services could were as be~~ successfully delivered through a "one health"
approach. Based on this success a "system model conceptual model" ~~is was~~ evolved to
propagate its replication in other rural communities across the country India.

Key words: rabies, prophylaxis, dog vaccination, surveillance, one health, health services
research, system conceptual model

1. INTRODUCTION

Rabies is a zoonotic disease caused by a RNA virus and usually transmitted to man-humans
following the bite of a rabid animal. The disease is almost always fatal both in man-humans and
animals as there is no cure once the signs and symptoms appear. Though all mammals are
susceptible to rabies some serve as hosts and vectors which ~~The animals involved in the~~

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73 ~~transmission of rabies~~ include dogs, cats, mongoose, foxes, ferrets, raccoons, skunks, wolves
 74 ~~and, bats, and other mammals.~~ In India, the most common vectors are the dogs (96%) ~~and,~~
 75 cats (2%), ~~besides and others other (mammals (2%))~~ like mongoose, foxes, etc (1). India has the
 76 highest ~~burden incidence~~ of human rabies deaths ~~of at~~ 20,000 ~~(36%)~~ annually ~~which~~
 77 ~~corresponds to 36%~~ of the estimated global ~~incidence of burden of~~ about 55,000 (2) and about
 78 17 million animal bites each year (3). ~~One health is a concept that promotes partnership among~~
 79 ~~multiple disciplines including human and veterinary medicine. The development of strategies for~~
 80 ~~implementing "one health" involves important steps toward our understanding of how to control~~
 81 ~~and ultimately, prevent zoonotic disease transmission, which would improve the health and lives~~
 82 ~~of both animals and humans. Schools of medicine, veterinary medicine, and public health~~
 83 ~~should embrace the "One Health" concept.~~

84 In Asia, Thailand, Philippines and Sri Lanka have successfully reduced the burden of human
 85 rabies and controlled dog rabies by effectively integrating medical and veterinary services
 86 ~~popularly known as by a~~ "one health approach" (4,5). ~~The "one health approach" is a concept~~
 87 ~~that promotes partnership among multiple disciplines including human and veterinary medicine.~~
 88 ~~The development of strategies for implementing "one health" involves important steps toward~~
 89 ~~our understanding of how to control and ultimately, prevent zoonotic disease transmission,~~
 90 ~~which would improve the health and lives of both animals and humans. Schools of medicine,~~
 91 ~~veterinary medicine, and public health should embrace the "One Health" approach.~~ But in India
 92 there is very little ~~"cooperation and coordination"~~ ~~collaboration~~ between medical and veterinary
 93 services. ~~Besides there is no system or mechanism integrating the two sectors for prevention~~
 94 ~~and control of this disease.~~ There are two separate ministries, one for preventing rabies in
 95 humans' ~~viz.i.e.~~ public health and the other for controlling rabies in animals' ~~viz.i.e.~~ agriculture
 96 and animal husbandry. Also, rabies is a neglected disease, ~~i.e. a disease of low priority~~ both in
 97 public health and veterinary sectors. The other impeding factors include vastness of the country
 98 and the three tier system of governance i.e. Central or Federal Government, ~~State or~~
 99 Provincial Government, and local self government i.e. in urban areas Municipalities or Civic
 100 Corporations, and in rural areas known as Zilla Parishats (ZP). ~~India being a multi-political party~~
 101 ~~democracy when different political parties are in place at the central, state and local self~~
 102 ~~governments it often leads to poor collaboration among themselves.~~

103 ~~The dog is mythologically~~ ~~mythologically,~~ historically and socio- culturally a much loved animal
 104 ~~and also revered in some communities. Besides historically and socio- culturally dog is a much~~
 105 ~~loved animal and due to mythology in some communities it is also revered!~~ Hence, attempts to

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control the ever growing dog population have not been successful. However, recently from 2007 to 2011 a "National Pilot Project on Human Rabies Prevention" was implemented by Government of India in five cities, which attempted to bring together both medical and veterinary sectors for preventing the disease rabies in humans (6). In this background, it was considered necessary to do a "health services research" (6) and demonstrate "a model project" in a rural area of India to prevent rabies in humans and control it in dogs through integration of medical and veterinary services including animal welfare services. Hence, this "Consequently this "one health health services research" experiment (7) was conducted in three villages, near Bangalore, Karnataka, a southern state of India.

2. MATERIAL AND METHODS

A medical college, a veterinary college including an animal welfare organization came together for this purpose. The Department of Community Medicine, Kempegowda Institute of Medical Sciences, Bangalore [www.kimscommunitymedicine.org] and Department of Pathology of Veterinary College, Bangalore [www.kvafsu.kar.nic.in] along with "Karuna" an animal welfare organization (AWO), Bangalore [www.karunaananimalwelfare.org] had combined expertise integrated for this project work. The project was implemented in three study villages viz i.e. Kumbalagodu, Thagachikuppe and Gerupalya comprising with a 10,220 population of humans. The nearby three villages viz i.e. Ramohally, Vinayakanagara and Bhimanakuppe having a population of 6,023 humans formed the control group, with no inputs from the project.

The activities were conducted over a two years period from December, 2009 to November, 2011. The core project team comprised of two faculty members, a professor and an associate professor of community medicine, medical officer (tutor) from a medical college; professor of pathology from veterinary college, a veterinarian from state government veterinary services and a veterinarian from the animal welfare organization. The core project team comprised of two faculty members from medical college, a medical officer and field staff; from veterinary college, a faculty member and a veterinarian from veterinary college and; and from the AWO, a veterinarian and field staff.

The various community level activities conducted included the household surveys using structured questionnaire at the beginning of the project to assess the baseline knowledge, attitude and practice of people regarding prevention and control of human and animal rabies. The survey was again conducted in the same households using same questionnaire at the end

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138 of the project to know the difference between baseline & endline observations. Besides live
 139 stock census, base line & end line door to door household surveys; training and
 140 orientation of formal and informal village leaders, women self help groups, medical and
 141 veterinary personnel, school teachers and others; development of socio-culturally acceptable
 142 rabies information, education and communication (IEC) materials like posters on rabies post-
 143 exposure prophylaxis (PEP), responsible pet ownership, training aid flip chart for village level
 144 volunteers including volunteers from Department of Women & Social welfare, chart on
 145 snake and ladder game, indoor annual wall calendar, school book label, outdoor wall
 146 painting writings, rabies video DVD and its transmission through cable television net work, use of
 147 folk dance, public rallies, drawing competitions in schools; providing rabies pre-exposure
 148 prophylaxis (PrEP) by intradermal route and measuring its effectiveness through sero-
 149 surveillance of vaccinees and PEP through by both intradermal (ID) and intramuscular (IM)
 150 routes as feasible; clinical and laboratory surveillance for rabies in animals and humans, training
 151 of veterinarians in rabies diagnosis using direct rapid immunohistochemical
 152 immunohistochemical test (dRIT) ; animal welfare activities work consisting of mass dog
 153 vaccination, collaring, deworming and sero-surveillance. The project was periodically
 154 monitored by both national and international observers. The project activities and progress
 155 made were monitored on quarterly basis by the project advisors. Besides two international
 156 observers from Global Alliance for Rabies Control (GARC) visited the project villages in
 157 November, 2010 and December, 2011 for an on-site appraisal. An observer from National
 158 Centre for Disease Control (NCDC), Delhi visited the project implementing institutions in April,
 159 2011 and reviewed the progress made. For more details refer to the "adopt a village project"
 160 report (8).

161 3. RESULTS AND DISCUSSION

162 An overview of activities done under conducted under the project is shown in table-1. The
 163 regular service providing veterinary manpower as compared to medical manpower [excluding
 164 the project team] at 1:11 in the study villages was grossly inadequate. It was found that the
 165 veterinary manpower as compared to medical manpower, in the ratio of at 1:11
 166 was grossly inadequate. There were 446 dogs in three study villages having a human
 167 population of 10,220 resulting in a dog : man human ratio of 1: 23 which The live stock of cow,
 168 buffalo, sheep and goat are known hosts of rabies in the region and dogs & cats the common
 169 vectors of the disease. The dog: man ratio of 1:23 was more as compared to higher than
 170 national the national figures of 1: 36 (3). This made the people more prone to dog bites and
 171 consequently there was a higher incidence of animal bite in the project villages.

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172 The rabies IEC materials were developed based on the results of baseline ~~survey~~ household
 173 ~~survey on knowledge, attitude and practice~~ of people on rabies prevention and ~~socio~~ their socio-
 174 cultural acceptance. The outdoor wall ~~paintings~~ writings depicting the message of rabies and its
 175 prevention were done with the consent of the head of the household. ~~on the Wall~~
 176 ~~painting~~ writings were ~~on walls of those~~ houses that are strategically located ~~giving a~~ clear
 177 view to the community. ~~for easy readability~~. The indoor domestic annual wall calendars having
 178 12 pages one ~~for page for~~ each month are ~~are~~ very popular in the villages. These calendars
 179 generally display ~~as the day, and date, list~~ of important local festivals, events, ~~etc~~ for every
 180 month. ~~and for one year having 12 such sheets with a hook to be hung on the wall for easy~~
 181 ~~reference~~. Such calendars were specially printed ~~was got printed with having twelve with~~
 182 ~~rabies~~ different rabies education messages ~~for one for~~ each month. One calendar was provided
 183 to all households in the three ~~study villages~~ study ~~and villages and some community~~
 184 organizations/institutions like schools, mother and child care centers, health centers, grocery
 185 shops, etc. One calendar was provided to each household, and. The calendar was very popular
 186 and ~~The rabies~~ Rabies message prevention messages were effectively communicated amongst
 187 through these calendars to the household members and others.

188 The school children have a set of books to use for one year and ~~each book on~~ the front cover of
 189 ~~each~~ has book has a self adhesive label, which provides for writing the name, class and other
 190 details of the pupil. Such labels were printed with an additional message of rabies prophylaxis
 191 and given to school children through their teachers ~~in the class rooms~~. Similarly, the The snake
 192 and ladder chart is a popular indoor game which ~~are is used for to play~~ ed with dice; the snakes
 193 represent the "bad practices in rabies prevention" and the ladder "good practices in rabies
 194 prevention". ~~and the same was got printed with rabies messages and given to schools for use~~
 195 ~~by older children during play time. This was again popular amongst the children in the schools.~~

196 The thick paper board ~~thick~~ wall posters ~~having rabies~~ depicting rabies prophylaxis messages
 197 were fixed at strategic places in the community halls, schools, health ~~centres~~ centers, grocery
 198 shops, ~~etc~~ and other places were served as a good source of rabies information to the
 199 community. After training volunteers from the villages ~~village level volunteers in on~~ rabies
 200 prophylaxis a well designed and ~~tested simple~~ tested simple rabies education aid flip was chart
 201 was provided to ~~them to them~~ to for educating e the people community about the disease and
 202 its prevention. A documentary video film (DVD) on rabies in local dialect (Kannada) prepared by
 203 Rabies in Asia Foundation was used in shown in the schools and through local cable television
 204 network for community education. The folk dance was another popular medium used for

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improving community awareness about rabies and its prevention. The eEducational sessions on rabies conducted in the schools not only benefitted the students both students but also the teachers and teachers. The drawing competition held in the schools at the start & end and end of the project on the theme of "Rabies prevention" had was successful in improving the rabies awareness. A documentary video film (DVD) on rabies in local dialect (Kannada) prepared by Rabies in Asia Foundation (www.rabiesinasia.org) was shown in the schools and also through local cable television network for community education. The folk dance was another popular medium used for improving community awareness about rabies and its prevention. The two World rabies days (WRDs), 28th September, of 2010 and 2011 were successfully used to hold public rallies and other to create rabies awareness activities in the villages.

The training of veterinarians, medical doctors, health workers and village level volunteers and others on rabies prophylaxis held in separate batches was quite successful. This subsequently ensured timely and appropriate provision of rabies PEP in the community for the animal bite victims, which was confidence building and reassuring. The PrEP was provided to 323 school children whose parents gave consent. 0.1mL of Injection Rabipur (purified chick embryo cell vaccine) was given in the deltoid area by intradermal route in these children on days 0, 7 and 28. Five mL of venous blood was drawn from 52 vaccinated children whose parents had given consent and the rabies virus neutralizing antibody titre (RVNA) was estimated by rapid fluorescent focus inhibition test (RFFIT) at National Institute of Mental Health and Neurosciences, a WHO collaborating centre for research on rabies, at Bangalore. The PrEP was provided to 323 school children using Injection Rabipur (purified chick embryo cell vaccine) by ID route. This route. The vaccine was found to be safe and immunogenic by serology. (8)

The animal welfare campaign for responsible emphasized responsible pet ownership, dog collaring, mass dog vaccination and deworming were well received. Mass vaccination of dogs in the community was done using accomplished using Injection Nobivac R (Inactivated rabies vaccine) vaccine) three times i.e., at the start of the project, one month later and again after one year. Mass deworming was done by using Tablet Plozin (Praziquintel 50mg, Pyrantel pamoate 144mg & Fenbendazole 500mg) orally for owned dogs and injection Ivermectin (0.5ml for puppies & 1 ml for adults) subcutaneously for stray dogs. To assess the immunogenicity of Inj. Nobivac-R, of this vaccination the sera sera samples from sub sample of dogs of the dogs were tested for rabies virus neutralizing antibody using RFFIT on day 0 i.e., before first dose of vaccination, at day 365 days and, day 379 i.e., 14 days after one year booster dose for antirabies antibody using RFFIT. The geometric

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mean concentration of rabies virus neutralizing antibody was 0.60 (Range: 0.2 to 3.5) on day 0; 0.62 (Range: 0.5-2.0) on day 365 and 2.32 (Range: 0.5-4.0) on day 379. The vaccine was found to be immunogenic on day 379. However, no RVNA estimation was done before day 365 due to logistical problems in the field. This The vaccine was found to be immunogenic following an annual booster dose.

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The educational sessions on rabies conducted in the schools not only benefitted the students but also the teachers. The drawing competition held in the schools at the start & end of the project on the theme of "Rabies and its prevention" was successful in improving the awareness. The two world rabies days (WRDs), 28th September, of 2010 and 2011 were successfully used to hold public rallies and other rabies awareness activities in the villages.

The animal welfare campaign for responsible pet ownership, dog collaring, mass dog vaccination and deworming were well received. Presently, many veterinary institutions in India that conduct laboratory diagnosis for rabies still routinely use the outdated "seller's stain" and demonstrate "Negri bodies" in the brain of the suspect animal for laboratory diagnosis of rabies. In this project, for the first time Through this project the local veterinarians were trained to use dRIT, a simple field based test diagnostic test developed by CDC, Atlanta, USA, for diagnosis of rabies in animals (97). The dRIT was successfully evaluated in the field conditions in Chad, Africa (10). Surveillance for rabies was conducted using both medical and veterinary manpower in project villages. Later the test was successfully used for diagnosing rabies in six ruminants large animals i.e. three cows, one calf and two goats were diagnosed of rabies by dRIT in the field study villages. The laboratory diagnosis of rabies in dogs was not possible as dog deaths were not reported by the community despite educating them about the importance of rabies surveillance in the dogs. This was because dogs are not of economic value to the community.

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Incidentally, there were no cases of human rabies reported during the project period in both study and control villages during the project period.

Following implementation of various public health and veterinary activities there was a significant improvement in the knowledge, attitude and practices (KAP) of people on rabies prevention in the study villages as compared to the control villages ($P=0.001$) (8).

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268 The cost of entire project was US \$ 85,958. This included actual money spent of US \$
269 31,604 plus the estimated cost of donated goods & free services provided which was US \$
270 54354.

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271 The financial cost of the project was US \$ 31,604 US and\$ and the economic cost was US \$
272 85,958 US \$.The economic cost was 2.7 times more than the financial cost. This was due to
273 resource mobilization in terms of personnel, supplies and expertise at the local and community
274 level. The distribution of the cost of the activities waswas: awareness and education (25%);
275 veterinary component ((22%), training and capacity building, (19%), monitoring and evaluation
276 (19%) and medical component (15%).

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277 A total of 688 dogs were vaccinated with —Lastly, thoughWhile the human Inj. Nobivac-R on
278 days 0, 1st booster at the end of 3 months & another booster at the end of one year. A total of
279 148 sera samples were tested for rabies virus neutralizing antibody titers by RFFIT. There was
280 good immuneresponse on day 379 after annual booster vaccination. Lastly, following
281 implementation of various public health and veterinary activities there was a significant
282 improvement in the knowledge, attitude and practices (KAP) of people on rabies prevention in
283 the study villages as compared to the control villages (P=0.001)(8).

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284 population and area of coverage of for the projectthis project was small, still-it was suitable for
285 this experiment to test the implementation of an array of public health and veterinary activities.
286 The activities could be blended well and made acceptable to the community. This supports and
287 strengthens the conclusion of another recent study from India that it is possible to implement a
288 successful—"one health—" approach for rabies prevention and controlprogramme, in an
289 environment of strong political will, evidence-based policy innovations, clearly defined
290 roles and responsibilities of agencies, co-ordination mechanisms at all levels, and a
291 culture of open information exchange(110).

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292 4. LESSONS LEARNED

293 1. The intersectoral collaboration among the departments of public health, veterinary health,
294 school education, local self government, women and social welfare was key to success.

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295 2. The rabies education materials must—be cost-effective be, long lasting—based on local
296 traditions, conditions and interesting especially to school children.

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298 ~~Based on the activities, results and experience from this study a "conceptual model"(11) is~~
299 ~~provided for medical personnel and veterinarians in the country to enhance rabies prevention~~
300 ~~and control work in rural community. (Figure 1).~~

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302 ~~The PrEP by ID route for school children was found to be safe, feasible and~~
303 ~~immunogenic.(8).~~

304 ~~Cost analysis of the project. The financial cost of the project was US \$ 31604 and the~~
305 ~~economic cost was US \$ 85958.The economic cost was 2.7 times more than the financial~~
306 ~~cost. This was due to resource mobilization in terms of personnel, supplies and expertise~~
307 ~~at the local and community level. The distribution of the cost of the activities was~~
308 ~~awareness and education (25%); veterinary ((22%), training and capacity building, (19%);~~
309 ~~monitoring and evaluation (19%) and medical component (15%).~~

313 ~~4. LESSONS LEARNT LEARNED~~

314 ~~1. The intersectoral coordination collaboration betweenamong the departments of public~~
315 ~~health, veterinary health, school education, local self government, women and social~~
316 ~~welfare was key to success.The intersectoral coordination and cooperation between~~
317 ~~public health and veterinary services at community level was not easy. The difficulty was~~
318 ~~more managerial (man management) and less technical in nature.~~

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319 ~~2. The laboratory diagnosis of rabies in dogs was not possible as dog deaths were not~~
320 ~~reported by the community despite educating them about the importance of rabies~~
321 ~~surveillance in the dogs. This is because dogs are not of economic value to the~~
322 ~~community.The intersectoral coordination between the departments of public health,~~
323 ~~veterinary, school education, local self government, women and social welfare was key~~
324 ~~to success.~~

325 ~~2. 33. The rabies education materials must be cost effective, long lasting based on local~~
326 ~~traditions, conditions and interesting especially to school children.~~

327 4. The laboratory diagnosis of rabies in dogs was difficult not possible as none reported
328 these events.

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329 Lastly, it It is sincerely hoped that the lessons learnt learned from this project would
330 will be of some helpused, in formulating rabies prevention and control strategies in
331 India as now aunder the " National Rabies Control Programme" is under way byof
332 Government of India during the twelfth five year plan ((22012-17).(6)

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333 455. CONCLUSION AND RECOMMENDATION

334 Based on the activities, results and experience from this study a "conceptual model"(121) is
335 provided for medical personnel and veterinarians in the country to implement "one health
336 approach "for rabies prevention and control work in rural community. (Figure -1).

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337 It is hoped that the results of this project will be useful in formulating rabies prevention and
338 control strategies under the " National Rabies Control Programme" of Government of India
339 during the twelfth five year plan (2012-17)

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341 1. The intersectoral collaboration among the departments of public health, veterinary health,
342 school education, local self government, women and social welfare was key to success.

343 2. The rabies education materials must be cost effective, long lasting based on local traditions,
344 conditions and interesting especially to school children.

346 It is hoped that the results of this project will be useful in formulating rabies prevention and
347 control strategies under the " National Rabies Control Programme" of Government of India
348 during the twelfth five year plan (2012-17)

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349 Based on the activities activitiesdone, results shown and experience gained from this astudy a
350 "system conceptual model"(1011) is provided was evolved. (Figure 1). This in conclusion is
351 the message of the project for other medical, andpersonnel and veterinarians in the country and
352 for the attention of all those involved in to enhance rabies prevention and control work in rural
353 community of rabies. .(Figure 1).

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355 | **DEFINITIONS.**

356 | **Health services research.** ~~The~~ A systematic study of the means by which biomedical and other
357 | relevant knowledge is brought to bear on the health of individuals and communities under a
358 | given set of conditions.

359 | ~~**One health.** Is a concept that promotes partnership between human and veterinary medicine.~~
360 | ~~The development of strategies for implementing "one health" involves important steps toward~~
361 | ~~our understanding of how to control, and ultimately, prevent zoonotic disease transmission,~~
362 | ~~which would improve the health and lives of both animals and humans. Schools of medicine,~~
363 | ~~veterinary medicine, and public health should embrace the "One Health" concept and prepare~~
364 | ~~their students to meet the challenges of the future.~~

365 |
366 | ~~**Financial cost.** Money spent on goods materials goods and services.~~

367 |
368 |
369 |
370 |
371 | ~~**Economic cost.** Financial cost plus estimated monetary value of donated donated honorary~~
372 | ~~goods materials goods and services.~~

373 |
374 | **COMPETING INTERESTS.** Authors have declared that no competing interests exist.

375 |
376 |
377 | **APPROVALS AND CONSENT**

378 | The project was approved by the institutional ethics committee of Kempegowda Institute of
379 | Medical Sciences. The approval of State Government of Karnataka was obtained for the
380 | different activities done in the community. The consent of the formal leaders of the village,
381 | school teachers, heads of the households, parents / guardians of the school children was taken.

382 | **ACKNOWLEDGEMENTS**

383 |
384 | This project was implemented following a financial grant from Global Alliance for Rabies
385 | Control-, Kansas, United States of America. The formal permission given by the Departments of

Public Health and School Education, Government of Karnataka, [Bangalore, –India for the conduct of this study](#) is gratefully acknowledged. The authors thank Drs. Deborah Briggs, Executive Director, Global Alliance for Rabies Control and S. Abdul Rahman, President, Commonwealth Veterinary Association, for their constant support and guidance. The technical and logistical support extended by Dr. S Yathiraj, Dean, Veterinary College, Bangalore is duly placed on record. [The help & support of Dr. D. Nagabushana, Veterinary officer is gratefully acknowledged.](#) The technical expertise and help of Dr. Sudha Chandrasekhar, Associate Professor of St.John's Research Institute, Bangalore for conducting the cost analysis of the project is ~~gratefully~~ duly acknowledged. The overall coordination and help of the trustees of Rabies in Asia Foundation is sincerely acknowledged. Lastly, field work of this project was possible due to the cooperation and participation of the community, school teachers, government veterinary staff and public health staff and from the field staff of the Department of Community Medicine of Kempegowda Institute of Medical Sciences, Bangalore.

AUTHORS CONTRIBUTIONS

This project was a collaborative work of all the authors. MKS put forth the idea, mentored, monitored the project work and prepared the manuscript. DHAN did the coordination and liaison work and prepared the project report. NRRM planned and supervised the field work. MLS was responsible for the veterinary component of the study. PK was the medical officer and postgraduate trainee who organized the field work. SNM conducted the laboratory training and responsible for sero-surveillance. BCRK was responsible for ~~the~~ mass dog vaccination, deworming and animal welfare work. GB performed ~~the~~ data and statistical analysis. All authors have read and approved the final manuscript.

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472 **Table 1: Adopt a village, rural rabies prevention project: An overview ~~and activities done of~~**
473 **~~activities conducted in study villages~~**

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476 **Socio-demography**

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477 ~~Number of Villages~~

478 ~~3~~

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479 ~~Number of households~~

2043

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480 Total human population

10,220

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481 Medical manpower (medical-4; paramedics-5; traditional - 2)

11

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482 Veterinary manpower (live stock inspector)

1

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483 Live stock census (dogs-446; cats-56, cows-348, buffalo-45, sheep-165 & goat-275)

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484	Dog: ~~man-human~~ ratio		Formatted: No underline, Font color: Auto
485	1:23		Formatted: No underline, Font color: Auto
486	Rabies awareness and education materials developed and used/ displayed/distributed		Formatted: No underline, Font color: Auto
487	(In local dialect, Kannada)		Formatted: No underline, Font color: Auto
488	~~Number of~~ Outdoor wall ~~paintings-writings~~ (on the prominently located houses)		Formatted: No underline, Font color: Auto, Double strikethrough
489	~~_____~~ 11		Formatted: No underline, Font color: Auto
490	~~Number of~~ Annual wall calendars (in local dialect) distributed to households		Formatted: No underline, Font color: Auto, Double strikethrough
491	~~_____~~ 2000		Formatted: No underline, Font color: Auto
492	~~Number of~~ Book labels distributed through school teachers amongst school children		Formatted: No underline, Font color: Auto, Double strikethrough
493	~~_____~~ 1000		Formatted: No underline, Font color: Auto
494	~~Number of~~ Snake and ladder game thick charts given to schools (for children to play in schools)		Formatted: No underline, Font color: Auto, Double strikethrough
495	~~_____~~ 16		Formatted: No underline, Font color: Auto
496	~~Number of~~ Thick Posters displayed/fixed on the walls (in schools and community centres)		Formatted: No underline, Font color: Auto, Double strikethrough
497	~~_____~~ 65		Formatted: No underline, Font color: Auto
498	Rabies training aid (for village level volunteers)	15	Formatted: No underline, Font color: Auto
499	Rabies DVD (in local dialect, Kannada; 15 minutes duration)	1	Formatted: No underline, Font color: Auto, Double strikethrough
500	Rabies awareness and education activities		Formatted: No underline, Font color: Auto
501	~~Number of~~ Veterinarians and other health staff trained in rabies prophylaxis		Formatted: No underline, Font color: Auto
502	~~_____~~ 40		Formatted: No underline, Font color: Auto, Double strikethrough
503	~~Number of~~ Village level (rabies) volunteers attended training programme on rabies ~~and its prophylaxis~~		Formatted: No underline, Font color: Auto
504	~~_____~~ 24 ~~_____~~ 24		Formatted: No underline, Font color: Auto, Not Highlight
505	~~&and its prophylaxis~~		Formatted: No underline, Font color: Auto
506	~~Number of~~ Rabies education sessions conducted in the village per month		Formatted: No underline, Font color: Auto
507	~~_____~~ 14		Formatted: No underline, Font color: Auto, Double strikethrough
508	~~Number of~~ Rabies education sessions conducted in the schools per month		Formatted: No underline, Font color: Auto
509	~~_____~~ 5		Formatted: No underline, Font color: Auto
510	~~Number of~~ School children attended rabies education sessions		Formatted: No underline, Font color: Auto
511	~~_____~~ 370		Formatted: No underline, Font color: Auto
512	~~Number of~~ Drawing competitions (start& end of the project) for school children		Formatted: No underline, Font color: Auto
513	~~_____~~ 6		Formatted: No underline, Font color: Auto
514	Rabies DVD shown (in local dialect, Kannada)	102 +	Formatted: No underline, Font color: Auto
515	(number of times shown in schools-6; ~~local cable television network -96~~)		Formatted: No underline, Font color: Auto

516	<u>102</u>		Formatted: No underline, Font color: Auto
517	~~local cable television network -96)~~		Formatted: No underline, Font color: Auto
518	Use of folk dance	1	Formatted: No underline, Font color: Auto
519	Use of public rally	2	Formatted: No underline, Font color: Auto
520			
521	Rabies prophylaxis in humans		Formatted: No underline, Font color: Auto
522	~~Incidence of animal Animal bite/exposure per 1000 persons per year~~		Formatted: No underline, Font color: Auto, Double strikethrough
523	~~19~~		
524	Number of rabies PEP given	69	Formatted: No underline, Font color: Auto
525	Number of rabies PrEP given (school children-323, vets& pet owners-45)	368	Formatted: No underline, Font color: Auto
526	Number of rapid fluorescent focus inhibition test (RFFFIT) ~~for antirabies antibody test~~ done		Formatted: No underline, Font color: Auto
527	61		
528	<u>Number of vaccinees protected (RFFIT titers ≥0.5 IU/mL)</u>	61	Formatted: No underline, Font color: Auto, Not Highlight
529	Rabies prophylaxis in animals		Formatted: No underline, Font color: Auto
530	~~Total number of vaccine doses administered~~ Mass vaccination of dogs		Formatted: No underline, Font color: Auto
531	<u>688</u>		Formatted: Space After: 0 pt, Line spacing: single
532	(primary - 262; one month booster - 183; annual booster-243)		
533	~~688~~		Formatted: No underline, Font color: Auto
534	Number of RFFIT (antirabies antibody test) done	148	Formatted: No underline, Font color: Auto
535	Rabies surveillance		Formatted: Double strikethrough
536	Number of veterinarians (15) and others (1) trained in dRIT (sessions held - 2)	16	Formatted: No underline, Font color: Auto
537	Number of dRIT done		Formatted: No underline, Font color: Auto
538	06		Formatted: No underline, Font color: Auto
539	~~Incidence-Number~~ of animals(ruminants) positive for rabies		Formatted: No underline, Font color: Auto, Double strikethrough
540	06		Formatted: No underline, Font color: Auto
541	~~Incidence of hH~~ Human rabies cases		Formatted: No underline, Font color: Auto, Not Highlight
542	~~Nil~~		Formatted: No underline, Font color: Auto
543	Costing of the project (2 years duration)		Formatted: No underline, Font color: Auto, Not Highlight
544	<u>Total cost</u>	USD 85,958	Formatted: No underline, Font color: Auto
545	<u>Cost of actual money spent</u>	USD 31,604 (37%)	Formatted: No underline, Font color: Auto

546	<u>Cost estimate of donated goods and free services provided</u>	USD 54,354 (63%)	Formatted: No underline, Font color: Auto
547	<u>Total financial cost</u>	USD 31,604	Formatted: No underline, Font color: Auto
548	<u>Total economic cost</u>	USD 85,958	Formatted: No underline, Font color: Auto
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554 **Fig.1: Adopt a village project: “One Health” Experiment**

555 A model for rabies prevention and control in a rural community in India

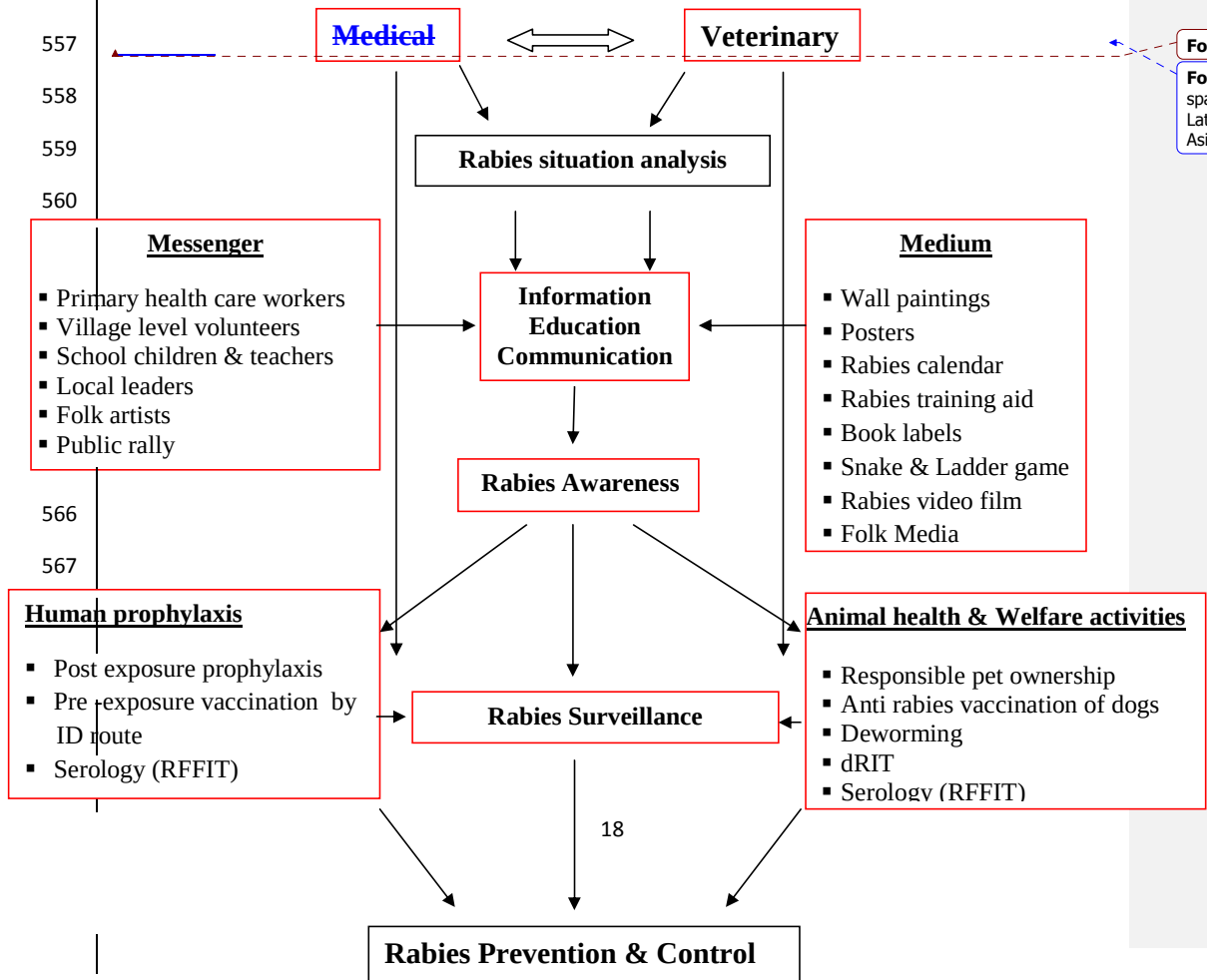
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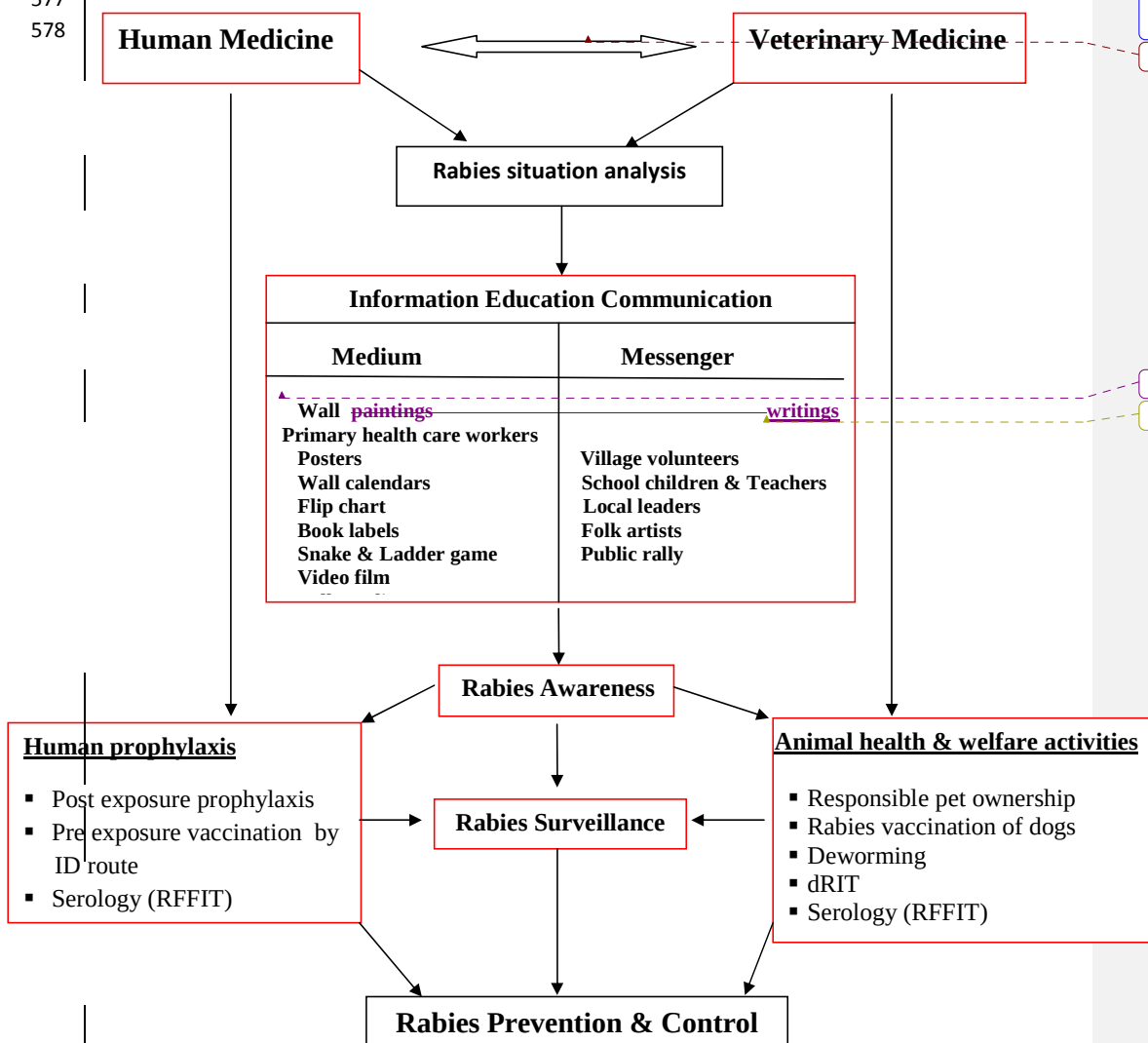
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Fig.1: Rural rabies prevention project, “One Health” Experiment-A Conceptual Model



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