Cystic echinococcosis in Peru: Current projects in CGH

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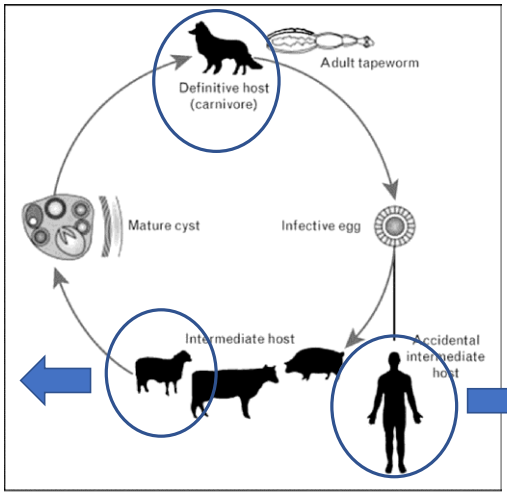
One Health: Spatial distribution of canine infection in endemic areas



Evaluation of US as a monitoring tool for control program

Human prevalence in endemic áreas

Evaluation of treatment approaches

Cystic echinococcosis in Peru

- Liver and lungs are the most commonly affected organs (ratio liver:lung of 3:2)
- Diagnosis is based on imaging methods .
- Surgical treatment is the main approach
- Conservative (partial resection of the cyst) or radical (complete removal of the three cyst layers)
- Development of a new cystic lesión (5 to 15%) after 6 months to 10 years of surgery – UNDERESTIMATED

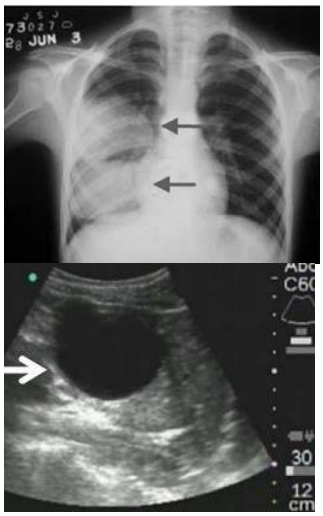


Figure 3. Lung (A) and liver (B) cystic lesions. **Source:** Reyes M, et al Human and Canine Echinococcosis Infection in Informal, Unlicensed Abattoirs in Lima, Peru in Plos Neg Trop Disease, 2012

Human prevalence in endemic áreas

High prevalence of liver cystic echinococcosis using a combined survey strategy in a Peruvian rural community

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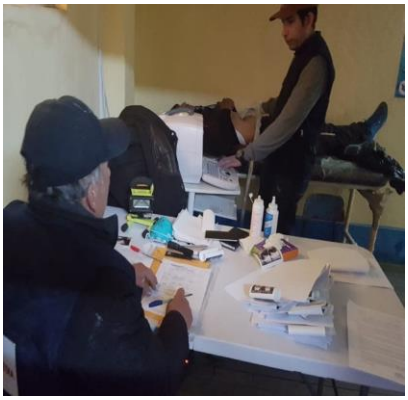
Methodology

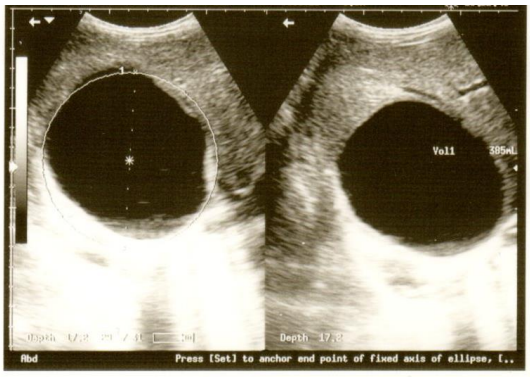
- Community survey performed in Corpacancha using US and EITB
- US were recorded
- All positive were invited to CT

Methodology





Ultrasound + CT



EITB+, US-, CT+

Results (1/2)

Cystic echinococcosis (CE) in Corpacancha, Junin-Peru 2018

	n/N	Overall		Male		Female	
		Prev.	IC 95%	Prev.	IC 95%	Prev.	IC 95%
Liver CE by US	36/220	16.4	11.7-21.9	12.8	6.8-21.2	19.0	12.6-27.0
Seroprevalence by EITB	19/79	24.1	15.1-35.0	21.2	9.0-38.9	26.1	14.3-41.1

n = cases; N = total; Prev. = prevalence; IC = binomial exact confidence interval.

Results (2/2)

Cystic echinococcosis (CE) in participants with positive EITB results and/or liver CE by US

	n/N	Overall		Male		Female	
		Prev.	IC 95%	Prev.	IC 95%	Prev.	IC 95%
Liver and/or lung CE by CT	32/36	88.9	73.9-96.9	93.3	68.1-99.8	85.6	63.7-97-0
Liver CE by CT	29/36	80.6	63.9-91.8	73.3	44.9-92.2	85.7	63.7-97.0
Lung CE by CT	11/36	30.6	16.3-48.1	26.7	7.8-55.1	33.3	14.6-57.0
CE in other organ by CT	4/36	11.1	3.1-26.1	6.7	0.2-31.9	14.3	3.0-36.3

n = cases; N = total; Prev. = prevalence; IC = binomial exact confidence interval.

Conclusion

- By now, we have screened to 67% (224/333) and 83% (91/110) of population and households, respectively.
- In total, 88% (36/41) of participants with a positive result in either US or EITB agreed CT evaluation. In this group, 30.6% (11/36, 95% CI 16.3-48.1) had also lung involvement.
- Prevalence of households with one or more infected member was 27.5% (25/91, 95% CI 20.0-39.8) and 33.3% (8/24) of them had 2 or more members with CE.
- To our best knowledge, these are the highest coverage and both individual and household prevalence reported in the literature from Peru.

Evaluation of treatment approaches

Liver cystic echinococcosis: pre-clinical assessment of a novel, single step percutaneous treatment procedure (intracystic albendazole sulfoxide injection)

Santivanez, Saul J.

Universidad Peruana Cayetano Heredia, Lima, Peru

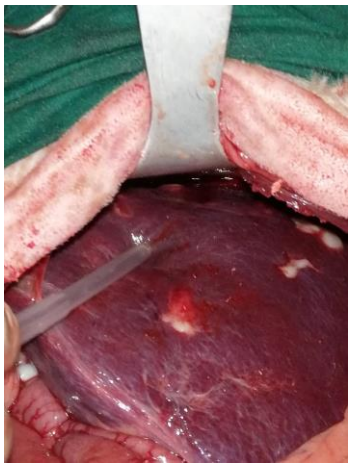
Abstract

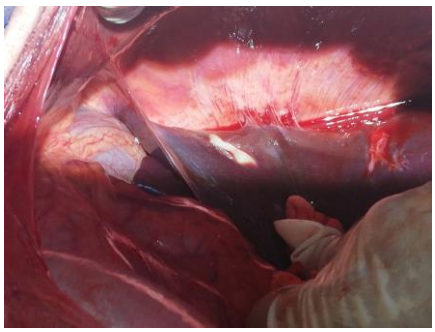
Cystic echinococcosis (CE), a zoonotic disease caused by the larval stage of the dog tapeworm Echinococcus granulosus, is endemic to areas where livestock are raised including Eurasia, UK, Australia, South America and North and East Africa, and considered a serious and costly public health problem in endemic regions. Liver CE is the most common clinical presentation, representing around 70% of human CE cases. Treatment procedures for liver CE have evolved over the past four decades. Currently, four treatment modalities are used: (1) medical treatment with albendazole (ABZ), (2) PAIR (Puncture, Aspiration, Injection of protoscolicidal agent; Reaspiration), (3) surgery to remove the cyst and (4) watch and wait for inactive, clinically silent cysts. In most endemic countries, surgery is the main treatment approach for liver cysts. PAIR has gained ground in the treatment of liver CE and can be performed in centers with limited resources as much as ultrasound guiding is available. PAIR however has some technical drawbacks that include the need to rule out the presence of a cysto-biliary fistula, and is not completely efficacious. A simpler, safer an more effective treatment approach would be of great benefit for patients in endemic regions. The current proposal will evaluate a new treatment approach that consists on a single step injection of albendazole sulfoxide (ABZ-SF), the active metabolite of ABZ, into the cyst. This procedure is less resource and time demanding than PAIR, should not be hampered by the presence of cysto-biliary fistula, and should also be safer than oral ABZ therapy since it avoids the systemic toxicity associated with a prolonged therapy with oral ABZ. The first project is a pilot placebo controlled experimental / interventional animal safety study comparing two different doses of ABZ-SF to determine the higher safe doses as well as to provide preliminary information about efficacy of the antiparasitic drug injection. The second study is a blind, placebo controlled randomized trial testing the highest safe dose of ABZ-SF identified in study 1. Finally, in a third study, which is also a blind, controlled randomized trial, we will determine the minimal needed concentration of intracystic ABZ-SF to achieve treatment success. This proposal can eventually provide a new therapeutic approach for human liver CE, and should result in an R34 application for a future human trial.

Methodology

- Pre-clinical study
- Randomized controlled trial
- Three-arm:
  - 50 ug/ml ABZ-SF solution
  - 100 ug/ml ABZ-SF solution
  - Physiological/normal saline (0.95%) solution
- Double blinded
- Primary endpoint:
  - Evaluation of the biochemical, toxicological and histopathological effects of the treatment.
- Enrolling status at october 2019:

Procedure



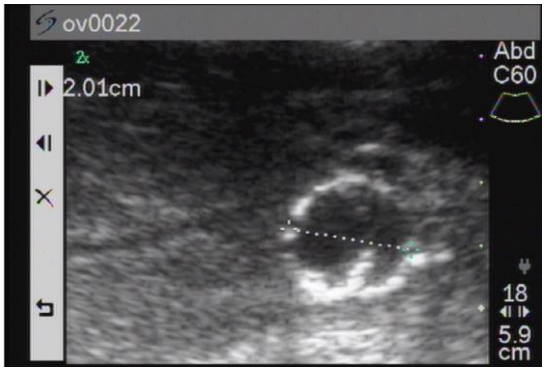


Evaluation of US as a monitoring tool for control program

Standardization of ultrasound as a tool for evaluating CE in sheep

- One hundred ten animals from Corpacancha, were evaluated. Animals under 3 years old, cachectic, and those with respiratory or motor pathologies were excluded from the study

Standardization of ultrasound as a diagnostic tool for CE in sheep



Results

Table 1. Test performance of liver ultrasonography and liver tomography to detect sheep with at least one viable CE

Index test	Sensitivity % (95%CI)	Specificity % (95%CI)	ROC area (95%CI)
Case definition = Any suspicious lesion of hydatid cyst by necropsy			
Liver ultrasonography*	57.1 (42.2 to 71.2)	100.0 (66.4 to 100.0)	0.786 (0.716 to 0.856)
Liver tomography	81.6 (68.0 to 91.2)	88.9 (51.8 to 99.7)	0.853 (0.731 to 0.974)
Case definition = Suspected lesion of hydatid cyst (only size ≥ 20 mm) by necropsy			
Liver ultrasonography*	68.0 (46.5 to 85.1)	66.7 (48.2 to 82.0)	0.673 (0.549 to 0.797)
Liver tomography	56.0 (34.9 to 75.6)	93.9 (79.8 to 99.3)	0.750 (0.642 to 0.857)
Case definition = Suspected lesion of hydatid cyst (only viable and size ≥ 20 mm) by necropsy			
Liver ultrasonography*	84.6 (54.6 to 98.1)	62.2 (46.5 to 76.2)	0.734 (0.609 to 0.859)
Liver tomography	76.9 (46.2 to 95.0)	93.3 (81.7 to 98.6)	0.851 (0.727 to 0.976)

* A sheep was considered positive for liver ultrasonography (index test) when we found at least 1 lesion compatible with CE (independently of human's WHO stage classification) and of any size.

One Health: Spatial distribution of canine infection in endemic areas

Objective

- Describe the spatial distribution (using dot pattern maps) of cases of canine echinococcosis in a highly endemic livestock community of human hydatidosis in October 2018.
- Determine the existence of spatial aggregation patterns (hotspots) of canine echinococcosis in a highly endemic livestock community of human hydatidosis in October 2018.
- Evaluate the spatial association between the presence of canine echinococcosis and human hydatidosis around the usual place where the dog lives.

Methods (1/2)

Methods (2/2)

Thank you!

Contributing to control Cystic Echinococcosis

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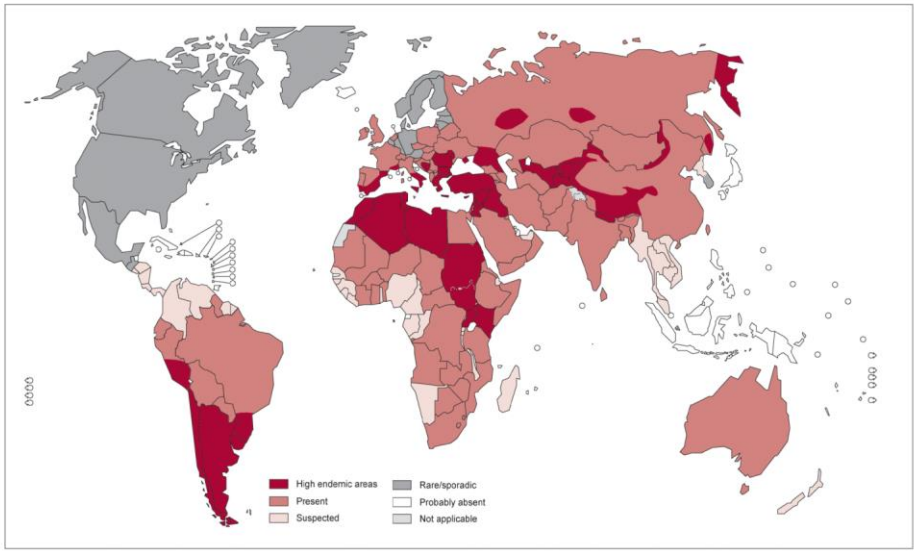
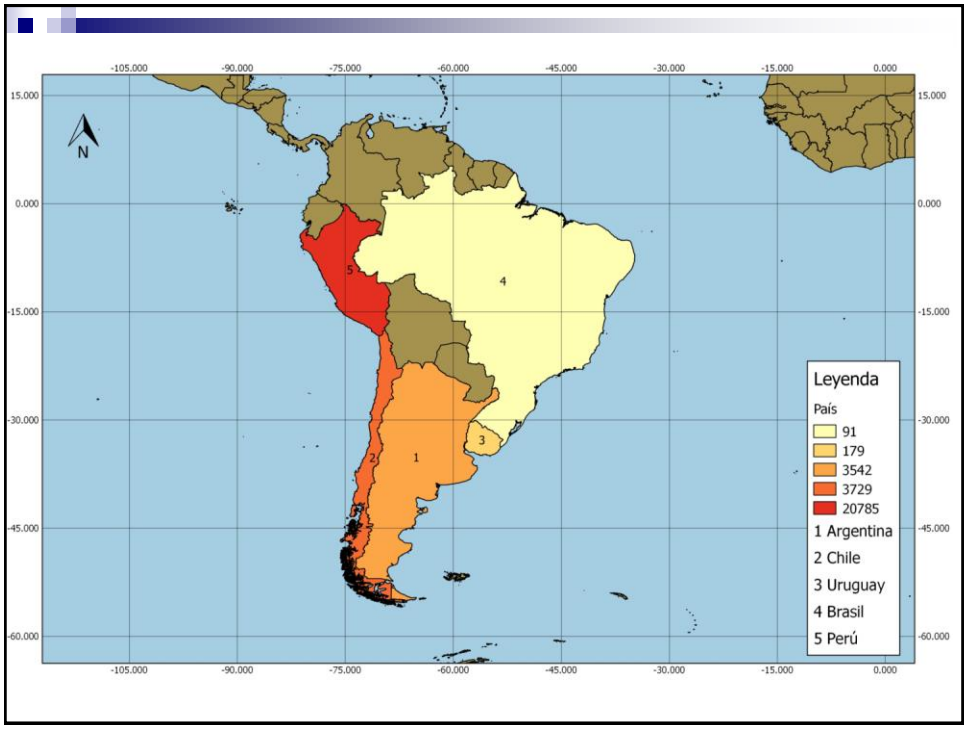
Distribution of *Echinococcus granulosus* and cystic echinococcosis, worldwide,2011



Data Source: World Health Organization
Map Production: Control of Neglected Tropical Diseases (NTD)
World Health Organization

World Health Organization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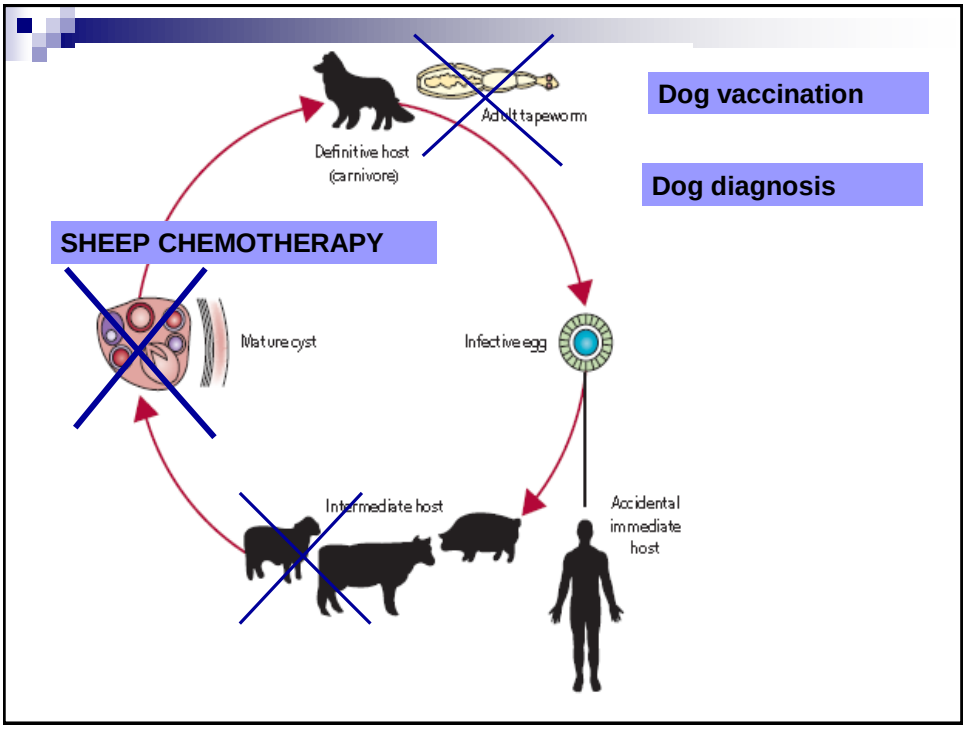
2 Chile
3 Uruguay
4 Brasil
5 Perú

5

What we have done and what we are doing

6



Sheep chemotherapy

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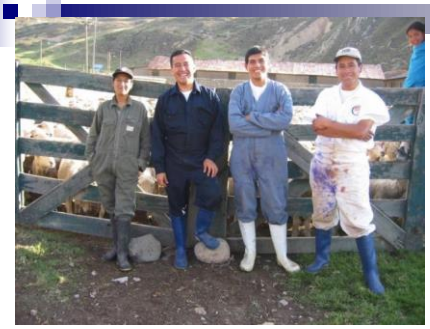

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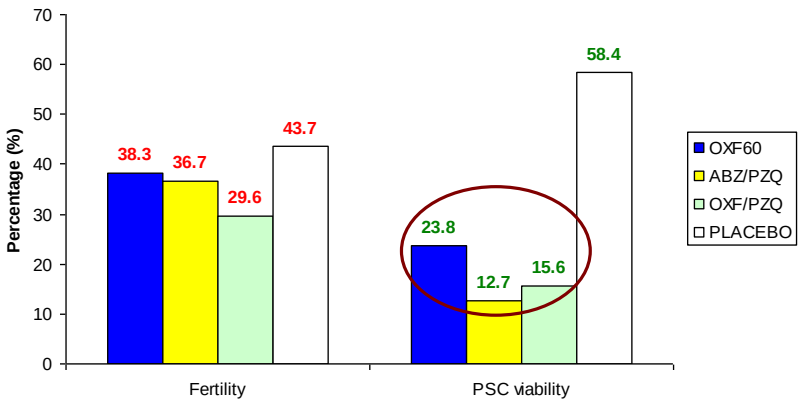
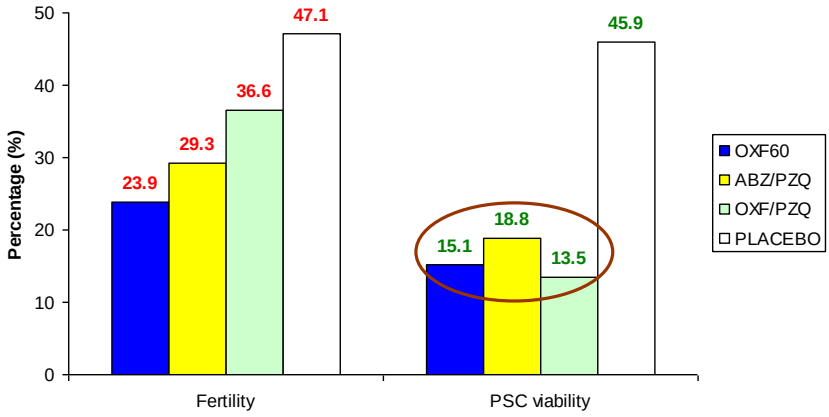
Percentage of cyst fertility and protoscolex viability between the groups for lung cysts



- **Fertility was not significantly different**
- **PSC viability was statistically lower than control group (p<0.05)**
- **Efficacies: OXF60=59%, ABZ/PZQ=78%, OXF/PZQ=73%**

10

Percentage of cyst fertility and protoscolex viability between the groups for liver cysts



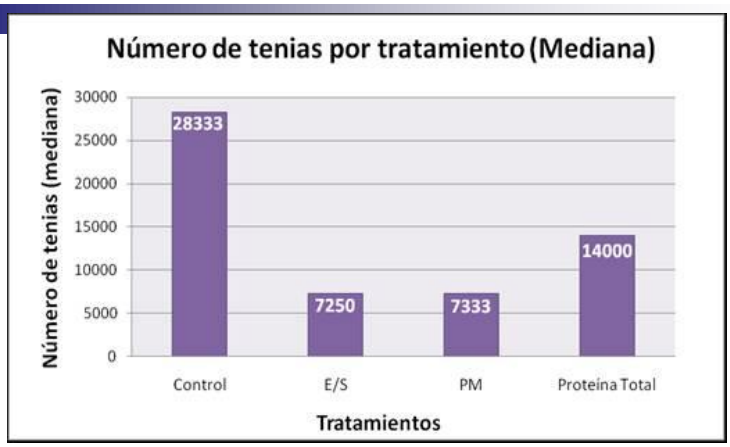
- **Fertility was not significantly different**
- **PSC viability was statistically lower than control group (p<0.05)**
- **Efficacies: OXF60=67%, ABZ/PZQ=59%, OXF/PZQ=71%**

Future works

- Looking for ideal “feasible” chemotherapy in sheep
  - Easy to treat / one dose
  - Cheap
  - Efficacious / effective
  - No side effects
- Mathematical models
  - Evaluation alone or with other strategies
  - Effect over the parasite biomass / burden

DOG IMMUNIZATION

13



GRUPO	MEDIANA	N	Rango	Mínimo	Máximo
CONTROL	28333	3	38600	4400	43000
E/S	7250	3	18150	100	19250
PM	7333	3	34131	2619	36750
PROTEÍNA TOTAL	14000	3	33540	3460	37000
TOTAL	10666	12	41900	1100	43000

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"UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS"
Facultad de Medicina Veterinaria
Unidad de Posgrado
Doctorado en Medicina Veterinaria

"Characterization of antigenic proteins from protoscoleces and adult worms of *Echinococcus granulosus*"

Mg. Faride V. Altamirano Zevallos

CONCYTEC
CONSEJO NACIONAL DE CIENCIA, TECNOLOGÍA E INNOVACIÓN TECNOLÓGICA
Convenio N° 215-2014-FONDECYT
FONDECYT
FONDO NACIONAL DE DESARROLLO CIENTÍFICO, TECNOLÓGICO Y DE INNOVACIÓN TECNOLÓGICA

Aim

- To identify antigenic proteins from excretory / secretory products and hydrophilic proteins of protoscoleces and adult worms of *Echinococcus granulosus* as vaccine candidates

Future trials

- Protein sequencing by MALDI TOF/TOF
- Applications: Candidate immunogens, diagnostic tests.
- CoproWB, CoproELISA, IgAs, detergent phase proteins
- See more in Poster session ….

Dog immunization trial

- **Experimental Design:**
  - 2 to 6 months of age
  - 2 groups (6 animals per group):
    - **Group 1 (Immunized):** E/S (Adult + Protos. - 175 µg), M (Adult + Protos. - 175 µg), 3 doses + Quil-A (50 µg/ml), Intranasal
    - **Group 2 (Control):** PBS + Quil-A (50 µg/ml), Intranasal
  - Three (3) immunizations each 15 days, after 15 days of last immunization, animals were challenged orally with 100,000 live protoscoleces
  - Animals were euthanized to 67 days post-challenge

N° OF WORMS FOR SEGMENT OF INTESTINE					
N°	Code	Anterior	Middle	Distal	TOTAL
1	EG097 (C)	8,000	4,265	56	12,321
2	EG098 (I)	560	540	143	**1,243**
3	EG099 (C)	7	46	3	56
4	EG100 (I)	785	1,023	80	**1,888**
5	EG102 (C)	1,559	5,749	481	7,789
6	EG103 (I)	152	71	566	**789**
7	EG104 (C)	689	4,618	70	5,377
8	EG105 (I)	336	960	11	**1,307**
9	EG106 (C)	3,817	5,080	650	9,547
10	EG107 (I)	610	5,140	12	**5,762**
11	EG108 (C)	6,360	1,035	380	7,775
12	EG109 (I)	6,240	1,360	475	**8,075**

Development and validation of a Copro-ELISA for diagnosis of *Echinococcus granulosus* in dogs

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doi:10.4269/ajtmh.18-0645

Development and Validation of a Copro-Enzyme–Linked Immunosorbent Assay Sandwich for Detection of *Echinococcus granulosus*–Soluble Membrane Antigens in Dogs

Luis M. Jara,[1]* Magaly Rodriguez,[2] Faride Altamirano,[3] Antonio Herrera,[3] Manuela Verastegui,[2] Luis G. Gímenez-Lirola,[4] Robert H. Gilman,[5] and Cesar M. Gavidia[3]

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Abstract. Cystic echinococcosis (CE) is a parasitic zoonosis caused by the larval stage of the tapeworm *Echinococcus granulosus*. Detection of the adult stage in the canine definitive host is essential for estimating infection rates, surveillance and monitoring of CE control programs. This study sought to develop and validate a coproantigen sandwich enzyme–linked immunosorbent assay (copro-ELISA), based on antibodies against *E. granulosus*–soluble membrane antigens (EGMA), that is capable of distinguishing infected and noninfected dogs. Anti-*E. granulosus* polyclonal immunoglobulin G antibodies were obtained from rabbit antiserum against EGMA. Optimization of the test was performed with 51 positive and 56 negative stool samples of canine echinococcosis. Specificity, sensitivity, cross-reactivity, intra- and inter-assay precision, and over time detection were evaluated. According to the receiver operating characteristic analysis, the diagnostic sensitivity and specificity were 96.1% (CI: 85.9–99.6) and 98.2% (CI: 89.5–100), respectively. Negative and positive predictive values were 96.5% (CI: 91.7–100) and 98% (CI: 94.1–100), respectively. No cross-reactivity with *Taenia hydatigena*, *Dipylidium caninum*, or *Toxocara canis* was observed. Intra- and inter-assay repeatability showed values of less than 15% of the variation coefficient. The over time detection was from 20 to 27 days postinfection with *E. granulosus*. The copro-ELISA based on EGMA detection offers a simplified in-house development of diagnostic testing. This assay showed high specificity and sensitivity and had no cross-reactivity with other parasites. Further studies and development

Copro-ELISA

- Sensitivity: 96.1%
- Specificity: 98.2%
- No cross reactivity with other parasites in faeces
- See more in Symposium 11 (Diagnosis of Echinococcosis in definitive host)

Research Group

- César Gavidia
- Manuela Verástegui
- Faride Altamirano
- Luis Jara
- Antonio Herrera
- Luis Gómez
- Leny Sánchez
- Janet Acosta
- Luis Gimenez-Lirola
- Robert Gilman

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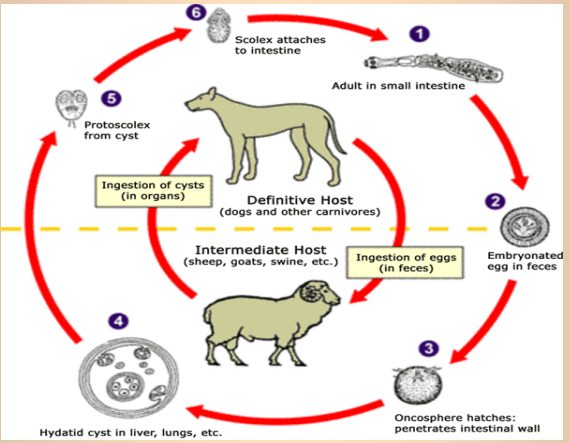
CYSTIC EQUINOCOCIESIS IN PERU

M.V. JOSE LUIS BUSTAMANTE NAVARRO - National Zoonosis Coordinator – DPCEM – DGIESP - MINSA

HIDATIDOSIS IN PERU



Human hidatidosis is a cosmopolitan zoonotic disease and an economic and social problem for families, the community and other sectors of the economy such as agriculture.

Human infection is high , approximately 190 x 100,000 inhabitants; the morbidity rate 530 x 100,000 hospitalized patients. the mortality rate is low, apparently from 1 to 12% of patients

- The economic loss of human hydrydosis has been estimated at $850,000 and the livestock economy has estimated $500,000 per year per year.
- In summary, the economic loss of hydatidosis in Peru would amount to more than $1,000,000 per year.
- Canine echinococcosis is important in rural areas,, but it is necessary to consider the infection of dogs in urban areas because of their easy access to killing centers.

- The knowledge of hydatidosis is very scarce in the general population and the "ignorance" of the problem in endemic areas is more pronounced and this is related to the low educational level of the rural population.
- A pilot program to control this parasitic zoonosis in the central highlands was carried out in the Country as a collaborative effort between various institutions such as: Ministry of Health, Pan American Sanitary Bureau, National University of San Marcos and the Agricultural Societies of Social interest.

- This program demonstrated the feasibility of controlling this zoonosis in endemic areas. In recent years, the diagnosis of human hydatidosis has been improved, both by the implementation of imaging and serological diagnostic techniques.
- The registration of human and animal hydatidosis is incomplete, which does not allow for adequately measuring the magnitude of the problem and in relation to the definitive host, knowledge is subject to research work that is still limited.

HYDATIDOSIS IN PERU

CANINE INFECTION (PILOT PLAN): This pilot plan was unfinished because violence in the country in the study area prevented it from continuing.

Central Sierra

	% INFECTION
• **SAIS TUPAC AMARU**	
1976	**11.4**
1980	**1.6**
• **SAIS PACHACUTEC**	
1978-1979	**36.3**
1980	**14.0**

HYDATIDOSIS IN PERU

CONTROL: it is based primarily on

1. HEALTH EDUCATION

Conduct Change: Do not give viscera infected dogs

The difficulty: ignorance (high illiteracy)

2. DOSAGE OF DOGS

There is good drug

The difficulty: large number of "lazy" dogs

3. CATTLE SLAUGHTER CONTROL

Difficulty: home slaughter without health inspection

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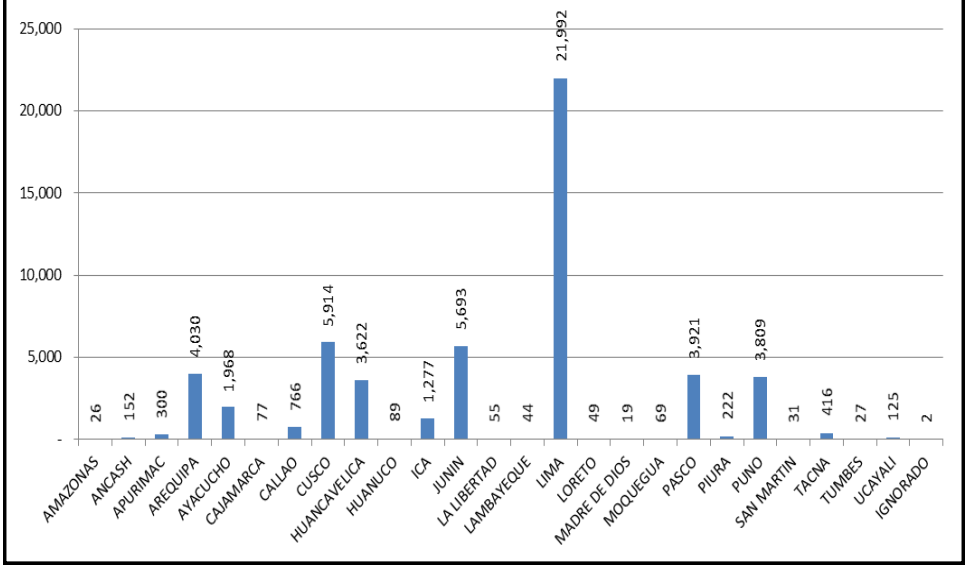
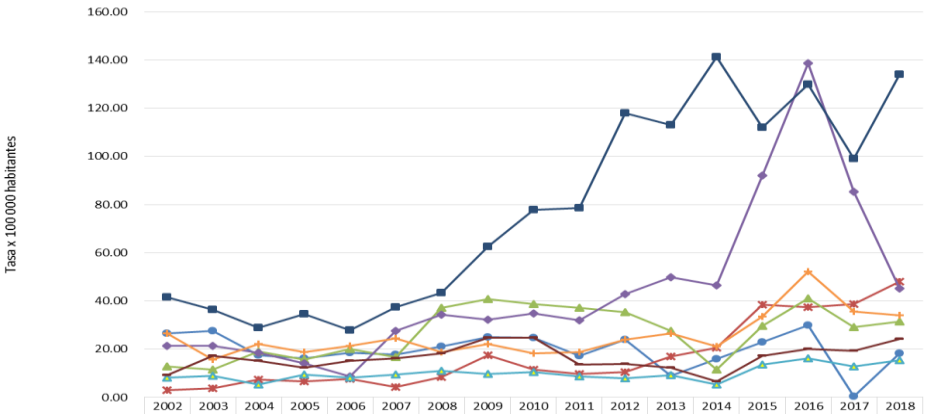
Graphic 01: Accumulated cases or cystic echinococcosis by regions 2002-2018



Graphic 02:Incidence rate per 100,000 person-years of cystic echinococcosis by regions 2002-2018



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
AREQUIPA	26.56	27.47	17.43	16.27	18.57	17.62	21.12	24.89	24.71	17.30	23.93	9.05	16.02	22.92	29.82	0.30	18.27
AYACUCHO	2.90	3.87	7.29	6.70	7.59	4.30	8.50	17.57	11.53	9.72	10.51	16.92	20.70	38.34	37.35	38.80	47.96
CUSCO	12.70	11.43	18.97	15.55	20.19	16.59	37.24	40.76	38.75	37.16	35.44	27.68	11.50	29.62	41.00	29.13	31.52
HUANCAVELICA	21.43	21.45	18.60	14.05	8.70	27.61	34.21	32.22	34.90	31.90	42.81	49.85	46.61	92.13	138.60	85.44	45.30
ICA	8.13	9.03	5.32	9.51	8.13	9.41	10.95	9.74	10.44	8.60	7.99	9.07	5.39	13.59	16.10	12.71	15.43
JUNIN	26.61	15.66	22.12	18.82	21.44	24.50	18.71	22.05	18.28	18.83	23.99	26.44	21.03	33.54	52.08	35.69	34.06
PASCO	41.49	36.37	28.83	34.64	27.95	37.51	43.42	62.65	77.83	78.56	117.95	113.07	141.40	112.11	129.93	99.20	133.94
PUNO	9.19	17.29	15.15	12.29	15.08	16.16	18.13	24.84	24.84	13.56	13.04	12.23	6.56	17.17	20.01	19.49	24.29

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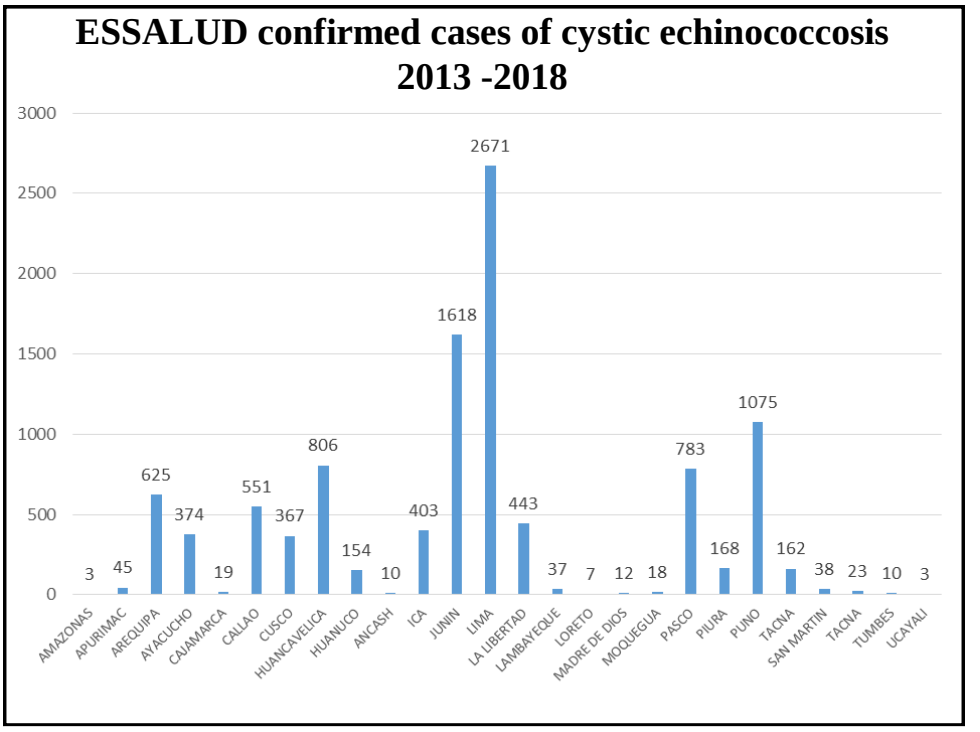
CONFIRMED CYSTIC ECHINOCOCCOSIS REPORTED BY ASSISTANCE HEALTH NETWORKING ESSALUD PERIOD 2013 - 2018

REGION	2013	2014	2015	2016	2017	2018	TOTAL
AMAZONAS	0	0	0	0	0	3	3
APURIMAC	2	2	12	9	11	9	45
AREQUIPA	3	103	109	141	136	133	625
AYACUCHO	123	75	60	37	36	43	374
CAJAMARCA	13		1	4	1	0	19
CALLAO	124	90	134	41	69	93	551
CUSCO	5	49	61	57	97	98	367
HUANCAVELICA	59	213	161	126	191	56	806
HUANUCO	78	18	19	9	14	16	154
ANCASH	7	0	1	0	2	0	10
ICA	1	70	72	90	73	97	403
JUNIN	228	312	246	272	293	267	1618
LIMA	392	527	440	413	480	419	2671
LA LIBERTAD	400	11	6	7	10	9	443
LAMBAYEQUE	2	9	9	5	6	6	37
LORETO	4	0	1	2	0	0	7
MADRE DE DIOS	0	0	0	0	9	3	12
MOQUEGUA	1	3	3	4	6	1	18
PASCO	13	142	105	136	211	176	783
PIURA	132	14	5	2	4	11	168
PUNO	69	215	219	213	186	173	1075
TACNA	115	11	15	15	0	6	162
SAN MARTIN	33	1	1	0	1	2	38
TACNA	0	0	0	0	17	6	23
TUMBES	8	1	1	0	0	0	10
UCAYALI	0	0	0	1	0	2	3
TOTAL	1812	1866	1681	1584	1853	1626	10422


ESSALUD confirmed cases of cystic echinococcosis
2013 -2018
3000
2500
2000
1500
1000
500
0
3
45
625
374
19
551
367
806
154
10
403
1618
2671
443
37
7
12
18
783
168
1075
162
38
23
10
3
AMAZONAS
APURIMAC
AREQUIPA
AYACUCHO
CAJAMARCA
CALLAO
CUSCO
HUANCAVELICA
HUANUCO
ANCASH
ICA
JUNIN
LIMA
LA LIBERTAD
LAMBAYEQUE
LORETO
MADRE DE DIOS
MOQUEGUA
PASCO
PIURA
PUNO
TACNA
SAN MARTIN
TACNA
TUMBES
UCAYALI


STRUCTURAL DETERMINANTS
Livestock rearing without sanitary control.
Communities with poor basic sanitation
Trade in meat and offal without sanitary control
Slaughtering in the communities
Rearing of dogs without sanitary control
Social programs do not include the approach of echinococcosis

SHEEP PRODUCTION (VS)
CYSTIC ECHINOCOCCOSIS (HYDATIDOSIS)







Control and prevention

- Deworming dogs
- Ovine vaccination
- Labor Control
- Environmental pollution control
- Population control of Dogs
- **SANITARY EDUCATION**

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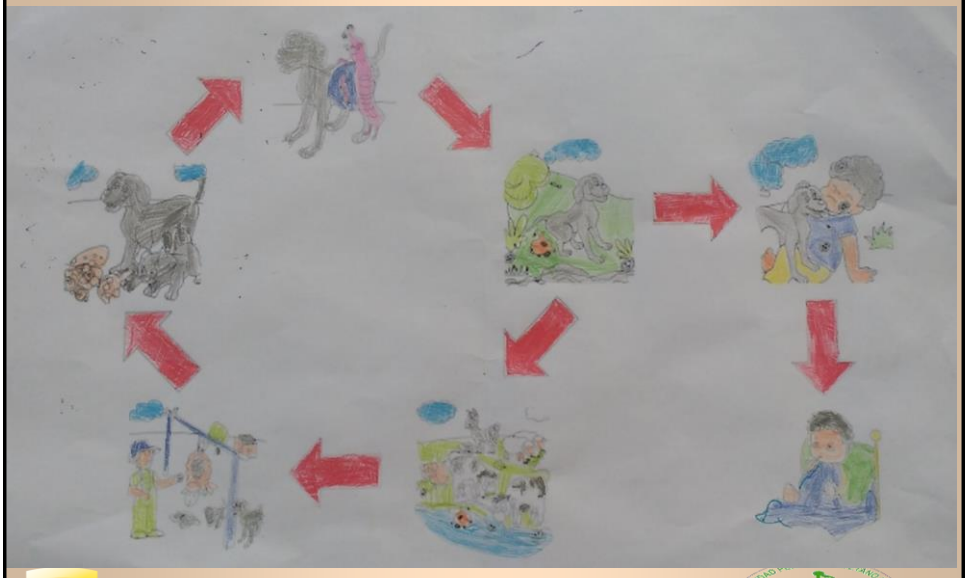
Facultad de Medicina Veterinaria y Zootecnia

BIOLOGICAL CYCLE OF HYDATIDOSIS



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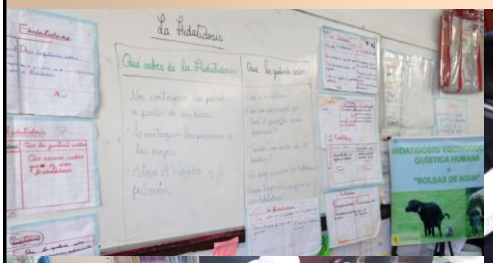
Educational sessions

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SAPUVET - PERÚ

PERÚ Ministerio de Salud | Dirección General de Intervenciones Estratégicas en Salud Pública

ANALYSIS ON THE PERUVIAN CYSTIC ECHINOCOCCOSIS REPORTS

- **The health information system-HIS reported 54,695 cases during the period 2002 – 2018.**
- **Regions with the highest incidence: Pasco, Huancavelica, Junín, Cusco and Puno.**
- **There is an underreporting of this zoonosis. ESSALUD informed 10,422 during the period 2013-2018.**
- **There is joint work experience in a comprehensive manner among health, agriculture (SENASA) and education sectors in 5 pilots.**
- **National Guidelines is pending approval. This guideline will incorporate the monthly mandatory notification.**
- **The Ministry of Health, being the ruling organism, assumes the challenge of regulating integral actions to monitor, prevent and control cystic echinococcosis in Peru.**

CARE FOR PEOPLE

- Capture . - According to case definition
- Clinical Evaluation.- Signs and Symptoms

DIAGNOSIS OF CYSTIC ECHINOCOCCOSIS

- Clinical evaluation
- Diagnosis by means of imaging
  - Radiography
  - Ecography
  - CT scan
  - Magnetic resonance (mri)
- Immunological Diagnosis. Demonstration of circulating antibodies
  - Screening test
    - Agglutination of latex particles
    - ELISA with IgG
- Proof of confirmation.
  - Immunoblot or westerm blot
- Anatomopathological diagnosis. - Histopathological study

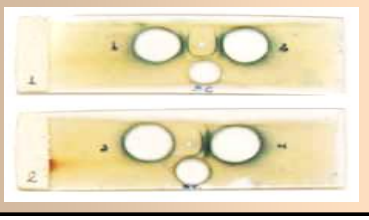
DIAGNOSIS OF THE LABORATORY

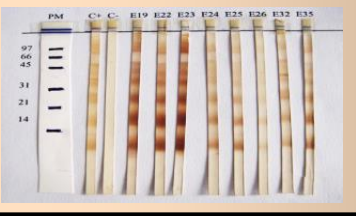
SCREENING TESTS

- Latex agglutination
- igc elisa test

CONFIRMATORY TESTS

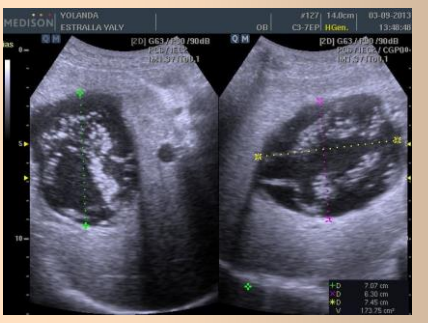
IMMUNOBLOT LG C





Technological Transfer of the diagnostic method of Latex Agglutination for Hydatidosis of the LRN Laboratory. Parasitic Zoonosis to LRR

LRR Arequipa, Ayacucho, Apurímac, Cusco, Junín, Huancavelica, Lima, Puno, Tacna.
Hosp. Daniel A. Carrión Cerro de Pasco.






Photograph of cerebral chysical disease

Fig. 3 (Caso 1). Acto operatorio: se puede observar la extensa craneotomía realizada (doble craneotomía) para resecar en mejores condiciones la masa multiquística.

Fuente: Orrego ET AL Masa multiquística de cráneo 1997. Reunión Equinococosis/ Hidatidosis 2006.

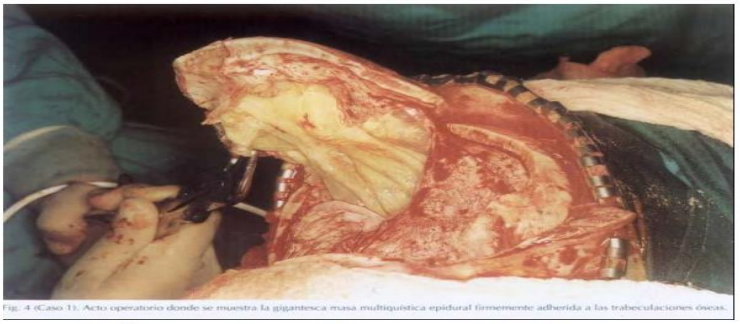
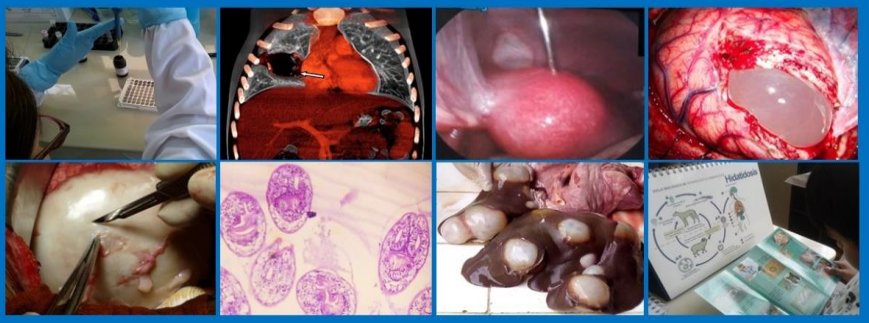


Fig. 4 (Caso 1). Acto operatorio donde se muestra la gigantesca masa multiquística epidural firmemente adherida a las trabeculaciones óseas.

Fuente: Orrego ET AL Masa multiquística epidural 1997. Reunión Equinococosis / Hidatidosis 2006

ATLAS OF HYDATIDOSIS IN CHILDREN



Cortesía : Dr. Henry Hernández Islas

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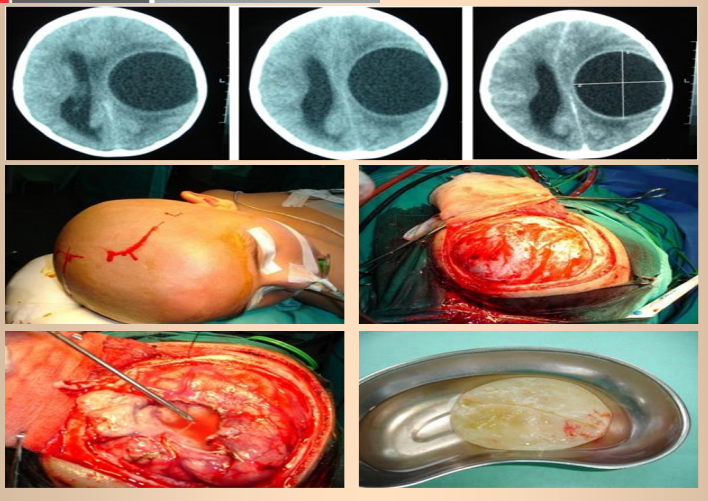

Case report: Cerebral TEM demonstrates the presence of hydatid cyst located at the level of the left parietal fronto region with mass effect. It was operated using a combination of microsurgery techniques and the traditional technique of Dowling and Orlando. Western blotting for hydatidosis was negative. It evolved favorably.

Atlas hydatidosis in children.
Chapter IV 1. Cerebral EQ. L. Gutierrez

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INSTITUTO NACIONAL DE SALUD DEL NIÑO

Informal slaughter of supply animals

Collaboration: Román Bances Santamaría.

Consumption of raw viscera of cattle by dogs

Collaboration: Darío C. León Pereira

PERÚ | Ministerio de Salud | GENERAL DIRECTION OF STRATEGIC INTERVENTIONS IN PUBLIC HEALTH

National plan for the prevention, monitoring and control of echinococcosis/ hydatidosis with a focus on the social determinants of health in a territorial management framework, 2014-2021

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CONSOLIDATION OF THE INTERSECTORAL ARTICULATION FOR INTEGRAL CARE OF CHEMICAL EQUINOCOCOSIS

- **May 2013 "*National Seminar for the Development of the Intersectoral Plan for the Monitoring, Prevention and Control of Echinococcosis / Hydatidosis in Peru*" was held, with the PAHO Technical Cooperation, participating in the Health and Agriculture technical teams.**
- **August 2013, through D.S. N ° 271 - 2013 - PCM, the Monitoring and Control of Cystic Echinococcosis / Hydatidosis is declared of National Interest. (A temporary multisectoral commission consisting of Health, Agriculture, Education and National Agrarian Confederation is appointed)**
- **April 2014 the Final Report of the Multisectoral Commission is issued.**
- **Allocation of resources to SENASA for intervention in 5 pilots located in the regions of Pasco, Junín, Huancavelica, Puno and Cusco.**
- **June 2015 the First Peruvian Day of Cystic Echinococcosis / Hydatidosis and annual meeting of the South American Initiative for the control of Cystic Echinococcosis / Hydatidosis was developed, with PAHO Technical Cooperation**

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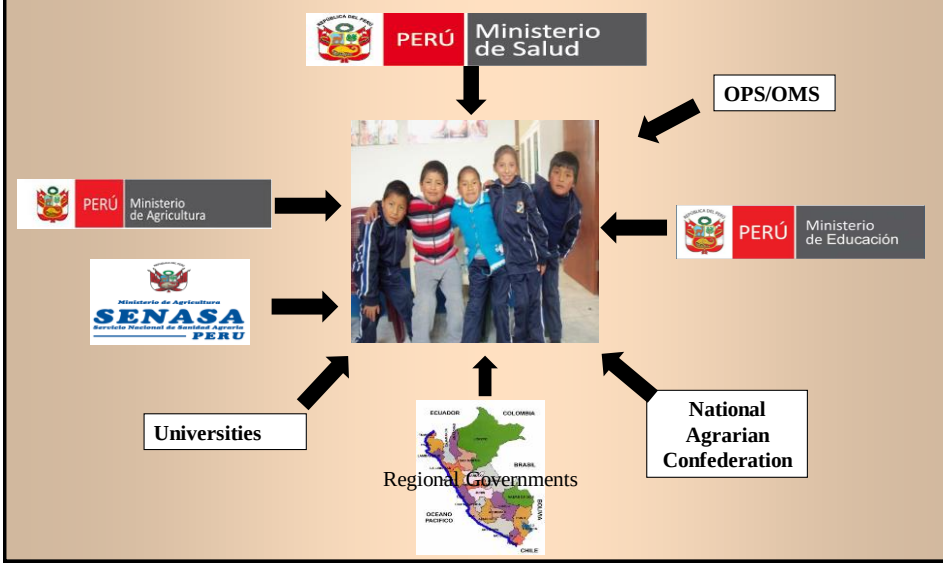


Conclusions

- Peru is probably the country of the americas with the highest incidence and prevalence of hh.
- Coexistence and contact with dogs are important for their infestation.
- Hp is more common in Peru compared to the rest of the world.
- Eco is the most important DX method for both the DX and the TX to follow.
- Surgery is the only therapeutic option.

CHALLENGES FOR THE COMPREHENSIVE CARE OF CYSTIC ECHINOCOCCOSIS

- From the information of the HIS System, it reports 54,695 cases attended in the period 2002 - 2018. Due to the evolution of cases per 100000 inhabitants, the regions that are being prioritized are Pasco, Huancavelica, Junín, Cusco and Puno.
- There is a sub-register of this zoonosis, evidenced by the ESSALUD reports that in the 2013 – 2018 period alone, 10422 cases were reported. Again, the sub-register of the Puno region is evident.
- The Technical Standard of Health is currently being validated with priority regions in which its mandatory notification is considered on a monthly basis.
- In this zoonosis, if we have experience working together between the Health and Agriculture Sectors (SENASA), establishing 5 pilots for integrated control in the regions prioritized by the Ministry of Health, being the challenge to make viable all the control alternatives studied and even in the Pasco Region and Cusco with the participation of the Education Sector.

LIFE COURSE APPROACH

The life course approach involves the sequence of events that occur throughout the existence of people and populations, which interact to influence on their health from preconception to death, or even transcend future generations.

Source: World Health Organization. World aging and health report. Ginebra: WHO; 2015

PERÚ Ministerio de Salud

EL PERÚ PRIMERO

THANK YOU

If you are not doing something,do something
If you are doing little, do more
If you are doing a lot, do it better

Michael Marmot

PERÚ Ministerio de Agricultura y Riego

SENASA PERU

The Control and Prevention of Hidatidosis/Cystic Echinococcosis Pilot Program

M.V. Ubaldo Flores Barrueta

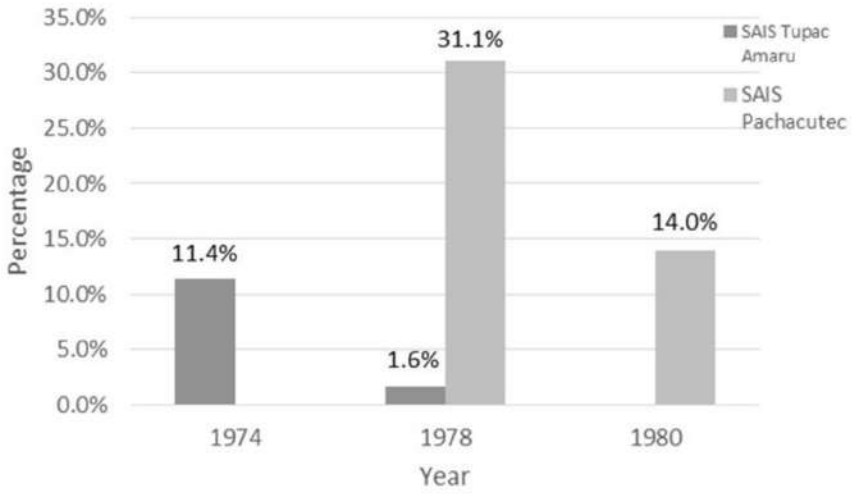
Director of the Sub Directorate of Risk Analysis and Epidemiological Surveillance (SARVE)

National Service of Agrarian Sanity (SENASA)

Background

- 1974: Pilot control program to CE elimination in Junin (1974 – 1980).
- 2013: Peru became a member of the Sub Regional South Cone Project of Control and Surveillance of Hidatidosis.
- 2014: The government of Peru declared of the national interest the program of Surveillance, Prevention and Control of Hidatidosis/Cystic Echinococcosis (H-CE).

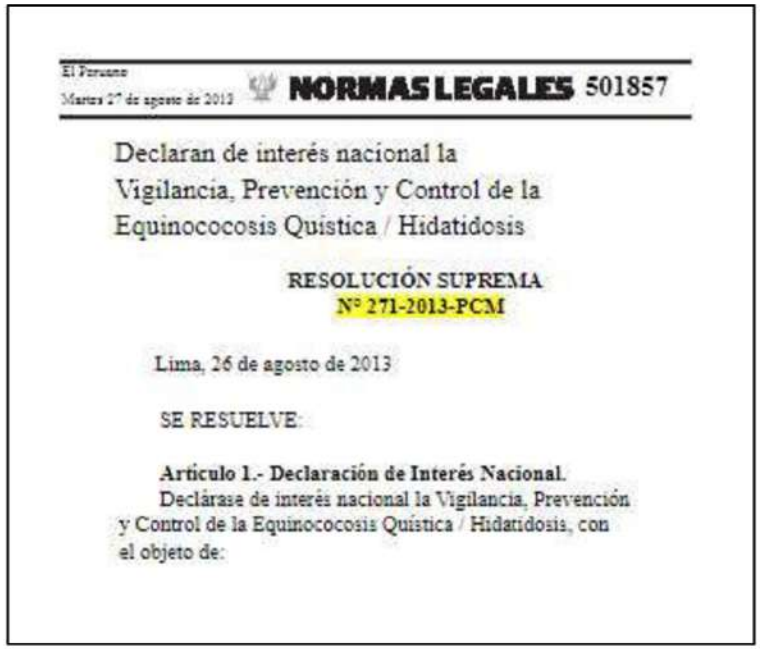
Percentage of canine echinococcosis in the Pilot Control Program in the Junin Region: 1974 – 1980*



This program was developed between 1974 -1980 in ranching cooperative (SAIS by the acronym in Spanish): Túpac Amaru and Pachacutec, in Junín region.
Source: Adapted from Náquira, 1993.

How it started…

- The declaratory emitted by the government of Peru in 2013, appointed a multi sectorial committee conformed by a group private and public entities.
- The multi sectorial committee release protocols for Hydatidosis prevention and control.
- 2015: SENASA started the Control and Prevention of Hidatidosis/Cystic Echinococcosis Pilot Program.



El Peruano
Martes 27 de agosto de 2013

NORMAS LEGALES 501857

Declaran de interés nacional la Vigilancia, Prevención y Control de la Equinococosis Quística / Hidatidosis

RESOLUCIÓN SUPREMA
Nº 271-2013-PCM

Lima, 26 de agosto de 2013

SE RESUELVE:

Artículo 1.- Declaración de Interés Nacional.
Declárase de interés nacional la Vigilancia, Prevención y Control de la Equinococosis Quística / Hidatidosis, con el objeto de:

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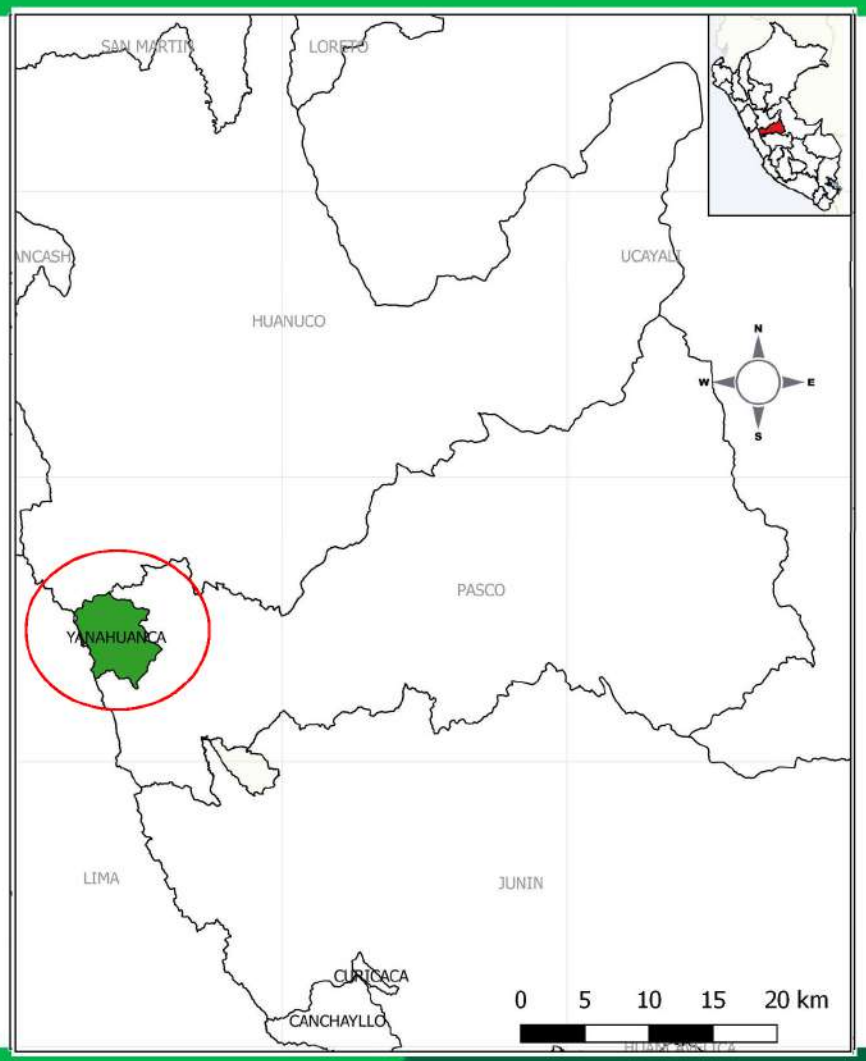
Objective	• Strategy evaluation • Cost –effectivity evaluation • Best strategy would be recommended.
Strategies	• Dog antiparasitic treatment • Sanitary education • Sheep vaccination • Sheep antiparasitic treatment
Target population	• Humans • Sheep • Dogs
Entities involved	• SENASA • MINSA • MINEDU • Local and Regional Governments



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DEPARTMENT	Province	District	Community
Cusco	Canchis	Maranganí	Sullca, Quisini, Occobamba
Huancavelica	Huancavelica	Ascención	Quintanillapampa, Quinta Boliviana, Millpo, Pucarumi
Junín	Jauja	Canchayllo	San Juan, Canchayllo
		Curicaca	San Francisco, Putja
Pasco	Daniel Alcides Carrión	Yanahuanca	12 Octubre, Andachaca, Sgo Pampa, Uchumarca
Puno	Melgar	Nuñoa	Passana Ccollo, Santa Cruz Sincata

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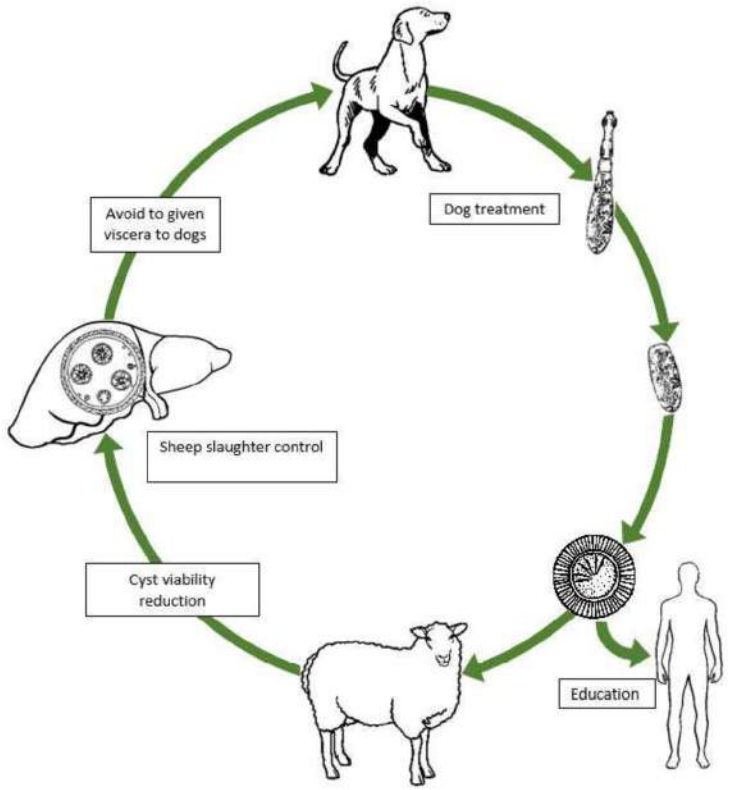
Strategies implemented in the Hidatidosis/Cystic Echinococcosis Pilot Program

Department	Dog Antiparasitic treatment	Oxfendazole sheep treatment	Sheep vaccination with EG95 vaccine	Educational program
Cusco	X			X
Huancavelica	X		X	X
Junín			X	X
Pasco	X	X		X
Puno	X	X		X

Activities

- Dog Antiparasitic treatment (praziquantel).
- Sheep interventions:
  - Oxfendazole treatment in sheep
  - Sheep vaccination with EG95 vaccine
- Educational program .
- Active surveillance :
  - Dog (feces)
  - Sheep (blood samples)



Dog Antiparasitic treatment

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- Praziquantel 5mg/Kg.
- Given every 3 months.
- Dispensers, pathe
- Tablet cost (Un): $/. 0.19
- Inversion per year (average): $/. 7,400.00

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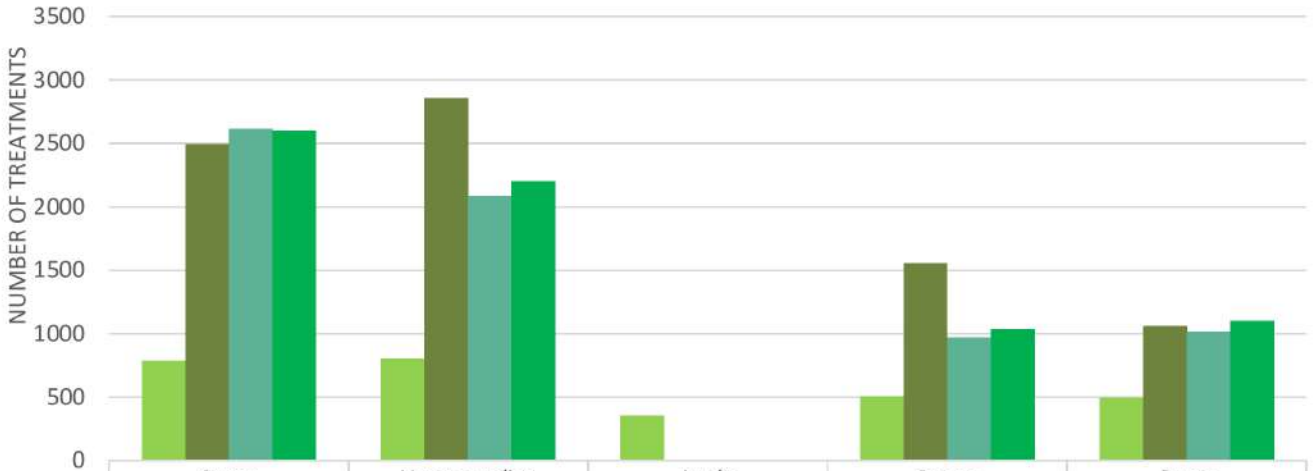
H/C-E Pilot Program: Dogs Antiparasitic treatments (Praziquantel 5mg/kg)

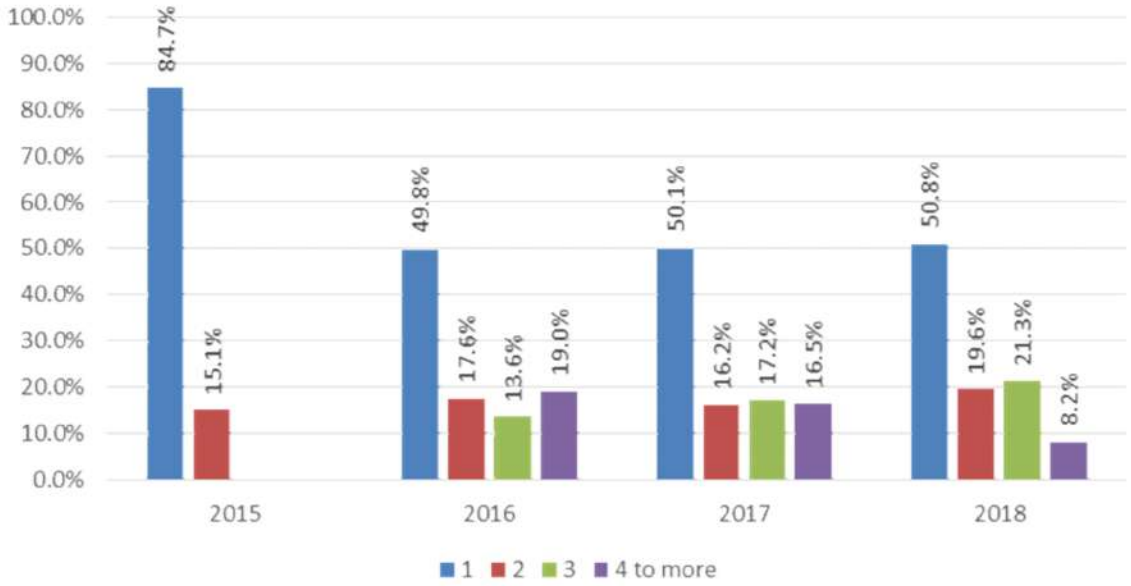


	Cusco	Huancavelica	Junín	Pasco	Puno
2015	785	803	356	504	495
2016	2494	2859	0	1552	1059
2017	2613	2084	0	969	1014
2018	2597	2200		1036	1097

Source: SIGSA - SENASA

H/C-E Pilot Program: Treatments per dog by year (Praziquantel 5mg/kg)

- One single dose 49 – 50%:
- In one dose: only 21% - 25% are new animals (no more than six moths old).
- In one dose: 55% - 62% are older animals.



Source: SIGSA - SENASA

Sheep oxfendazole treatment

- Given every 3 months.
- Oxfendazole: 60 mg/kg.
- Oral dispensers
- 10 ml of suspension: $/. 0.15
- Inversion per year (average): $/. 5,930.00

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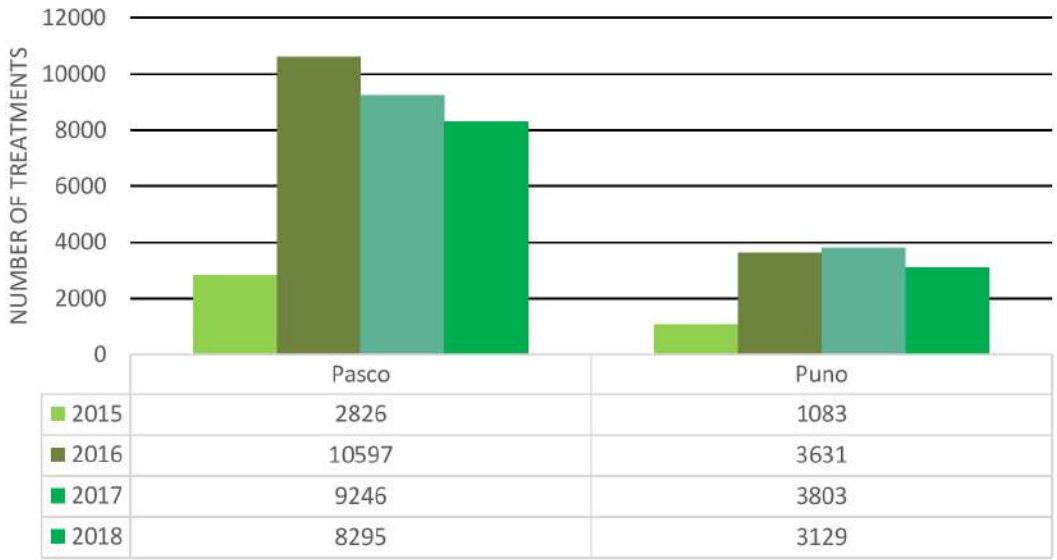
H/C-E Pilot Program: Sheep oxfendazole treatment



	Pasco	Puno
2015	2826	1083
2016	10597	3631
2017	9246	3803
2018	8295	3129

Source: SIGSA - SENASA

Number of treatment per sheep	Percentage (%)
1 - 4 Treatments	59.8%
5 – 8 Treatments	34.8%
9 to more	5.3%

Number of visit to the sheep producer	Percentage (%)
1 - 4V	16.0%
5 - 8V	13.2%
9 to more	70.8%

Sheep vaccination

- Vaccination 30 d, 60 d, 1 year.
- Vaccine: EG95.
- University of Melbourne - Australia.

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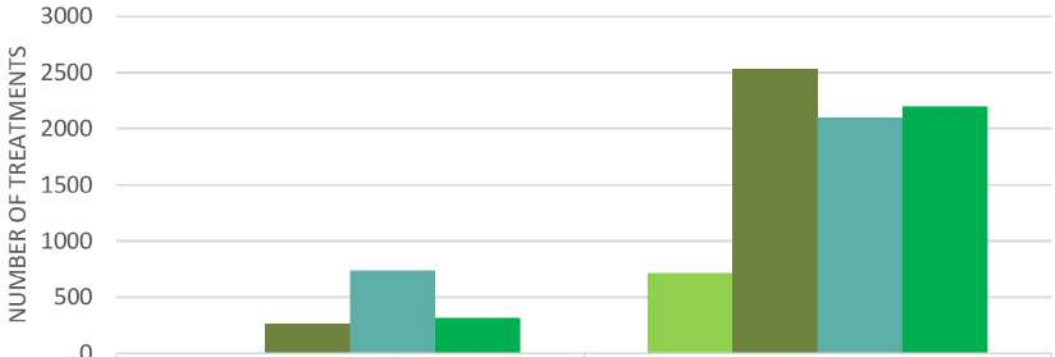
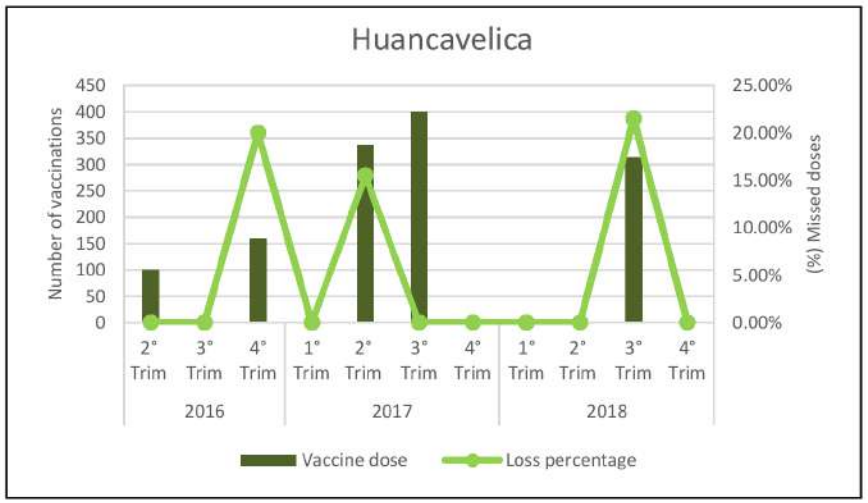
H/C-E Pilot Program: Sheep vaccination (EG95)

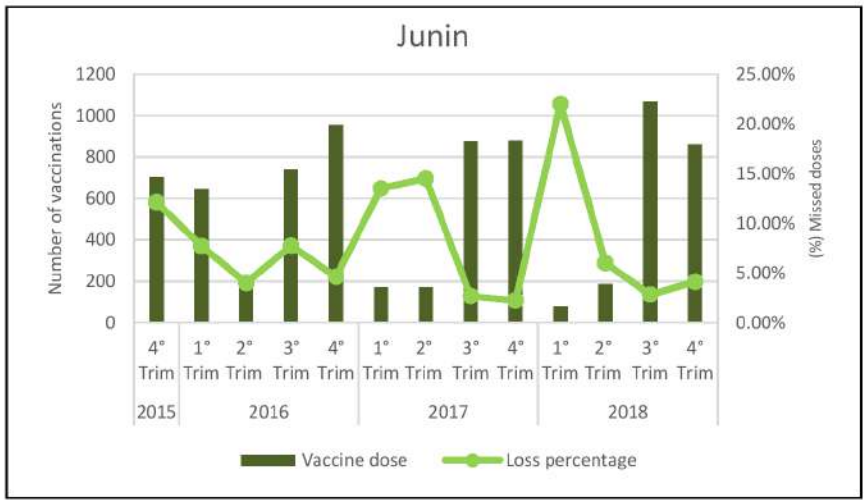


	Huancavelica	Junín
2015	0	713
2016	260	2533
2017	738	2100
2018	314	2198

Source: SIGSA - SENASA

H/C-E Pilot Program: Sheep vaccination (EG95) – Use of vaccine

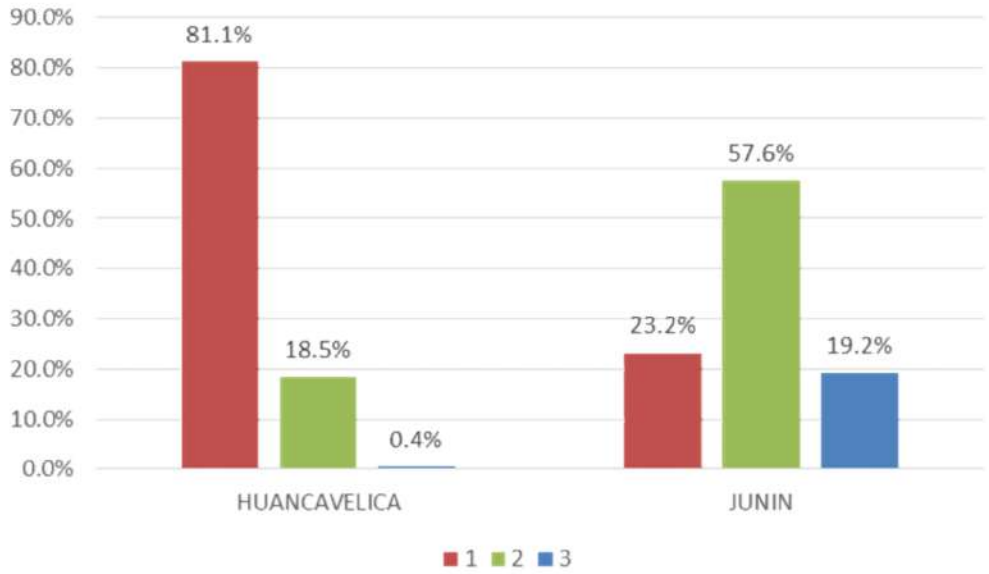




- Vaccine presentation: Bottle per 100 doses.
- Total vaccinations (2015 – 2018): 8,886 doses / 95 bottles.
- Missed doses: 6.77% (Junin: 5.70%; Huancavelica: 12.53%).

Source: SIGSA - SENASA

H/C-E Pilot Program: Sheep vaccination (EG95) – Number of vaccinations per sheep

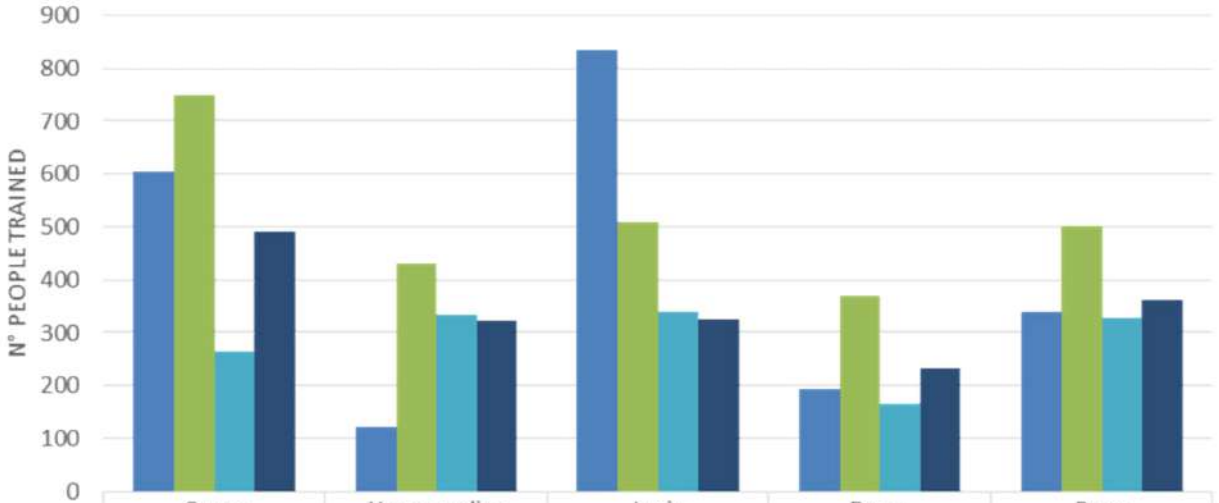


Source: SIGSA - SENASA

Educational program

- Workshops or talks.
- Making sense about cyst echinoccocosis in population who lives in the communities.
- Activities carried out in all communities.

H/C-E Pilot Program: People trained

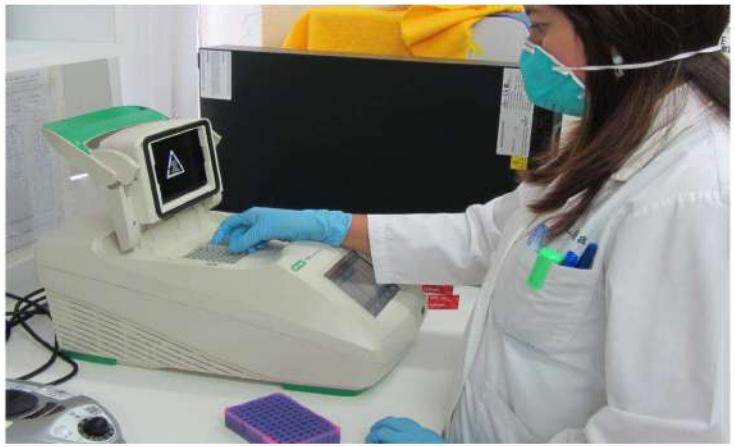


	Cusco	Huancavelica	Junin	Pasco	Puno
2015	605	121	834	194	338
2016	749	431	509	369	501
2017	265	333	338	165	328
2018	490	324	327	232	361

Source: SIGSA - SENASA

Active surveillance

- Yearly.
- Sheep: Western blot (Moro et al., 1997).
- Dogs: copro- PCR y coproELISA.



H/C-E Pilot Program: Active surveillance - 2015

Department	Copro PCR test* - 2015		
	Total samples	Positive	%
Cusco	187	43	23.0%
Huancavelica	149	23	15.4%
Junin	154	36	23.4%
Pasco	208	25	12.0%
Puno	108	4	3.7%
Total	**806**	**131**	**16.3%**

*Not validated test

Department	Copro ELISA test* - 2015		
	Total samples	Positive	%
Cusco	41	15	36.6%
Huancavelica	23	5	21.7%
Junin	34	10	29.4%
Pasco	25	17	68.0%
Puno	4	3	75.0%
Total	**127**	**50**	**39.4%**

*test running in samples positives by copro PCR (2015)

Source: SIGSA - SENASA

H/C-E Pilot Program: Western blot test

Department	2015			2016		
	Total samples	Positive	%	Total samples	Positive	%
Cusco	107	13	12.1%	266	83	31.2%
Huancavelica	99	24	24.2%	333	76	22.8%
Junin	103	22	21.4%	266	95	35.7%
Pasco	103	21	20.4%	266	66	24.8%
Puno	88	16	18.2%	266	25	9.4%
Total	500	96	**19.2%**	1397	345	**24.7%**

Source: SIGSA - SENASA

H/C-E Pilot Program: Copro-Elisa test

Department	2016			2017		
	Total samples	positive	%	Total samples	positive	%
Cusco	187	15	8.0%	187	22	11.8%
Huancavelica	235	5	2.1%	162	14	8.6%
Junin	159	6	3.8%	159	35	22.0%
Pasco	197	31	15.7%	67	11	16.4%
Puno	108	12	11.1%	107	9	8.4%
Total	**886**	**69**	**7.8%**	**682**	**91**	**13.3%**

Source: SIGSA - SENASA

H/C-E Pilot Program: Investment

- 2014: Census, diagnostic test.
- More investment in technical and professional staff.
- Total investment (2018): $/. 600,708.32

Year	S/.	$
2014	128,624.83	38,977.22
2015	572,657.99	173,532.72
2016	471,535.56	142,889.56
2017	311,398.66	94,363.23
2018	498,120.41	150,945.58
Total	**1'982,337.45**	**600,708.32**

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H/C-E Pilot Program: Achievements and future goals

- Agreement signed between the university and SENASA.
- The Permanent multi sectorial committee was created.
- Regional and Local Governments declared local interest the Prevention and Control of Hidatidosis.
- Analysis (Cost – effectivity) .
- Scientific publication.

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