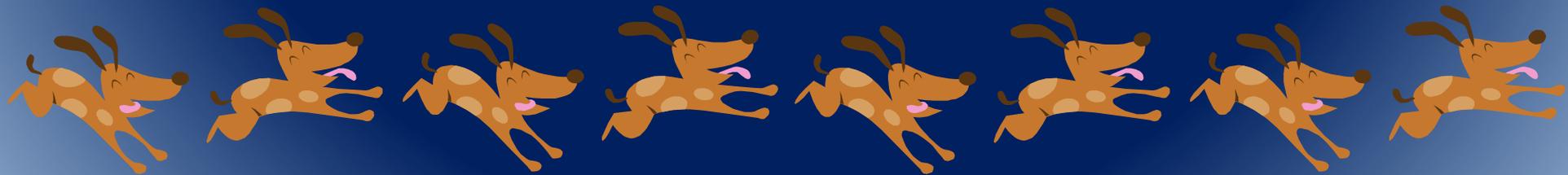


# HEPATITIS E SEROPREVALENCE STUDY IN *CANIS LUPIS FAMILIARIS* AND ASSOCIATIONS TO HUMAN OWNERS, SMITH COUNTY, TEXAS

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# Beginnings

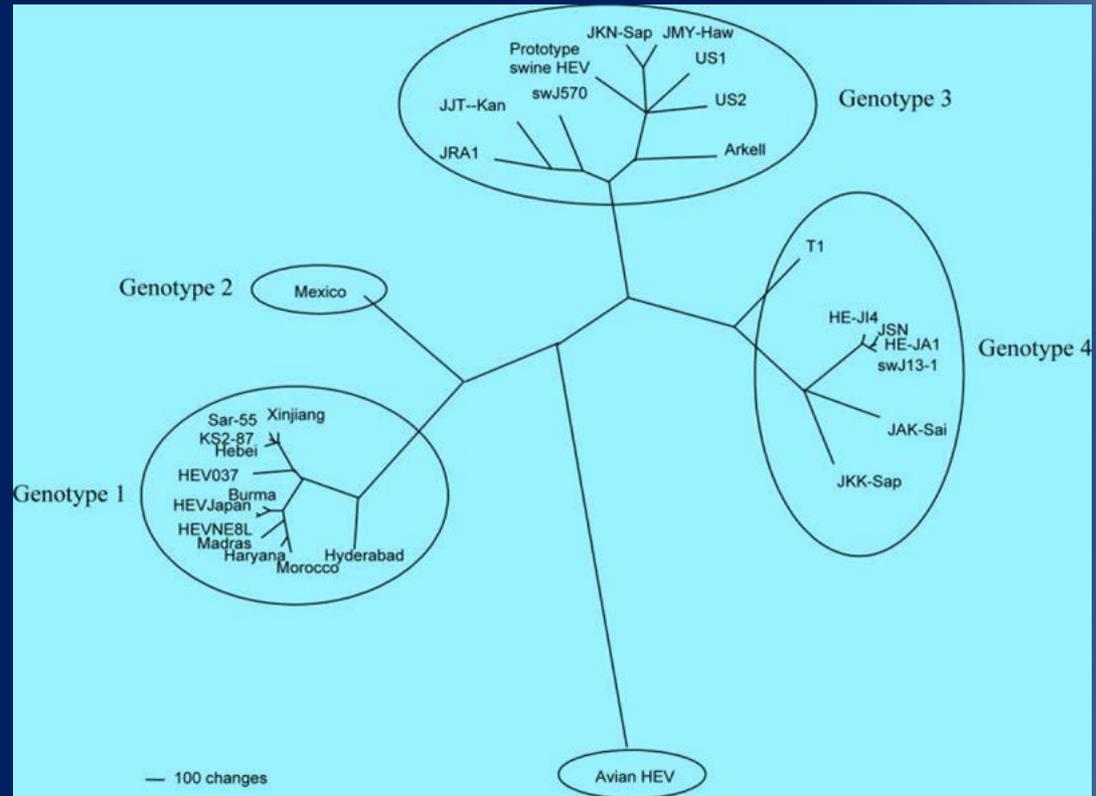
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- 1st identified 30 years ago
  - 1955 New Delhi, India Epidemic - 30,000 cases
- Seldom found in children, affects those 15 to 40 years of age, and more prevalent in males than females
- Consequences of infection range from asymptomatic to, in extreme cases, death
- General populace fatality rate is less than 0.1%  
In pregnant women rate jumps to 18-25%



# Biological & Genotype Info

- Enzyme linked immunosorbent assay (ELISA) developed to test for HEV IgG and IgM in the 90s
- 4 genotypes represented by the geographic area in which they were first isolated
  - 1: Burmese; 2: Mexican (limited to primate hosts)
  - 3: US; 4: Chinese (zoonotic strains)



Unrooted HEV Phylogeny



# HEV in Developed Countries

- Sporadic human cases began in 1980s
  - Cases in UK, Japan, EL Paso, Netherlands, Italy & Germany
  - 2009 San Antonio – 2 cases, 1 fatal
  - 2011-2012 France – 280 confirmed cases
- 1988-1994 found 21% of 18,000 individuals 2002 study on swine workers and blood donors in US
- Swine Workers & Blood Donors
  - 18-23% prevalence



# HEV's Zoonotic Background

- Every age in domestic swine and found to be highest in those less than 2 months old
- Chinese, Indian, and Vietnamese studies on domestic animals found 14-27% prevalence in canines
- Recent studies into HEV contaminated human food products
  - US: 10% of commercially available swine livers were contaminated
  - Italy: 53% contamination rate, highest of multi-country study
  - 1 out of 4 contaminated pork stuffs were still capable of HEV replication



# Methods

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- 144 canines from Smith County Holding Facility, Pets Fur People, and Tyler Veterinary Center
- IgG does not appear in the blood until several weeks after the acute phase and can be detected 1.5 to 4 years after initial infection
- After collection procedures were completed data was uploaded into statistical analysis software (SPSS v 20).



# Results: Canine Characteristics

- 144 canines
- Average age 4.3 years, range: 1 – 14 years old
- 40 different breeds, 7 AKC breed groups
- N per Site:
  - HF n=51 (35%)
  - PFP n=45 (31%)
  - TVC n=47 (33%)



TABLE 1. Canine Characteristics

Breed	N	Mean Age	% Male	% Mix	# TVC	# PFP	# HF	# HEV +	AKC Group	Animal Contact?
American Blue Heeler	2	2	50%	0%	0	2	0	1	Herd	Animal
Australian Shepherd	2	4	50%	100%	1	0	1	1	Herd	Animal
Basenji	1	2	0%	0%	0	1	0	1	Hound	Animal
Beagle	5	3.8	20%	0%	1	4	0	3	Hound	Animal
Border Collie	9	1.89	67%	100%	0	3	6	3	Herd	Animal
Boxer	6	2.67	83%	67%	1	1	4	2	Work	Non
Chihuahua	13	6.15	46%	8%	2	11	0	7	Toy	Non
Chow	5	3.6	60%	100%	0	1	4	2	No Sport	Non
Cocker Spaniel	4	9.5	0%	25%	4	0	0	1	Sporting	Animal
Coon Hound	1	5	0%	100%	0	1	0	1	Hound	Animal
Corgi	1	6	100%	100%	0	0	1	0	Herding	Animal
Cur	1	2	100%	0%	0	1	0	1	Herding	Animal
Dachshund	7	4.86	86%	29%	3	4	0	1	Hound	Animal
Doberman	1	3	0%	100%	0	0	1	0	Working	Non
English Setter	1	7	0%	0%	1	0	0	1	Sporting	Animal
German Shepherd	7	2.29	43%	86%	2	2	3	1	Herding	Animal
Ger. Shorthair Pointer	2	3	50%	0%	2	0	0	1	Sporting	Animal
Golden Retriever	1	7	0%	0%	1	0	0	0	Sporting	Animal
Great Pyreneese	1	10	0%	0%	1	0	0	0	Working	Non
Greyhound	4	6.25	25%	0%	4	0	0	0	Hound	Animal
Heeler	2	2	100%	100%	0	0	2	0	Herding	Animal
Hound	3	2	0%	100%	0	0	3	0	Hound	Animal
Jack Russell Terrier	2	7	100%	100%	1	0	1	0	Terrier	Animal
Lab	32	3.8	56%	56%	11	8	13	13	Sporting	Animal
Maltese	1	2	100%	0%	0	0	1	0	Toy	Non
Mastiff	1	3	100%	100%	1	0	0	1	Working	Non
Papillon	1	7	0%	0%	1	0	0	0	Toy	Non
Pitbull	7	2.57	43%	71%	0	0	7	1	Terrier	Animal
Pointer	1	4	0%	100%	0	0	1	1	Sporting	Animal
Rat Terrier	1	9	100%	0%	0	1	0	1	Terrier	Animal
Red Heeler	1	13	100%	0%	1	0	0	0	Herding	Animal
Rottweiler	1	2	0%	100%	0	0	1	0	Working	Non
Saluki	1	4	100%	0%	1	0	0	0	Hound	Animal
Schnauzer	5	4.6	40%	20%	2	2	1	2	Working	Non
Sharpei	1	3	0%	100%	0	0	1	0	No Sport	Non
Shilutzu	1	2	100%	100%	1	0	0	1	Toy	Non
Springer Spaniel	1	3	100%	100%	1	0	0	0	Sporting	Animal
Terrier	4	7.25	25%	100%	2	2	0	2	Terrier	Animal
Yorkshire Terrier	2	9	0%	0%	1	1	0	2	Toy	Non
Undetermined	2	6.5	50%	100%	1	0	1	1	--	--
<b>Total</b>	<b>144</b>	<b>4.32</b>			<b>47</b>	<b>45</b>	<b>52</b>	<b>52</b>		

# Results: Hepatitis E Results

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- Of 144 samples drawn, 143 were returned from the laboratory
  - 57 (40%) were negative
  - 34 (24%) were unable to be determined due to hemolysis
  - 52 (36%) were positive
- **HF:** 60% negative; 27% undetermined; 13% positive
- **PFP:** 18% negative; 18% undetermined; 64% positive
- **TVC:** 38% negative; 26% undetermined; 36% positive



# Results: Hepatitis E Results

- Overall rate for Smith County is 48%
- Significant Difference Between the Facilities ( $p=0.000$ )
  - HF: 18%; PFP: 78%; TVC: 49%
- When mixed breed was controlled for, location was found to be significant:
  - PFP 21 times & TVC 5.2 times more likely to be positive than HF
- The majority were male (58%)
- Breeds with the highest number of positive were:
  - 25% of all Labs were positive; 58% of Chihuahuas; 60% of Beagles
- Those reported/determined to be mixed breed were marginally less likely to be positive ( $p=0.073$ )



# Results: Human-Canine Connection

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- Those who had higher knowledge were more likely to have positive animals ( $p=0.028$ ).
- When mixed breed and knowledge were controlled for, familiarity with zoonotic diseases was the predictor of positivity ( $p=0.044$ , 67%).



# Results: Human-Canine Connection

P values from statistical analyses of canine contact or characteristics

‡

Question	Human Knowledge	Human Familiarity - Zoonoses	Human Import. Vaccines	Human Concern Contracting	Canine Age	Canine HEV Pos
Gender	0.173	0.453	0.763	0.890	0.583	0.241
Is given <u>chewtoys</u>	0.305	0.566	0.876	0.390	0.104	0.703
Owner has other canine	0.093*	0.353	0.753	0.247	0.010**	0.134
Contact w/other canines	0.153	0.285	0.480	0.931	0.067*	0.448
Contact w/domestic	0.409	0.254	0.421	0.081*	0.154	0.264
Contact w/wild animal	0.145	0.009**	0.350	0.000**	0.010**	1.000
Contact w/animal	0.836	0.312	0.421	0.081*	0.154	0.458
Is a working dog?	0.195	0.055*	0.864	0.479	0.229	0.285
Taken for walks?	0.020**	0.244	0.121	0.411	0.868	0.476
Allowed to lick?	0.363	0.006**	0.281	0.580	0.526	0.169
Professionally groomed	0.260	0.061*	0.771	0.619	0.665	0.716
Groomed at all	0.731	0.929	0.593	0.251	0.175	0.545

\*\*p value is significant ( $p < 0.05$ )

\*p value is marginally significant ( $0.10 > p > 0.05$ )



# Seroprevalence Results

Sought to answer 4 questions:

- Is evidence of HEV infection found in canines in Smith County? – *Yes, 48% were positive*
- Is there any demographic parameter that makes canines more likely to be positive? – *Not really*
- What do human owners know about zoonotic diseases? – *They're not very familiar with them*
- Is there a link between owner's cognitions/ environment and HEV positivity? – *Yes, facility*



# Further Studies

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- Is HEV genotypes 3/4 what we're seeing in Smith County?
- What is the origin of HEV in this area?
- How is it being spread?
- How far has it spread?
- Is it related to human behavior and cognition?
- Does it pose a real risk?
- How can we prevent it?



# Our Future Plans

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- Currently seeking grants to confirm
  - The original IgG findings with WanTar laboratories.
  - Will be looking for IgM in samples from original study.
- What does HEV do to canines? Are there any symptoms?
- Human-Canine Matched Pair Study
- Human Non-Specific Hepatitis Studies

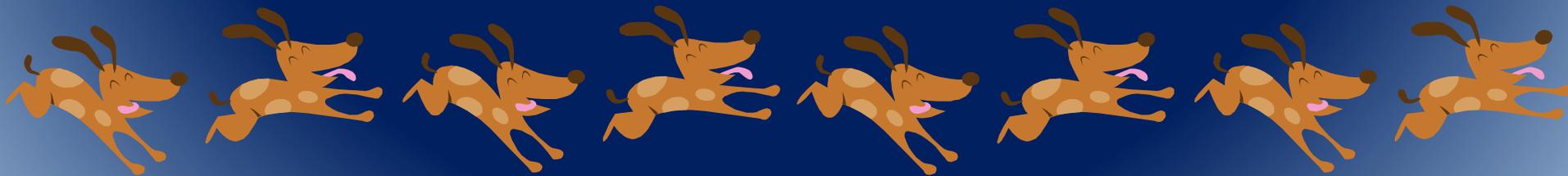


# Conclusion

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Hepatitis E came on the scene within the last 50 years. It has been steadily moving into our own backyards, and in order to prevent it we have to know more about it.

This study, the first of its kind in the US and the first in the world to look closely at the owners, found 48% of canines tested to be positive.



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Tempe