Jiminy Cricket! Exploring the Opinions of the Veterinary Profession Regarding Entomophagy and the Management of Insect Livestock

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Introduction

- It is estimated that we will have to **double** the global food supply to feed the world's estimated population of >9 billion by 2050. Climate change threatens to further reduce food production efforts.
- **Entomophagy**, the consumption of insects, is being discussed as a viable option for feeding ever-growing human and animal populations.
  - Insects are a nutritious and abundant alternative food source, that can be produced with a high efficiency and food conversion rate.
- The **Health Belief Model (HBM)** is a public health behavior model used to better understand why individuals might participate in preventive behaviors against an undesirable outcome.
  - The major constructs of the HBM: **perceived threat, perceived benefit, perceived barriers, cues to action** (stimuli needed to trigger the decision-making process), and **self-efficacy** (the belief that one can successfully complete the behavior of interest, despite considered barriers).

Objective

The **objective** of this study was to collect the opinions of the LSU veterinary community regarding insect production and entomophagy using the Health Belief Model.

Hypotheses

- We hypothesize that the majority (>50%) of respondents will have a positive view of entomophagy and rearing of insects in regard to perceived benefit and self-efficacy, a neutral or positive view in regard to perceived threat and perceived barriers, and a neutral or negative view of in regard to cues to action.
- We hypothesize that veterinary students and veterinarians with <5 years of practice would be more likely to practice entomophagy and insect medicine than veterinarians with >5 years of practice.

Methods

Literature Review and Preliminary Survey Construction: A preliminary survey was constructed based on findings from a literature review on studies involving consumer opinion of entomophagy and the benefits of insect production, as well as on the use of HBM in research.

Participant Inclusion Criteria: Participants were members of the LSU veterinary community either enrolled as a veterinary student or hired as a veterinary house officer or faculty veterinarian.

Interviews and Survey: Pilot interviews were conducted to refine the final survey. Interviews lasted 20-30 minutes and involved 25 members of the LSU veterinary community. The edited survey was emailed to the LSU veterinary community to request participation. 113 responses were recorded for preliminary data.

Survey Analysis: Using data from interviews and survey responses, Kruskal Wallis ANOVAs determined if there were differences in each independent variable (gender, age, years in practice, and diet) by the outcome variables (survey questions). When a difference was found, Mann Whitney U tests were used to further characterize the difference. SPSS 24.0 was used to analyze the data. A $p<0.05$ was used to determine statistical significance.

Results

Figure 1. Participant Demographics

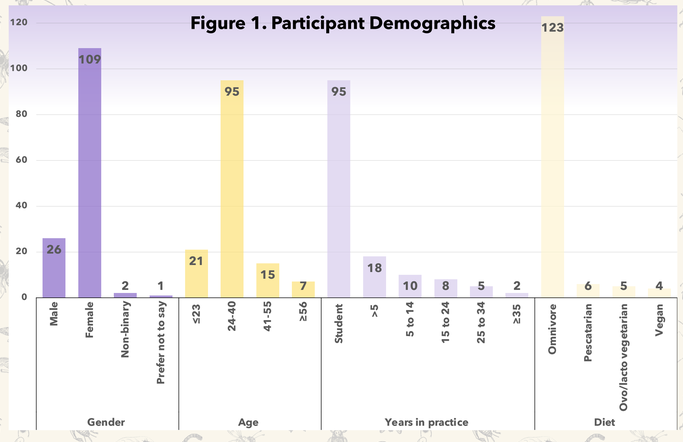

Table 3. Survey Questions Where ≥70% of Respondents Were in Agreement

Questions Where ≥70% of Respondents Answered "Agree" or "Strongly Agree"	Total (%)
I believe there is a global food crisis or an issue with global food security today.[a]	124 (90%)
I am concerned with the potential of a global food crisis in the future.[a]	127 (92%)
It is one of the roles of the veterinary profession to participate in combatting any potential food crisis.[a]	126 (91.3%)
Insects could be a valuable additional food source for humans.[b]	118 (85.5%)
Insects should be used to develop feed for omnivorous and carnivorous animals.[b]	113 (81.9%)
If I was starving, I would eat edible insects to survive.[b]	122 (88.4%)
The US general population would not want to eat insects.[c]	121 (87.7%)
Questions Where ≥70% of Respondents Answered "Disagree" or "Strongly Disagree"	**Total (%)**
I do not see any benefit in feeding insects to the human population.[b]	124 (90.0%)
I am worried that insect production would compete for resources with current food animal production.[c]	101 (73.2%)
Questions Where ≥70% of Respondents Answered "Yes" or "Somewhat"	**Total (%)**
Before this survey, were you aware of a potential global food crisis?[d]	134 (97.1%)
Would you say that you are aware of the economic and environmental impacts attributed to food animal production?[d]	127 (92%)
Questions Where ≥70% of Respondents Answered "No"	**Total (%)**
Have you ever taken a course or attended a lecture on insect medicine?[d]	105 (76%)
Have you ever practiced (or assisted with) veterinary medicine on insects?[d]	129 (93.8%)
Would you say you are aware of the laws in place regarding insect production?[d]	131 (94.9%)

[a] Question from perceived threat section of the survey. [b] Question from perceived benefit section of the survey. [c] Question from perceived barriers section of the survey. [d] Question from cues to action section of the survey.

Table 1. Significant Differences in Survey Question Responses by Gender

Question	Gender (N=135)	Response (%)						P value
Generally, I am scared of insects.		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	I don't know	p=0.001
	Male (n=26)	0 (0.0%)	1 (3.8%)	2 (7.7%)	12 (46.2%)	11 (42.3%)	0 (0.0%)	
	Female (n=109)	16 (14.7%)	24 (22.0%)	16 (14.7%)	34 (31.2%)	19 (17.4%)	0 (0.0%)	
The thought of eating insects makes me uncomfortable.		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	I don't know	p=0.001
	Male (n=26)	1 (3.8%)	7 (26.9%)	4 (15.4%)	8 (30.8%)	6 (23.1%)	0 (0.0%)	
	Female (n=109)	27 (24.8%)	41 (37.6%)	14 (12.8%)	20 (18.3%)	6 (5.5%)	1 (0.9%)	
If I was starving, I would eat edible insects to survive.		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	I don't know	p=0.043
	Male (n=26)	20 (76.9%)	6 (23.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
	Female (n=109)	63 (57.8%)	32 (29.4%)	5 (4.6%)	4 (3.7%)	2 (1.8%)	3 (2.8%)	
Would you eat a whole insect (that was properly prepared)?		Yes		No		Maybe	I don't know	p=0.006
	Male (n=26)	16 (61.5%		1 (3.8%)		7 (26.9%)	0 (0.0%)	
	Female (n=109)	36 (33.0%)		19 (17.4%)		39 (35.8%)	2 (1.8%)	

Figure 2. Responses to "Self-efficacy Question 1": "Would you ever be willing to eat an insect?"

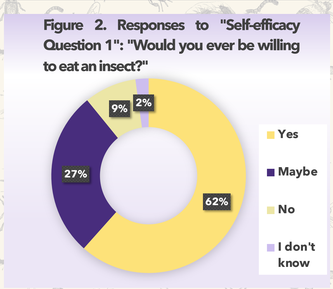

Figure 3. Responses to "Self-efficacy Question 5": "Would you ever be willing to practice insect medicine?"

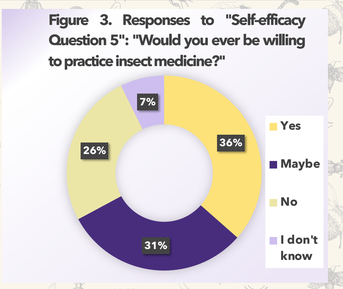

Table 2. Significant Differences in Responses to Cues to Action Question 1 Based on Years in Practice

"I know more about insects than the US general population"

Years in Practice (N=138)	Total Responses (%)				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Students (n=95)*a	3 (3.2%)	25 (26.3%)	23 (24.2%)	31 (32.6%)	13 (13.7%)
>5 years in practice (n=18)*ab	3 (16.7%)	8 (44.4%)	5 (27.8%)	2 (11.1%)	0 (0.0%)
5-14 years in practice (n=10)*	1 (10.0%)	3 (30.0%)	2 (20.0%)	2 (20.0%)	2 (20.0%)
15-24 years in practice (n=8)*bc	0 (0.0%)	1 (12.5%)	4 (50.0%)	3 (37.5%)	0 (0.0%)
25-34 years in practice (n=5)*	0 (0.0%)	4 (80.0%)	0 (0.0%)	0 (0.0%)	1 (20.0%)
≥35 years in practice (n=2)*c	0 (0.0%)	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

*A significant difference was found overall in responses to this question between groups differing by years in practice. (Kruskal-Wallis p=0.014)
a A significant difference in responses was found between students and practitioners with <5 years of practice. (Mann-Whitney p=0.001)
b A significant difference in responses was found between practitioners with <5 years of practice and practitioners with 15-24 years of practice.(Mann-Whitney p=0.02).
c A significant difference in responses was found between practitioners with 15-24 years of practice and practitioners with ≥35 years of practice. (Mann-Whitney p=0.053)

Conclusions

Based on this subset of the LSU veterinary community, it appears that the practice of entomophagy and further investigation into insect production medicine would be well-received by the veterinary profession. This sample of veterinary professionals seemed to appreciate a need for alternative food sources and agreed that the potential for a global food crisis is severe (perceived threat). The majority of participants expressed a positive view of these ideas in regard to perceived benefit and self-efficacy, by agreeing that incorporating insects into food and feed markets would have value going forward. This survey also showed that female veterinary professionals in this subset had more perceived barriers to insect consumption than males, and that students and younger veterinary professionals have more confidence in their previous knowledge (cues to action) of insects than professionals who have been working for longer.

Acknowledgements

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