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Horse meat in the Mexican marketplace (#390)

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Introduction

Mexico does not have a reported tradition of horse meat consumption. It is therefore surprising that significant numbers of horses, sourced both nationally and from abroad, are slaughtered in Mexico. Indeed, in 2016 Mexico produced 78,864 tonnes of horse meat placing it the third largest producer in the world (FAO, 2017). Production is not regulated and it is likely that some of these slaughter animals are from working or sporting activities where injuries are often treated with drugs that render the meat unsuitable for human consumption (European Commission, 2014). In fact, the volume destined for human consumption is unknown, but the horse meat remaining in the local market is significant at 76,227 tonnes. Little attention was accorded Mexican media reports in 2015 of horse meat fraudulently sold in the domestic market following the EU suspension of imports. And mislabelling of horse meat in Mexico is not new as almost 20 years earlier, Flores-Minguia et al (2000) found 11 of 40 sausage and hamburger samples contained undeclared horse meat. Given reports of fraudulent labelling practices and ensuing scandals, one must question the final destination of the large volumes of horse meat produced in Mexico and the periodic excess of imports in this unregulated market. The aims of this Mexican study were therefore to determine the presence of fraudulent horse meat sales in a sample set of fresh and processed meat.

Methods

Meat sampling: Raw samples of beef steak or ground beef were purchased from supermarkets, city and street markets, butcher shops and street vendors. Cooked meat samples from steak tacos, golden tacos, gorditas and burritos were obtained from city and street markets, street vendors and two types of restaurants. A total of 157 establishments were sampled randomly across six cities.

Species determination by DNA analyses of meat samples
Target gene selection and oligonucleotide primers: Oligonucleotide primers to identify horse meat based on the mitochondrial cyt*b* gene sequences available in the Genbank database were designed using the Primer3 Output designing tool of Lasergene software. The nucleotide sequence was submitted to the basic local alignment search tool BLAST to identify regions of local similarity among homologue sequences of different species and calculate the statistical significance of the matches. Selected primers (PFw1-Eqca and PRv-Eqca; Table 1) were synthesized by Probiotek Inc. (Monterrey, Mexico). *Sample preparation, DNA extraction and amplification:* DNA extraction and amplification were based on the methods of Hernández-Chávez et al (2011) and Espinoza Alvarado et al (2017).
Electrophoresis: Amplified PCR fragments (5 µl) were analysed in a 2.0% agarose gel containing Gel Red 1x (Biotium, Hayward, California, USA) in TAE buffer (40 mM Tris–acetate, 1 mM EDTA) for 60 min at 50 V.

Results

Overall, 10% of the samples sold as beef tested positive for horse meat (Table 2). Proportions of samples containing horse meat were similar among cities and ranged from 7.1 to 12.5%, except in San Vincente de Chicolopan where horse meat was not detected in any of the 40 samples tested. The proportion of positive tests in samples from raw and cooked meat was also similar at 9.5% and 11.0%, respectively. Burritos were the meat type in which horse meat was most prevalent at 28.6%. The incidence of detection in the other meat and meat products varied from 4.9 to 12.9%. None of the samples from supermarkets tested positive for horse meat, whereas the greatest incidence was in the restaurant-type establishments (18.2%).

Conclusion

Fraudulent sale of horse meat is illegal in Mexico and market regulation is imperative to reducing public health risks associated with residues. According to a survey of 800 Mexicans (Parametria, 2015), 96% were in favor of strict labeling controls for meat products. Three quarters of those surveyed also claimed that they would never eat horse meat. Given this resistance, what impact would regulation have on the market? Would it help to alleviate illicit activity or have other consequences, such as those of the US ban which resulted in a surge in horse meat in the Mexican market. One vendor in this study claimed sales of labelled horse meat had increased 30% over the past year, and attributed this to media-based dissemination of information. Could campaigns accompanying regulation reduce market impact. There is nothing inherently wrong or dangerous with knowingly consuming horse meat in a regulated market. Indeed, horse meat is a comparable source of animal protein to that of bovine, porcine and avian origin, and is highly nutritious. When significant populations of consumers live below the poverty line and lack food security, is banning or regulation in isolation the answer?

References

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Table 1. The DNA sequences selected for oligonucleotide design

Primer	Target gene	Sequence (5'→ 3')	Amplicon (bp)	T_m (°C)
PFw1-Eqca	*Cytb*	CTACATCGGTACTACCCTCGTC	22	63.5
PRv-Eqca	*Cytb*	AATGTACGACTACCAGGGCTG	21	61.5

Table 2. Samples sold as beef in which horse meat was detected by DNA analyses.

	Yes (n)	No (n)	Total (n)	Yes (%)	No (%)
Overall	43	390	433	10	90
Mexico City	12	84	96	13	88
Aguascalientes	8	66	74	11	89
Zacatecas	4	52	56	7	93
Pachuca	4	30	34	12	88
Chihuahua	15	118	133	11	89
San Vincente Chicolopan	0	40	40	0	100
Steak (raw)	10	136	146	7	93
Ground meat (raw)	18	132	150	12	88
Tacos (cooked)	8	54	62	13	87
Gorditas (cooked)	3	58	61	5	95
Burritos (cooked)	4	10	14	29	71
Supermarkets (raw)	0	70	70	0	100
Butcher shops (raw)	17	129	146	12	88
City markets (raw and cooked)	11	95	106	10	90
Street vendors (raw and cooked)	9	89	78	12	89
Loncherias or economic kitchens (cooked)	6	27	33	18	82