Local adaptation of *Triatoma infestans* response to thermal variability: implications of climate change over Chagas diseases incidence

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INTRODUCTION

- Vector-borne diseases (VBDs) are susceptible to climate change due to vectors are ectothermic insects.
- Chagas diseases is a VBD and it is one of 17 Tropical Neglected diseases of the world (WHO, 2017).
- *Triatoma infestans* is the most important vector of Chagas disease in the Southern cone.
- Most of studies evaluate climate change's effects over vectors assuming that vector populations do not show geographic variation

Goal: to evaluate temperature effects on the thermal tolerance of two populations of *Triatoma infestans*, the main vector of Chagas disease in the Southern cone.

MATERIALS & METHODS

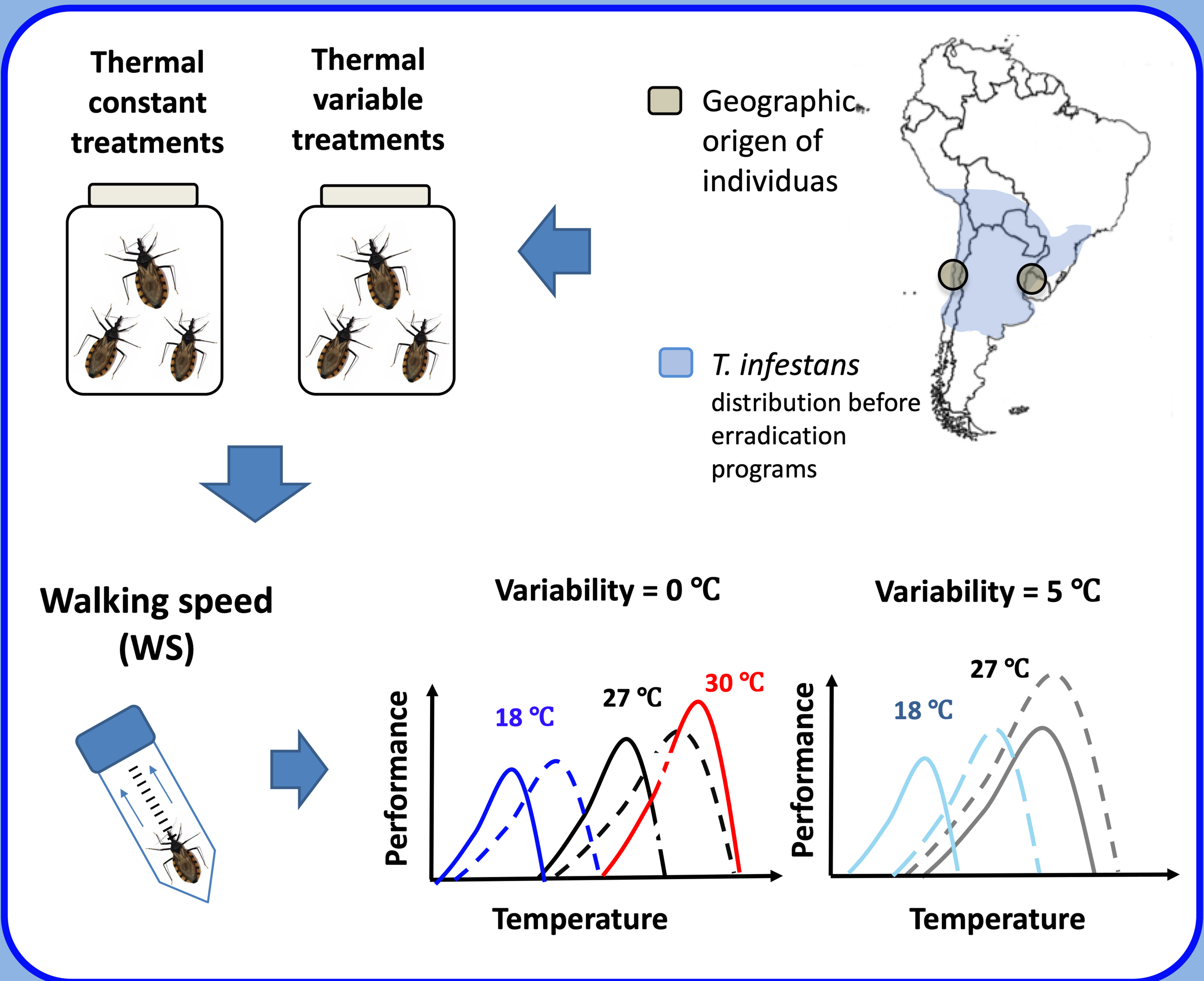

Fig. 1. Methods summary.

- We used fifth instar individuals from two laboratory colonies with different geographical origin.
- Both colonies are maintained at 27 °C for several generations
- All individuals were acclimated to five thermal treatments 18±0, 18±5, 27±0 , 27±5 and 30±0 °C during 5 weeks.
- The performance curve were estimated measuring the walking speed **(WS)** of individuals exposed during one hour at eight temperatures from 8 to 43 °C
- We fit GAM models for WS including body mass (**mb**), thermal treatment (**T**), country of origin (**C**) allowing to change TPCs with thermal treatment (T) and country (C)
- Model selection was done using AIC criteria.

RESULTS

- The best model for **WS** included thermal treatment (**T**), **mb**, and **country of origin (C)** (Table 1)
- TPCs varied with thermal treatment and geographic origin (Table 1, Fig. 2- 4

Thermal performance curves of *T. infestans* changed with acclimation and geographic origin.

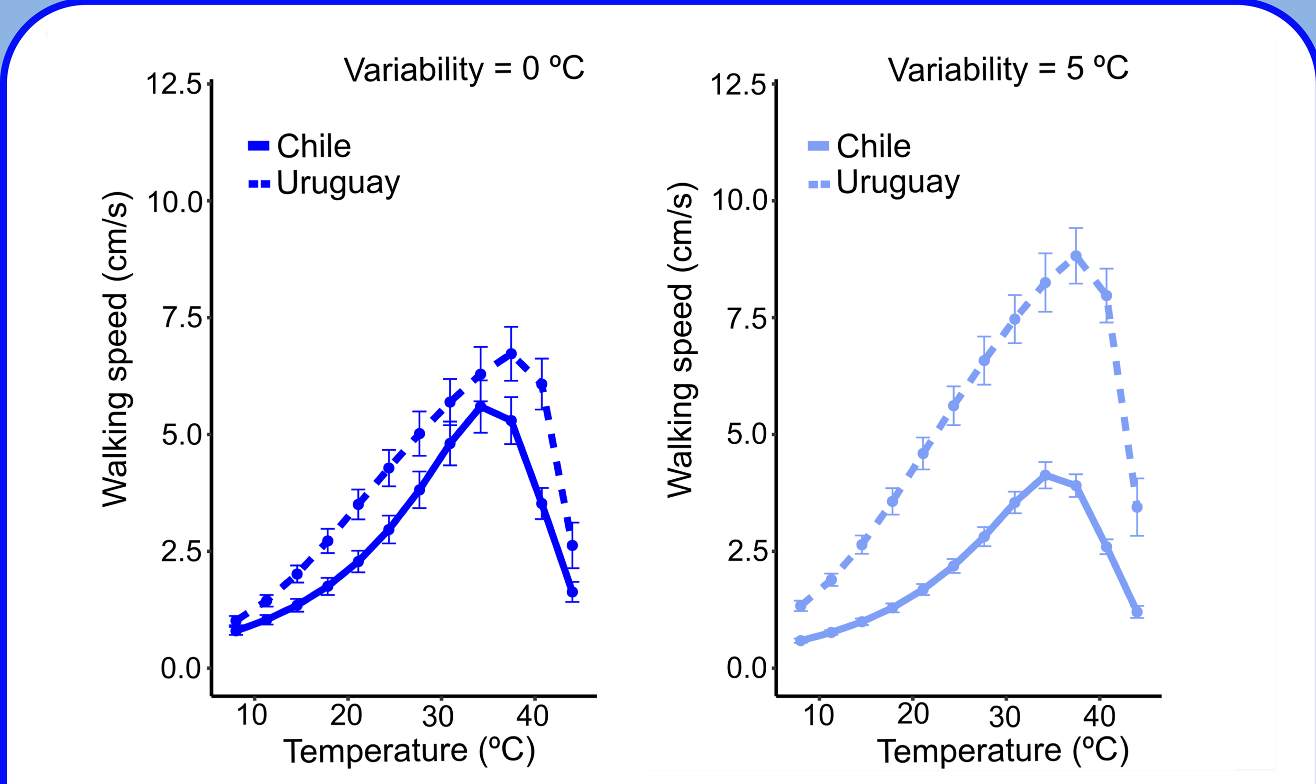

Fig. 2. Performance curves for individuals from Chile and Uruguay acclimated at 18±0 ºC and 18±5 ºC. Data are shown in mean ±SE.

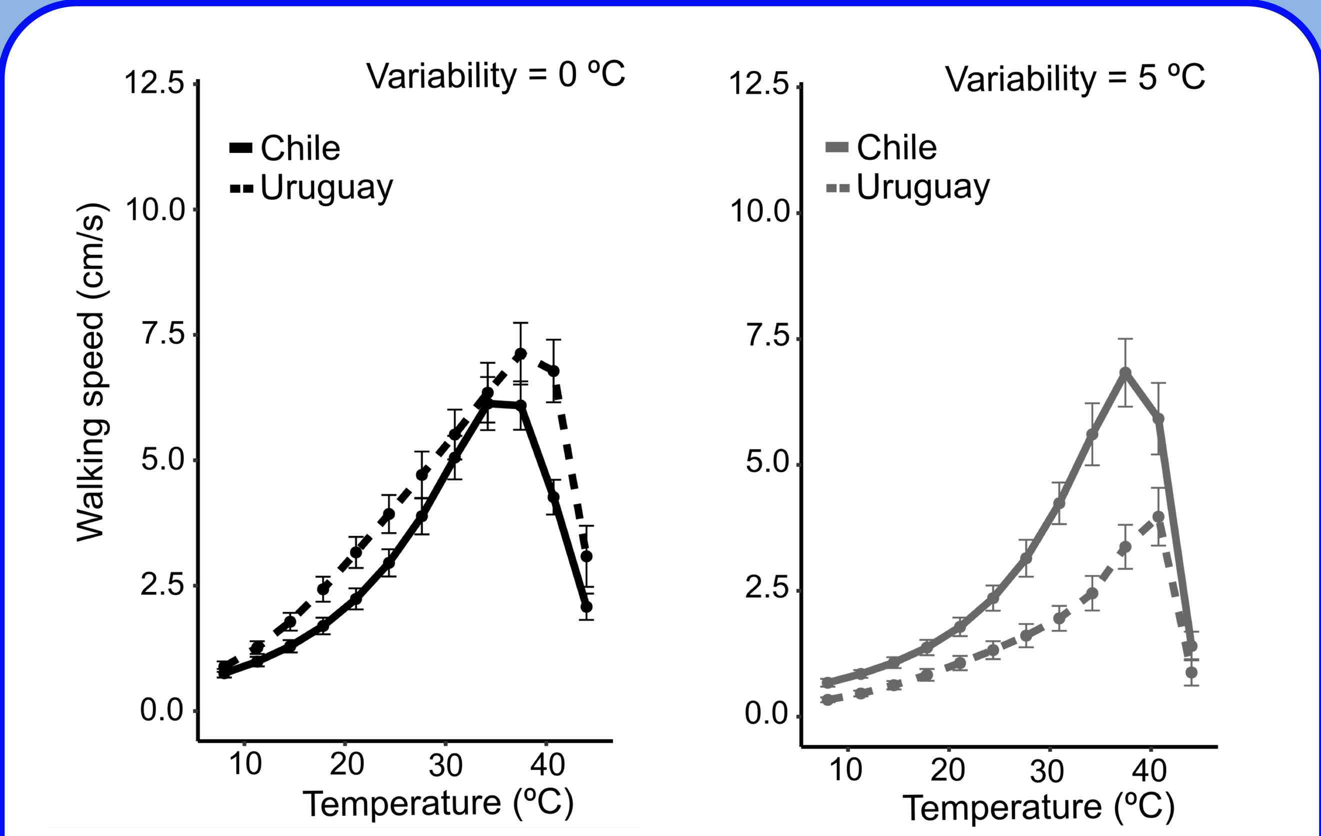

Fig. 3. Performance curves for individuals from Chile and Uruguay acclimated to 27±0 ºC and 27±5 ºC. Data are shown in mean ±SE.

Individuals from Uruguay performed better at lower temperatures than individuals from Chile. At 27 ºC with variability individuals from Chile performed better than individuals from Uruguay

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Models for WS	AICc	GVC	r^2_{adj}	Deviance
s(Tmp, by=T) +s(Tmp, by=C) + s(ID) + mb + T + C + T x mb + C x T	**7167.04**	**0.422**	**0.422**	**53.2**
s(Tmp, by=T) + s(ID) + mb + T + C + T x mb + C x T	7200.33	0.430	0.411	52.8
s(Tmp) + s(Tmp, by=C) + s(ID) + mb + T + T x mb+ C + C x T	7208.51	0.432	0.418	51.6
s(Tmp, by=T) + s(Tmp, by=C) + s(ID) + mb + T + C + C x T	7214.87	0.433	0.405	51.7
s(Tmp, by=T) + s(Tmp, by=C) + s(ID) + mb + T + C	7327.19	0.460	0.34	48.5
s(Tmp, by=T) + s(Tmp, by=C) + s(ID) + T + mb	7325.01	0.460	0.337	48.4
s(Tmp, by=T) + s(Tmp, by=C) + s(ID) + T + C	7325.01	0.460	0.337	48.4
s(Tmp, by=T) + s(Tmp, by=C) + s(ID) + T	7430.37	0.487	0.325	45.3
s(Tmp, by=T) + s(Tmp, by=C) + s(ID)	7518.00	0.510	0.269	42.3
s(Tmp, by=T) + s(ID) + C + T	7362.87	0.470	0.335	47.9
s(Tmp, by=T) + s(ID) + C	7358.26	0.468	0.324	47.7

Table 1. Model selection for **WS** using GAM models

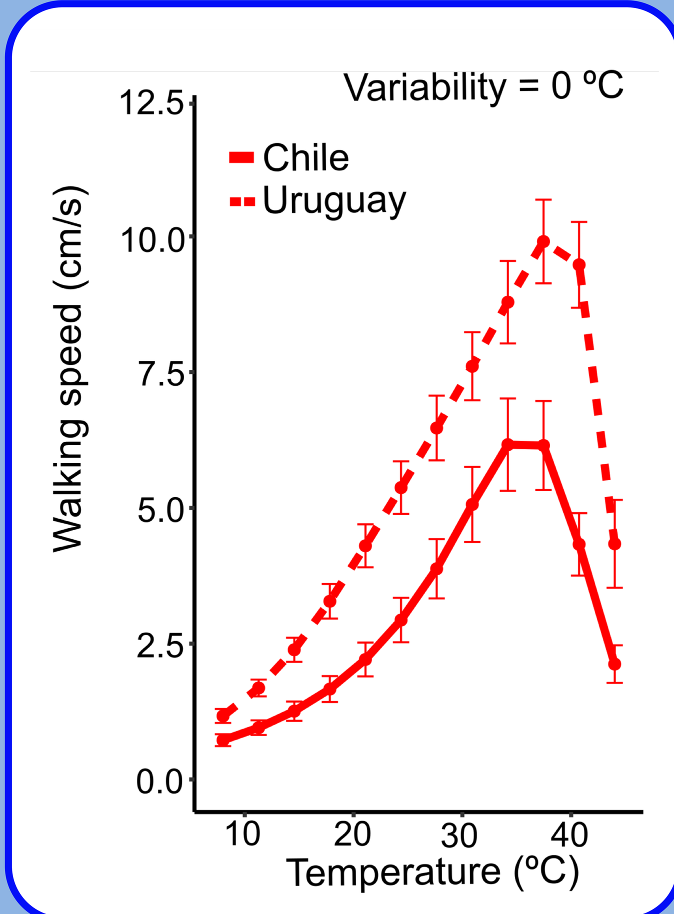

Fig. 5. Performance curves for individuals from Chile and Uruguay acclimated to 30±0 ºC.
Data are shown in mean and s.e.m.

Both colonies of *T. infestans* are maintained at the same conditions. Thus, the diferential response to thermal variability is due to local adaptation

CONCLUSIONS

- *T. infenstans* showed acclimation capacity and this capacity was different between Uruguay and Chile populations
- TPCs varied with thermal variabiltiy and geographic origin
- This work evidenced that studies using one single population to predict vector tolerance changes with climate change are flawed.
- Higher temperature variability during winter could favored vector survival and disease incidence, especially in Uruguay

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