Prevalence of *Oxalobacter formigenes* intestinal colonization in human populations

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STUDY OVERVIEW

The importance of *Oxalobacter formigenes* (*Of*), an oxalate-degrading gut microbe, in preventing calcium oxalate kidney stones has gained attention in recent years. However, the process by which individuals are colonized remains poorly understood. As the incidence of stone formation is increasing in the U.S. and worldwide, the factors influencing colonization are of great clinical interest. To provide additional insight into this process, we tested three unique populations to examine the relationship between geographical region, age, and in one subgroup, the effect of chronic parasitic infection and treatment, on *Of* status. The populations examined included: (i) adult and child members of the Tanzanian Hadza tribe, one of the last hunter-gatherer populations in the world; (ii) Quechua children, indigenous Amerindians of Bolivia, examined before and after treatment if diagnosed with Chagas carriage (CC); and (iii) a cohort of urban U.S. mothers and their infants, tested at 12 and 18 months of age.

Hypotheses: 1) The prevalence and rate of *O. formigenes* colonization differs significantly between populations in the US and indigenous populations of Bolivia and Tanzania. 2) The earliest age of colonization differs between US and indigenous populations. 3)Treatment with Benznidazole, an antiparasitic, will not alter *Of* status in children with Chagas carriage.

METHODS

Population	Study Design	n	Location
Hadza	Cross-sectional examination of subjects ages 0-81y	251	7 villages in Tanzania
Quechua	Children ages 5-14y, examined 2 months apart, before and after treatment with Benznidazol if diagnosed with CC	85	rural Bolivia
US	Mothers ages 28-42y examined post delivery	30	New York City
	Infants examined at 12 months and 18 months	40	

O. formigenes colonization was determined using an Of-specific PCR assay (for *oxc*) on DNA extracted from stool samples.

RESULTS

Table 1: Prevalence of *Of* by geographic location in pediatric populations

	Hadza	Quechua	US infants
Age range (years)	0-18	5-14	1-1.5
Number of samples	92	85	40
Percent colonization	64	55	0
Earliest age of colonization (years)	0.9	5	N/A

Table 2: Prevalence of *Of* by geographic location in adult populations

	Hadza	US mothers
Age range (years)	19-81	28-42
Number of samples	159	30
Percent colonization (%)	49	33

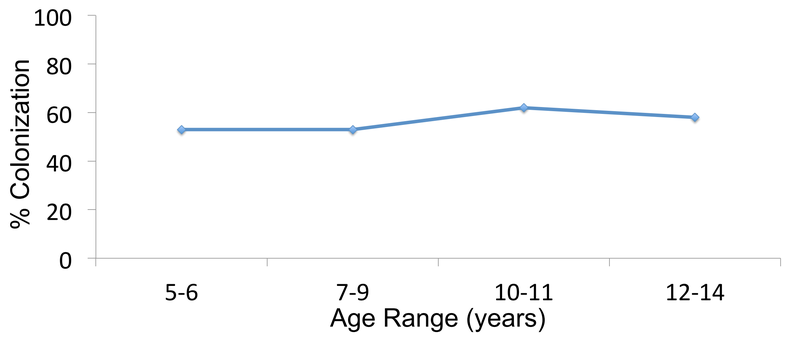

Figure 1: *Of* colonization by age in Quechua children. *Of* colonization was stable around 60% in 5-14y Quechua children.

Figure 2: *Of* colonization by age in Hadza population. Prevalence of *Of* colonization was 50% in children 0-3y, and increased to 79% in children 4-6y. *Of* was present in only 32% of the 19-29y group. Colonization stabilized around 60% above 30 y.o.

RESULTS

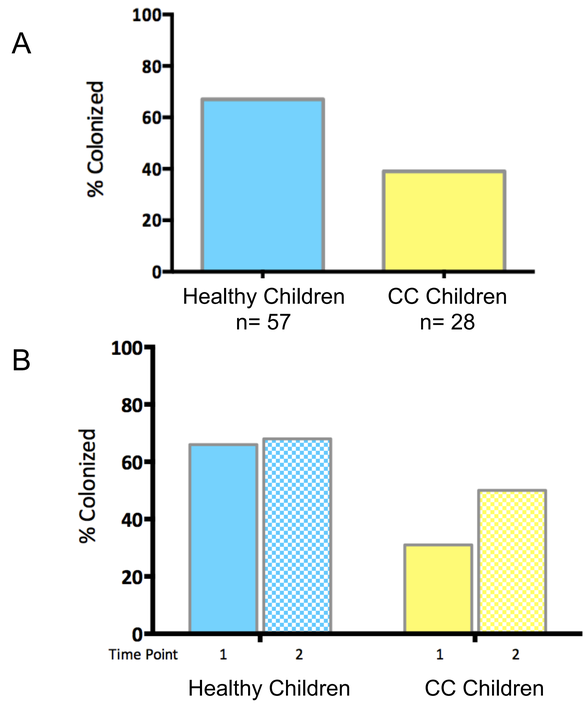

Figure 3: *Of* colonization in healthy Quechua children and those diagnosed with Chagas carriage. A) Healthy children had higher colonization rates than CC children (67% vs. 39%, p=0.02). B) Samples were collected from children at time points 2 months apart, before and after treatment for CC children (ns).

CONCLUSIONS

- *Of* is more prevalent in Hadza adults than US adults. Quechua children and teens have similar rates of colonization to Hadza children and teens.
- *Of* could not be detected in any US infants at 18months but 3 of 7 Hadza infants were colonized by 18 months.
- Comparing the US findings with those in remote populations support the hypothesis that modern practices are decreasing human colonization by ancient microbiota populations.
- Future directions include using qPCR to quantitate the levels of *Of* in each population, determining the levels of oxalate in Hazda diets and determining if levels correlate with *Of* status, and using multivariate analysis to identify other factors that potentially affect *Of* status.

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