MEASURING MICROBIOME CHANGES OF SALIVA AND CUD DURING RUMINATION EVENTS IN MASAI GIRAFFE (*GIRAFFA CAMELOPARADALIS TIPPELSKIRCHI*)

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Abstract

Giraffe in captivity are at risk for nutrition related life-threatening diseases such as wasting syndrome, peracute mortality, and ruminal acidosis (Ball *et al.*, 2002; Clauss *et al.*, 2002; Potter & Clauss, 2005). As obligate browsers, they may have different fiber requirements for rumen microbial health than domestic ruminant heterospecifics, such as dairy cows or sheep (Clauss *et al.*, 2002; Hatt *et al.*, 2005). Understanding effects of diet and environment on giraffe welfare in real time requires rumen samples to be collected from live giraffe with minimal stress to the individual. Accepted standard methods for characterizing rumen microbiome in live domestic ruminants are invasive, stressful, have potential negative animal welfare implications, and are considered inappropriate for endangered ruminants such as giraffe. Previous work in sheep (Kittelmann *et al.*, 2015) and dairy cattle (Tapio *et al.*, 2016) have identified buccal swabs and rumen bolus (cud) samples as quick and non-invasive proxy samples of the rumen microbiome.

This pilot study is aimed at determining if dietary changes of rapidly fermentable carbohydrates and fiber amount and source has the ability to alter the rumen pH and microbial abundance and diversity of Masai giraffe (*Giraffa camelopardalis tippelskirchi*) as measured by two non-invasive proxies (saliva and cud). Two adult (1.1) and one juvenile (0.1) Masai giraffe housed at the Toronto Zoo were trained for voluntary saliva and opportunistic cud collection. Four diets consisting of two different commercial pellets (TZ Herbivore Cube and Mazuri® Moose Maintenance) at two different inclusion rates are paired with two fresh browse amounts: ~10 kg as fed per individual per day and ~20 kg as fed per individual per day (see Table 1). Each giraffe will be on each of the four diets for a period of 28-days. Saliva and cud samples will be collected during or immediately after a rumination event once per week, four times per period. Diet intake will be measured daily over 7 consecutive days per period. A third party lab (Diversigen®, Minneapolis, MN) will use 16S ribosomal RNA gene of bacteria for sequencing microbial population diversity and abundance. This pilot study will provide insight into how diet impacts microbial communities of giraffe saliva and cud and whether this method of proxy sampling merits further investigation as a tool to assess rumen health and assist with prevention or early indication of disease state such as ruminal acidosis, wasting, and peracute mortality syndrome in a managed setting for giraffe.

Literature Cited

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Table 1. Four diet treatments with varying fiber origin, fiber amount and fermentable carbohydrate amounts.

	% Diet As Fed			
Diet	**Fresh Browse**	**TZ Herbivore Cube[1]**	**Mazuri® Moose Maintenance**	**Mid-bloom Alfalfa Hay[2]**
A	10	25	0	65
B	20	15	0	65
C	20	0	15	65
D	10	0	25	65

[1]Toronto Zoo 16% ADF Herbivore Cube

[2]Alfalfa hay will be compensating for any calorie deficit from the concentrate and browse portions. Therefore 65% is approximate and will vary based on individual needs to maintain animal body weight.