

Leveraging passive sampling and unique equine population exposures to assess negative post-natal health outcomes

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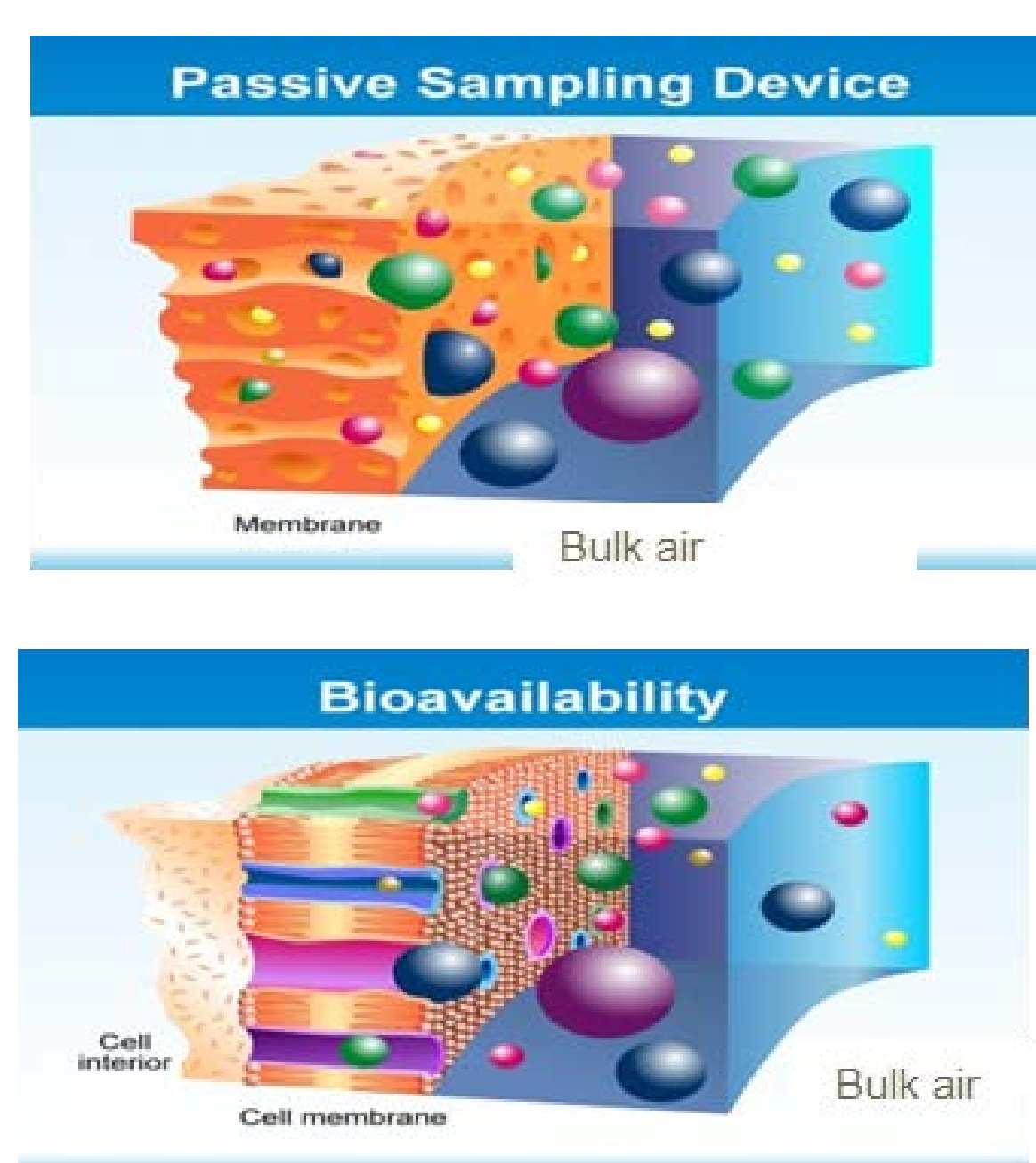
Introduction:

In 2012 a high prevalence of neonatal foals born with neurological deficits (altered mentation and dysphagia) was observed at a farm located in Pennsylvania (PA) near a number of unconventional natural gas drilling (UNGD) sites. The farm proprietor also owned another horse farm in New York (NY) that was not situated near UNGD sites. Newborn foals and mares on the NY farm did not exhibit similar health issues. Over the last 5 years the frequency of dysphagia in foals at the PA facility has increased from 25 to 92%. From 2014 to 2016 passive sampling devices (PSDs) were deployed on brood mares at both farms continually, and PSDs were changed out every six weeks. PSDs were also deployed in the ambient air and in well water at each farm.

Results:

Over the course of the study 19 foals that were at the PA farm during gestation/birth exhibited dysphagia while only 2 foals from the NY farm exhibited this deficit. Well water PSDs showed increased (2-20X greater concentration) levels of PAHs in PA. PSDs deployed in ambient air showed pyrogenic signatures of PAH ratios at both sites. However, the pyrogenic signature at the PA farm is associated with fossil fuel combustion, while the pyrogenic signature at the NY farm is more consistent with biomass combustion. Individual mare PSDs were recovered at rates of 95% and 92% from horses on the NY and PA farm respectively, showing that this adaptation of PSDs is robust enough to withstand the equine environment. Chemical analysis for PAHs on mare-deployed PSDs resulted in quantitative identification of 60 individual PAHs. Continued analysis of biological samples from each mare-foal pair and analysis of PSDs could reveal environmental stressors associated with this negative health outcome in a mammal model. These results may further inform human health concerns regarding the proximity of residences to UNGD facilities.

Sampling



- Passive sampling devices deployed in air, water and on brood mares

Pennsylvania



Instances of Dysphagia Increasing Adjacent to natural gas extraction



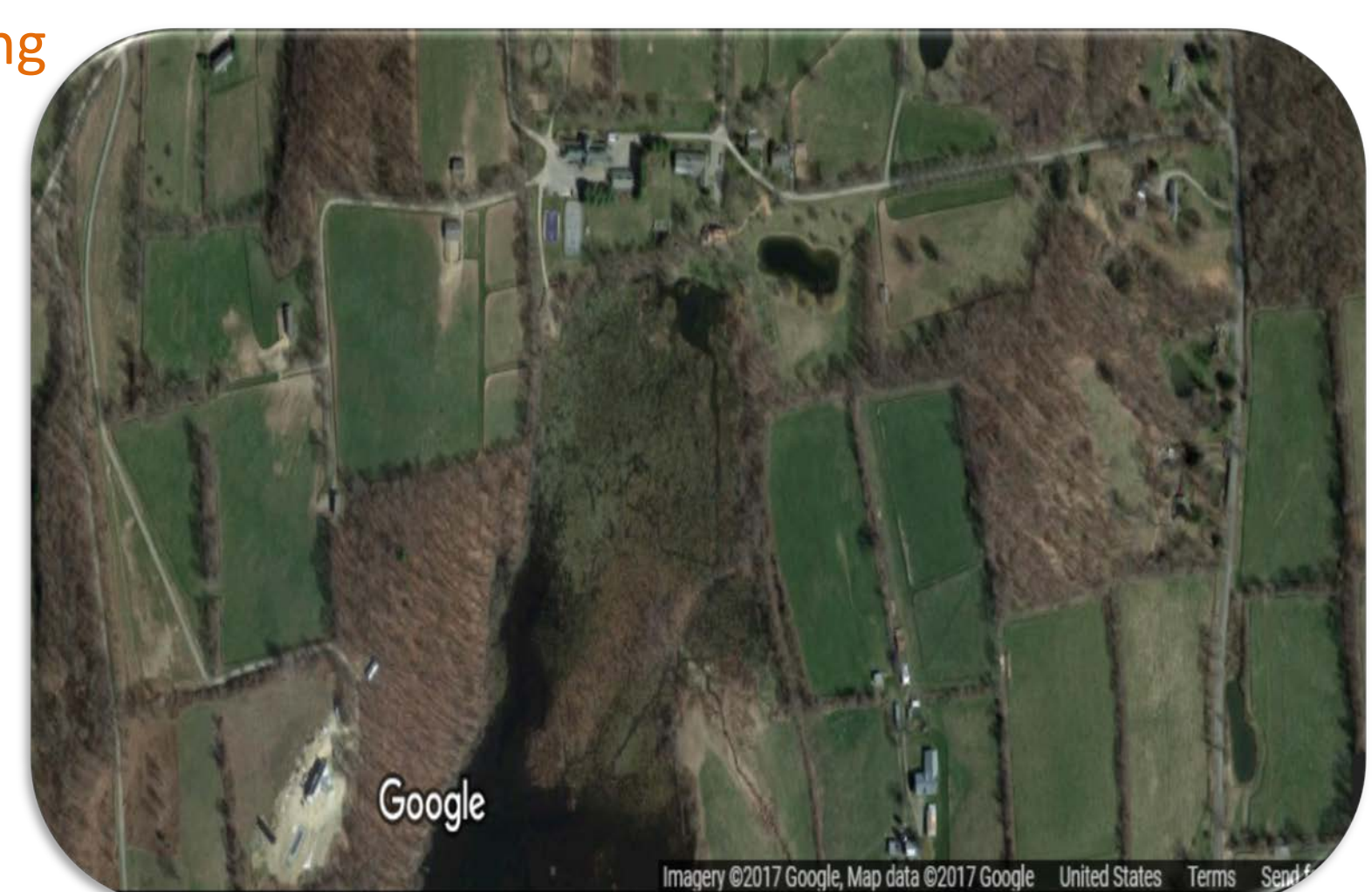
- 18 months continuous sampling

- Sample collection complete
- Sample analysis complete
- Data analysis ongoing

New York



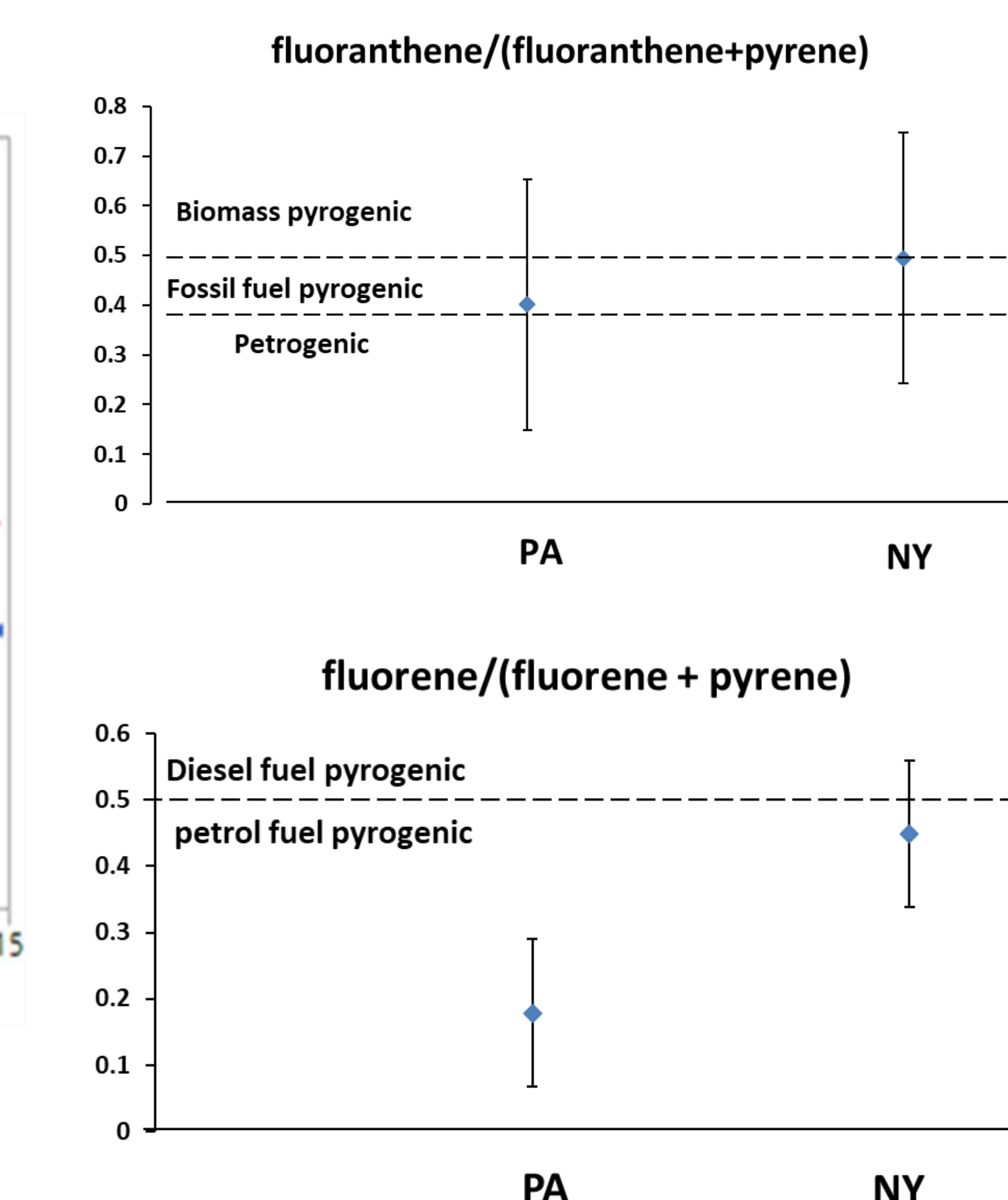
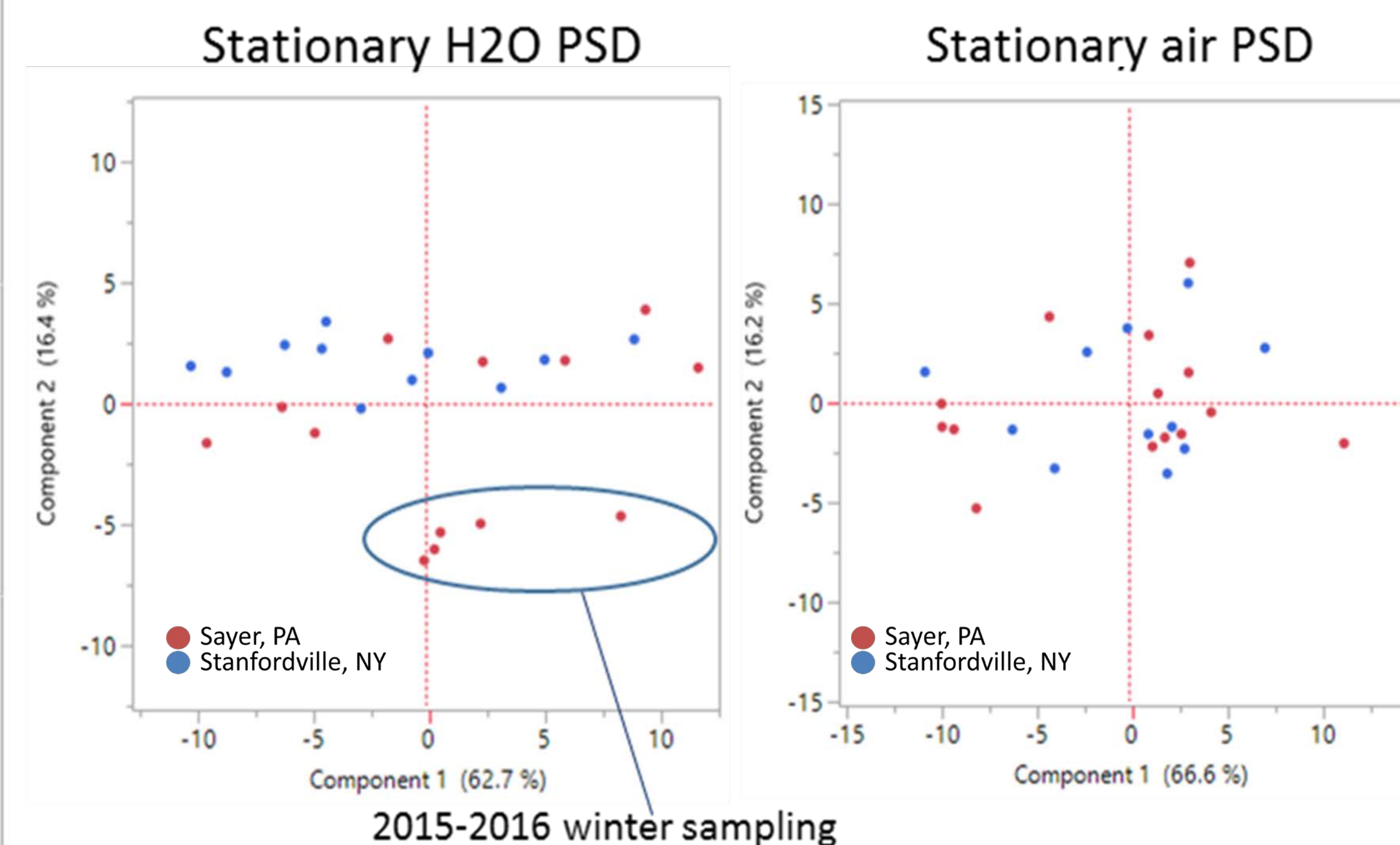
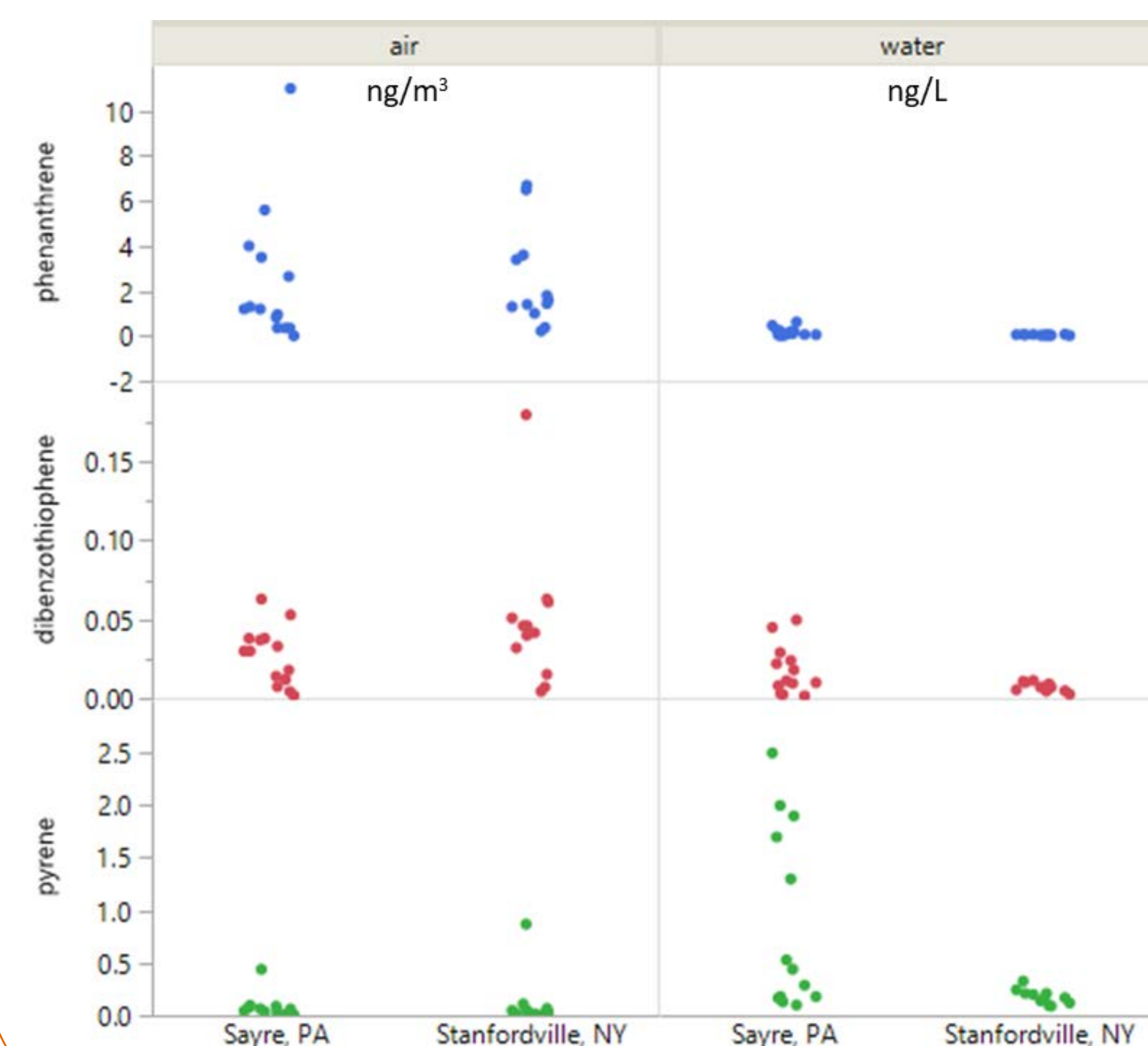
Healthy Foals Not Adjacent to natural gas extraction



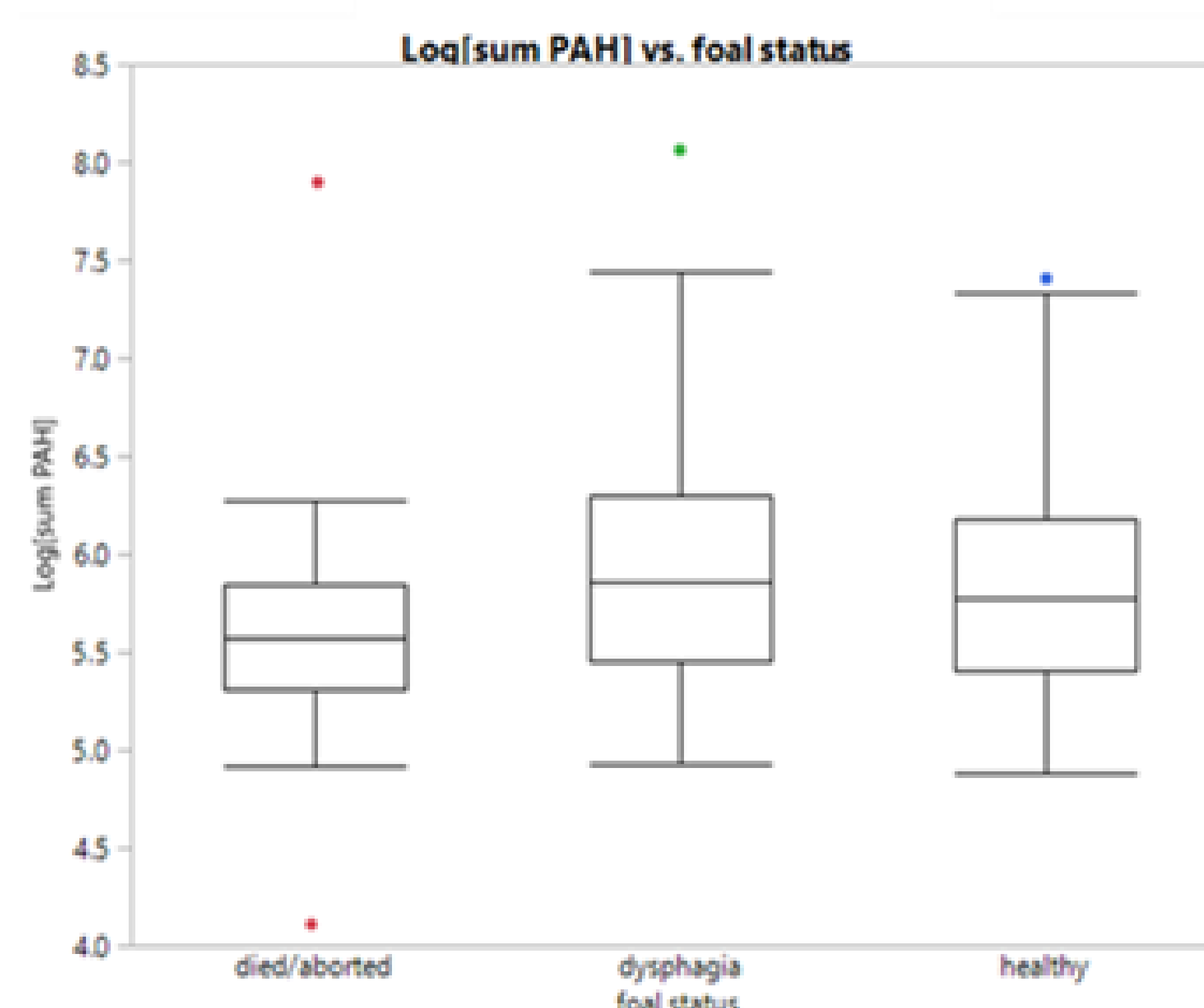
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Environmental samplers



Mare-Foal PSD



Brood Mare samplers

