Hypothesis: California sea lions for which the cause of death is malnutrition will have decreased activities of gluconeogenic enzymes as compared to California sea lions that did not die from malnutrition; additionally, that juvenile sea lions that present with malnutrition will have a higher rate of survival if the electrolytes phosphorus, magnesium, and potassium are individually monitored within the first week in treatment than if they are not monitored.

Proposed Research to Accomplish: (From proposed “Specific Aims”)

Specific Aim 1: This study aims to evaluate the efficiency of gluconeogenesis when a California sea lion undergoes starvation. The project will accomplish this by comparing gluconeogenic enzyme activity in liver samples taken post-mortem in animals that died of malnutrition and those that died of causes other than malnutrition or liver disease.

Specific Aim 2: This study aims to increase survival rate in the first week of refeeding of juvenile Caliofrnia sea lions with malnutrition. This goal intends to be accomplished by monitoring and supplementing serum magnesium, phosphorus, and potassium in the first ten days. Overall survival rate will also be monitored and compared with retrospective data to see if careful refeeding might lead to a decrease in “crashes” and an increase in successful rehabilitation.

Brief Discussion of Results – What Actually Happened:

The gluconeogenic enzyme study is well underway but progress has been slowed due to lower-than-expected sample size. The study has determined that California sea lion phosphoenolpyruvate carboxykinase (PEPCK) and pyruvate carboxylase (PC) are stable over time after death for at least 24 hours. This enables the use of samples taken at various times after death since it is not reasonably possible to regulate time of necropsy. Preliminary results do not suggest a deficit in gluconeogenic capacity in animals that died of malnutrition, although it is impossible to make any significant claims at this point in time. More samples are needed to compare the activity of PEPCK and PC in animals that died of malnutrition to those that died of other causes that presumably do not affect the liver. This study will also hopefully help determine reference ranges for these enzymes, though again, more samples are needed.

The electrolyte study aims changed significantly from that which was proposed, but still yielded clinically significant results. Preliminary data suggested that improving outcome was not possible by simple supplementation, so the study became entirely retrospective, including over two thousand malnourished sea lion pups and yearlings admitted in the past eleven years. I am currently conducting a survival analysis based on blood values and other factors upon admission and how they predict outcome for malnourished animals. High magnesium and phosphorus levels are significant predictors of death during rehabilitation. Low calcium and total protein are also significant predictors of death during rehabilitation. Additionally, all of these values are significant predictors of early death during the first 10 days of rehabilitation. Potassium is not a significant predictor of outcome. The model analyzed so far has included age, sex, year admitted, and state of nutrition on admission.