

## Massive Elephant Maths! Endocrinology

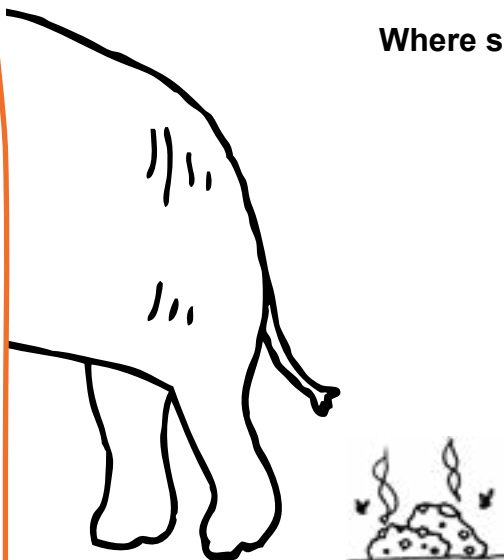
Endocrinology is the study of hormones which are secreted through the **Endocrine glands**.

This study is really important to us at Chester Zoo as we can monitor reproductive hormones in elephant poo to work out whether our elephants are pregnant.

If they aren't pregnant, we can work out where they are in their cycle which is also useful to know! Then we know when is the best time to put our animals together to breed.

In this activity, we'll show you how the process works, and then you'll get the chance to work out whether our elephants are pregnant or not!

**Where shall we begin? At the end! Let's work backwards...**



Our keepers collect the poo samples from our female elephants on a regular basis.

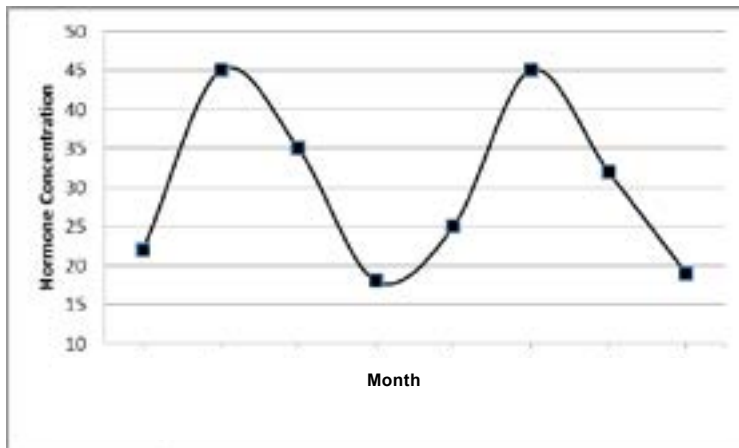
*("How do you know who's poo is who's?", we hear you ask eagerly. We could feed just one elephant some sweetcorn or lentils, then look for who's poo contains them – clever eh?)*

Our Conservation Physiologists mix the sample with alcohol to separate the progesterone hormone secretions from the rest of the poo. This process is called an **immunoassay**.

**That's where the maths begins!**

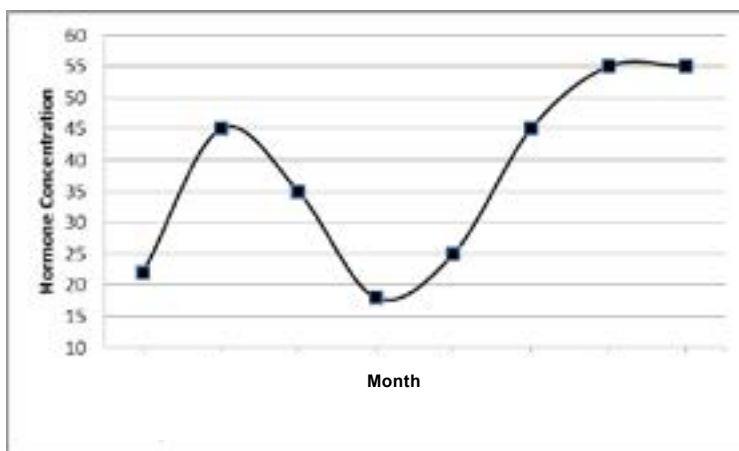
## MASSIVE ELEPHANT MATHS!

### Endocrinology: How does it work?

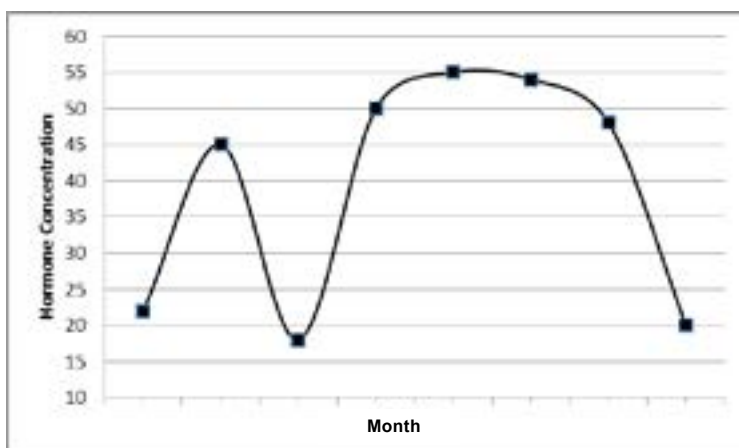


As the female comes into season (**oestrus**), there is a fall in **Progesterone**, which means that we can see that she isn't pregnant at that point.

The Progesterone levels rise again with the cycle, before dipping as the next cycle begins. Knowing her cycling pattern is important as then we can plan when to introduce her to a male in the hope of a mating!



However, *if* the female becomes pregnant, the Progesterone level will remain high throughout the pregnancy – by taking regular samples such as these, we can see when she became pregnant and estimate a due-date. Then our keepers can get ready for a new arrival.



After a *long* 22 month pregnancy, that's when she's due to give birth! The hormone levels will drop just before the birth, and so we know that the birth is imminent! That means the keepers can prepare for a new arrival.

## MASSIVE ELEPHANT MATHS!

### The challenge

So, now you know how the process works and what we're looking for, we've got some data for you to put into a graph! Plot the data below to see which (if either or both) of our two elephants are pregnant.

| Date of sample | Hormone Concentration (ng/ml) |            |
|----------------|-------------------------------|------------|
|                | Elephant 1                    | Elephant 2 |
| 01/08/2014     | 22                            | 18         |
| 01/09/2014     | 45                            | 42         |
| 01/10/2014     | 35                            | 40         |
| 01/11/2014     | 18                            | 12         |
| 01/12/2014     | 25                            | 35         |
| 01/01/2015     | 45                            | 48         |
| 01/02/2015     | 48                            | 62         |
| 01/03/2015     | 19                            | 60         |

Can you predict what the graphs will look like in the future? Estimate the next 6 months for both elephants.

What can we tell by looking at these graphs?

Why do you think it is important for us to know this information in the zoo?