

Does Birth Control Really Work for You?

The Impact of Body Mass Index on Monophasic Pill Efficacy

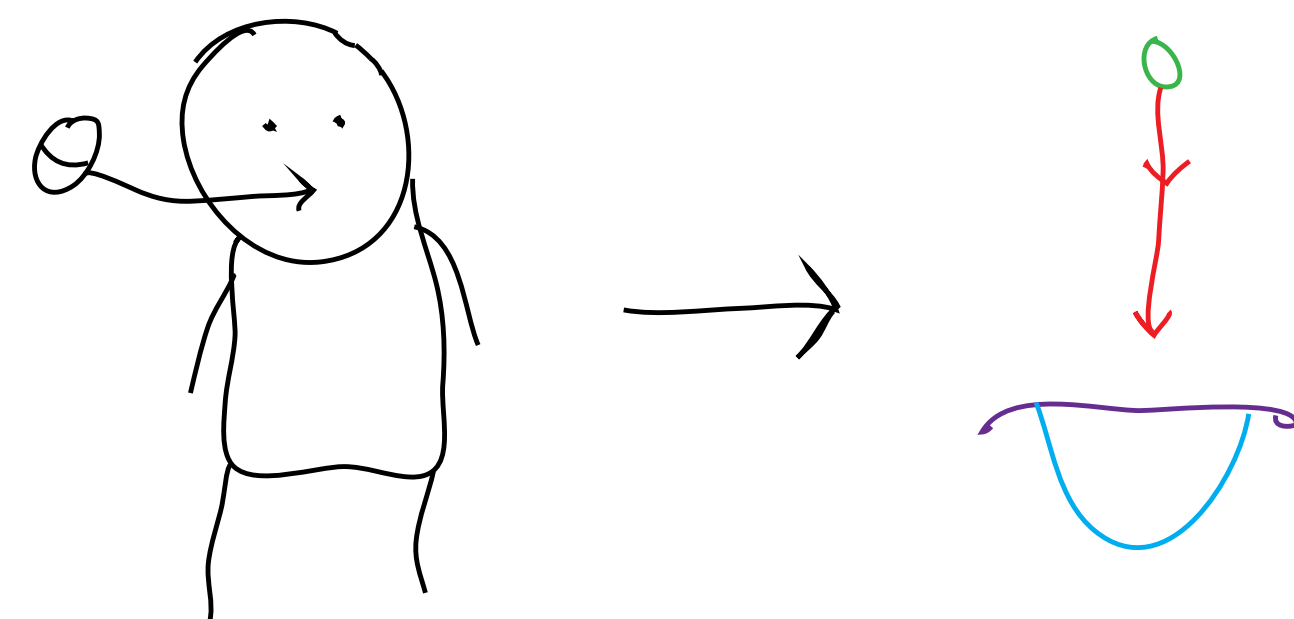
Casey Alvarado, Aditi Joshi, Liani Lye / Modeling and Simulation / Fall 2013

background

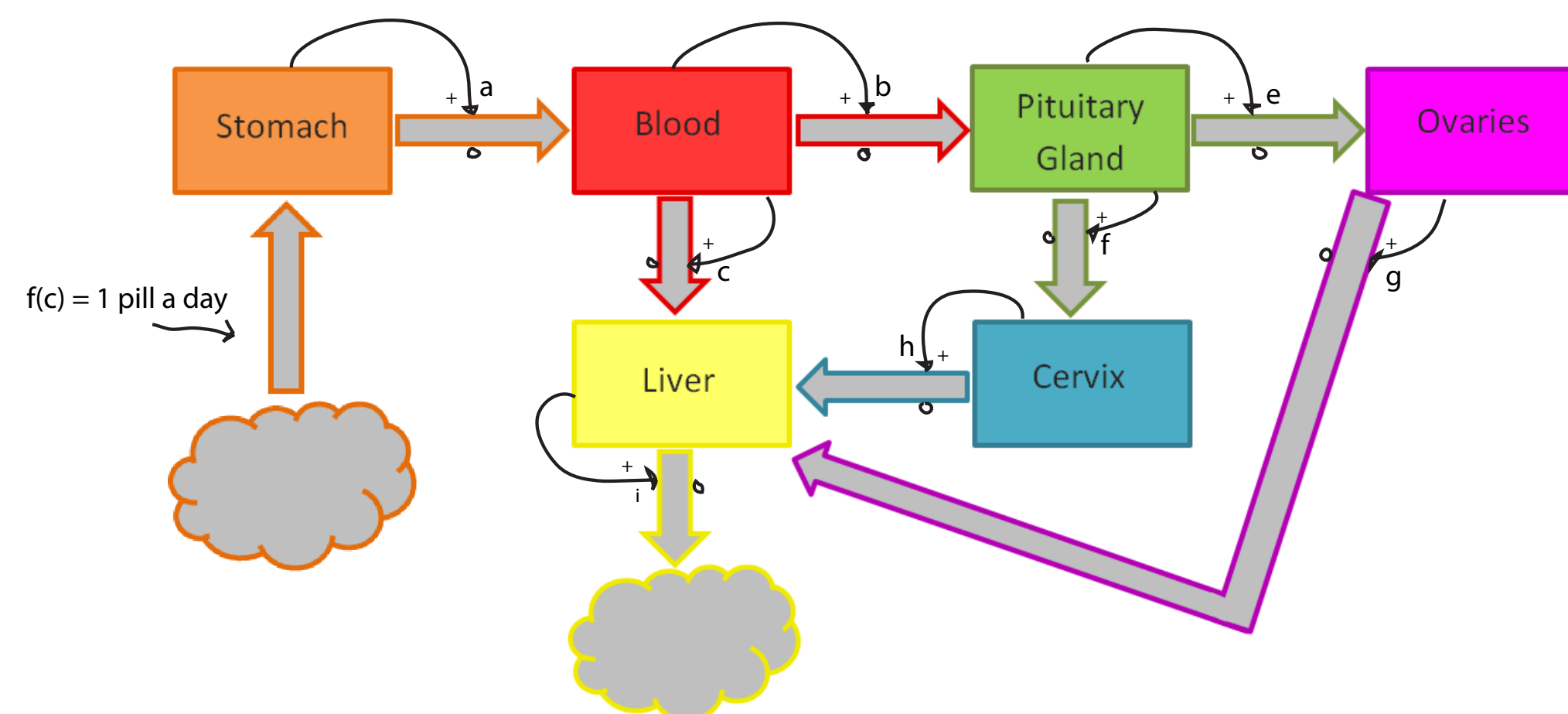
The Pill is one of the most common forms of birth control. The Pill works by introducing synthetic estrogen and progesterone into the body, thus overriding natural regulation to prevent ovulation. **When progesterone levels reach 3ng/mL, ovulation is suppressed.** We are examining the effect of BMI on the time taken to reach 3ng/mL.

understanding the system

After the Pill is consumed, synthetic estrogen and progesterone cycle through the body, eventually reaching the ovaries and cervix and taking into effect to prevent ovulation.

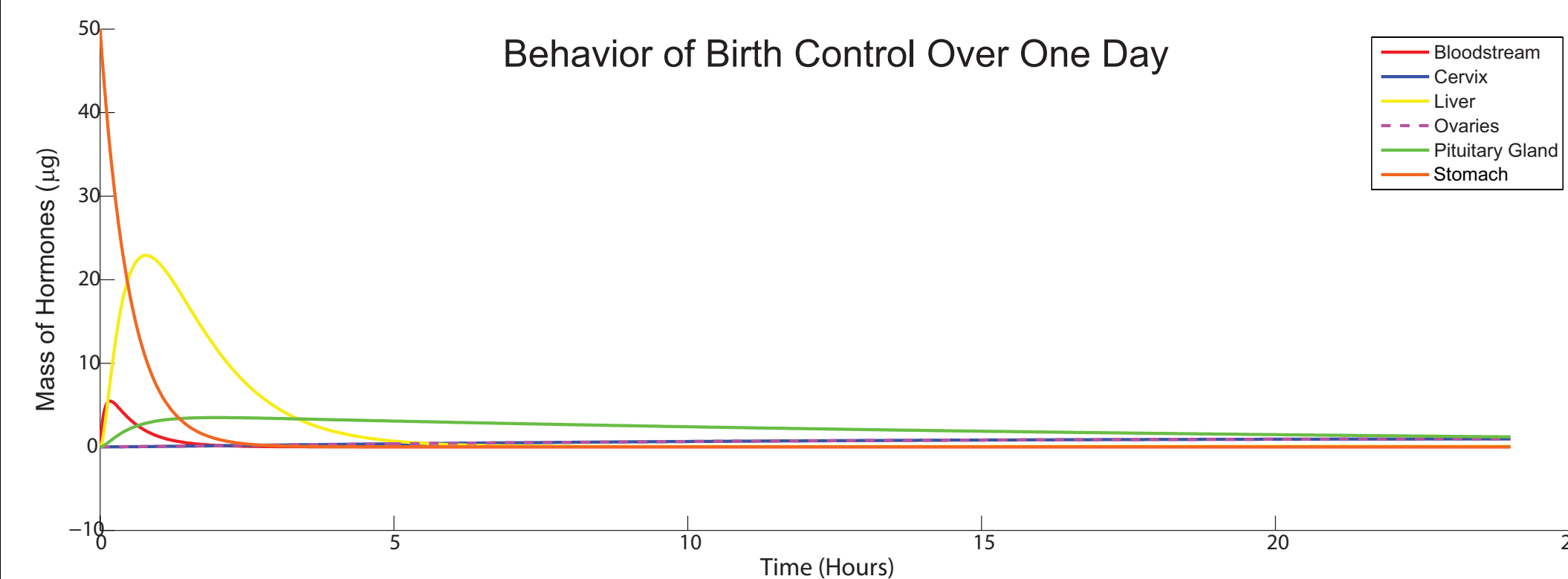


A simple pictorial.

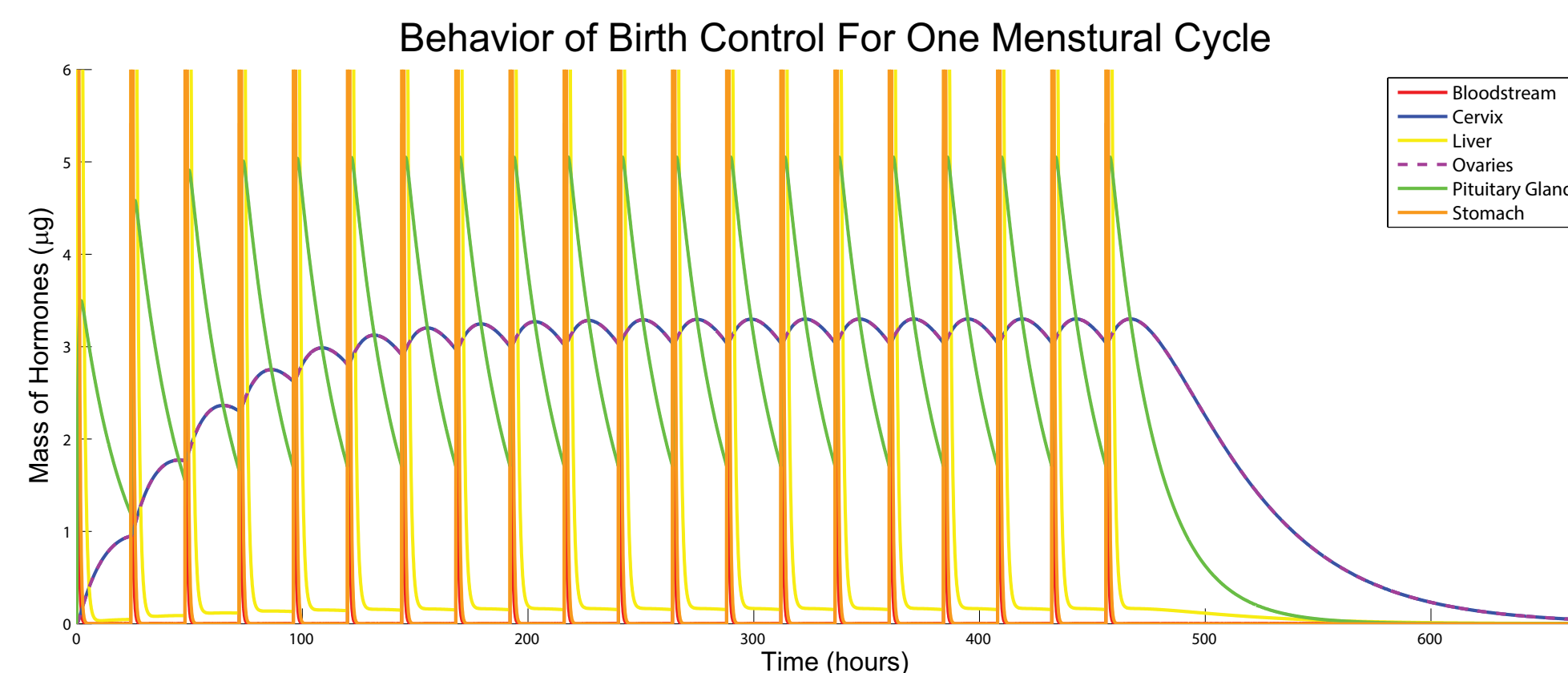


Stock and flow diagram.

visualizing the system

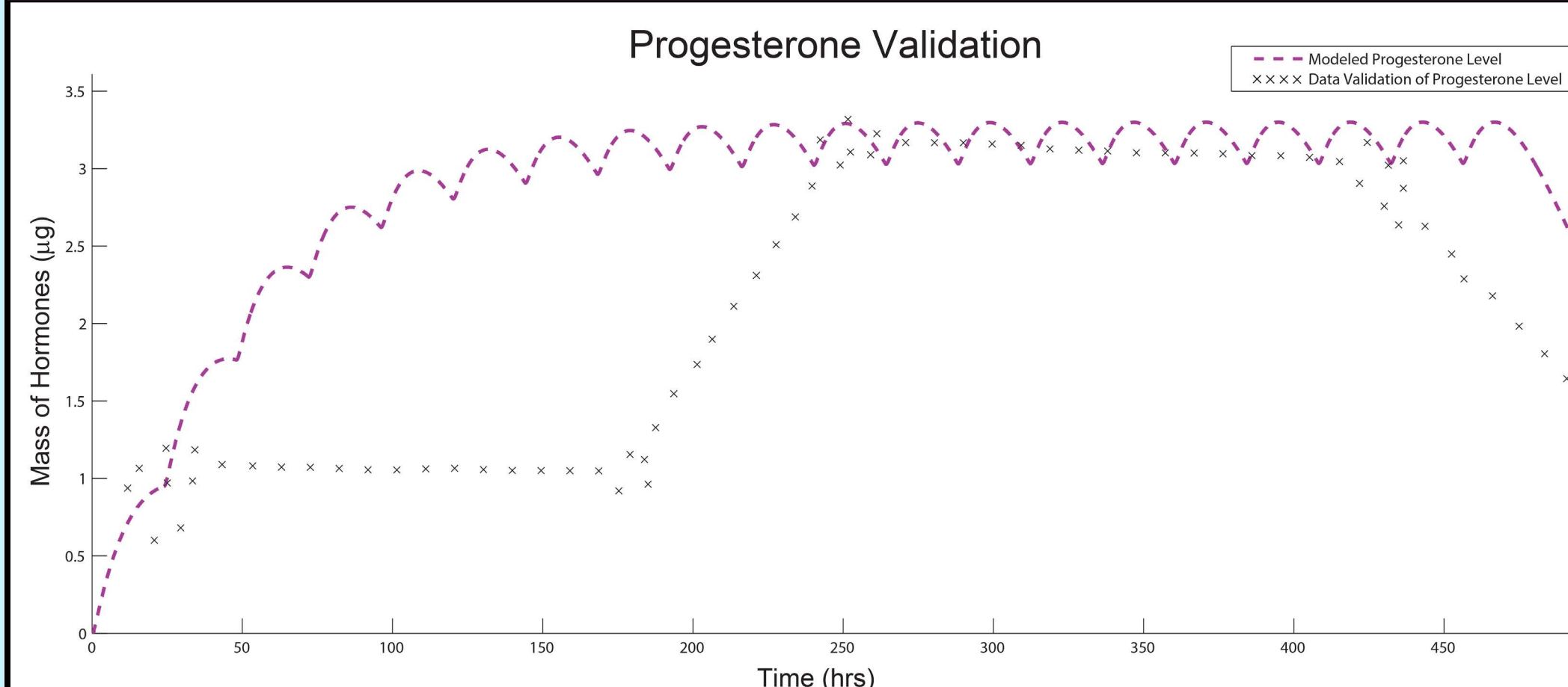


This graph shows the hormone levels in all the body compartments over a one-day period. Hormone levels spike after consumption but soon level out.



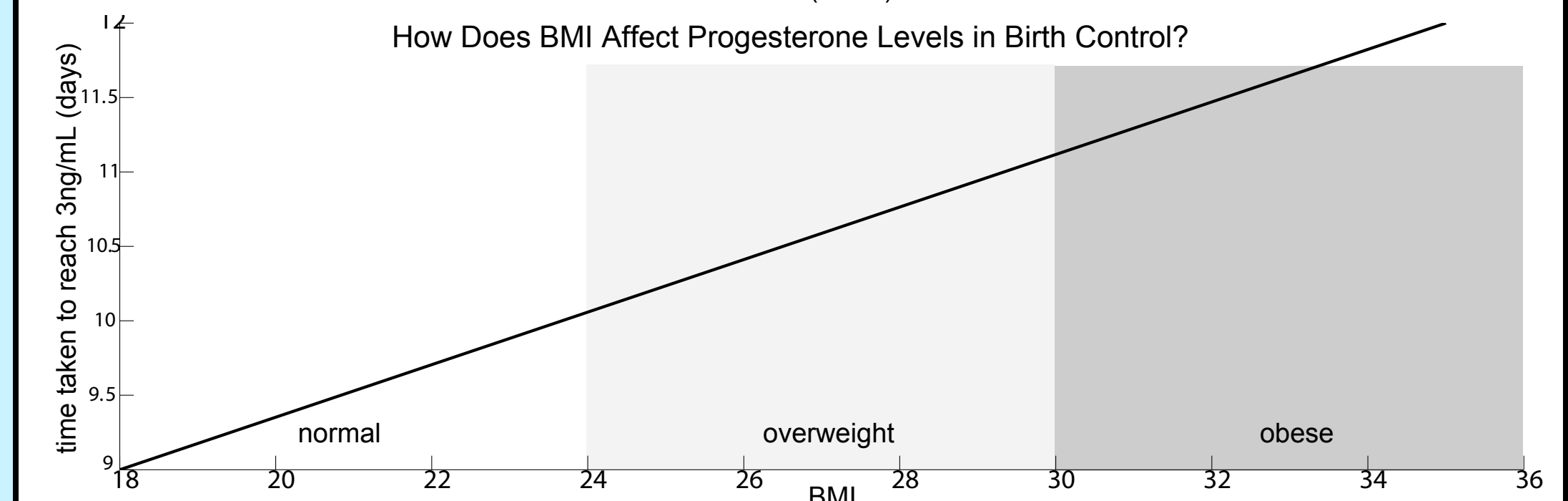
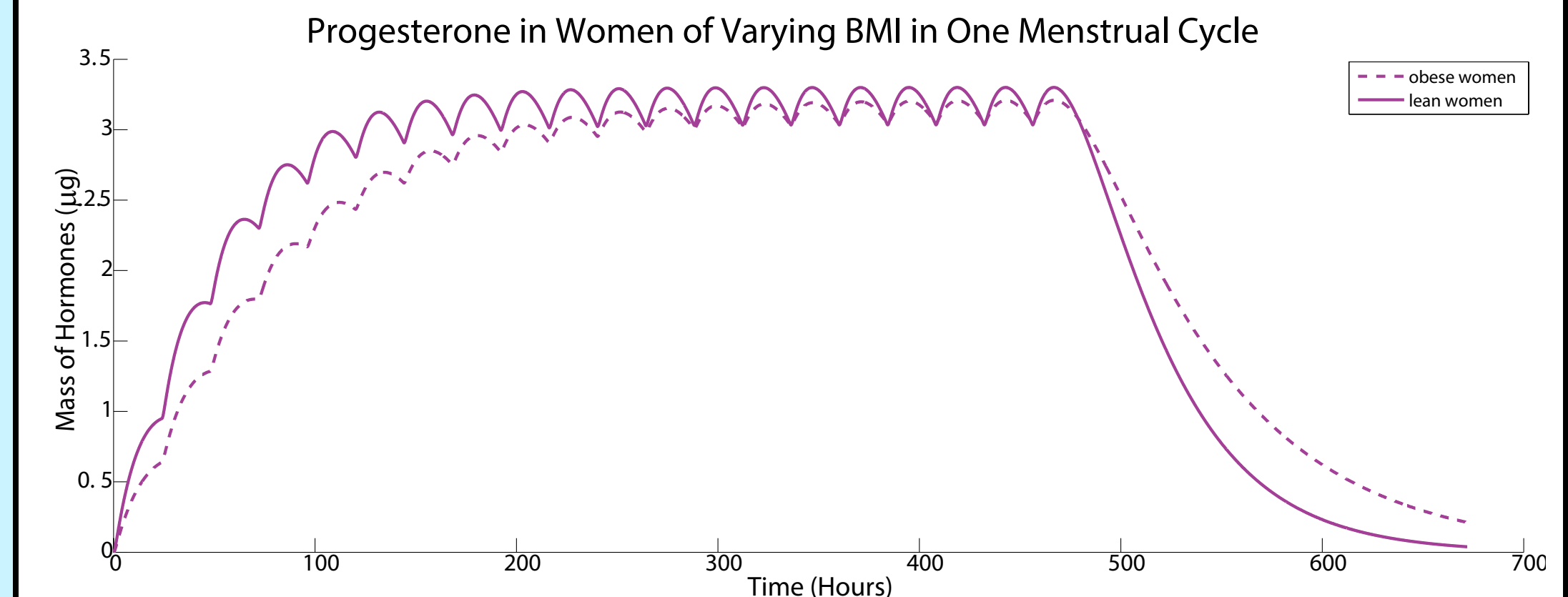
This graph shows us the hormone levels in all body compartments over one menstrual cycle.

validation



This graph shows our model plotted over the data points. This overlay shows us that the overall behavior is consistent with our data, though actual points do not line up due to discrepancies in dosage and start time.

answering the question



These graphs demonstrate that higher BMIs are correlated to longer times to reach the critical progesterone level of 3ng/mL.

limitations

- LH and FSH, other hormones, not modeled
- Metabolic rate not modeled
- Model does not work for more than one month

conclusion

We simulated the effect of BMI on estrogen and progesterone levels by regulating the rates at which hormones reach the liver and leave the ovaries and cervix. **Higher BMI is correlated to a longer time taken to reach the critical progesterone level 3ng/mL.** We speculate that this has to do with fat absorption of hormones; however, this has not been confirmed by the scientific community.