Hormone Signaling Case Studies

Sarah:

Sarah arrives at your office, and you take some initial information from her and measure her vitals. You find her blood pressure is 150/90 and her pulse is 92 beats per minute (bpm). Through your oral history with Sarah, you find out that she is a 50 year old female, who works in an office and is in front of her computer most of the day. She is often quite busy, so her lunches and dinners are often from fast food restaurants, pizza delivery or microwave frozen meals. When she is home, she stays up late and falls asleep with the TV on. She mentions that lately she has been going to the bathroom more often and has been quite thirsty and has been very tired. Sarah had not yet had breakfast before she came to your office, so you order some initial bloodwork and you find that her blood potassium level is 3.8 nmol/L, blood sodium is 142 nmol/L and her fasting blood glucose is 145 mg/dl.

After you review her initial blood work results you ask her to come back for a few more tests. First, you run a small sample of her blood to measure the amount of C-peptide in the blood. C-peptide is a small fragment that is removed from insulin before it becomes active. The amount of C-Peptide in the blood is strongly related with the amount of insulin in the blood (and is easier to measure than insulin). Next you ask Sarah to take a glucose tolerance test. For this test Sarah is asked to drink a liquid with a known amount of glucose in it (75g). A blood sample is taken every 30 minutes after ingesting the drink and blood glucose levels are measured. This helps to determine how well the body can remove excess sugar (glucose) from the blood. Two hours after drinking the liquid, blood glucose levels are less than 200 mg/dL if a patient is effectively removing glucose from the blood.

After these tests are complete, you review Sarah's results. You find that she has 2.3 ng/ml C-peptide in the blood, and her blood glucose levels 2 hours after drinking the liquid is 260 mg/dl.

Patient Trait	Measurement Value	Normal Range
Age		
Active lifestyle (Y/N)		
Thirstier than usual (Y/N)		
Blood pressure		<120/80
Pulse (bpm)		60-100
Fasting blood glucose (mg/dl)		75-105
Blood sodium (nmol/L		135-145
Blood potassium (nmol/L)		3.5-5.0
Glucose tolerance test		<200
C-peptide test (ng/ml)		0.5-2.0

Abby:
Abby is a 28 year old long-haul trucker that has not been feeling well. She spends most of her day driving her semi, and mostly eats at truck stops on the way. When Abby arrives as your office, you find that her blood pressure is 135/85 and her pulse is 98 bpm. She reports to you that she can go long stretches without feeling like she needs to drink water, which helps her spend more time on the road without taking a pit-stop. You order some initial blood work that reveals that her blood sodium levels are 139 mmol/L, blood potassium is 4.8 mmol/L and her blood glucose is 99 mg/ml.

Although Abby's fasting blood glucose is within the normal range, it is at the high end of normal, so you ask her if you can run the C-Peptide test and if she will do a glucose tolerance test. When you get Abby's test results back, you find that her C-peptide levels are 0.6 ng/ml and 2 hours after drinking the liquid with glucose in it for the glucose tolerance test her blood glucose levels are 155 mg/dl.

Patient Trait	Measurement Value	Normal Range
Age		
Active lifestyle (Y/N)		
Thirstier than usual (Y/N)		
Blood pressure		<120/80
Pulse (bpm)		60-100
Fasting blood glucose (mg/dl)		75-105
Blood sodium (nmol/L		135-145
Blood potassium (nmol/L)		3.5-5.0
Glucose tolerance test		<200
C-peptide test (ng/ml)		0.5-2.0

Michael
Michael is 13 years old, and his mom brings him to your office because he hasn't been feeling well, has been sleeping a lot and seems to always be filling his water bottle at home, even when he is just sitting doing his homework. You ask Michael how he normally likes to spend his day and what he likes to eat. You find out that when he is not in class, he is on a soccer team that practices every day, and then after dinner he likes to go riding his bike or walking his dog. You measure his vitals and observe that his heart rate is 65 bpm and his blood pressure is 105/65. You run some initial tests on a small blood sample and find that his blood glucose level is 140 mg/ml, his blood sodium is 145 and his potassium is 3.9. The elevated blood glucose is concerning, so you ask him to come back for some additional tests.

After Michael's additional tests are complete, you observe that the level of C-peptide in his blood is 0.2 ng/ml and two hours after he drank a liquid with glucose for a glucose tolerance test his blood glucose level is 252 mg/dl.

Patient Trait	Measurement Value	Normal Range
Age		
Active lifestyle (Y/N)		
Thirstier than usual (Y/N)		
Blood pressure		<120/80
Pulse (bpm)		60-100
Fasting blood glucose (mg/dl)		75-105
Blood sodium (nmol/L		135-145
Blood potassium (nmol/L)		3.5-5.0
Glucose tolerance test		<200
C-peptide test (ng/ml)		0.5-2.0

Normal ranges obtained from https://www.iapac.org/fact-sheet/normal-laboratory-values/