

# Ms. Thomas



Load Ms. Thomas (Ms Thomas.ICS) using the **File / Load Initial Conditions** main menu selection.

Is Ms. Thomas OK? Actually, the thumbnail sketch on the  Charts panel suggests that she is not OK. She is confused – maybe worse.

To get a rough idea of Ms. Thomas's condition, advance the solution in 1 hour intervals for a total of 3 hours, collecting data at the start and at the end of each interval. Check Ms.

Thomas's blood pressure, heart rate, temperature and respiration using the  Monitor panel.

Variable	12:00	1:00	2:00	3:00
Systolic Blood Pressure (mmHg)				
Diastolic Blood Pressure (mmHg)				
Heart Rate (/Min)				
Temperature (deg F)				
Respiration Rate				



(/Min)				
--------	--	--	--	--

The initial values look pretty good, but trouble soon develops. What does the pulse pressure and heart rate data suggest?

Click main menu selection Restart to restart the solution.

Attend to Ms. Thomas. Be prepared to discuss the following points.

- What is the matter with Ms. Thomas?
- What interventions are possible? Which do you recommend? Can you describe a beneficial course of action?
- What physiological and pathophysiological mechanisms are causing Ms. Thomas's condition?
- What physiological mechanisms, if any, are actually beneficial to Ms. Thomas condition?
- Summarize Ms. Thomas's acid/base status?
- What is Ms. Thomas's fluid volume status?
- What is Ms. Thomas's renal excretory status?



- Specifically, what are the neurological, endocrine and metabolic components of Ms. Thomas's condition?



# Ms. Thomas – Notes



Ms. Thomas has untreated Type I diabetes mellitus or insulin dependent diabetes mellitus (IDDM).

The key word here is *untreated*. Ms. Thomas has had little or no insulin therapy and is at extreme risk of falling into a coma caused either by hyperglycemia or ketoacidosis.

## Creating Ms. Thomas

Ms. Thomas was created by simulating nearly complete loss of pancreatic beta cells. Specifically, pancreatic insulin secretion was clamped at 1 mU/Min compared to a typical secretion of 10 mU/Min.

The new parameters values are:

“Insulin Secretion, Clamp Level” = 1.0

“Insulin Secretion, Clamp Switch” = 1.0 // On

Then the solution was advanced for 18 hours (1080 minutes). Hyperglycemia and ketoacidosis quickly developed.

## Interventions

Ms. Thomas’s condition is initially not very clear. So go to the  Blood Chemistry panel.



Several values jump out. Ms. Thomas has a blood glucose concentration of 1200 mG/dL compared to a normal of around 100 mG/dL. This increase is enough to produce a hyperglycemic coma.

There is also a severe acidosis. It is metabolic since blood  $pCO_2$  values are normal to low.

Blood ketoacids concentration is very high, causing a large anion gap and a small strong ion difference.

This looks like IDDM with inadequate insulin replacement. You could check the plasma insulin levels just to make sure.

The proper intervention is to inject insulin to bring the blood glucose concentrations down. I injected 20 U, but ended up with ventricular fibrillation due to hypokalemia.

So there are some additional issues during treatment that I should look into. Ms. Thomas is excreting 11 mL/Min urine vs. a normal flow of 1 mL/Min. She has become dehydrated and the dehydration is intracellular, with a cell water of 23 L vs. a normal volume of 28 L. Plasma  $[K^+]$  is increased and this has stimulated aldosterone secretion.

I'll look into this further. With a shot of insulin, the osmolarity falls and water rushes into the cells. Apparently  $K^+$  rushes in also, lowering plasma  $[K^+]$  to lethal levels.

Apparently, an aggressive drip must accompany the insulin. At minimum, careful management is needed.

Some useful panels are



Glucose

Insulin

Glucagon

pH

## References

I'm looking for some suitable references now.

