

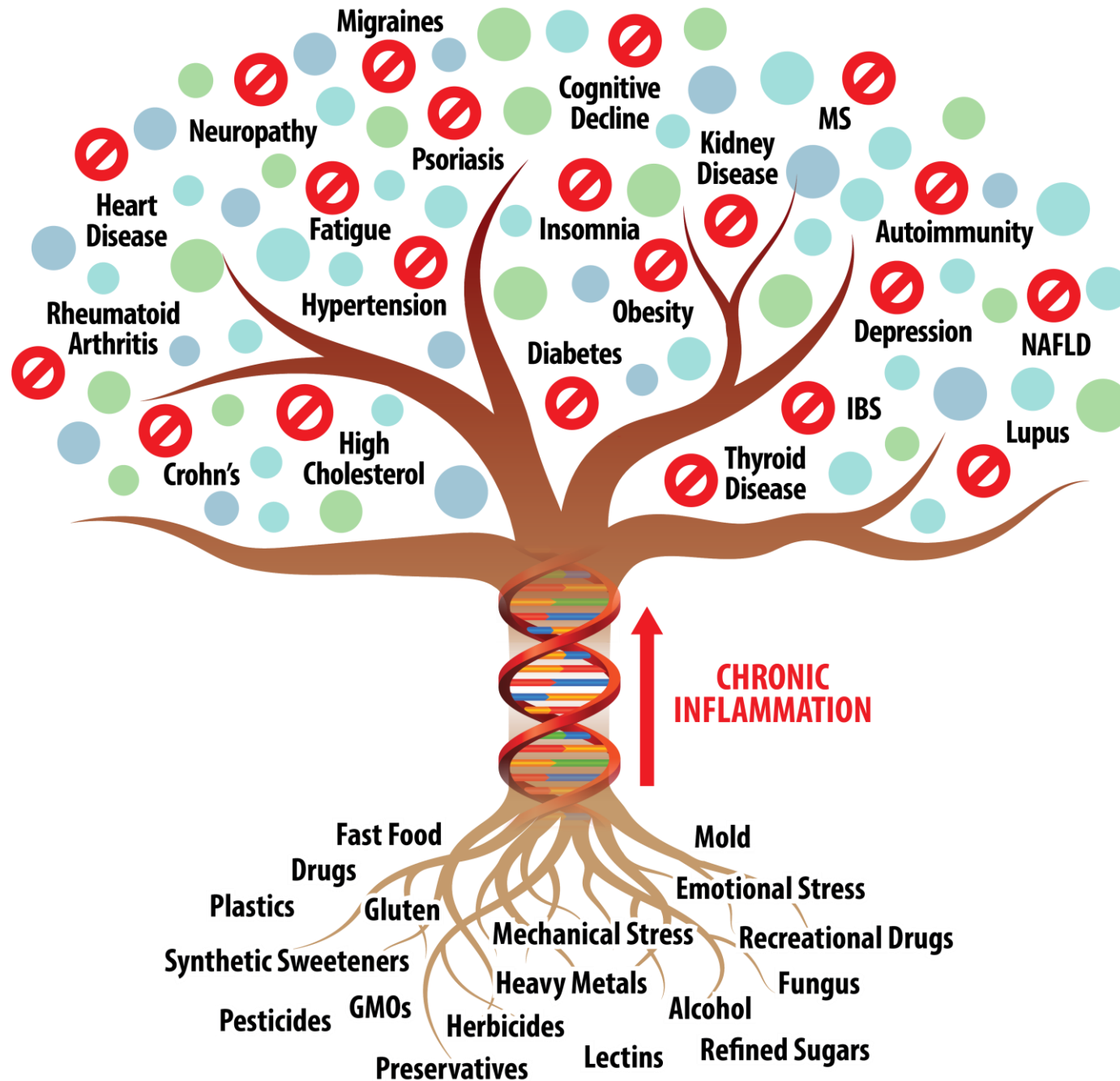
Casual Friday Presents

Type 1.5 Diabetes

and support considerations

A BIOGENETIX CLINICAL PRESENTATION

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Latent autoimmune diabetes in adults: Not type 1, not type 2, a little of both

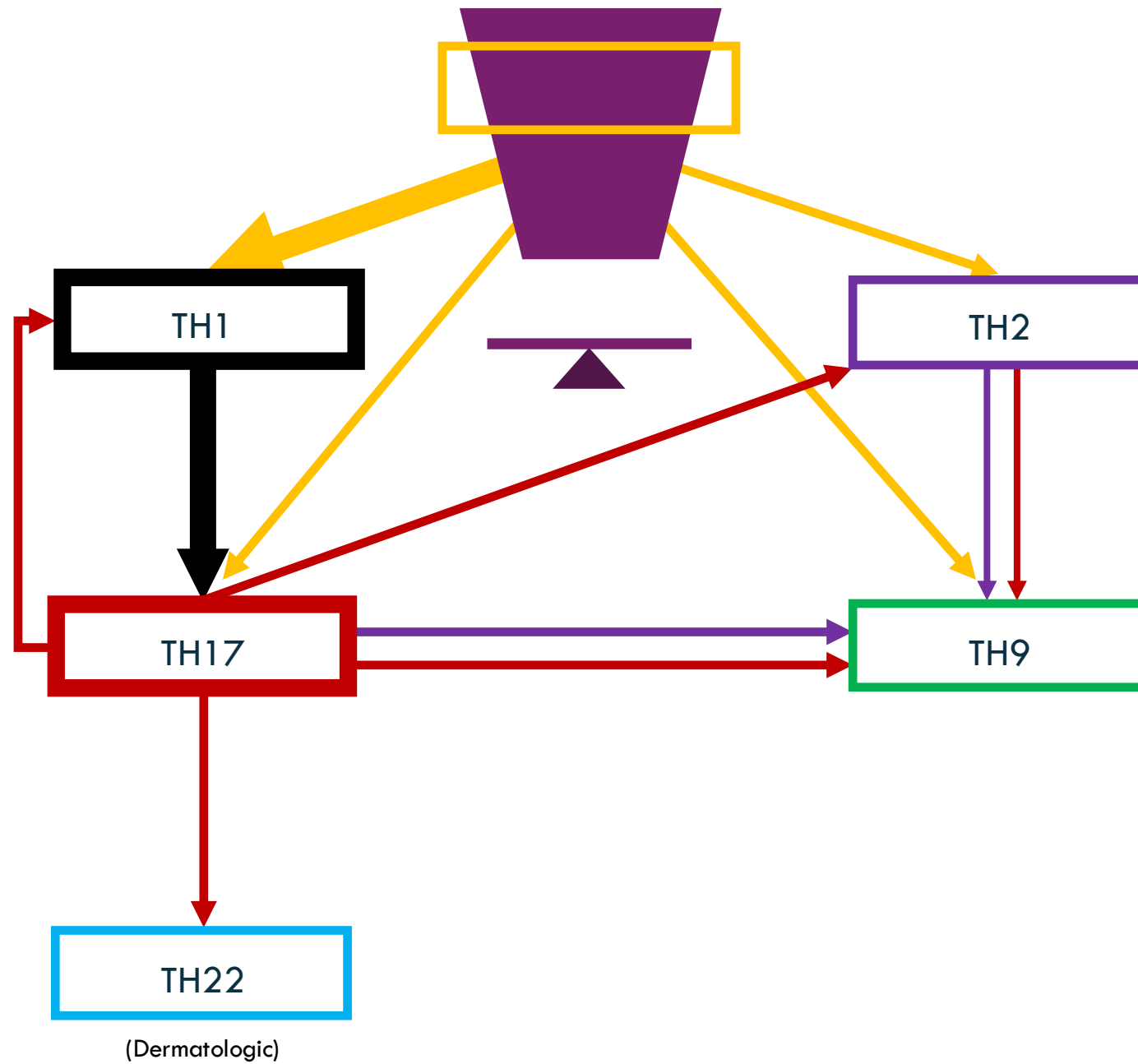
Michelle D. Lundholm, MD and Keren Zhou, MD

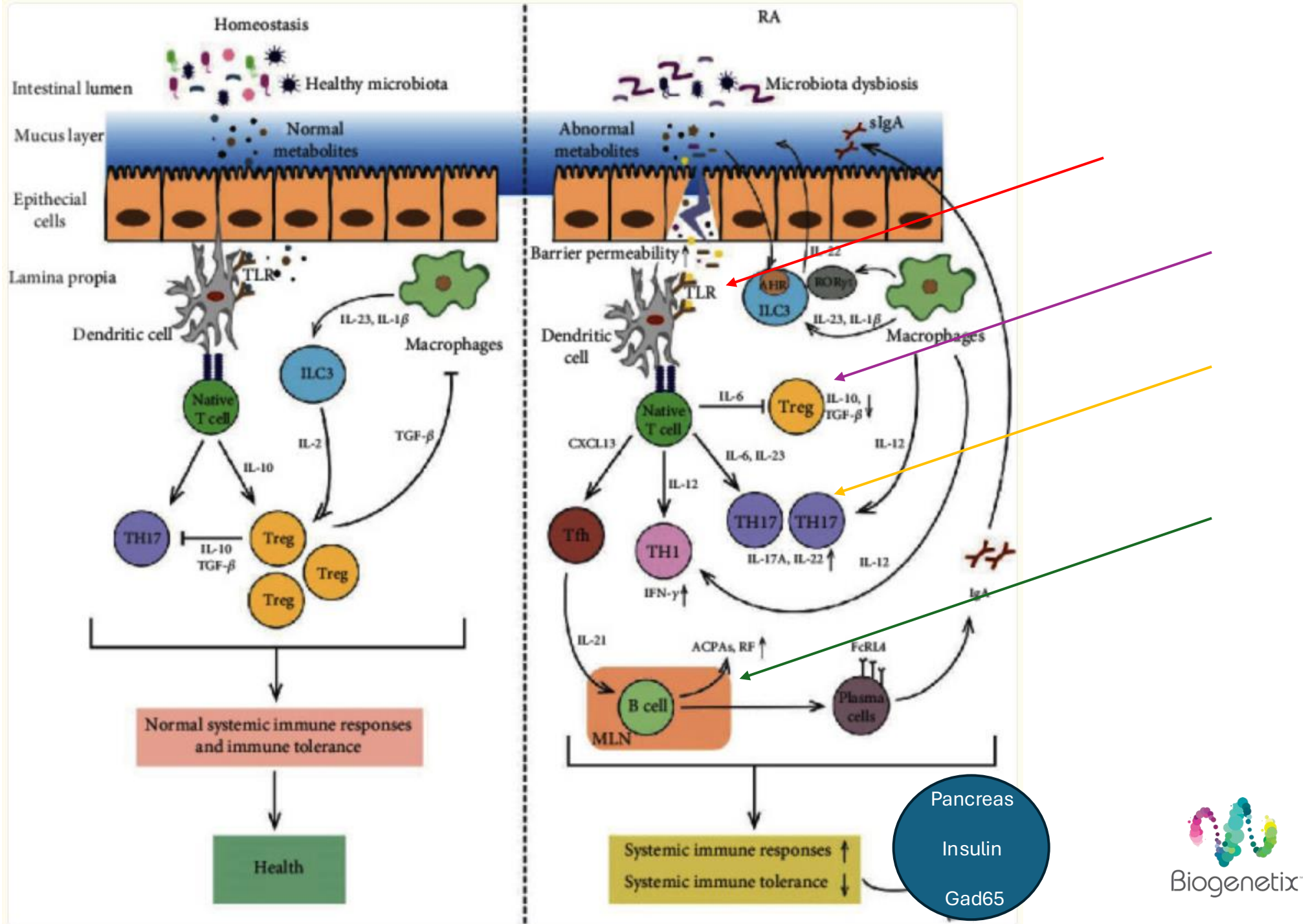
Cleveland

Latent autoimmune diabetes in adults (LADA) is a slowly progressive form of autoimmune diabetes that shares features of type 1 and type 2 diabetes, often leading to misdiagnosis and a delay in starting needed insulin therapy. This review summarizes LADA's presentation, diagnostic criteria, and management, emphasizing the importance of testing for antibodies early in the course of disease when patients have atypical features of type 2 diabetes.

KEY POINTS

- LADA is a slowly progressive autoimmune-mediated form of diabetes that is often misdiagnosed as type 2 diabetes.
- To detect LADA promptly, diabetes-associated antibody testing should be obtained in patients with diabetes who are lean and do not have metabolic syndrome or in those with a personal or family history of autoimmune disease.
- Noninsulin therapies can be used in the early stages, but patients eventually require insulin months to years after their diagnosis, as guided by C-peptide and hemoglobin A1c monitoring.
- Rather than waiting for noninsulin therapies to fail, proactive antibody testing and subsequent monitoring can ensure that patients with LADA benefit from the appropriate use of insulin.
- Further research is needed on beta-cell preservation and immunosuppressive therapies to slow the progression of LADA.





How type 1.5 differs

Feature	Type 1	Type 2	LADA (Type 1.5)
Cause	Autoimmune	Insulin resistance	Autoimmune
Onset	Rapid (often childhood)	Gradual	Gradual (adult)
*Insulin needed	Immediately	Sometimes later	*Eventually required
Body type	Often lean	Often overweight	*Often lean or average



Symptoms

Early symptoms can look like type 2:

- Increased thirst
- Frequent urination
- Fatigue
- Blurry vision

As it progresses (and insulin drops):

- Weight loss
- Higher blood sugar despite treatment



Diagnosis

Suspect LADA if:

- Adult with diabetes but **not overweight** (significant)
- *Blood sugar worsens quickly despite oral meds
- You have other autoimmune conditions (like thyroid disease, MS, Lupus)

Tests include:

- Autoantibodies**

- GAD-65 ab
- Insulin ab
- Antipancreatic Islet cell antibodies
- Zn Transporter 8 Ab (targets beta cells)

- C-peptide levels** (to measure insulin production)



Medical Treatment

As insulin production declines over time:

- Early stage:
 - Diet, exercise
 - Sometimes oral medications (though not always effective long-term)
- Later stage:
 - **Insulin therapy may become necessary**

*Many MD's recommend **starting insulin earlier** to preserve remaining beta cell function.





Cheat sheet

Type 1 – fast AI

Type 1.5 – slow AI

Type 2 – insulin resistance

Case:

64 yo male

5'10" - 250 lbs

Dx: type 2 dm

RX: metformin, glipizide, insulin



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Cheat sheet

Type 1 – fast AI

Type 1.5 – slow AI

Type 2 – insulin resistance

Case:

70 yo female

5'5" - 104 lbs

Dx: type 2 dm

RX: metformin, insulin

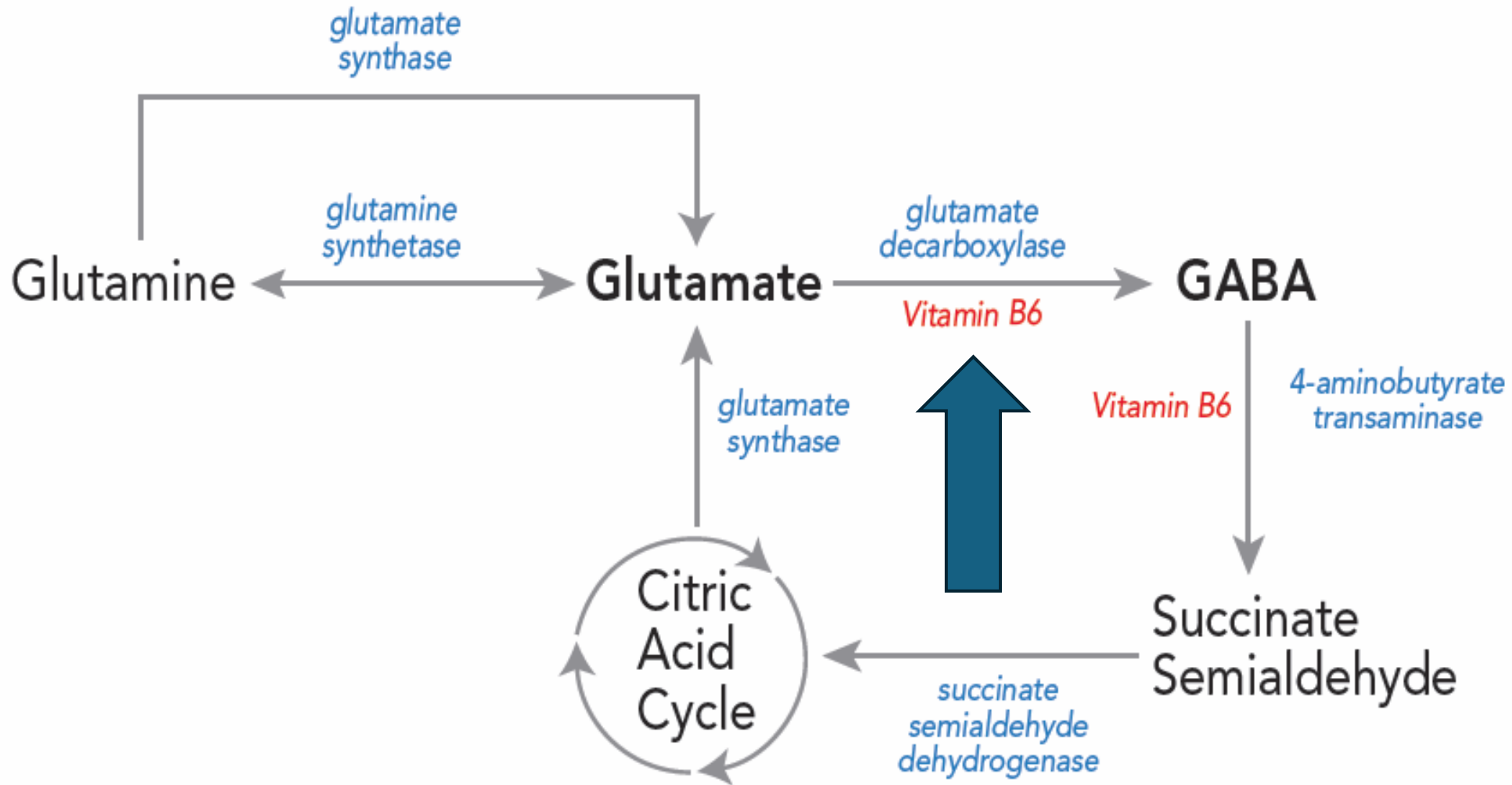


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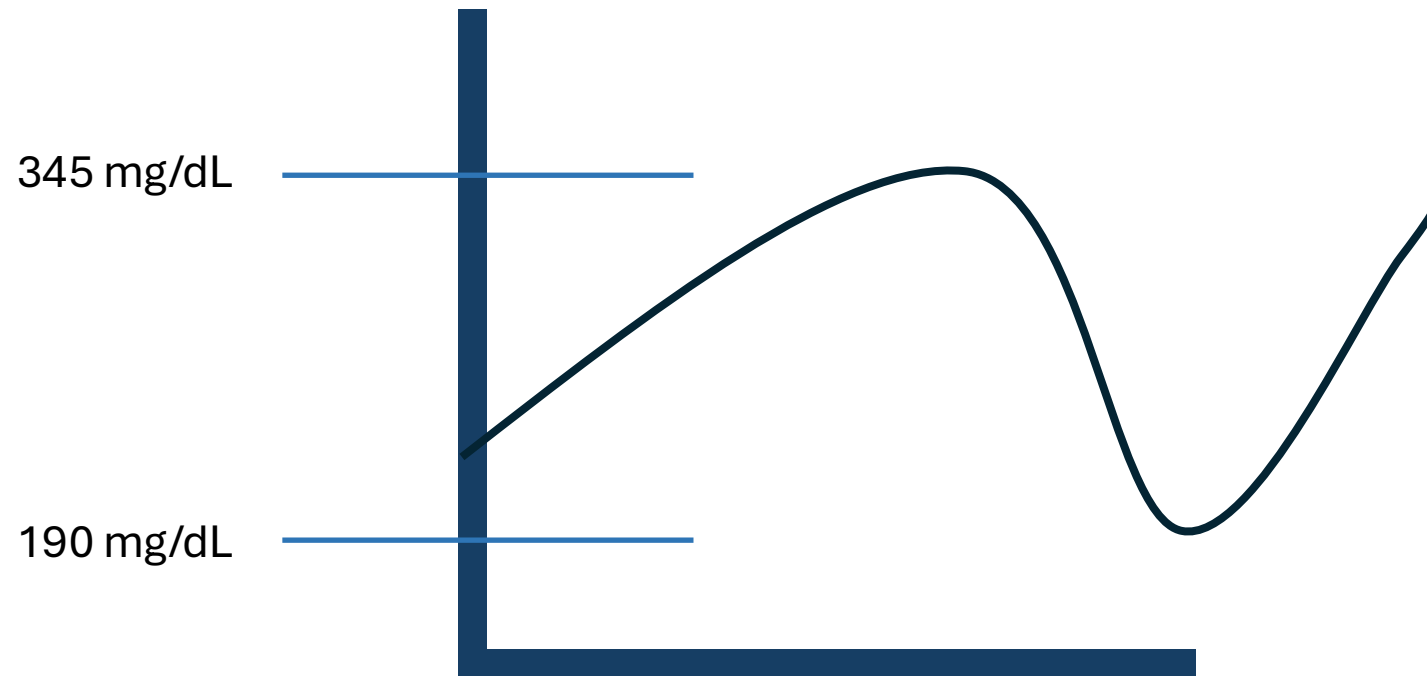
Clinical Pearls

1. If they're on insulin, check for type 1.5.
 - GAD65 ab, Insulin ab, pancreatic islet cell ab.
2. Correlate gi function to what you see in front of you.
3. Any other symptoms that are pertinent?
4. Onset...
5. Glucose window.
6. Treatment considerations.

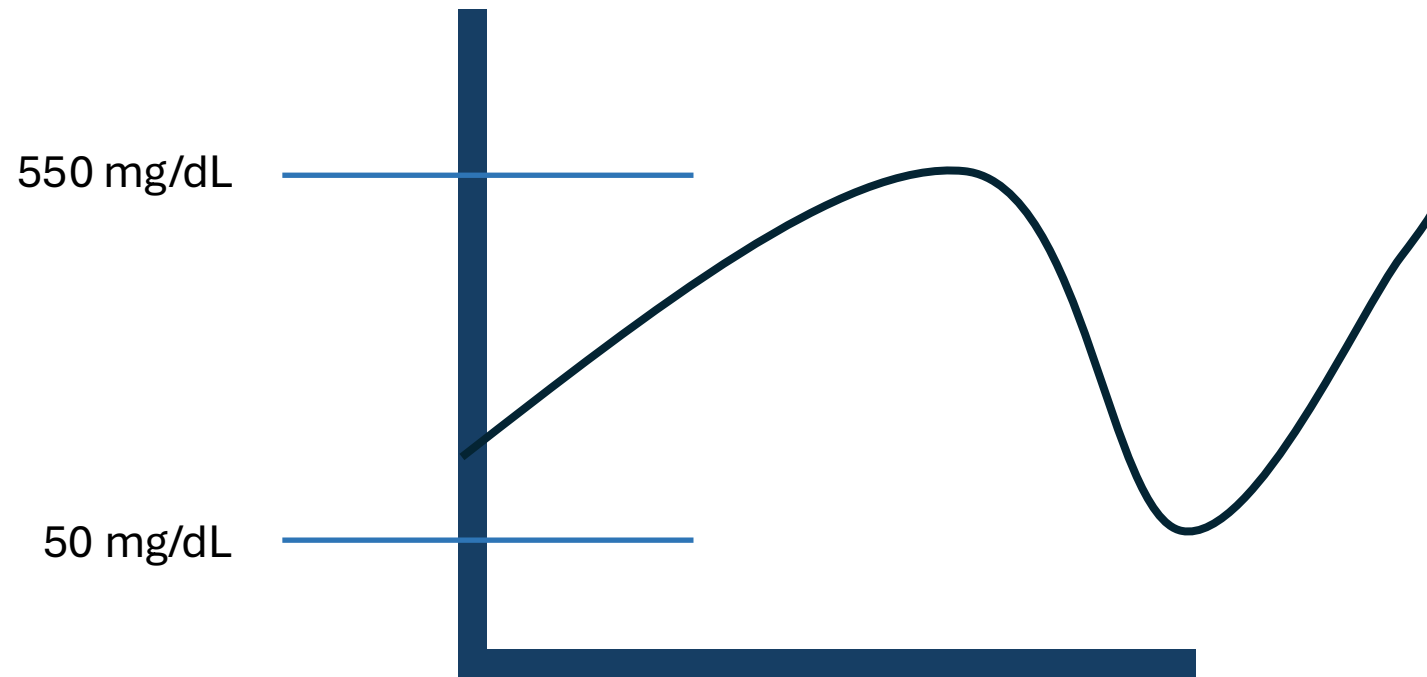




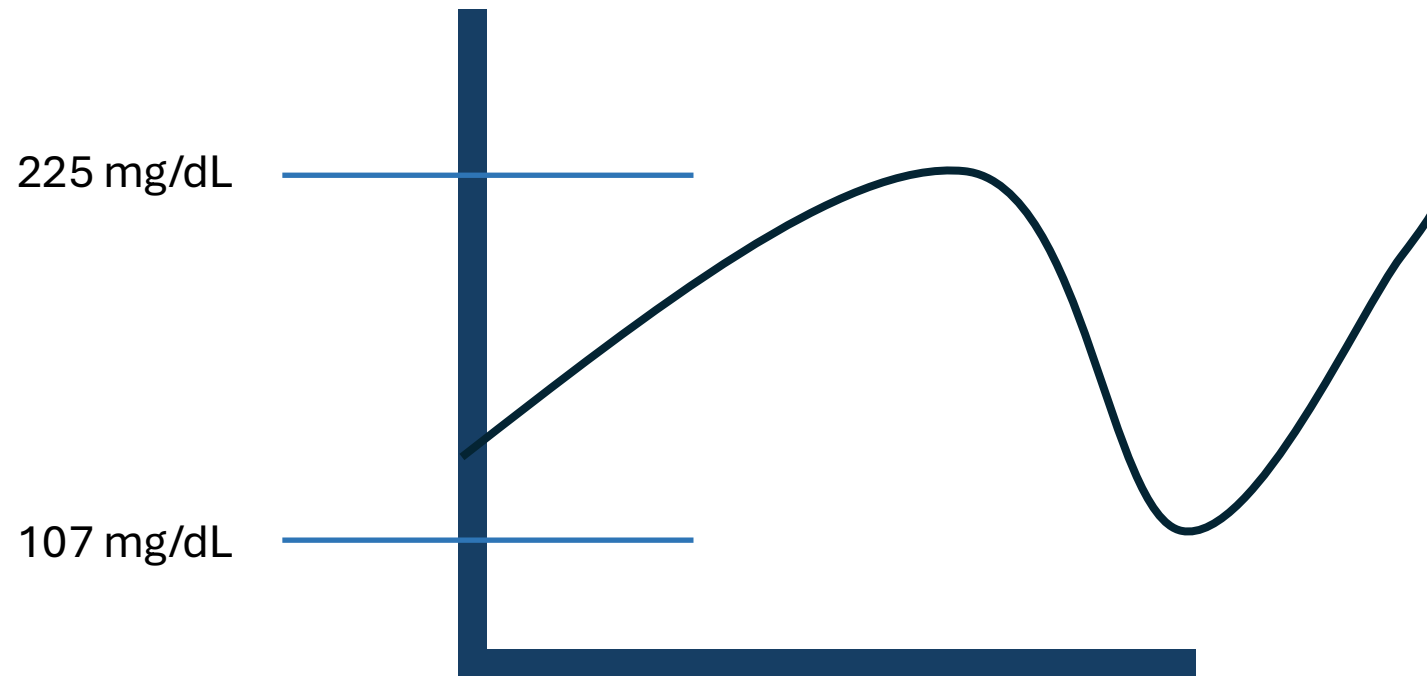
Glucose Window



Glucose Window



Glucose Window



A1C Chart based on ADAG formula

A1C-Derived Average Glucose (ADAG) Study;

eAG in mg/dl = (28.7* hba1c)-46.7 or

eAG in mmol/l = (1.59 x HbA1c)-2.59

A1C	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1
mg/dl	68	71	74	77	80	82	85	88	91	94	97	100
mmol/l	3.8	3.9	4.1	4.3	4.4	4.6	4.7	4.9	5.1	5.2	5.4	5.6
A1C	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3
mg/dl	103	105	108	111	114	117	120	123	125	128	131	134
mmol/l	5.7	5.8	6.0	6.2	6.3	6.5	6.7	6.8	6.9	7.1	7.3	7.4
A1C	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5
mg/dl	137	140	143	146	148	151	154	157	160	163	166	169
mmol/l	7.6	7.8	7.9	8.1	8.2	8.4	8.5	8.7	8.9	9.0	9.2	9.4
A1C	7.6	7.7	7.8	7.9	8.0	8.5	9.0	9.5	10.0	11.0	12.0	13.0
mg/dl	171	174	177	180	183	197	212	226	240	269	298	326
mmol/l	9.5	9.7	9.8	10.0	10.2	10.9	11.8	12.5	13.3	14.9	16.5	18.1
Super Optimal	Optimal		Normal			Pre Diabetes		Diabetes		Dangerous		



72 yo f
5'4"
140lbs

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Glucose ⁰¹	114 High	157 07/15/2025	mg/dL	70-99
BUN ⁰¹	23	25 07/15/2025	mg/dL	8-27
Creatinine ⁰¹	0.74	0.68 07/15/2025	mg/dL	0.57-1.00
eGFR	86	92 07/15/2025	mL/min/1.73	>59
▲ BUN/Creatinine Ratio	31 High	37 07/15/2025		12-28
Sodium ⁰¹	140	140 07/15/2025	mmol/L	134-144
Potassium ⁰¹	4.4	5.1 07/15/2025	mmol/L	3.5-5.2

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Hemoglobin A1c ⁰¹	6.8 High	6.7 07/15/2025	%	4.8-5.6
Please Note: ⁰¹				
Prediabetes: 5.7 - 6.4				
Diabetes: >6.4				
Glycemic control for adults with diabetes: <7.0				
Estim. Avg Glu (eAG)	148		mg/dL	

Insulin Antibodies

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Insulin Antibodies ⁰²	35 High		uU/mL	
This test is also known as insulin autoantibody or IAA.				
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▼ C-Peptide, Serum ⁰¹	0.2 Low	0.2 08/01/2024	ng/mL	1.1-4.4
C-Peptide reference interval is for fasting patients.				
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ GAD-65 ⁰¹	592.3 High		U/mL	0.0-5.0

Homocyst(e)ine

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Homocyst(e)ine ⁰¹	8.8		umol/L	0.0-19.2

Uric Acid

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▼ Uric Acid ⁰¹	2.5 Low		mg/dL	3.1-7.9
Therapeutic target for gout patients: <6.0				

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▼ Insulin ⁰¹	0.5 Low		uIU/mL	2.6-24.9

66 yo f
5'6"
196lbs

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Glucose ⁰¹	154 High		mg/dL	70-99
BUN ⁰¹	10		mg/dL	8-27
Creatinine ⁰¹	0.93		mg/dL	0.57-1.00
eGFR	68		mL/min/1.73	>59
▼ BUN/Creatinine Ratio	11 Low			12-28
Sodium ⁰¹	137		mmol/L	134-144
Potassium ⁰¹	4.2		mmol/L	3.5-5.2

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
Lipids ⁰¹				
▲ Cholesterol, Total ⁰¹	244 High		mg/dL	100-199
▲ Triglycerides ⁰¹	262 High		mg/dL	0-149
HDL Cholesterol ⁰¹	58		mg/dL	>39
▲ VLDL Cholesterol Cal	47 High		mg/dL	5-40
▲ LDL Chol Calc (NIH)	139 High		mg/dL	0-99
T. Chol/HDL Ratio	4.2		ratio	0.0-4.4

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Hemoglobin A1c ⁰¹	8.6 High		%	4.8-5.6
Estim. Avg Glu (eAG)	200		mg/dL	

Insulin Antibodies

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Insulin Antibodies ⁰²	168 High		uU/mL	
<p>Confirmed by dilution. This test is also known as insulin autoantibody or IAA.</p> <p>This test was developed and its performance characteristics determined by LabCorp. It has not been cleared or approved by the Food and Drug Administration.</p> <p>Reference Range: <5.0 Negative > or = 5.0 Positive</p>				

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Insulin ⁰¹	149.0 High		uIU/mL	2.6-24.9

66 yo f
5'4"
110lbs

Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Glucose ⁰¹	329 High		mg/dL	65-99
BUN ⁰¹	20		mg/dL	8-27
▼ Creatinine ⁰¹	0.55 Low		mg/dL	0.57-1.00
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ Hemoglobin A1c ⁰¹	12.9 High		%	4.8-5.6
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▼ C-Peptide, Serum ⁰¹	0.4 Low		ng/mL	1.1-4.4
C-Peptide reference interval is for fasting patients.				
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▲ GAD-65 ⁰³	477.1 High		U/mL	0.0-5.0
Results confirmed on				
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▼ Uric Acid ⁰¹	1.9 Low		mg/dL	3.0-7.2
Therapeutic target for gout patients: <6.0				
Test	Current Result and Flag	Previous Result and Date	Units	Reference Interval
▼ Insulin ⁰¹	1.8 Low		uIU/mL	2.6-24.9

