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LABS Live 2021

The future of diagnostics

What Chemistry teaches us about Biology - getting the more clinical information out of Chemistry Panel Interpretation



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A close-up photograph of a laboratory experiment. A glass pipette is positioned vertically, with a single drop of bright orange liquid suspended at its tip. The drop is about to fall into a clear glass test tube in the foreground. In the background, several other test tubes are visible, slightly out of focus. The entire scene is bathed in a soft, cool blue light, creating a clean and scientific atmosphere.

What Chemistry Teaches Us About Biology

Insights from Chemistry Lab Testing

Robert Sheeler, M.D.

Chair, Emerson Ecologics Medical Advisory Board

A Christmas Carol

Charles Dickens



What you **knew**

What you **know**

What you **might
enjoy knowing**

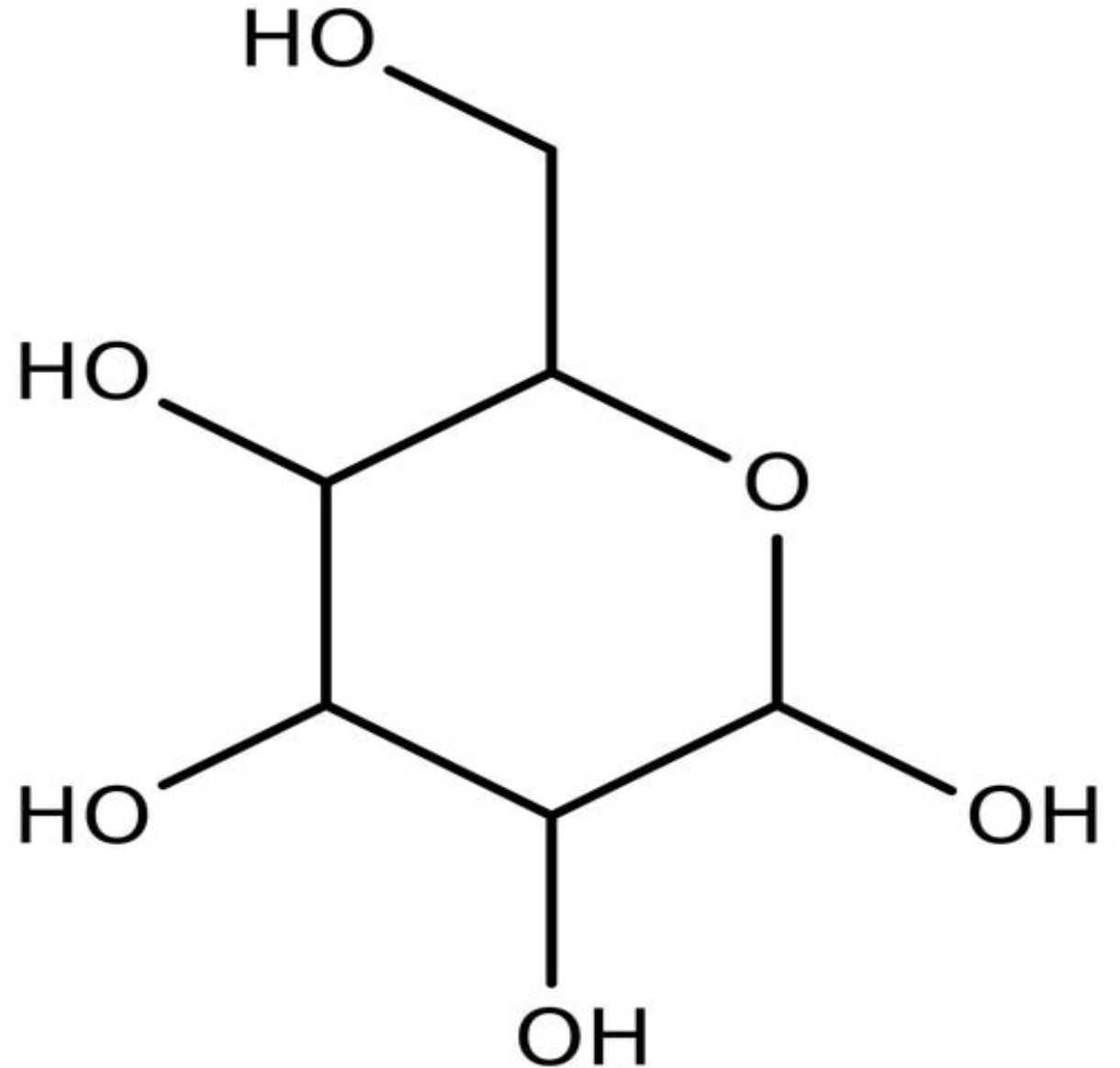


Glucose

Lab Normal: 60-100

Optimal: 83-90

98, 101, 102, 104, 106,
117, 118, 120, 121,
125, **127**



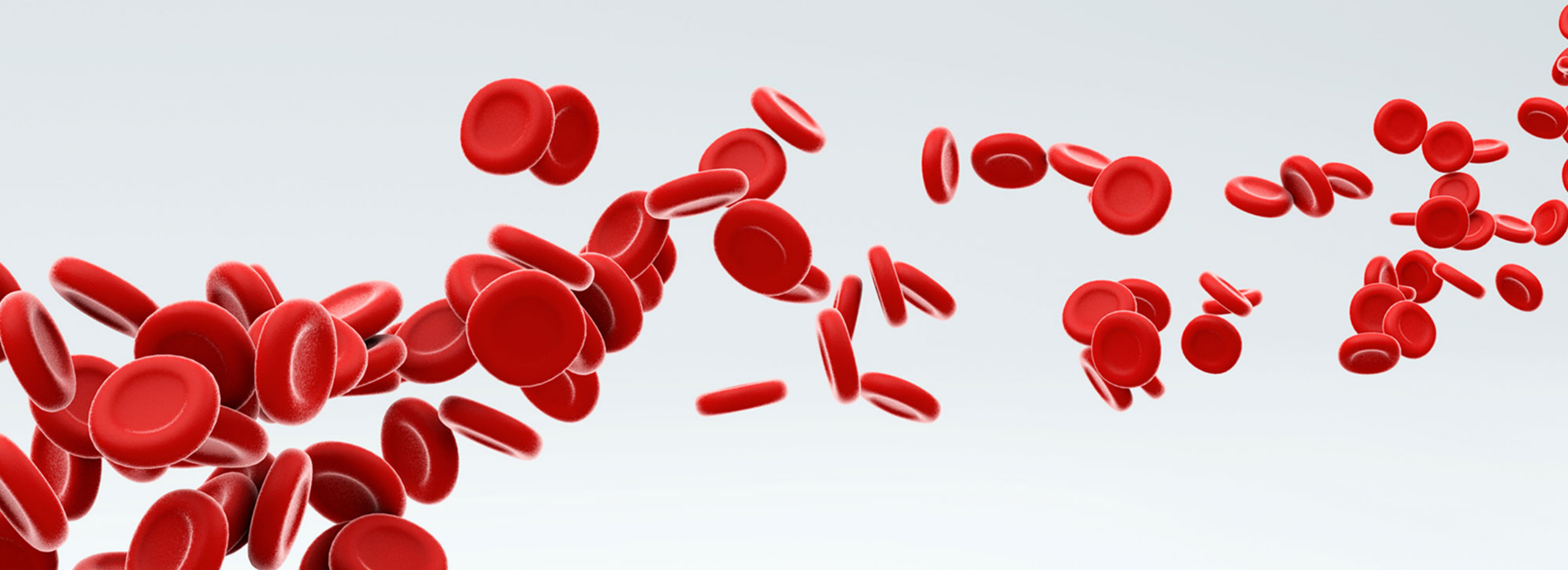


A1c – Area
Under the Curve



RBC Lifespan –

2 to 3 months



**Can A1c ever go up
if a person gets healthier?**

Markers of Oxidative Stress

Oxidized LDL

8-deoxyguanosine

Glucose / A1c Patterns

FASTING GLUCOSE	HEMOBLOGIN A1c
NORMAL	NORMAL
ELEVATED	NORMAL
NORMAL	ELEVATED
ELEVATED	ELEVATED

**What goes up 20 years
before diabetes diagnosis?**

Fasting Insulin

Ideal 4-7

Mildly Elevated 9-11

Moderately Elevated 12-19

Elevated 20 or over

What do you think if FBS and A1c are elevated and fasting insulin is low?

Supplements of value for elevated sugar

- Berberine
- Bitter Melon



Berberine vs. Statins

Cholesterol

Glucose

Microbiome

Endothelial Function

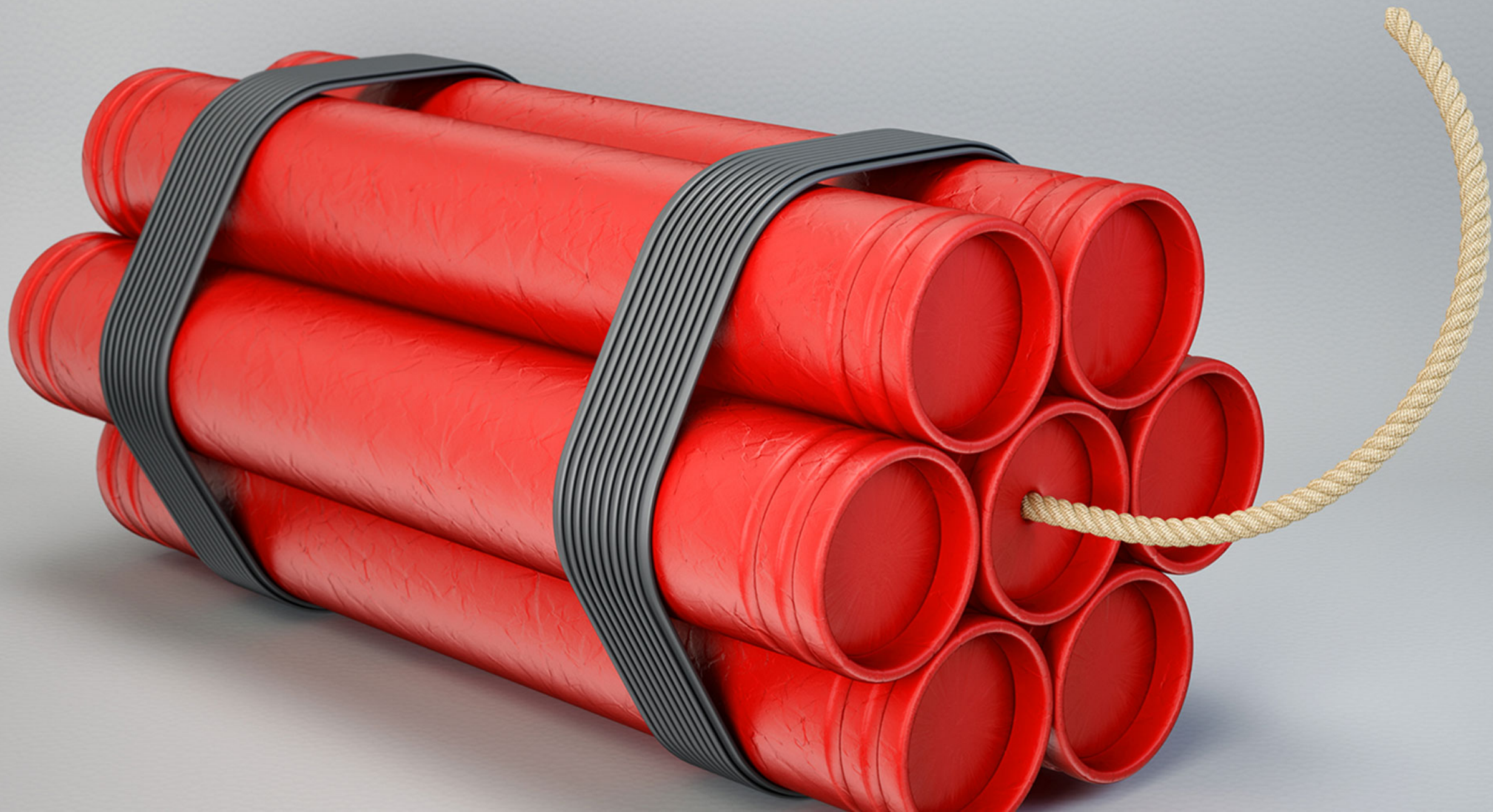
Cholesterol

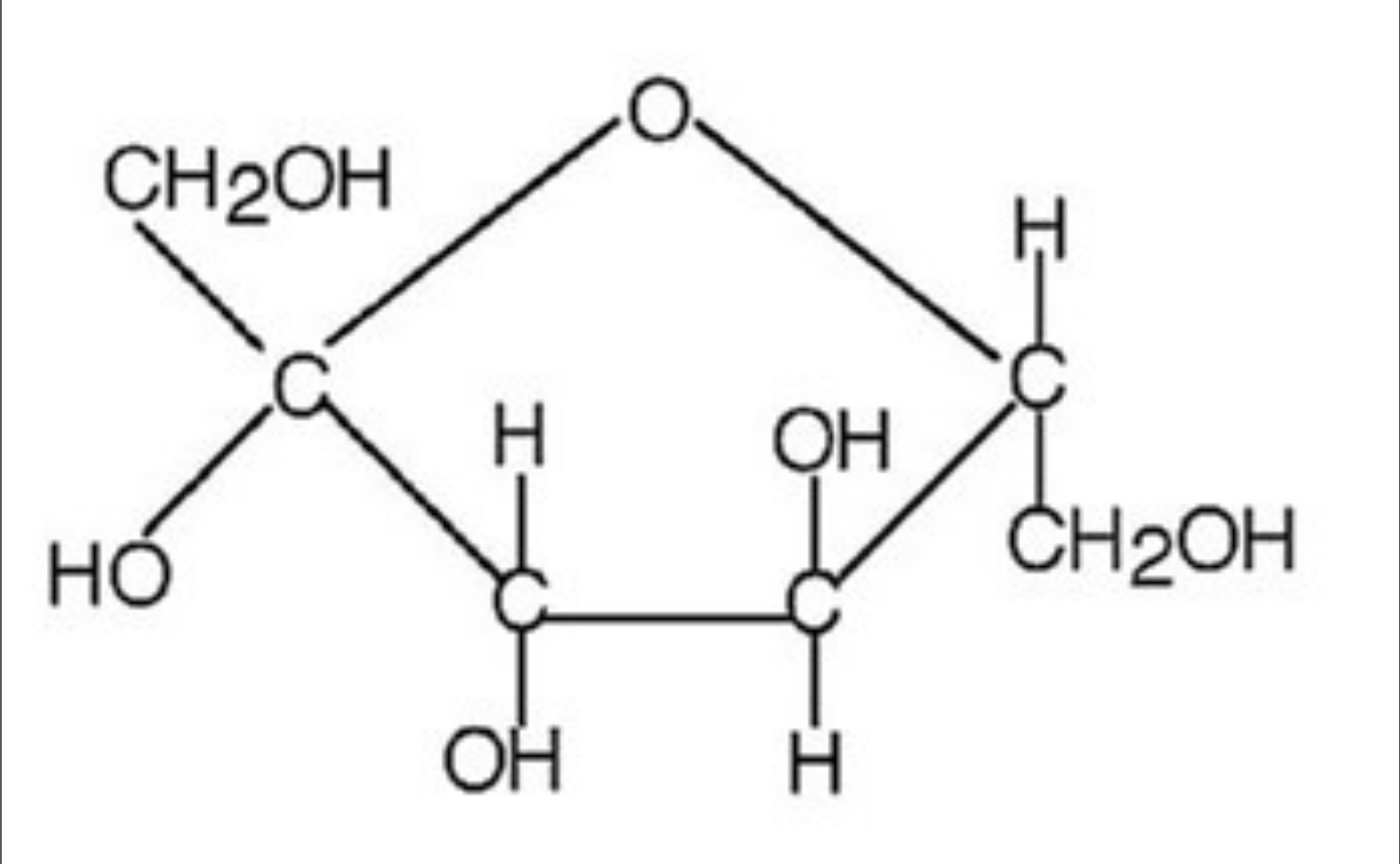
Glucose

Microbiome

Endothelial Function









Uric Acid

- inflammatory
- related to glucose metabolism dysfunction
- gout



LDH < **140**



Electrolyte and Chemistry Pattern

Na+	122
K+	5.2
Cl-	92
CO ₂	16
Glucose	512



$$\text{Anion Gap} = [\text{Na}^+] - [\text{Cl}^- + \text{CO}_2]$$

$$122 - 108 = 14$$

AG > 10 abnormal

Acidosis

ANION GAP

- Salicylates / ASA
- Ethanol & Ethylene Glycol
- Lactic Acidosis
- Iron
- Acetaminophen
- **DKA**
- Iron
- Uremia
- Carbon Monoxide

NON-ANION GAP

- Various renal tubular acidosis
- Chronic kidney disease
- Diarrhea / fistula output
- Hyperaldosteronism

Which is more likely with AST to ALT ratio <1 *[Deritts Ratio]*

- Alcoholic Hepatitis
- Cirrhosis
- Acute Viral Hepatitis

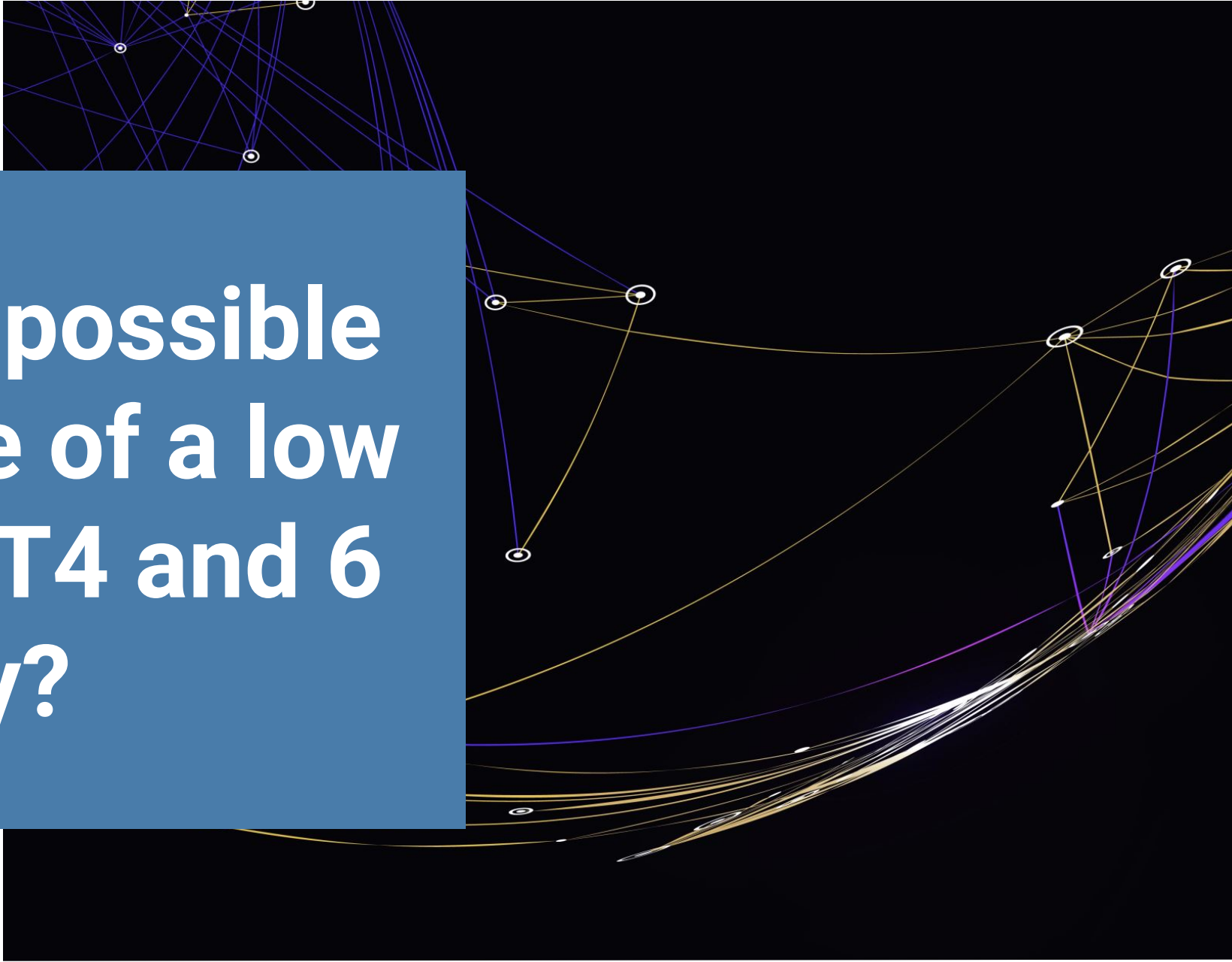


What Vitamin may help prevent NAFLD?

Vitamin C –
1000 mg. dose
has a good effect



**What could cause an AST of 650
and an ALT of 25 in a healthy
medical student?**



What is the possible significance of a low AST and ALT4 and 6 respectively?

Is Gilbert's
Disease totally
benign, as many
textbooks state?



What is a typical pattern of liver functions in Cholestasis?

- AST
- ALT
- GGT
- Alkaline Phosphatase
- Bilirubin direct/indirect



What is a typical pattern of liver functions in Cholestasis?

- AST – mildly up
- ALT- mildly up
- GGT- elevated
- Alkaline Phosphatase- up significantly
- Bilirubin direct/indirect- up direct



Obstructive Jaundice –
mostly conjugated bilirubin

Bilirubin bound to albumin –
unconjugated / indirect bilirubin

Conjugated / direct bilirubin –
more easily excreted in bile

What would you think of a COVID patient with an elevated unconjugated bilirubin?

What common drug class can cause hemolysis in patients with G6PD deficiency?

HINT- it's not the only one but it rhymes with alone....

**What else other than liver disease
elevates alkaline phosphatase?**

AND

What causes low alkaline phosphatase?

**What other diseases should you think of
with elevated transaminases?**

Other causes of persistently elevated transaminases

- Sarcoid [check A.C.E. level]
- Alpha-One Antitrypsin [free genetic testing]
- NASH – Nonalcoholic Steatohepatitis [imaging such as MRE]
- Autoimmune Hepatitis [ANA, Microsomal Antibodies, Mitochondrial Antibodies]

What is the difference in likely disease states between these two patients:

PATIENT 1

- Ferritin 800
- Fe/TIBC 57%

PATIENT 2

- Ferritin 450
- Fe/TIBC 30%

What could be learned from the following Chem Panel Results

Albumin	4.5
Na	137.0
K	4.0
ALT	3.0
AST	4.0
Bilirubin	0.1
Alkaline Phos	120.0



**SPEP showing poly-clonal
gammopathy is often seen
in chronic liver disease**

What condition can present with any of these issues? How do you test for it?

1. Anemia
2. Diarrhea
3. Headaches
4. Depression
5. Hashimoto's thyroiditis

Celiac Disease

TTG IgG; TTG IgA, IgA

[Whipple's Disease can also share a lot of these presenting issues]

What causes significantly elevated amylase with a normal lipase?

What type of patient is most likely to have significant renal dysfunction with a normal creatinine?

What is another test will pick this up?

Older patients who are sarcopenic

They may at baseline have low creatinine because they have low muscle mass

With renal dysfunction their creatinine may not elevate much

Cystatin-C is a good alternative test in this situation

What might cause this pattern in a patient with heart failure:

- Creatinine 1.0
- BUN 40.0

What else can elevate BUN significantly without raising creatinine or cystatin C?

What would be the most common cause of this pattern of chemistry results:

Potassium	5.9
Creatinine	4.0
BUN	60.0
1,25-OH Vitamin D	Low
Phosphorous	High
Cystatin C	High
Calcium	Low



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