

* Citric Acid Cycle

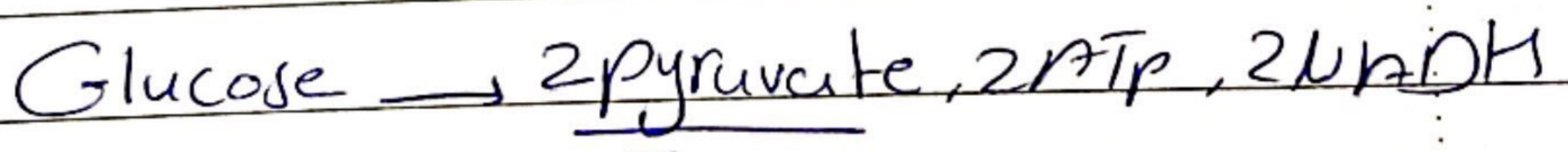
- used for catabolic & anabolic
- happen in Mitochondria Matrix
- TCA or cribs cycle
- The cycle accepts acetyl Co A

↓
2 Carbons molecule
Connected to Coenzyme A

The 2 carbons comes from
pyruvate, fatty acids, A.T.P

- Some enzymes of this path are in the Mitochondria membrane sexonase clehydrogenase enzyme

Remember Glycolysis



Contain high energy electrons, rich
in C-H Co. bond so it can be
further oxidized to Acetyl Co A

* Pyruvate \rightarrow Acetyl CoA

omega compound enzyme complex
enzyme, called pyruvate dehydrogenase

no invertebrate
Enzymes formed together

loss carboxylic acid Group
as CO_2 which mean we need
a Decarboxylation

- At the same time the pyruvate is oxidized
(NAD^+ is oxidizing agent & it will become
reduced)

Molecule which is
is acetyl Group

Transferred to co-enzyme A to produce
Acetyl A Coenzyme, which mean we need
to transferase activity

* Acetyl CoA could also be produced
from breakdown of Fatty acid/ a.a

* E_2 Required for oxidation / reduction

21 E₂ } see e
24 E₁ } 60 enzymes form
11 E₃ } the pyruvate dehydrogenase

* Pyruvate losses one of the carbon
as CO₂

- So the first reaction is catalyzed
by pyruvate dehydrogenase

~ This enzyme take what's left from
pyruvate & add them to thiamine
pyrophosphate

• Then the E₂ enzyme has an arm
made of lipoic acid → (coenzyme to E₂)
& this arm take acetyl Group (& C₂U i.e.
to coenzyme) & know we have acetyl CoA

* The Disulfide bond must be broken to
carry the acetyl CoA, so that the acetyl CoA
will be give to coenzyme & know we
have acetyl Coenzyme A

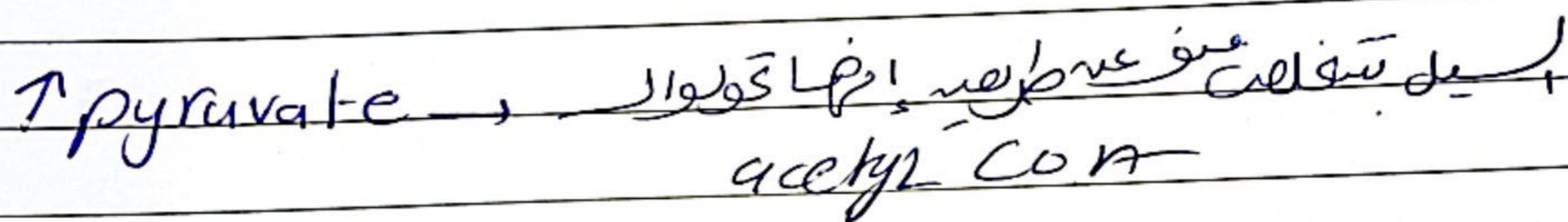
- & this one can enter the cribs cycle
but will remains is reduced lipoamide
(which mean it must be recycled) So another
enzyme E₃ will use NAD⁺ & FAD to regenerate
lipoamide acid, so that it can go & take another acetyl CoA
& give it to coenzyme

* Pyruvate dehydrogenase is under allosteric control & phosphorylation

- Pyruvate dehydrogenase complex can be phosphorylated (it becomes inactive)

* Pyruvate inhibit this protein kinase which means the enzyme will not be phospho. & it become active to convert some to acetyl CoA

cell uses
it Energy / lipid



↑ NADH inhibits the pyruvate dehydrogenase
why?

cause NADH carry high energy electrons that could be used to make more ATP by Electron Transport Chain reaction which mean

↑ NADH, ↑ ATP

↓ si il no point في

Acetyl Co A

↓ Citric cycle ↓

ATP ~

* For the cribs cycle, for every Acetyl CoA entering the cycle

3 NADH will be produced

1 FADH

1 ATP

2 CO₂

1 Glucose → 2 Pyruvate → 2 Acetyl CoA

Electrons carried could be used to make more ATP by oxidative phosphorylation or electron trans. chain

→ ~~is it regulation, no~~ Crebs cycle -

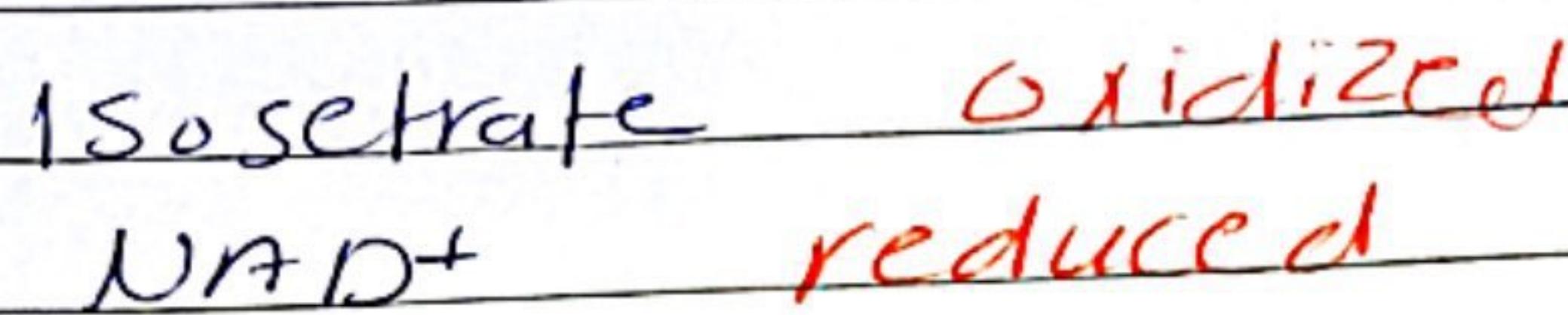
2 → setup

- Energy harvest → NADH, FADH will be produced

* Acetyl CoA enters cycle & compound to oxaloacetate to produce Cetrate, & that requires the enzyme Cetrate synthase

Then we have isomerisation reaction where Cetrate is converted to Isosetrone

→ The next step is con. of isosetrate to α-ketoglutarate, during this reaction we have 2 activities decarboxylation & redox reaction



First step → Take the high energy electrons of the enzyme used in this step is Isocitrate dehydrogenase

1 decarboxylation (remove of Carboxyl Group as CO_2)



2 oxidation/reduction

3 Group reduction

Then succinyl-CoA is converted to succinate by succinyl-CoA synthase, during this reaction 1 GTP is converted to GTP



Step 6 oxidation/reduction reaction.

→ succinate is oxidized to fumarate

Step 7 Fumarate is hydrated to become L-Malate by Fumarase & then L-malate to oxaloacetate

* 4 oxidation/reduction reaction catalyzed by 4 dehydrogenase enzymes

- NADH \rightarrow 2.5 ATP

- FADH \rightarrow 1.5 ATP

- 3 control points

↳ ↑ Citrate Synthase

• inhibited by ATP & NADH

رجسٰتِ ادائیٰ Cycle of حیوانات ملائکہ۔

ATP & Succinyl CoA

2-Iso citrate dehydrogenase

• inhibited by NADH, Succinyl CoA & ATP

• activated by ADP

ATP uses 1 ATP is 1 ADP is -

* Ratio NADH / NAD⁺ / ATP / ADP will determine whether cycle activate it or slow down

* Glyoxylate cycle

↳ Short cut of crib's cycle

↳ animals → Sugars
↳ new plants → Sugars
Fat → sugar that
Could be burned

Lipid into embryo in new seeds *
in embryo

energy to grow, so energy stored
in embryo stored in the form of
lipid not sugar Why?

because 1 gram of lipid store
twice of energy stored in Glucose

* Isocitrate lyase enzyme

↳ Isocitrate →

Isocitrate → succinate

↳ new molecule called Glyoxylate

Acetyl CoA → -

* Crib's cycle linked to O_2 because it

produce $NADH$, $FADH_2$

impossible to carry high energy electron
from Glucose to O_2 , final electron
acceptor

NADH, FADH₂

Take electrons to electron transport chain

ATP + $\frac{1}{2} \text{O}_2 \rightarrow \text{GTP} + \text{H}_2\text{O}$ (yield no. sites) $\rightarrow 3\text{Pi}$
oxidative phosphorylation

as metabolic Catabolic cycle \rightarrow ~~is also~~ *

- A.A could be fit in the cycle
to produce intermediate for cycle or
some intermediate could be used to make
a.a

- Acetyl co A could be come
from Glucose / Lipid / a.a

* Pyruvate come from a.a

* phosphoenol pyruvate used to
make a.a

* fumarate intermediate of cycle
could be synth. from some
a.a