

β-Oxidation

- TOTAL ATP generation = Palmitic Acid
- β-oxidization = $1 \text{ NADH} + \text{H}^+$; $1 \text{ FADH}_2 \times 7 \text{ turns} = 35 \text{ ATP}$
- 8 Acetyl-CoA molecules enter into Krebs Cycle
- 8 ATP
- $3 \text{ NADH} + \text{H}^+ \times 8 \text{ turns} = 72 \text{ ATP}$
- $1 \text{ FADH}_2 \times 8 \text{ turns} = 16 \text{ ATP}$

Total ATP Production = 131 ATP (don't forget initial investment of ATP in β-ox 1-2 ATP)

TOTAL = 130 ATP

Play it again Sam...

- How about Stearic Acid ($\text{C}_{18}\text{H}_{36}\text{O}_2$)
- β-Oxidization → $(18/2)-1 = 8 \text{ turns}$
 - ATP investment = 1 ATP
 - $1 \text{ NADH} + \text{H}^+$; $1 \text{ FADH}_2 \times 8 \text{ turns} = 40 \text{ ATP} - 1 = 39 \text{ ATP}$
- 9 Acetyl-CoA molecules enter into Krebs Cycle
- 9 ATP
- $3 \text{ NADH} + \text{H}^+ \times 9 \text{ turns} = 81 \text{ ATP}$ in ETC
- $1 \text{ FADH}_2 \times 9 \text{ turns} = 18 \text{ ATP}$ in ETC

Total ATP Production = 147 ATP

Bottom Line...

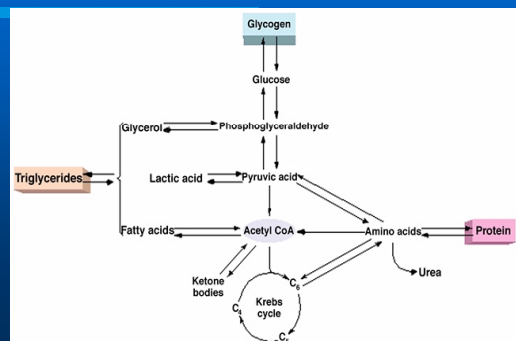
- Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)
 - Aerobic metabolism = 38 ATP
- Stearic acid ($\text{C}_{18}\text{H}_{36}\text{O}_2$)
 - Aerobic metabolism = 147 ATP

But is it Efficient?

- Fat produces @ 30% more ATP/C atom than CHO
- 1 lb of FAT can yield much more ATP than 1 lb of CHO
- **But what about O_2 consumed / ATP produced?**
 - 6 O_2 needed → Glu → 38 ATP
 - 26 O_2 needed → Stearic acid → 147 ATP
- CHO ∴ 12% more efficient

Hey Fatty, remember me?

- Recall this term
Triglycerides?
- Glycerol + 3 FFA's
 - Now what?
 - $147 \text{ ATP} \times 3 = 441 \text{ ATP}$
 - What about the glycerol backbone?
 - Nets = 19 ATP



What about the glycerol backbone?

- Converted to 3-phosphoglyceraldehyde (glycolysis)
 - Nets = 19 ATP
- **NOTE:** The gluconeogenic role of glycerol becomes important when glycogen reserves are significantly depleted from either dietary restriction of CHO, long-term exercise or heavy training.