

Energy Systems

- There are two things that can make your body change from one energy system to another:
 1. Lack of fuel for that energy system.
 2. Time.
- We want our body to use the energy system that will allow us to compete at the highest maximum effort while producing the most explosive power.

Energy Systems

- The cells must generate and use energy to maintain their highly organized structure to do **Mechanical Work**.
- They do this by transforming chemical energy into mechanical energy.
- Show me the money \$\$\$ = ATP
- Think of your muscle cells as the Bank.
- ATP is the only money your muscles recognize!

Energy Systems

- ATP – Adenosine Tri-Phosphate
- $\text{ATP} \longrightarrow \text{ADP} + \text{P}_i + \text{Energy} = 7.3 \text{ cal}$
- ADP – is Adenosine Di-Phosphate
- When ATP is used to do cellular work the products are ADP + P_i which must be re-converted to ATP if work is to be continued.
- These conversions are called Phosphorylations.

Energy Systems

- Phosphorylations are clustered into 3 metabolic systems to provide energy at different rates (Power) and volumes (Capacity).
- Anaerobic Alactic
- Anaerobic Lactic
- Aerobic
- **Only a small amount of ATP can be stored in the cells therefore, it must continually be re-synthesized.**

Energy Systems

- **Power** = the rate at which ATP can be produced.
- **Capacity** = the total amount of ATP that can be produced.

Energy Systems

- Hockey players use all three energy systems.
- Hockey is predominantly an Anaerobic Lactic sport (**80-90% max effort**).
- However, hockey also requires explosive power so it is an Anaerobic Alactic sport (**100% max effort**), as well.
- Hockey also uses the Aerobic system (**after 10 minutes of training 50-60% max effort**).

Energy Systems

| Energy Systems | Power Characteristics | Endurance / Capacity | Delay before Peak Power is reached | Peak Power can be maintained for about: |
|--|-----------------------|----------------------|------------------------------------|---|
| Anaerobic Alactic 100% max effort | Very High | Very Low | 0 seconds | 5-8 seconds |
| Anaerobic Lactic 80-90% max effort | High | Low | 1-2 seconds | 30-45 seconds |
| Aerobic Carbohydrates after 10 minutes of training 50-60% max effort | Moderate | Moderate | 60-90 seconds | 6-8 minutes |
| Aerobic Lipids (Fats) | Low | Very High | Several minutes | Several hours |

Energy Systems

- Anaerobic Alactic system (CP is the energy source/fuel) requires **2 steps to recreate ATP** - just add Creatine phosphate. It doesn't last long.
- Anaerobic Lactic system involves **10 steps to recreate ATP** (Glycogen is the energy source/fuel – Lactic Acid is a by-product). It is a slower system but lasts longer.
- Aerobic system (CHO, Protein & Fat are the energy source/fuel) involves a **30 step process to recreate ATP**. This is the slowest method of producing ATP but it provides an almost unlimited supply.

Energy Systems

- In hockey we use all 3 energy systems.
- It is important that we feed these systems with the right types of food/fuel.
- In order to have **explosive power** we need **Creatine Phosphate** in our system. You can get CP from eating meat. You can also supplement CP but remember that your body has a maximum threshold that it can store. If you supplement CP you will have expensive urine!
- **Glycogen** is the main source of our predominant energy system (Anaerobic Lactic). You get glycogen by eating **carbohydrates**, or when your body runs out of carbohydrates by **converting protein to carbohydrates** (this is a slow process – aerobic).
- **Your body loves fat** but it is important to **eat the right types of fat**. The Aerobic system will burn fat but again it is a slow process. **Stay away from trans-fats and saturated fats; they are extremely unhealthy!**

Energy Systems

Champions eat to train and train to win.

What you eat and how you train go hand in hand!

References

- Dr. Lynneth Wolski, PHD – level 4 module @ NCI/ICS 2008