

THE AEROBIC (*air-robic!*) PATHWAYS

- ▶ Watch this video on aerobic glycolysis: <http://ow.ly/G5dju>
- ▶ Watch this video on oxygen use: <http://ow.ly/G5dmh>

Energy System 1 – The Aerobic Use of Glucose (Glycolysis)

This energy system involves the breakdown of glucose (carbohydrate) to release energy in the presence of oxygen. The key to this energy system is that it uses OXYGEN to supply energy. Just like the anaerobic systems, there are many negatives and positives from using this pathway.

Diagram 33 below summarises the key features of this energy system.

When reading the details on the table keep in mind the differences between this and the previous systems that were looked at. In this way a perspective of their features can be appreciated and applied.

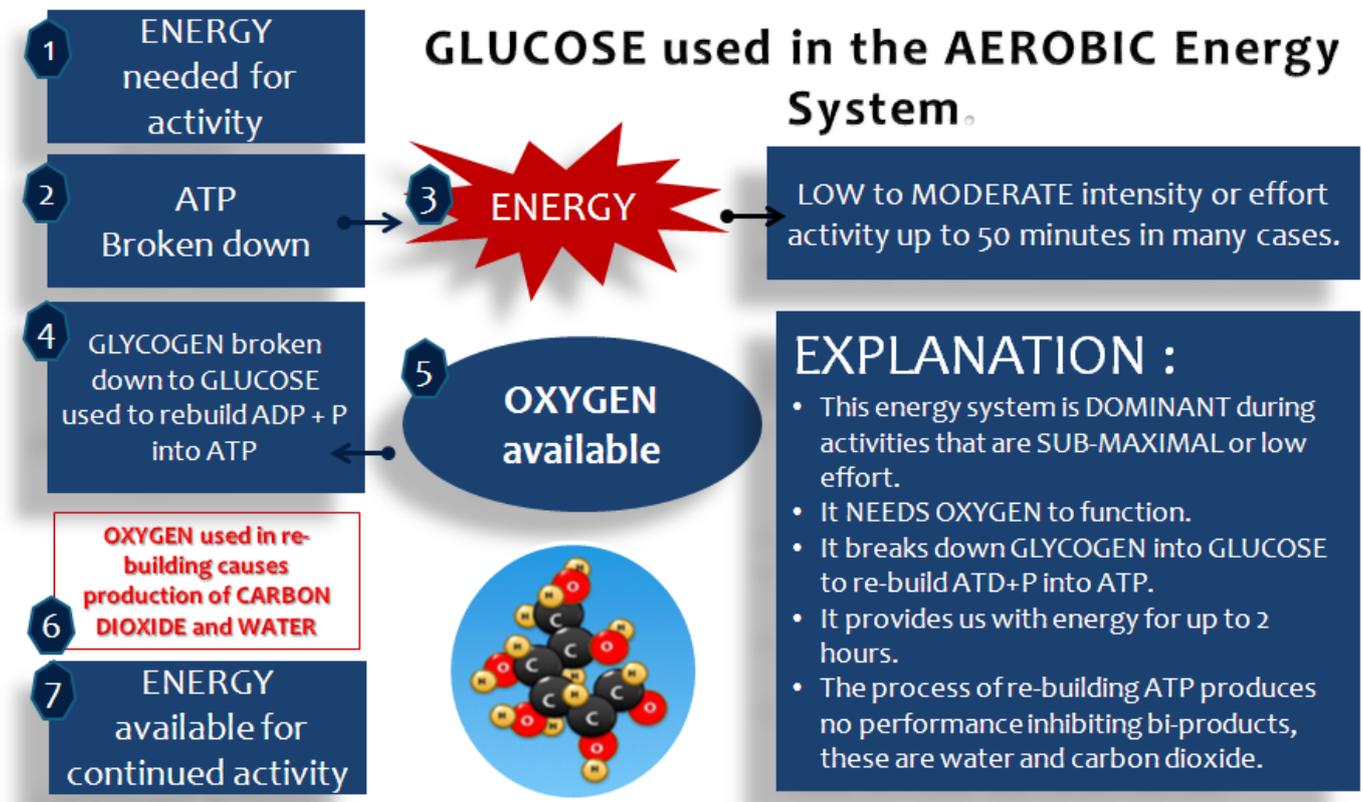


Diagram 33: The Key Features of the Aerobic Glycolytic System

Highlight 3 key features in the diagram that are important to the functioning of this system.

- 1: -----
- 2: -----
- 3: -----

Notes

Diagram 34 below lists the positives and negatives of this system.

In summary...
Aerobic Glycolysis (Carbohydrate / Glycogen / Glucose breakdown)
Energy System

Main source of energy for activities involving efforts over a long time - hours. This involves efforts of around 75-85% of maximum – depending on the fitness level of the individual.

Advantages:	:Disadvantages
<ul style="list-style-type: none"> - Provides energy for up to 2 hours. - Produces NO fatigue producing bi-products such as lactate. - Provides energy for prolonged period of time - hours. - Re-builds MORE ATP per gram of carbohydrate than its equivalent anaerobic partner. 	<ul style="list-style-type: none"> - Requires oxygen to function – and therefore energy delivery depends on the ability of the heart and lungs to do this. - Because of this is only dominant during sub-maximal efforts or activity. - Only 2 hours of carbohydrate stored in the body therefore only dominant whilst these stores are plentiful.

Examples – 42 km Marathon, 20 km Race Walk, Triathlon

Diagram 34: Advantages and disadvantages of the Aerobic Glycolysis Energy System

The critical factor as mentioned for this system is the need for oxygen in the process of energy supply. Because oxygen is needed, the activity or exercise associated with its use has to be SUB-MAXIMAL or of a low to moderate effort. This is because when activity or exercise gets too high, the supply of oxygen to the muscles by the heart and lungs can't keep up- oxygen supply can't meet the oxygen demand. If the intensity became too high the body would again turn to the anaerobic pathways for energy because they don't need oxygen for energy supply especially at the high levels needed for maximal anaerobic efforts.

Case Study – The Use of the Aerobic Glycolytic System During a Treadmill Test

The diagram below is of a student completing a continuous treadmill test. The student was required to run on the treadmill at a constant pace for a fixed period of time.

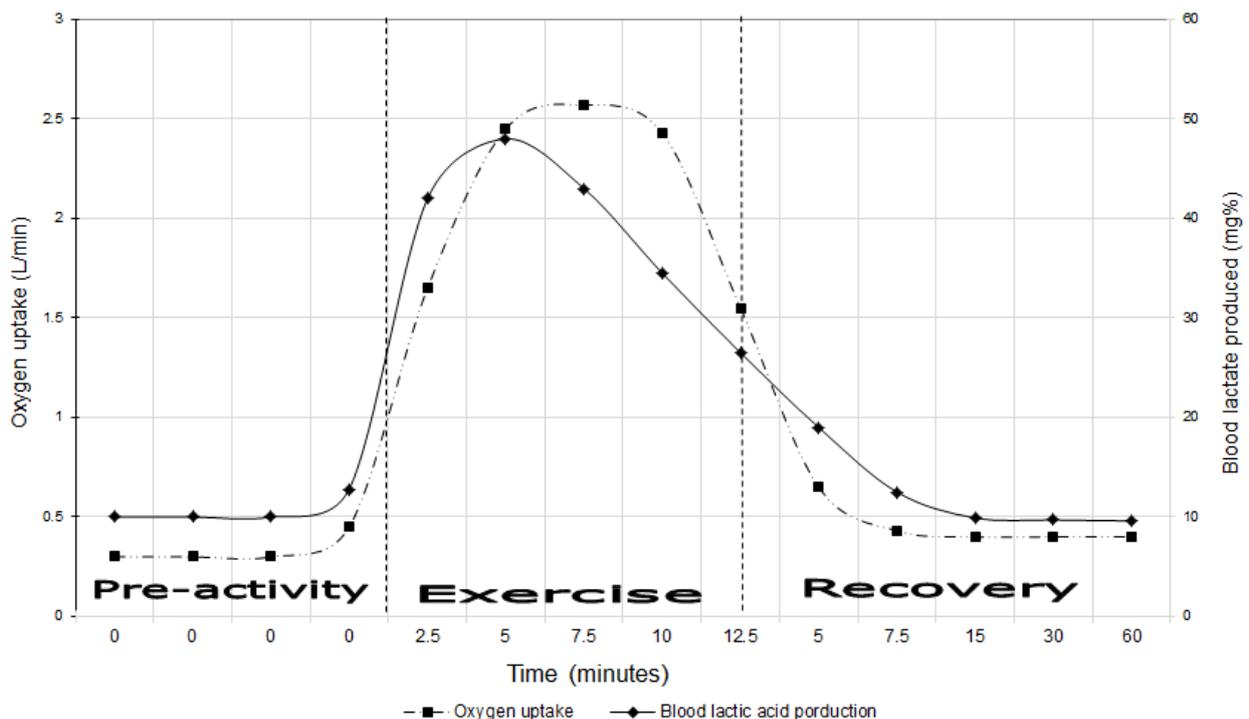


Diagram 35: Oxygen Consumption during a steady state treadmill test

Explain whether the student reached a steady state of effort.

The aerobic glycolytic energy system was dominant during this test. State 2 observations made from the data to support this.

1: -----

2: -----

Explain a reason for lactate levels rising in the early stages of the test.

During the test glucose (carbohydrate) is the dominant nutrient used for the release of energy. State two reasons for this observation.

1: -----

2: -----

The recovery process observed at the completion of the test (0-15 minutes) is commonly referred to as:

Energy System 2 – The Aerobic Use of Fat (Lipolysis).

This energy pathway involves the breakdown of fat – especially fatty acid to supply energy for work in the presence of oxygen. The key factor about this energy systems is that it too needs OXYGEN for energy release. Once again there are many negatives and positives related to its use as seen in Diagram 36 below.

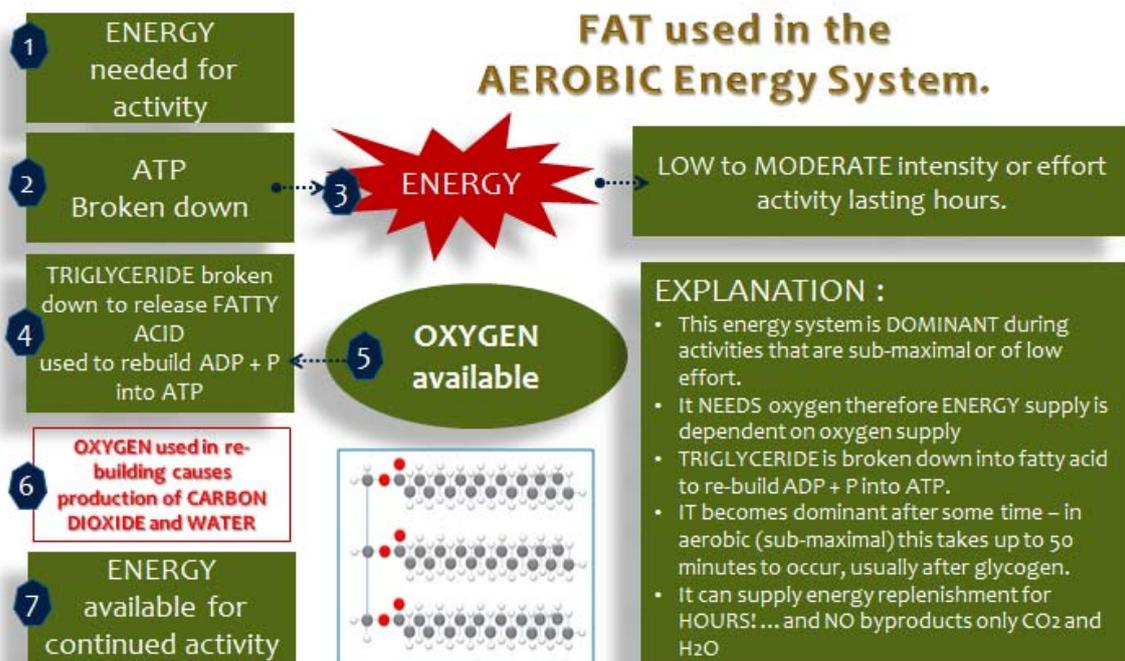


Diagram 36: The Key Features of the Aerobic Lipolysis System

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ACHPER Text page 23 Watch this video on aerobic glycolysis: <http://ow.ly/G5dfv>
Watch this video on oxygen use: <http://ow.ly/G5dmh>

Topic 3 – Key Features – The Aerobic Glycolysis System

- What are the key features – positives and negatives of this system?
- What are the fuels used – speed of energy production?

GLUCOSE used in the AEROBIC Energy System.

1 ENERGY needed for activity

2 ATP Broken down → 3 ENERGY

4 GLYCOGEN broken down to GLUCOSE used to rebuild ADP + P into ATP

5 OXYGEN available

6 OXYGEN used in re-building ATP Produces bi-products of CARBON DIOXIDE and WATER

7 ENERGY available for continued activity

LOW to MODERATE intensity or effort activity up to 50 minutes in many cases.

EXPLANATION :

- This energy system is DOMINANT during sub-maximal activity (up to 50 minutes but can be shorter in fitter athletes)
- It NEEDS oxygen therefore ENERGY supply is SLOWER.
- GLUCOSE is a chemical used to release energy – It is stored there.
- It needs to breakdown glycogen to glucose which requires 1 molecule of ATP to do.
- The bi-products of energy release are carbon dioxide and water.

- Highlight 3 key features in the diagram that are important to the functioning of this system.

Answer = Requires OXYGEN.

Is dominant during sub-maximal activity especially up to 50 minutes in longer activities.

Uses glucose (glycogen) in the process of energy supply.

Key Concept 1: Sources of Energy Affecting Physical Performance Topic 3

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Case Study – The Aerobic Glycolytic (Glycolysis) System During a Treadmill Test

The diagram below is of a student completing a continuous treadmill test. The student was required to run on the treadmill at a constant pace for a fixed period of time.

- Explain whether the student reached a steady state of effort.

Answer = Yes they did as oxygen consumption between 2.5 and 10 minutes remained fairly constant. This is well over 7.5 minutes.

Time (minutes)	Oxygen uptake (L/min)	Blood lactate production (mg%)
0	0.0	0.0
2.5	0.0	0.0
5	2.5	4.0
7.5	2.5	5.0
10	2.5	4.0
12.5	2.0	2.0
15	1.0	1.0
30	0.0	0.0
60	0.0	0.0

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Case Study – The Aerobic Glycolytic (Glycolysis) System During a Treadmill Test

The diagram below is of a student completing a continuous treadmill test. The student was required to run on the treadmill at a constant pace for a fixed period of time.

- The aerobic energy system was dominant during this test. State 2 observations made from the data to support this.

Answer =

- The activity took some 10 minutes to complete – far too long for the athlete to function anaerobically.
- Steady state was reached during minutes 2.5 to 10.
- Lactate although built up early due to oxygen deficit reduces from the 5th minute indicating enough oxygen was available to break it down.

Blood lactate levels were low – just below 50% mg and around 25% when activity stopped. This indicates plenty of oxygen available – intensity was therefore LOW and therefore AEROBIC. (We were asked for 2 BUT provided more!)

Key Concept 1: Sources of Energy Affecting Physical Performance Topic 3

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Case Study – The Aerobic Glycolytic (Glycolysis) System During a Treadmill Test

The diagram below is of a student completing a continuous treadmill test. The student was required to run on the treadmill at a constant pace for a fixed period of time.

- Explain a reason for lactic acid levels rising in the early stages of the test.

Answer = Oxygen deficit – the aerobic systems take time before they are dominant contributors because it takes time for oxygen to be delivered and glycogen to be broken down into glucose.

- During the test glucose (carbohydrate) is the dominant nutrient used for the release of energy. State two reasons for this observation.

Answer = The activity goes for 10 minutes at sub-maximal level. This is too short for fat to be mobilised as a dominant energy source in this time. Fat does provide some energy BUT carbohydrate given the intensity and duration of the test is the dominant nutrient.

- The recovery process observed at the completion of the test (0-15 minutes) is commonly referred to as:

Answer = EPOC – Excess Post Exercise Oxygen Consumption.

Key Concept 1: Sources of Energy Affecting Physical Performance Topic 3

Topic 3 – Key Features - The Aerobic Use of Fat (Lipolysis)

- What are the key features – positives and negatives of this system?
- What fuels are used – speed of energy production?
- The key features of this system can be summarised as follows:

