

RESEARCH ON THE pH EVOLUTION OF MEAT HARVESTED FROM HARES

Gabriela Tărnăuceanu (Frunză)¹, Roxana Lazăr¹, O. Ionescu², P.C. Boișteanu¹

¹„Ion Ionescu de la Brad” University of Agricultural Sciences and Veterinary Medicine – Iași, Faculty of Animal Husbandry
²University Transilvania-Brașov, Faculty of Silviculture and Forestry
 e-mail: tarnauceanu.gabriela@yahoo.com

Knowing the acidity development in muscle during the period after slaughter, to its maturation, is of particular importance because this parameter has direct links with the sensory characteristics of meat (tenderness, consistency, aroma) and influences the water holding capacity and suitability of meat in storage. It is known that the game has a higher amount of connective tissue mainly due to the intense activity, that is why the meat has an elastic consistency which is maintained for a longer period (which is why matures, tenderizing required). The purpose of this paper is to monitorize pH changes in hares meat and correlate the obtained values with the need of knowing the proper time for processing, preparation and consumption. We determined the pH evolution of hare meat after slaughter, during maturation, to autolysis and altered it from a total of 25 individuals (13 males and 12 females).

Keywords: evolution, meat, hares, males, females

INTRODUCTION

To appreciate the freshness of meat it is currently being used pH evaluation which is usually slightly acidic (values from 5,5 to 6), tending to shift to alkaline (over 6,7), together with the changes occurring in its maturation [5].

Acidity is the concentration of organic acids in meat, including acidic substances and is expressed most often by pH [6]. As a result of the accumulation of lactic acid and protons H⁺ formed during glycolysis, pH of meat decreases throughout the muscle rigidity. After slaughter pH evolution is characterized by the decreasing speed of the pH and its magnitude. PH decrease speed is directly proportional to ATP hydrolysis speed, respectively with the ATP activity of muscle. This applies to the activity of myosin ATP-ase, there is also a mitochondrial ATP-ase, ATP-ase of the RSL (longitudinal reticulum sarcoplasmic) and cytoplasmic ATP-ase [3].

To ensure the animal protein need, man hunted and managed to tame a rather small number of species, including rabbits [2]. Rabbits and hares because of its superior capacity over other species of production and

reproduction, can make an important contribution in the global struggle to increase the animal protein source [1].

Some authors have shown the importance of controlled hunting by referring to the high potential of hare meat (*Lepus Europaeus Pallas*) in today's human diet [2].

MATERIAL ȘI METHOD

Biological material was composed of a total of 25 hares (13 males and 12 females) alive harvested and subjected to rest for 24 hours before slaughter. Different muscle groups were harvested (*Longissimus dorsi* muscles, *brachial triceps* muscle, *biceps femoris* muscle, *Semitendinos* muscle, *psaos major and minor*, *cervicalis* muscle, *intercostalis* muscle together with the main internal organs (heart, liver, kidney) to determine their pH evolution. Hares had an average age of 1,5 years and have been brought from the hunting fund Iași and Suceava. After harvest, samples were chilled to reach a constant temperature of +2⁰C in the thermal point. In the period studied (from slaughter to perfection maturation) Hanna Digital pH meter was used to measure the

meat acidity, which effectuates an automatic readout of the pH and temperature.

Measurement is performed by calibrating the pH meter with two standard solutions of known pH. After balancing the device, the electrode is inserted in previously prepared meat broth and the pH reading is achieved. Meat broth was prepared by adding 10 g of a finely chopped sample in 100 ml distilled water, boiling for 15 minutes and then filtering the mixture.

RESULTS AND DISCUSSION

PH evolution after slaughter may indicate suitability for preservation, processing, preparation and can induce the appropriate destination of the meat.

Stress is accompanied by muscle contractions, which helps to speed up the ATP hydrolysis in muscle, gradually falling in anaerobiosis, increasing the acidification speed. This phenomenon is clearly observed in hares.

At 30 minutes after slaughter the pH of the meat varies, depending primarily on the

type of muscle from which the sample (the lowest pH level meeting in *longissimus dorsi* muscle, *psoas* and *biceps femoris*, to cervical muscle and intercostal muscles that have found higher values of pH) and varies slightly depending on age and sex.

Evolution of pH meat of hares was monitored over a total of 18 days from slaughter.

Evolution of pH in the psoas muscles (Fig. 1) showed a steady constant until day 9, from an average pH value of $5,843 \pm 0,09$ at 24 hours of slaughter, reaching $6,21 \pm 0,06$ on day 10. Then there is a slight stagnation on day 14 and 15 followed by a rapid increase from day 16.

PH evolution in the intercostal muscles (Fig. 2) showed a mild ascending by day 5 (average values $6,48 \pm 0,02$), after what decreases until $6,3 \pm 0,01$ on day 6 and 8. From day 9 has been a clear increase in average values of pH, maintaining it relatively constant (being more pronounced for male meat) by day 18.

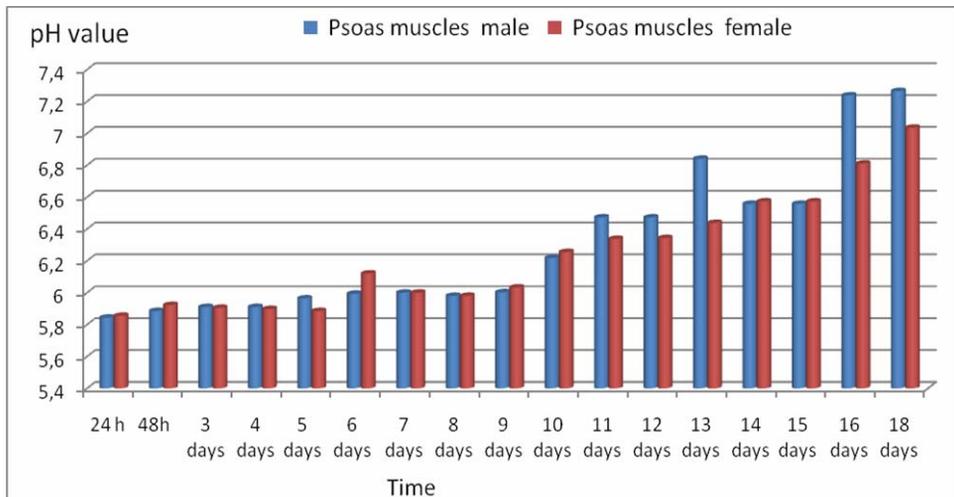


Fig 1. pH evolution in psoas muscle

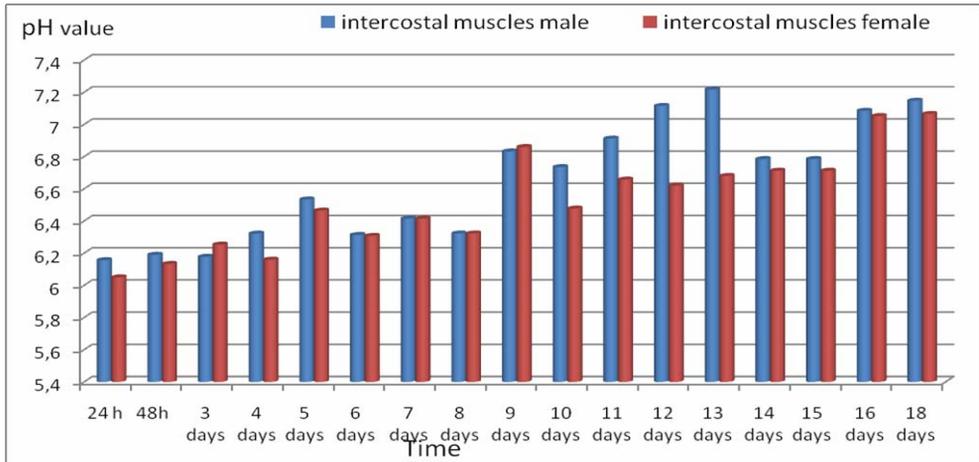


Fig 2. pH evolution to intercostalis muscle

In male neck muscles (Fig. 3) have been observed higher average values of pH. Until day 7 has been a relatively steady pH increase up to $6,41 \pm 0,02$, then a decrease,

reaching on day 8 average values of $6,25 \pm 0,01$; from day 9 pH evolution is predominantly increasing, higher values being observed for males.

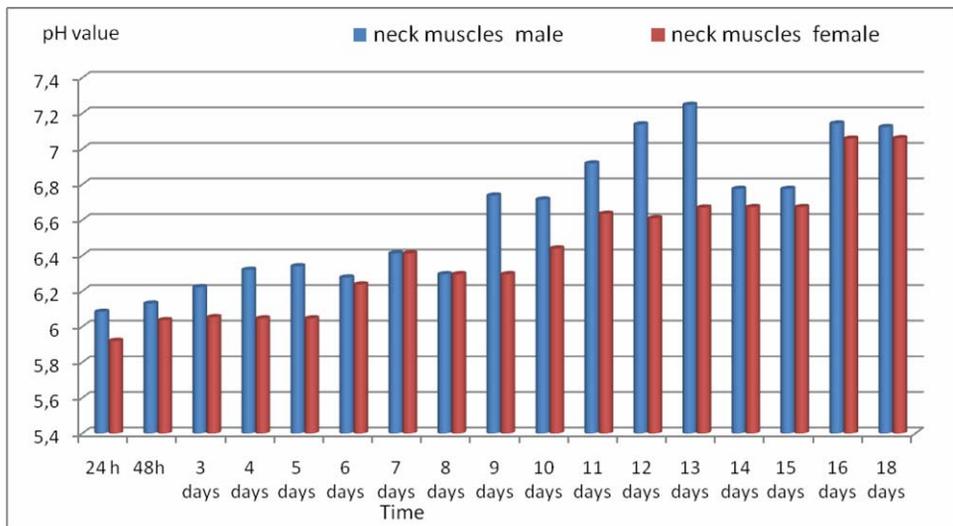


Fig 3. pH evolution to cervicalis muscle

Evolution of pH in *longissimus dorsi* muscles (Fig. 4) followed a steadily upward course until day 8, where there is a slight

decrease to average values of $5,89 \pm 0,06$ and then follows a fluctuating course, mostly upward until the end (day no. 18).

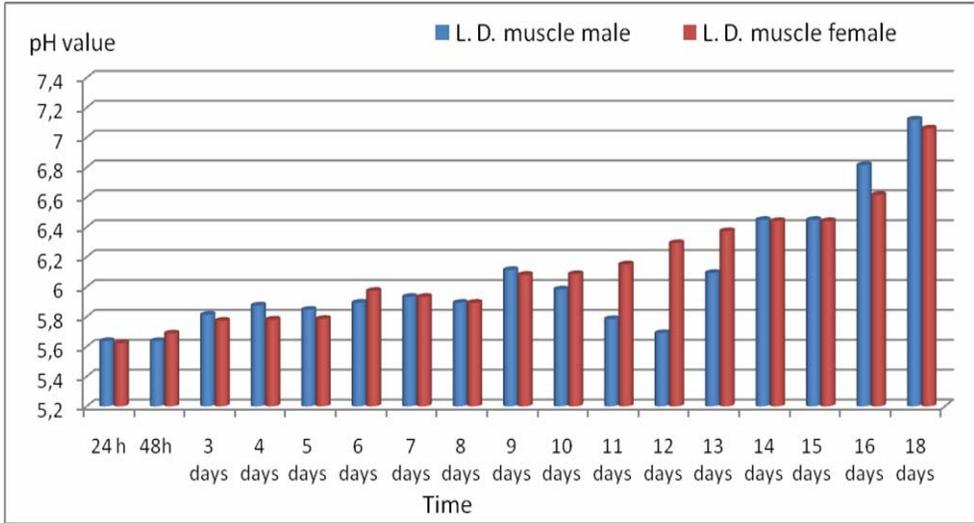


Fig 4. pH evolution to *Longissimus Dorsi* muscle

In *semitendinosus* muscles (Fig. 5) it is observed a predominantly upward change until day 9, where there is an obvious decrease (from average values of $5,96 \pm 0,05$

on day 8, to averages of $5,64 \pm 0,03$ on day 9), then there is a clear increase in average values of pH until alteration (day no. 18).

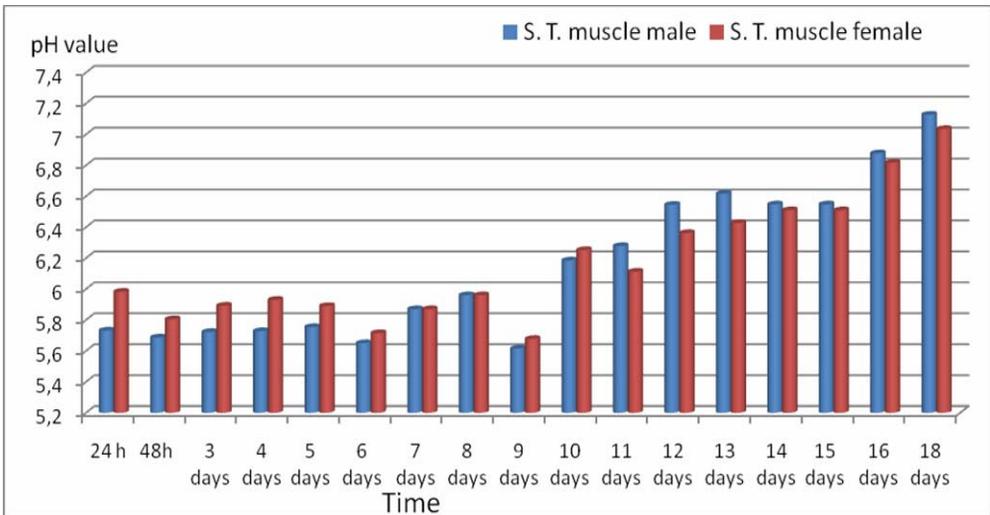


Fig 5. pH evolution to *Semitendinosus.* muscle

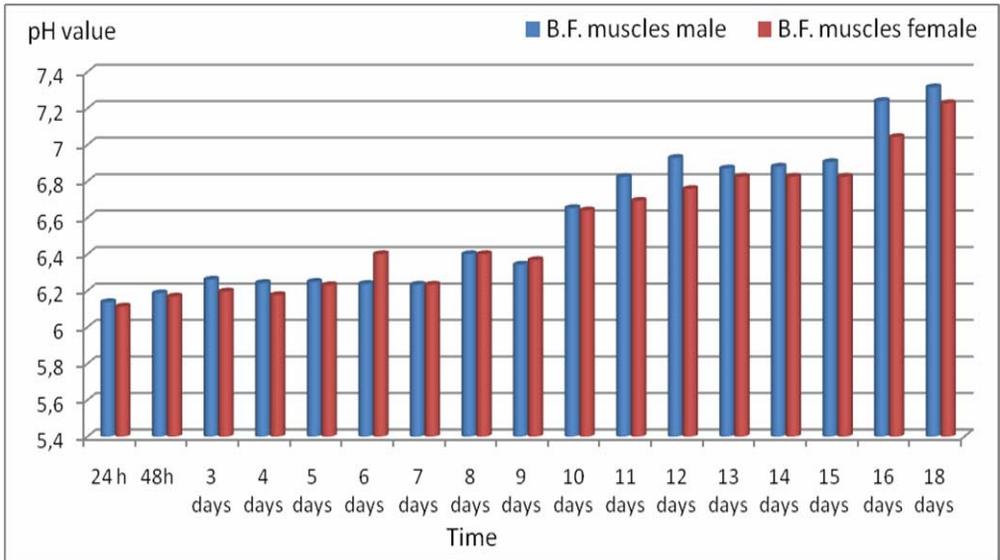


Fig 6. pH evolution to *biceps femoris* muscle

The *biceps femoris* muscles (Fig. 6) show a slightly steady increase in average values of pH by day 9, when decreases to $6,35 \pm 0,05$ and then increases again on day 10, reaching values of $6,65 \pm 0,04$ and over $7,14 \pm 0,05$ on day 18.

The same fluctuating evolution with similar pH values is observed in *triceps brachii* muscles (Fig. 7), showing a decrease until the average values of $6,07 \pm 0,06$ on day 7; from day 8 an increasing pH evolution is highlighted, higher values recorded in males.

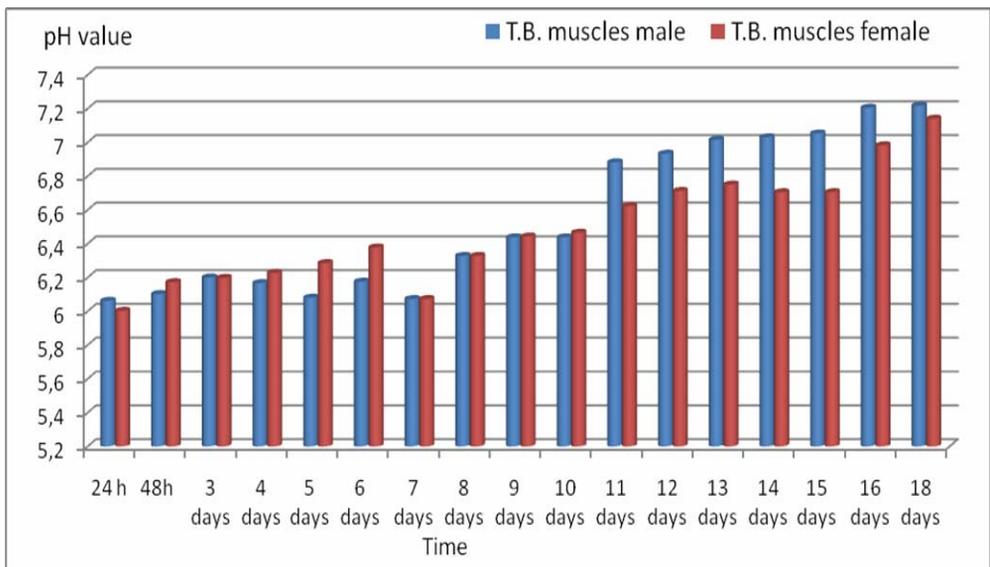


Fig 7. pH evolution to *triceps brachii* muscle

Offal (heart, liver, kidney) shows a similar fluctuating pH values evolution to increasing average values until day 9 and 10,

when they decrease, then increasing again until alteration (Fig. 8, Fig. 9, fig. 10).

For the heart there is an increasing, relatively steady pH evolution until day 9; day 10 shows a clear decrease of the pH value (from an average value of $6,87 \pm 0,12$ on day no. 9, the average value (from $6,87 \pm 0,12$ on day 9

until $6,63 \pm 0,10$ on day 10), then the evolution is predominantly upward until day 18, when it is altered, with higher values for males.

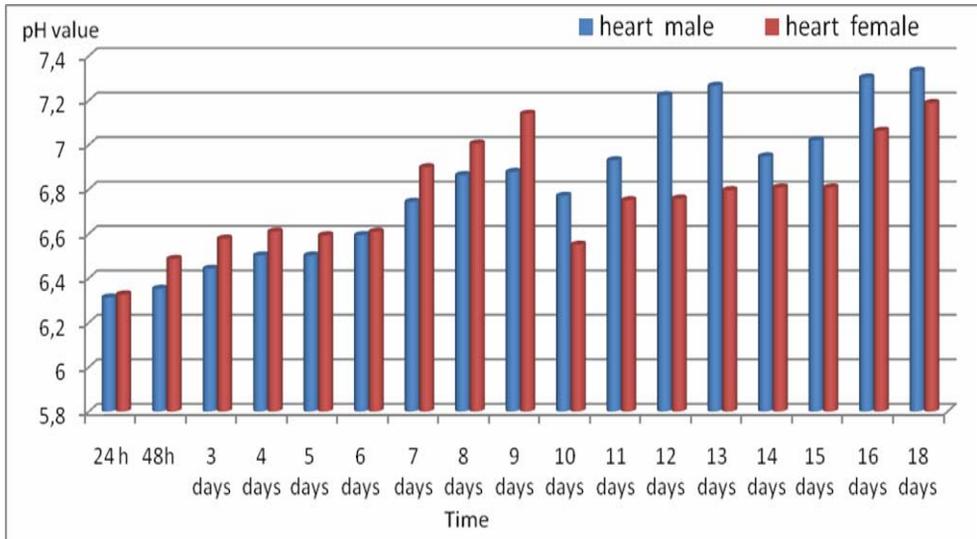


Fig 8. pH evolution of heart

Liver (Fig. 9) shows a clear decrease in average values of pH by day 9 (average values of 6.16 ± 0.16), than on day 8 (average values of 6.37 ± 0.11) and for day 10 (average values of 6.40 ± 0.09). From day 11 has been observed a mostly increasing evolution in average values of pH by day 18 reaching higher values than 7.15.

Kidney (Fig. 10) shows a decrease in average values of pH by day 10 (from average values of 6.87 ± 0.07 on day 9, to average values of 6.69 ± 0.08 on day 10, and on day 11, reaching average values of 6.74 ± 0.01), then evolution is steadily increasing until day 18, when exceeds the average value of 7.2.

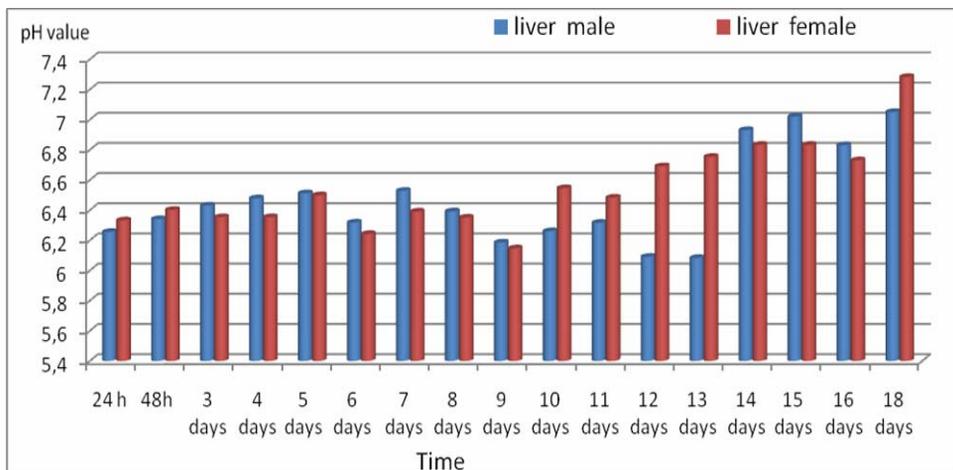


Fig 9. pH evolution of liver

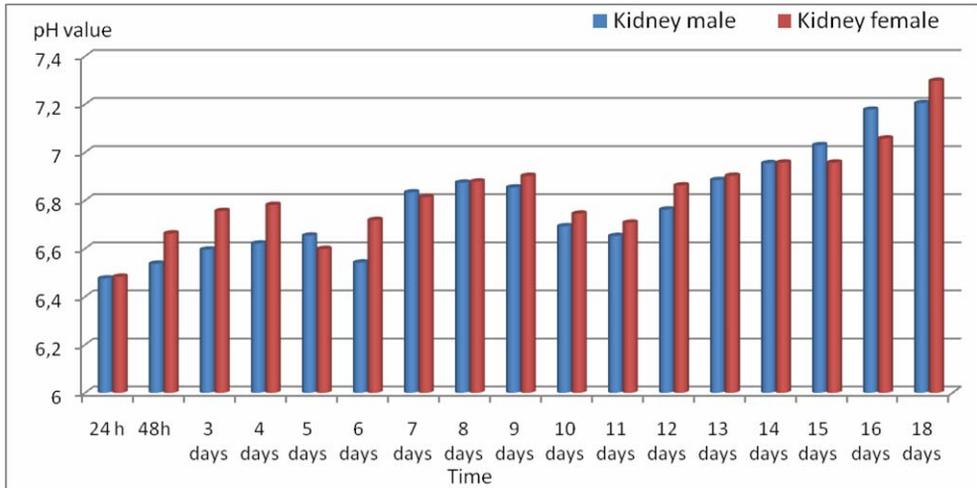


Fig 10. pH evolution of kidney

24 hours after slaughter the average values of pH hare meat is between 5,51-5,89 for the main muscle groups and the main organs have higher average values: 6,32 in the heart, 6,36 in the liver and 6,53 in the kidney.

CONCLUSIONS

The following research shows that in muscles containing white fibres and glycolitic metabolism stiffness occurs faster than in muscles containing red fibers and oxidative metabolism. Having a great glycolitic potential and ATP activity it can be explained why fast-white muscles have a dominant glycolitic metabolism, low pH values and a decreasing speed of pH higher than in red-slow muscles with a predominantly oxidative metabolism.

After slaughter meat storage temperature influences the decreasing speed of pH.

Muscles with low glycolitic potential (red-slow muscles) will be more affected by stress than red-fast muscles, which have great glycolitic potential.

The most affected muscles by stress will be white-fast muscles, which have great

glycolitic potential, but the path of ATP recovery will be short term anaerobic glycolysis.

Hares meat is a red meat with a rich nutritional value, due to high content of protein, vitamins, minerals and low fat content.

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