



INTRODUCTION

Donkeys belong to the equine family.

Donkeys milk has been used throughout history for its therapeutic properties and its rich composition.

As with most milk, composition includes vitamins, minerals, proteins and fatty acids.

In the following presentation we will demonstrate how the composition of Donkey Milk differs from other milks and why it is most comparable to Human Milk and how it benefits the Human body and its immune.

Studies have shown that Donkey Milk regulates the gastrointestinal flora, prevents inflammatory disease and modulates the human immune!

The whey protein fraction plays a major role in functional and nutritional effects.

The active proteins and peptides of Donkey Milk provide benefits in various fields.

Lysozyme and Donkey Milk

- Lysozyme is a whey protein
- It is dominant in Donkey Milk and a compact protein of 129 amino acids
- Donkey Milk has a higher content of lysozyme than all other milks
- Goat and Cow milk have only traces of lysozyme which deem it almost absent
- High content of lysozyme may be responsible for the low bacterial concentration in Donkey Milk
- Lysozymes accelerate the breakdown of certain carbohydrates found in cell walls of certain bacteria
- As such, lysozymes act as a part of the body's defense system against bacteria

Lysozyme and Donkey Milk

- Immunoglobulins (any class of proteins present in the serum and cells of the immune system which function as antibodies) in synergy with lysozyme contribute to the inhibition of bacterial growth. In addition to this some fatty acids such as linoleic acid, lauric acid and oleic acid when acting synergistically with lysozyme show antibacterial activity against bacteria.
- Lysozyme is used in the food industry due to its stability and resistance to various technological processes such as thermic treatment and to digestive tract conditions such as acid PH and gastrointestinal enzymes.

Lactoferrin in Donkey Milk

- Lactoferrin is also a whey protein found in Donkey Milk as well as other milks
- An iron binding protein that displays many biological functions, regulation of iron homeostasis, cellular growth, antimicrobial and antiviral functions and protection against cancer development and metastasis
- It controls the proper composition of intestinal microflora suppressing the growth of pathogenic and promoting the multiplication of non-pathogenic Lactobacillus (friendly bacteria which helps to break down food) and Bifidobacterium (group of bacteria called probiotics found in our stomach and intestines).
- Lactoferrin protects the intestinal epithelium
- Epithelium cells that line the intestinal lumen and perform the primary functions of digestion, water and nutrient absorption also forming a barrier against luminal pathogens
- Proline-rich polypeptide derived from Lactoferrin promotes T-cell maturation and inhibition of auto-immune disorders
- These substances are, able to modulate in different ways, mononuclear cell function (major cells in the human immune system) also enhancing the gut and its functions

Lysozyme, Lactoferrin and Donkey Milk

- Lysozyme together with Lactoferrin host a defense for antimicrobial proteins
- The content of Lysozyme and Lactoferrin enhances antibacterial activity hence contributing to host protection in the case of infections
- Antibacterial activity of Donkey Milk is explained by two mechanisms;
 1. Specific Structure of Lysozyme of Donkey Milk enables binding to calcium ions which improve its activity against bacteria.
 2. The synergistic activity of lysozyme and lactoferrin allows lactoferrin to bind to membrane proteins of bacteria disrupting the membrane and opening the pores to lysozyme which allows it to destroy the glycosidic linkage of peptidoglycans (bacterial cell wall).



CONCLUSION

Lysozyme being a common protein between both Donkey and Human milks and the synergistic activity between Lysozyme & Lactoferrin and Lysozyme & immunoglobulins and fatty acids as has been outlined, places Donkey Milk in a stand out unique position when combating bacteria and stimulating the human immune system.

In addition to its antibacterial activity, Donkey Milk and its whey proteins have been tested for antiviral activity, through this demonstrating the ability to inhibit the replication of Echovirus type 5 which is an enterovirus affecting the human gastrointestinal tract. This activity is due to high molecular weight whey proteins such as lysozyme lactoferrin lactoperoxidase and immunoglobulin.

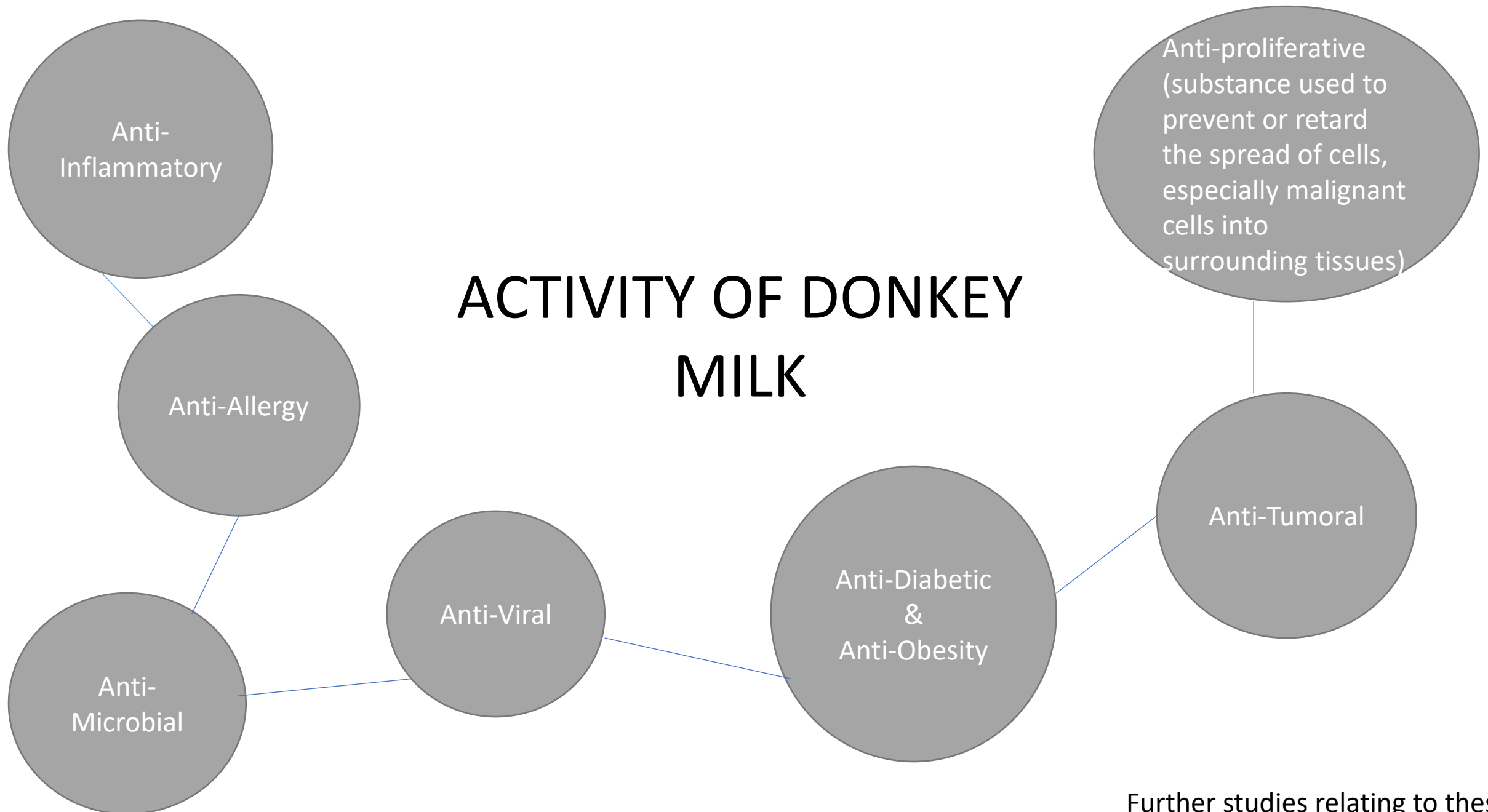


CONCLUSION

Donkey Milk has also been tested and found to be effective against fungal strains which are pathogenic for humans such as *Escherichia Coli*, *Salmonella enteritidis*, *Listeria monocytogene*, *Staphylococcus aureus*, *Bacillus cereus*, *Enterococcus faecalis*, *Shigella dysenteria*.

Antiviral activity of Donkey Milk has also been identified against two dermatomycotic fungus – *Trichophyton rubrum* and *Trichophyton mentagrophytes* which are the main cause of inflammatory *tinea corporis*.

The antimicrobial factors – lysozyme, lactoperoxydase and lactoferrin although are found in different milks their quantities differ considerably which impact the benefits. As an example the Lysozyme content in Donkey Milk and Human Milk is substantially higher than that of camel, cow and goat milks, where only traces are found.



Further studies relating to these activities will follow.