Significance of circadian rhythm, immunoglobulins, amino acid, lipids, mt-DNA and histone in autophagy of hepatocytes

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Abstract
Autophagy is found in all types of eukaryotic cells. It is normal process and maintains cellular homeostasis. In a different type of cells through encapsulation of damaged proteins or organelles into double membrane vesicles, it serves as active recycling system makes new building blocks and provides energy for cellular renovation and homeostasis. There are findings of autophagy in physiobiochemical and pathological processes. Autophagy is not only essential for homeostatic functions but also implicated in some diseases such as viral hepatitis and alcoholic hepatitis. Here it is summarized the physiobiochemical mechanism of autophagy and its role in different liver diseases.

Keywords: Autophagy, mt DNA, Histone, Apoptosis, Carcadian Rythm, Homeostasis & Mitophagy.

Introduction

Autophagy is consumption of the body's own tissue as a metabolic process is starvation and certain diseases. The process of starvation-induced autophagy was recently the focus of extensive research. The autophagy is a critical process for normal physiological events, which allows the lysosomal turnover of cellular energy metabolites, including degradation of intracellular organelles and specific proteins.[2] The dynamic recycling process, plays a vital role in the renovation and homeostasis of cells. The programmed cell death (PCD) pathway, such as apoptosis and regulated necrosis also play a vital role in normal cell renewing and homeostasis of the tissue.[3]

Autophagy is greatly induced during starvation or under other highly stressful conditions, leading to a rapidly increased number of autophagosomes. As a catabolic process, autophagy plays a key role in the maintenance of hepatocellular homeostasis. In the present study, it is observed that in autophagy of amino acid and lipids are increased when cells are starved. Moreover, reactive oxygen species (ROS) lead to mutations in mitochondrial DNA (mt DNA) that lacks histones and mitochondria have limited DNA repair capacity compared with the nucleus making mt DNA more vulnerable to oxidative damage. The damaged or mutated mt DNA would be degraded by mitophagy. Therefore, mitophagy is necessary for keeping hepatocellular homeostasis. Beside this mitophagy has effect on the regulation of apoptosis, circadian rhythm and immune response.[4]

Materials and Methods

A total number of (two hundred and fifty) 250 positive cases of liver diseases and 300 (three hundred) healthy controls have been taken from the department of gastroenterology, Owaisi Hospital & Research Centre (a Teaching Hospital to Deccan College of Medial Sciences) their physiological and biochemical parameters were measured.

Table: 1. Comparison of immunoglobulin in autophagy of hepatocytes with controls

Tests	Patients	Controls	P value
IgA (mg/dl) 80-350	614	92 – 503	< 0.001
IgG (mg/dl) 60-160	2018	680 – 18187	< 0.001
IgM (mg/dl) 40-250	456	44 - 375	< 0.001

Table: 2. Comparison of amino acid, lipid and histone in autophagy of hepatocytes with controls

Tests	Patients	Controls	P value
Amino Acid (mmol/L) 7.6-152	25	7.6 – 15.0	< 0.001
LIPIDTriglycerides (mg/dl)<150	266	100 – 200	< 0.001
Histone(units)<1.0	2.5	0.2 – 1.5	< 0.001

Cardiac rhythm in autophagy

Autophagy is activated rhythmically in a clock dependent manner; autophagy can affect circadian rhythm by degrading circadian proteins.[5]

Immune responses in autophagy

Autophagy acts as an immune effect that mediates pathogens clearance. The role of autophagy bridges both the innate and adaptive immune systems and includes functions in thymic selection, antigen presentation, promotion of lymphocyte homeostasis and survival and regulation of cytokine production.[6]

Conclusion

Autoghay maintains cellular homestatis and also the normal functions of cell and tissue.[7-8] To maintain cellular homeostasis and normal functions of tissues, cells routinely renew their components through specific process autophagy. In this review, we summarized various physiological and biochemical functions of autophagy in the liver. Moreover,

reactive oxygen species (ROS) can lead to mutations in mitochondria DNA (mt DNA) that lack's histones and mitochondria have limited DNA repair capacity compared with the nucleus,, marking mt DNA more vulnerable to oxidative damage. The damaged or mt DNA would be degraded by mitophagy. Therefore mitophagy is necessary for keeping hepatocellular homeostasis.[9-10]

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Conflict of Interest
None.

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