شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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قسم

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HANAA ALY

Effect of Kefir Extract against Sodium Hydroxide Induced Corrosive Esophageal Injury in Adult Male Albino Rats

Thesis

Submitted for Partial Fulfillment of Master's Degree
in **Anatomy and Embryology**

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2021

سورة البقرة الآية: ٣٢

Acknowledgments

First and foremost, I feel always indebted to ***Allah*** *the Most Beneficent and Merciful.*

I'd like to express my respectful thanks and profound gratitude to ***Prof. Dr.Hemmat Abd El Kader Abd El Hamied,*** *Professor and Head of Anatomy and Embryology, Faculty of Medicine, Ain shams University for her keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am deeply thankful to ***Prof. Dr. Youssef Shoukry Abdel Aal,*** *Professor of Anatomy and Embryology, Faculty of Medicine, Ain shams University, for his great help, active participation and guidance.*

I wish to introduce my deep respect and thanks to ***Dr. Noha Mohamed Gaber,*** *Lecturer of Anatomy and Embryology, Faculty of Medicine, Ain shams University, for her kindness, supervision and cooperation in this work.*

I would like to express my hearty thanks to all ***my family*** *for their support till this work was completed.*

Words fail to express my respect and appreciation to ***my husband Eng. Samir*** *for his unlimited help and support.*

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List of Abbreviations

Abb.	Full term
ASU	*Ain Shams University*
CARE	*Committee of Animal Research Ethics*
CT	*Computed tomography*
EUS	*Endoscopic ultrasound*
GERD	*Gastroesophageal reflux disease*
GIT	*Gastrointestinal tract*
H & E	*Hematoxylin and Eosin*
IL-6	*Interleukin-6*
LAB	*Lactic acid bacteria*
MAP	*Mitogen-activated protein*
MASRI	*Medical Ain Shams Research institute*
MRC	*Medical Research Centre*
MRI	*Magnetic resonance imaging*
NaOH	*Sodium hydroxide*
NF-kB	*Nuclear factor kappa light chain enhancer of activated B cells*
SEM	*Scanning electron microscopy*
TNF	*Tumor necrosis factor*

INTRODUCTION

The esophagus is a muscular tube, 25 cm long in the adult, that connects the pharynx to the stomach. Corrosive esophageal injury is an important problem specially in the pediatric age group.

Approximately 90% of these injuries are caused by alkaline substances such as potassium and sodium hydroxide. Ingestion of caustic agents can cause a wide range of injuries changing from mild esophagitis to fatal hollow viscus perforation. Alkaline substances are usually associated with liquefaction necrosis in esophageal mucosa. If they penetrate deep into the muscular layers, serious injury is inevitable ***(Janousek et al., 2006).***

Sodium hydroxide **(NaOH)** is one of the most commonly used laboratory and industrial chemicals. Sodium hydroxide is corrosive to all body tissues; concentrated vapors cause serious damage to the eyes and respiratory system. Ingestion of sodium hydroxide, which occurs frequently in children, can cause severe necrosis, with stricture of the esophagus and death. Contact with the skin can result in dermatitis, loss of hair, and necrosis due to irritation ***(Kurt and Bittner, 2000)***.

Kefir extract is the product of fermentation of milk with kefir grains ***(Altay et al., 2013)***.Kefir grains look like pieces of coral or small clumps of cauliflower, which contain a complex

mixture of both bacteria (including various species of lactobacilli, lactococci, leuconostocs and acetobacteria) and yeasts (both lactose-fermenting and non-lactose-fermenting) such that beneficial yeast as well as friendly probiotic bacteria found in yogurt ***(Simova et al., 2002)***. Kefir grains are added to different types of milk. It can be made from any type of milk; cow, goat or sheep, but commonly cow milk is used. The fermentation of kefir grains results in numerous components including lactic acid, acetic acid, alcohol (ethyl 2 alcohol) and aromatic compounds. That provides kefir's unique organoleptic characteristics: fizzy, acid taste, tart and refreshing flavor. Kefir contains vitamins, minerals and essential amino acids that help the body with healing and maintenance functions and also contains easily digestible complete proteins. The benefits of consuming kefir in the diet are numerous. Kefir has frequently been claimed to be effective against a variety of complaints and diseases ***(Lin and Change, 2000)***.

Many studies have demonstrated that kefir has antibacterial, antifungal and immunomodulator properties. Although several drugs have been used in the treatment of corrosive esophagitis ***(Vinderola et al., 2005)***, Kefir has not been used for this purpose until now. We evaluated the effects of kefir in corrosive esophagitis in this experimental study.

Aim of the Work

The aim of the present work is to investigate the possible curative role of kefir on the structure of esophageal mucosa when injured after corrosive agent in adult male albino rat.

REVIEW OF LITERATURE

Anatomy and Histology of the Esophagus in Humans

The esophagus is a muscular tube, 25 cm long in the adult, that connects the pharynx to the stomach. Between swallows the esophagus is collapsed but the lumen can distend to approximately 2cm in the anterior-posterior dimension and up to 3 cm laterally to accommodate a swallowed bolus. The esophagus descends anterior to the vertebral column through the superior and posterior mediastinum. After traversing the diaphragm at the diaphragmatic hiatus (T10 vertebral level) the esophagus extends to end at the orifice of the cardia of the stomach (T11 vertebral level)**.** Topographically, there are three distinct regions: cervical, thoracic, and abdominal ***(Ong and Orlando, 2002)***.

The wall of the esophagus consists of four layers: mucosa, submucosa, muscularis propria, and adventitia. Unlike other areas of the gastrointestinal tract (GIT), the esophagus does not have a distinct serosal covering. This allows esophageal tumors to spread more easily and makes them harder to treat surgically ***(Boyce and Boyce, 2003).***

The four layers of the esophagus are:

- ***Mucosa:*** The mucosa is thick and reddish cranially and more pale caudally. It is arranged in longitudinal folds that disappear upon distention. It consists of three sublayers:

  - ✓ ***Mucous membrane****:* A nonkeratinized stratified squamous epithelium. It covers the entire inner surface of the esophagus, except the lower esophageal sphincter, where both squamous and columnar epithelium may coexist.

  - ✓ ***Lamina propria:*** A thin layer of connective tissue

  - ✓ ***Muscularis mucosae:*** A thin layer of longitudinally, irregularly arranged smooth muscle fibers. The muscularis mucosae extends through the entire esophagus and continues into the rest of the gastrointestinal tract, being much thinner in the proximal part of the esophagus than in its distal part. At the pharyngeal end of the esophagus, the muscularis mucosae is represented by a few scattered smooth muscle fibers. Caudally, approaching the cardiac orifice, it forms a thick layer **(*Christensen et al., 1983).***

- ***Submucosa:*** The submucosa contains connective tissue as well as lymphocytes, plasma cells, a collection of autonomic fibers and ganglion cells (Meissner's plexus), vascular network (Heller plexus), and mucous glands ***(Long and Orlando, 1999).***

- ***Muscularis Propria:*** The upper third of muscularis propria is composed exclusively of striated (skeletal) muscle, and the lower third is composed of smooth muscle. In between there is a mixture of both, called the transition zone ***(Ghosh et al., 2006).***

- ***Adventitia:*** It is an external fibrous layer that covers the esophagus, connecting it with neighboring structures. It is composed of loose connective tissue and contains small vessels, lymphatic channels, and nerve fibers ***(Ghosh et al., 2006).***

Anatomy and Histology of the Esophagus in Rats

The esophagus runs from the pharynx to the stomach and can be divided into cervical, thoracic and abdominal parts. In rats, the esophagus is between 70 and 80 mm in length.

The esophagus is a straight tube that lies dorsal to the larynx in the cervical region, traverses the thorax posterior to the trachea, and passes through the esophageal hiatus in the diaphragm slightly left of midline, which is similar to the anatomy of human esophagus. The esophagus enters the midpoint of the stomach at the lesser curvature ***(Vdoviaková et al., 2016)***.

Regarding the histology of rat esophagus, as most tubular structures of the GIT, it has four distinct layers: mucosa which consists of three layers: (epithelium, lamina propria and muscularis mucosa), submucosa, muscularis externa, and serosa. The mucosa is lined by keratinized stratified squamous epithelium with dark staining basal cells resting on a well-defined basement membrane and a thin layer of cells containing granules of developing keratin (granular layer). The mucosa is normally in a contracted state due to longitudinal folding of the compact collagenous lamina propria ***(Meyer et al., 2014)***.

The lamina propria is a layer of dense connective tissue of collagen and elastic fibers. The muscularis mucosa beneath the lamina propria is not well developed in the rat, discontinuous throughout the esophagus and often appears in