National Ribat University
College of Graduate Studies and Scientific Research

The effect of ginger on lung Function

A thesis submitted for partial fulfillment of the Requirements for the degree of M.Sc in Human Physiology

By: Amani Abdalmageed Mohammed Salih
Supervisor: Professor Omar Abdul-Aziz Musa

(2017)
الآية:

(ويسقون فيها كأساً كان مزاجها زنجيبلاً)

سورة الإنسان

الآية (17)
Dedication

I dedicate this work to my parents, my husband

My daughters and my Son

to my sisters and my friends.

To everyone who supported me

throughout this dissertation
ACKNOWLEDGEMENTS

First of all, Praise to Allah for giving me strength and health to complete this work successfully.

I am deeply indebted to my major supervisor Prof. Omar Abdalaziz Mousa for his helpful guidance, honorable advice, supervision and understanding even on a personal level throughout the course of this work.

Thanks are also to Dr. Amir Almajazoob (National Ribat University).

Special appreciation to the soul of Prof. Mansur Bilal, my he rest in peace and all staff members and colleagues in physiology Department, Faculty of Medicine, National Ribat University.

Thanks to everybody helped me in any way or another and not mentioned above.
### Table of contents

<table>
<thead>
<tr>
<th>Contents</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td>II</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>III</td>
</tr>
<tr>
<td>LIST OF CONTENTS</td>
<td>IV</td>
</tr>
<tr>
<td><strong>CHAPTER 1: Article Review</strong></td>
<td></td>
</tr>
<tr>
<td>Background</td>
<td>1</td>
</tr>
<tr>
<td>Method</td>
<td>2</td>
</tr>
<tr>
<td>Results</td>
<td>3</td>
</tr>
<tr>
<td>Discussion</td>
<td>4</td>
</tr>
<tr>
<td>Conclusion</td>
<td>4</td>
</tr>
<tr>
<td>References</td>
<td>5-6</td>
</tr>
<tr>
<td><strong>CHAPTER 2: (The Paper)</strong></td>
<td></td>
</tr>
<tr>
<td>Abstract</td>
<td>7</td>
</tr>
<tr>
<td>introduction</td>
<td>8-9</td>
</tr>
<tr>
<td>Methods</td>
<td>9</td>
</tr>
<tr>
<td>Results</td>
<td>10</td>
</tr>
<tr>
<td>Table (1)</td>
<td>10</td>
</tr>
<tr>
<td>Figure (1)</td>
<td>11</td>
</tr>
<tr>
<td>Discussion</td>
<td>12</td>
</tr>
<tr>
<td>References</td>
<td>13</td>
</tr>
</tbody>
</table>
Review Article

Effect of ginger on lung function

A.AE.M.Salih<sup>1</sup> and O.AA.Musa<sup>2</sup>.

<1>Faculty of medicine Omdurman Islamic university

<2>professor of physiology, faculty of medicine, The Ribat national university.

**Background:**

Ginger is a member of the family Zingiberaceae; a small family with more than 45 genera and 800 species. (1) Its scientific name is *Zingiber officinale* named by an English botanist William Roscoe in 1807.

Ginger (*Zingiber officinale*) has been shown to have antithrombotic, antioxidant, anti-inflammatory, and anti-bacterial properties. In the 1970s ginger was first found to have anti-inflammatory properties including inhibition of prostaglandin synthesis. (2) The major constituents of ginger include paradol, gingerol, and myoga. Paradol has shown anti-inflammatory properties as a potent cyclooxygenase 1 (COX-1) inhibitor and anti-platelet aggregation in human whole blood. (3) These properties make it a potential treatment for musculoskeletal disorders. (4) Ginger has shown potential for use in cancer treatment. 6-Gingerol, another natural constituent of ginger, protected human leukemic HL60 cells from oxidative stress and induced cell death in promyelocytic leukemia HL60 cells. It also caused DNA fragmentation and inhibited Bcl-2 expression. Another component of ginger, myoga (*Zingiber mioga* Roscoe), showed powerful cytotoxic effects on human T lymphoma Jurkat cells. Recently ginger has received attention due to anti-inflammatory properties extending beyond the inhibition of prostaglandins. (2) A study on nine horses tested a single dose of ginger
post-exercise,\(^{(5)}\) has anti-inflammatory and cardiovascular effects and although ginger has been suggested to cause gastric ulcer in horses and proven in humans,\(^{(6)}\) many ulcer relief herbal supplements for horses contain ginger as a major ingredient.

Lung function test:

Lung function tests, also called pulmonary function tests, include measuring lung volumes and capacities by spirometry and measuring blood gases.

Recently the property of muscle power has been introduced as one of the pulmonary function tests.\(^{(7)}\)

The lung function tests are used to diagnose conditions such as asthma, pulmonary fibrosis, and chronic obstructive pulmonary disease, to follow the patients, to assess for surgery, for occupational compensation and as a research tool.

The traditional use of ginger needs further scientific investigation and in this paper some literature was reviewed to show the effect of ginger on pulmonary function.

Method:

An extensive internet and library search has been conducted on medical websites concerning the effect of ginger on lung function covering the period from 2006 to 2016.

Key words were Ginger – lung function – asthma

10 papers were found and 3 papers were reviewed.
Results:

Elizabeth A. Townsend et al conducted an experimental study in Jan 2011 about the effect of Active Components of Ginger in Potentiating B2-Agonist–Induced Relaxation of Airway Smooth Muscle by Modulating Cytoskeletal Proteins.

The objectives of the study were to determine if 6-gingerol 8-gingerol, or 6-shogaol potentiate B2-agonist–induced airway smooth muscle relaxation; and to define the mechanism(s) of action responsible for this potentiation if occurred. Primary human airway smooth muscle cells were used for cellular experiments. Purified phosphodiesterase or phospholipase C enzyme was used to assess inhibitory activity of ginger components using fluorescent assays. A G-LISA assay was used to determine the effects of ginger constituents on Ras homologene family member A activation. Significant potentiation of isoproterenol-induced relaxation was observed with each of the ginger constituents. 6-Shogaol showed the largest shift in isoproterenol half-maximal effective concentration. 6-Gingerol, 8-gingerol, or 6-shogaol significantly inhibited PDE4D, whereas 8-gingerol and 6-shogaol also inhibited phospholipase C activity. 6-Shogaol alone inhibited Ras homologene family member activation. Isolated components of ginger potentiate B2-agonist–induced relaxation in human airway smooth muscle. This potentiation involves PDE4D inhibition and cytoskeletal regulatory proteins. Together with b-agonists, 6-gingerol, 8-gingerol, or 6-shogaol may augment existing asthma therapy, resulting in relief of symptoms through complementary intracellular pathways.

They themselves also conducted another experimental study in September 2012 about the Effects of Ginger and Its Constituents on Airway Smooth Muscle Relaxation and Calcium Regulation in which they hypothesized that ginger and its active components induce bronchodilation by modulating intracellular calcium $\text{Ca}^{2+}$ in airway smooth muscle. In isolated human airway smooth muscle cell ginger caused significant and rapid relaxation.
Richard B. van Preemen et al published an experimental study in September 2010 about the cyclooxygenase-2 inhibitors in ginger. In this study in vitro investigations of ginger preparations and some isolated gingerol-related compounds have shown anti-inflammatory effects of ginger including inhibition of COX, (8) inhibition of nuclear factor κB (9) and inhibition of 5-lipoxygenase. (10) In vivo studies using animal models of inflammation and clinical trials have confirmed the anti-inflammatory activities of ginger preparations. For example, ginger extracts have been shown to inhibit joint swelling in an animal model of rheumatoid arthritis (11) and reduce knee pain in human subjects suffering from osteoarthritis. (12)

Since the anti-inflammatory constituents of ginger are incompletely understood, the study used a mass spectrometry-based screening assay to help identifying inhibitors of one of its pharmacologically important targets, COX-2. The materials used in this study were Human recombinant COX-2, ovine COX-1, arachidonic acid, PGE\(_2\), d\(_4\)-PGD\(_2\), and d\(_2\)-PGE\(_2\) (labeled with deuterium atoms at positions 3 and 4).

They concluded that Ginger preparations have a long history of human use for their anti-inflammatory properties, however, only recently have some of the compounds responsible for this activity and their mechanisms of action had been identified.

Discussion:

Most studies suggested the beneficial effect of ginger in lung function and asthma due to its bronchodilating effect as it contains B\(_2\) agonist components and its anti-inflammatory property as it act as natural corticosteroid and its inhibitory effect on leukotriene synthesis.

The recent guidelines of asthma management depends on using anti-inflammatory drugs (steroids) together with bronchodilators, if so, does ginger represent natural remedy for asthma? This needs further investigation..

Conclusion:

There is a significant effect of ginger on lung function and this needs clinical study.
References:


5-Liburt N.R. Effects of ginger and cranberry extracts on markers of inflammation and performance following intense exercise in horses. 2005 Masters Thesis, Rutgers, the State University of New Jersey.


Effect of ginger on lung function

A. A. E. M. Salih<sup>1</sup> and O. A. Musa<sup>2</sup>.

<sup>1</sup>Faculty of medicine Omdurman Islamic university

<sup>2</sup>Professor of physiology, faculty of medicine, The National Ribat University.

Abstract

Objectives: to investigate the effect of ginger extract on lung function in humans. (FEV<sub>1</sub>, FVC, FEV<sub>1</sub>/FVC ratio, PEFR).

Methods: Ginger was used in the form of powder capsules containing .5 gm for each capsule and 2 capsules per day were taken orally for six weeks by 13 students aged 20 years, 10 males and 3 females.

Results: the ginger extract increase lung function values (FEV<sub>1</sub>, FVC, FEV<sub>1</sub>/FVC ratio, PEFR) in the first weeks only.

Conclusion: ginger increase pulmonary function which needs further investigation in relation to asthma.
**Introduction**

Ginger is a member of the family Zingiberaceae; a small family with more than 45 genera and 800 species. (1) Its scientific name is *Zingiber officinale* named by an English botanist William Roscue in 1807.

Ginger (*Zingiber officinale*) has been shown to have antithrombotic, antioxidant, anti-inflammatory, and anti-bacterial properties. In the 1970s ginger was first found to have anti-inflammatory properties including inhibition of prostaglandin synthesis. (2) The major constituents of ginger include paradol, gingerol, and myoga. Paradol has shown anti-inflammatory properties as a potent cyclooxygenase 1 (COX-1) inhibitor and anti-platelet aggregation in human whole blood. (3) These properties make it a potential treatment for musculoskeletal disorders. (4) Ginger has shown potential for use in cancer treatment. 6-Gingerol, another natural constituent of ginger, protected human leukemic HL60 cells from oxidative stress and induced cell death in promyelocytic leukemia HL60 cells. It also caused DNA fragmentation and inhibited Bcl-2 expression. Another component of ginger, myoga (*Zingiber mioga roscoc*), showed powerful cytotoxic effects on human T lymphoma Jurkat cells. Recently ginger has received attention due to anti-inflammatory properties extending beyond the inhibition of prostaglandins. (2) A study on nine horses tested a single dose of ginger post-exercise, (5) which showed anti-inflammatory and cardiovascular effects. although ginger has been suggested to cause gastric ulcer in horses and proven in humans, (6) many ulcer relief herbal supplements for horses contain ginger as a major ingredient. As ginger has anti-inflammatory and antioxidant effect and it is used as a herbal medicine for cough, this pilot study was designed to investigate the effect of ginger on PFT with the intention to see its effect on asthma.

8
Methods:

Thirteen volunteer students, 10 males and 3 females aged 20 years were included in our study.

Ginger was taken raw; washed, dried and then ground. 500 mg of the powder form were packaged in gelatinous capsules by a packaging device brought from China.

Baseline readings of lung function (FEV₁, FVC, PER, and PEFR) for the 13 students were measured using digital spirometer and peak flow meter and then, 2 capsules of ginger per day were taken orally early in the morning on an empty stomach for five weeks.

Lung function parameters were measured weekly for five weeks and the values were compared with the baseline value.

P.value using T test comparing the results of each week with the baseline was considered significant if it is ≤ .05.
**Results**

FVC, FEV₁, and PEFR increased significantly after the first week of using 1 gm of ginger daily. FEV₁ continued to be higher during the five weeks but only statistically significant in the first week, while FVC decreased with time.

PEFR continue to be high and statistically significant over the five weeks (table 1, fig 1).

**Table (1)**

*Pulmonary function values in 13 medical students using 1 gm of ginger daily for five weeks:*

<table>
<thead>
<tr>
<th>variable</th>
<th>Baseline reading</th>
<th>1st week value</th>
<th>3rd week value</th>
<th>4th week value</th>
<th>5th week value</th>
<th>p.value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV₁</td>
<td>2.9831</td>
<td>3.4908</td>
<td>3.1400</td>
<td>3.1400</td>
<td>2.9985</td>
<td>.654</td>
</tr>
<tr>
<td>FVC</td>
<td>3.3208</td>
<td>3.6900</td>
<td>3.1400</td>
<td>3.223</td>
<td>3.2162</td>
<td>.777</td>
</tr>
<tr>
<td>PEF R</td>
<td>392.4615</td>
<td>494.0000</td>
<td>484.3846</td>
<td>425.0000</td>
<td>453.7692</td>
<td>.046</td>
</tr>
</tbody>
</table>
Fig(1):

*PEFR in 13 students using 1 gm of ginger daily for five weeks:*
**Discussion:**

The literature review showed that ginger increases all parameters of lung function and hence it is widely used as a herbal medication for most of pulmonary diseases because of its anti-inflammatory effect and also because of its bronchodilating effect as it contains B<sub>2</sub> agonist components, also some studies showed that it can be used as prophylactic for asthma attacks because of its leukotriene inhibiting property.\(^{(7)}\) This study showed that FEV<sub>1</sub> and FVC have increased in the first week only while the PEFR continue to be significantly high till the last week.

Finally it could be concluded that ginger has an effect on lung function and can be used as an adjuvant therapy in pulmonary diseases.
References:


5-Liburt N.R. Effects of ginger and cranberry extracts on markers of inflammation and performance following intense exercise in horses, Masters Thesis, Rutgers, the State University of New Jersey. 2005.
