Are EGGS what you actually think: Here's something interesting you might have no idea!

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Abstract:

The egg is composed of three components viz. egg shell, egg white, egg yolk. Egg has rich protein and nutrient quantity. The egg when soaked in vinegar show physical change such that its shell becomes very soft to touch. This is due to the egg is put in vinegar; the calcium carbonate of the shell reacts chemically with the vinegar's acid. This reaction is named oxidation. In every chemical reaction, the initial substances disappear and they transform into new substances. After a few minutes we observe the formation of little bubbles, meaning a gas is being generated. It becomes just like a water balloon but the study says that it's a rubber egg whereas the egg does not show any rubber like property. Finally, the egg increased in size because the liquid in the container has passed through the semi permeable membrane and has entered the egg. After the 24 hours we proved the egg bounces at different heights. Also study says that egg when placed in vinegar solution and after becoming soft it becomes hard when kept open to atmosphere but the experimental setup and the observation helps to prove this false. The egg vinegar also has many medical uses.

Keywords:
Egg shell, Egg white, Egg Yolk.

Requirements
Egg, container, Vinegar.

Reagent
Vinegar solution with 3.75g of acetic acid per 100 ml.

Procedure

1) Pour the vinegar solution in the container.
2) Put the egg in the container.
3) Capture the pictures according to need.
4) After 48 hours remove the egg.
5) Wash it properly.

Introduction

Nowadays eggs are consumed by many people. Many projects and paper are published on the egg just like the egg becoming softened when kept in vinegar solution and becoming hard when kept in coke. This isn't just a glimpse of nature this is a chemical change and can be used in the treatment of various diseases. This project is most likely to be said as rubber egg but there are no qualities of rubber found in the egg so it can be said as water balloon because it gets broken when dropped from height and the yolk get spread.

Literature Review:

1) Milk Food Technol., Vol. 37, No.5, pg no 260-275, tells about the layers of the egg and about the attack of the microbes over the different layers supporting the development of tissues of the chick. The main components of the egg are Egg white, egg yolk and the egg shell. There are various layers in the egg where the microbes attack and the process of the owning takes place. The book gives the detailed information about how a younger one is produced in the egg. It describes the layers and the attack of microbes.

2) Shapiro RL, Hathaway C, Swerdlow DL, CDC (Centers for Disease Control and Prevention), this book gives the detailed information about the botulism caused due to excess pickling of egg. the vinegar egg causes the disease known as foodborne botulism. the detailed info about foodborne botulism and study of the disease is published in the book and the person suffering from the same disease is studied by the author.

3) Functional characteristics of egg white solids obtained from papain treated albumen; J Food Eng, 51 (2002), pp. 263-269; The egg white consists of three layers inner thin egg white, outer thin egg white, thick egg white. Egg white is considered next to the yolk. It is not true, it is an envelope surrounded to the yolk. Egg white is the clear liquid contained in the egg. Its main aim is to protect the yolk in the egg. It consists of 90% of water including 10% of proteins. Egg white contains no fat and carbohydrate content is less than 1%. It contains almost 56% of the protein in the egg. It is also called as Albumen. It makes up around two third weight of the chicken egg.

EGG:

The egg consists of three main components that is egg shell, egg white and the yolk.

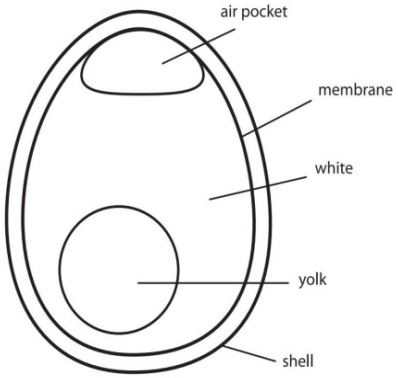


Fig (1): The structure of egg.

EGGSHELL

The eggshell is an important structure of the egg. It is the protective layer of the egg. It includes the cuticle, shell membranes, lysozyme, conalbumin, avidin, pH of the albumen. It forms embryonic chamber for the developing chick in the egg and also provides mechanical protection and also creates controlled gas exchange medium in egg. The eggshell contains thousands of pores. It allows air and moisture to pass through its pores. The inner shell membrane is five times weak then the outer shell membrane still is more protective. The inner and outer membrane provides an efficient defense against bacterial invasion and are made partly of keratin. The most common reason why egg does not get spoil is the presence of lysozyme, an anti-bacterial agent which is effective against gram positive bacteria. The eggshell consists of 97% of calcium carbonate. The chemical synthesized at the time of gas exchange process provides nutrition to the hen in diet and must be broken down in the digestive system. Then this chemical is resynthesized in the shell gland to form the shell again.

EGG WHITE

The egg white consists of three layers inner thin egg white, outer thin egg white, thick egg white. Egg white is considered next to the yolk. It is not true, it is an envelope surrounded to the yolk. Egg white is the clear liquid contained in the egg. Its main aim is to protect the yolk in the egg. It consists of 90% of water including 10% of proteins. Egg white contains no fat and carbohydrate content is less than 1%. It contains almost 56% of the protein in the egg. It is also called as Albumen. It makes up around two third weight of the chicken egg. It does not contain cholesterol.

EGG YOLK

Yolk is the nutrient bearing portion of the egg. Its aim is to provide food supply for the growth of embryo. When there is sufficient supply of food to hen its egg contains no yolk such egg is called as 'dwarf egg'. As the egg contains no yolk it does not hatch chick. The color of the yolk is dependent on the food supply to the hen. [(1)]

Beyond this the egg has two more layers VITELLINE MEMBRANE, CHALAZlFEROUS LAYER.

VITELLINE MEMBRANE

The vitelline membrane is an envelope like structure which surrounds the outer surface of the plasma membrane of an ovum. It is composed mostly of protein fibers and are bound to sperm plasma membrane receptors.

CHALAZlFEROUS LAYER

The chalaziferous layer is a fibrous layer of albumen. The layer surrounds the yolk and covers the entire egg yolk. This layer is just outside the vitelline membrane.

Chalaza

The singular of chalaziferous layer is called as chalaza. These chalazae are twisted in opposite directions and serve to keep the yolk centered. The more is the chalazae prominent, the fresher will be the egg

Nucleus of pander

It is a plug of whitish yolk. It has a particular significance for development and its function is purely a nutritive just like the rest of the yolk.

Germinal disk (Blastoderm)

Germinal disk also known as is actually a small circular white spot on the surface of the yolk. The sperm enters the egg through this spot. The nucleus of the egg is in the blasto disc. A disk is developed by the embryo and it gradually sends blood vessels into the yolk use to develop embryo by the nutrition.

Yellow yolk

The major source of vitamins, minerals, almost half of the protein, and all of the fat and cholesterol is the yellow yolk. The yolk contains less water and more protein than the white, some fat, and most of the vitamins and minerals

of the egg. The yellow yolk is composed of iron, vitamin A, vitamin D, phosphorus, calcium, thiamine, and riboflavin. Yolk color ranges from just a hint of yellow to a magnificent deep orange, according to the feed and breed of the hen.

White yolk

White yolk is also known as latebra. It is located in the center of the yolk. It has low fat and therefore stands out as a bright white area. The function of the latebra acts as a central structure around which the additional layers of the yolk are formed.

Air cell

As the egg ages, moisture and carbon dioxide leave through the pores of the shell, air enters to replace them and the air cell becomes larger.

Cuticle or bloom

The shell is produced by the shell gland (uterus) of the oviduct, and has an outer coating, the bloom or cuticle. The cuticle somewhat seals the pores and is useful in reducing moisture losses and in preventing bacterial penetration of the egg shell. [(2)]

VINEGAR

Vinegar is a liquid containing 5-20% acetic acid (CH_3COOH). Vinegar is produced by fermentation of ethanol and acetic acid bacteria. Vinegar has rich nutrients. Most commercial vinegar solutions available to consumers for household use do not exceed more than 5% of acetic acid. Solution exceeding more than 10% of acetic acid requires to be handled with care as it can cause harm to skin.

There are various types of vinegar solutions, when egg is placed in a container containing vinegar solution the outer covering of the egg softens.

EGG VINEGAR

Egg is placed in a container containing vinegar. This is the setup of the project and this shows chemical change in some hours.

Fig (2a): Egg placed in vinegar solution.

Eggshells are made up of calcium carbonate. The chemical formula for calcium carbonate is $CaCO_3$. Vinegar is a mixture made up of very dilute acetic acid. Therefore, vinegar contains acetic acid and water The chemical formula for acetic acid is CH_3COOH. The calcium carbonate in the eggshell and the acetic acid in vinegar interact setting off a chemical reaction. First, the acetic acid and calcium carbonate form carbonic acid, H_2CO_3, and calcium acetate,$\mathrm{Ca(CH_3COO)_2}$. [(3)]

Next, the carbonic acid breaks down to form carbon dioxide and water. This Carbon dioxide is released in the forms of bubbles.
The number of bubbles have exceeded near the egg after 12 hours of the setup. This can easily be observed in fig (2b).

Fig (2b): Observation after 12 hours of setup.

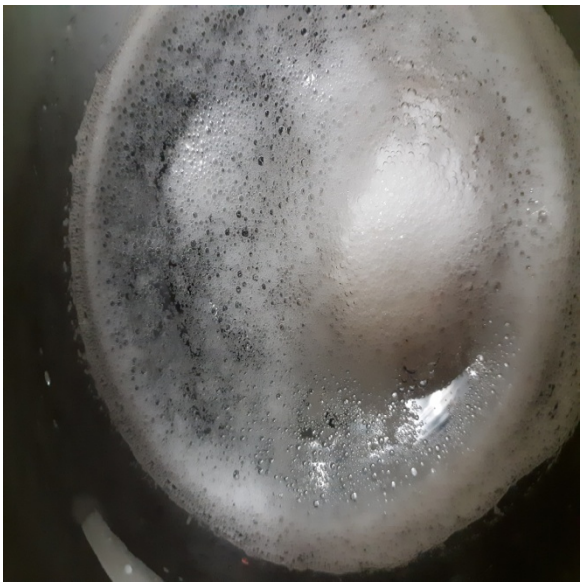


Fig (2c): Observation after 12 hours of setup.

The carbon dioxide has started evolving. This process takes place till the whole carbon is absorbed.
Small bubbles can be seen on the egg placed in vinegar solution.

The bubbles are no exceeded and are observed at the collected at the top of the vinegar solution. Just as shown below.
After 1 whole day of the setup the not only the width of the bubbles have increased but also the no of bubbles.

Fig (2d): Observation after 24 hours of setup.

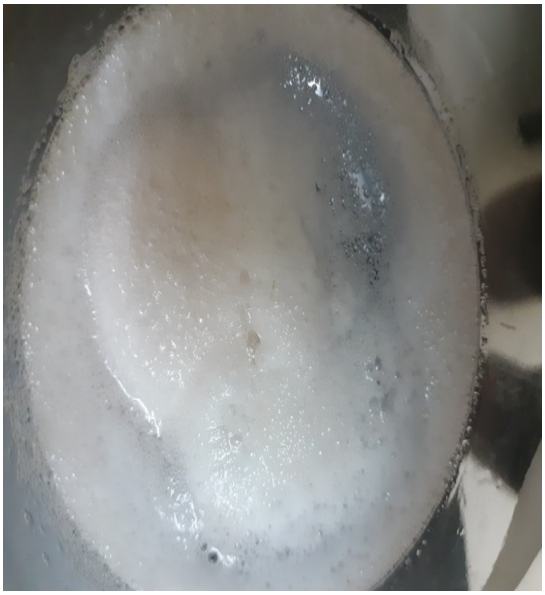
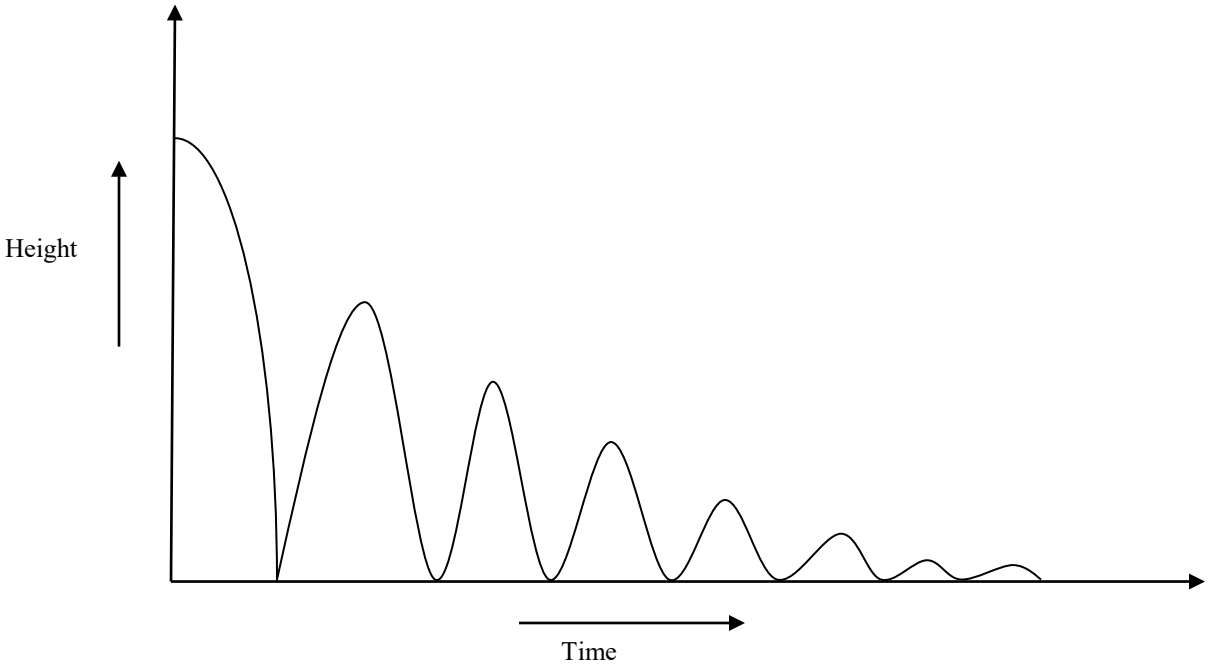


Fig (2e): Observation from the top of setup after 24 hours.

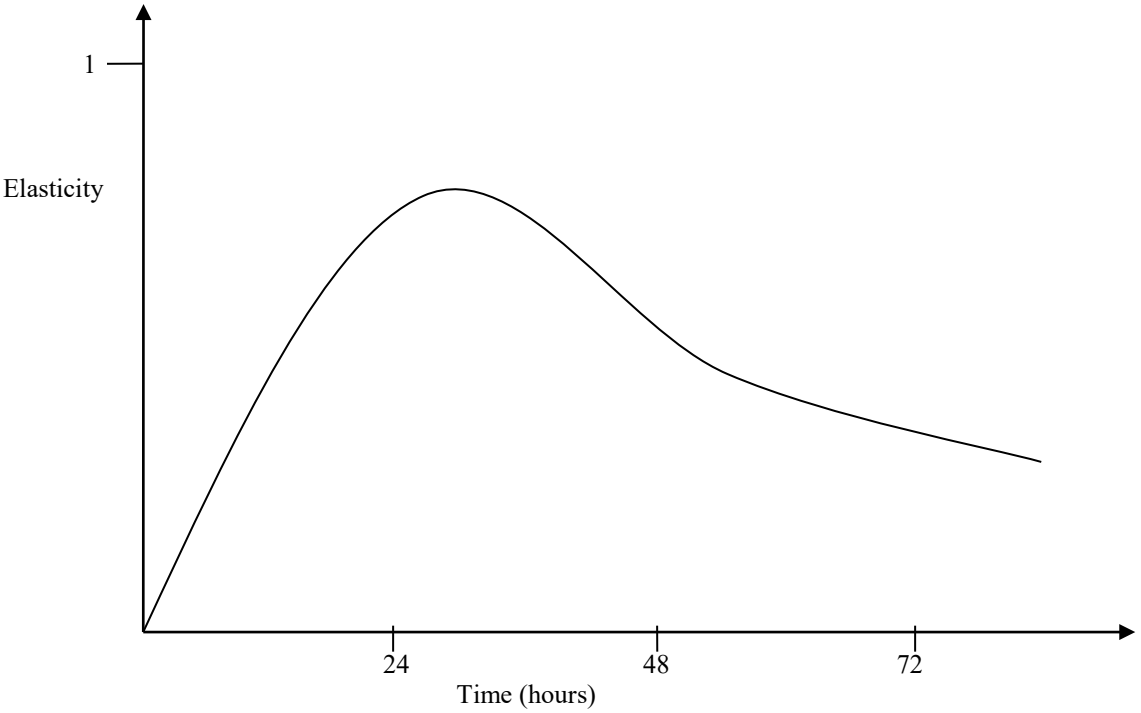
The process is taking place and the bubbles are the form of carbon dioxide floating out. This takes until the whole carbon is soaked. This floating carbon dioxide makes the egg soft and the egg becomes just like a **water balloon.**



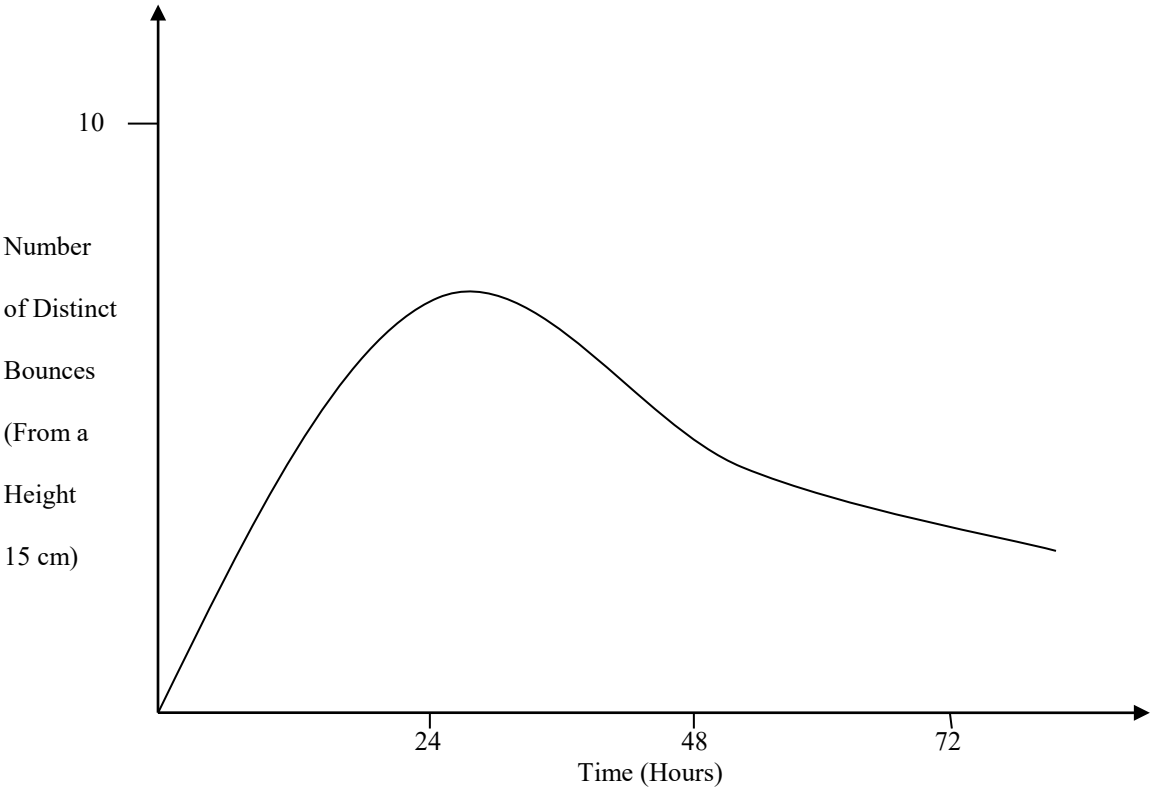
Graph 1: The graph mentioned above is about the height of bounces of egg with respect to time.

When the rubber egg is dropped from a certain height it comes to the ground and rebounds back. The height attained by the rubber egg is less than that the height from which it was dropped. In the next bounce the height attained by rubber egg decreases. Further the height attained goes on decreasing consequently. When the graph between the heights attained versus time is plotted, it is observed that the nature of the graph is same as that of damped oscillation. Hence, from the graph we conclude that the motion of the egg is a damped oscillation.

The graph (2) and (3) below shows the variation of elasticity of egg first increases to certain limit and attains a maximum value and then decreases gradually. So as is the trend with number of distinct bounces of the egg. The egg loses CO_2 and hence attains a surface which helps it to bounce. This occurs till a maximum elasticity is attained. After it when further the egg is kept in vinegar the elasticity decreases because of the exposure of the egg to acid for a longer time period. The maximum value of elasticity is attained between 24 to 28 hours of exposure to vinegar. In this span it also makes maximum number of bounces when dropped from a certain safe height ranging from 15cm to 20cm.



Graph 2: The graph above is about the variation of the elasticity with respect to time.



Graph 3: This graph is between the numbers of distinct bounces of egg versus the time.

Fig (2f): Observation after 48 hours of setup.

Fig (2g): Observation from the top after 48 hours of setup.

After the 48 hours of setup there is a small yellow spot observed on the egg and when viewed from the top of container its looks shiny.

Fig (3): Observation when egg is removed from vinegar solution after 48 hours.

Now the egg is just like a water balloon it consists yolk inside it but the shell has become just as soft as the balloon. This is not only because of the carbon bubbles.

The reaction which took place is:

$$CaCO_3 + 2CH_3COOH \rightarrow Ca(CH_3COO)_2 + CO_2 \uparrow + H_2O.$$

The carbonic acid breaks down to form carbon dioxide and water with other gases. When we left the egg in vinegar, the acetic acid in the vinegar broke down the calcium carbonate shell, producing the tiny carbon dioxide gas bubbles we saw. [(4)]

Also, another concept behind this is osmosis. **Osmosis** is the movement of a liquid, like water, across a membrane. Also if the color is added in the vinegar solution the egg absorbs that due to osmosis.

Fig (4): Observation when kept out of the Vinegar for 48 hours.
hours.

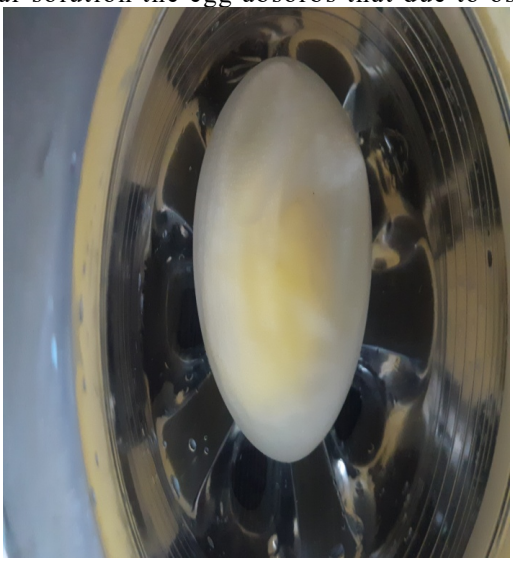


Fig (4a): Observation from the top view when Egg is kept out of vinegar solution for 48

The study says that the egg gains hardness when removed open in the environment after some times but there is no hardness gained by the egg. The observations states that there is loss of the water from the shell of the egg and due to which it shrinks. Loss of swelling is observed as all the water gets evaporated.
After the shrinking of the egg when it is kept in the water for some time it starts absorbing water the process of osmosis takes place and the egg swells again. This is observed from the fig below.

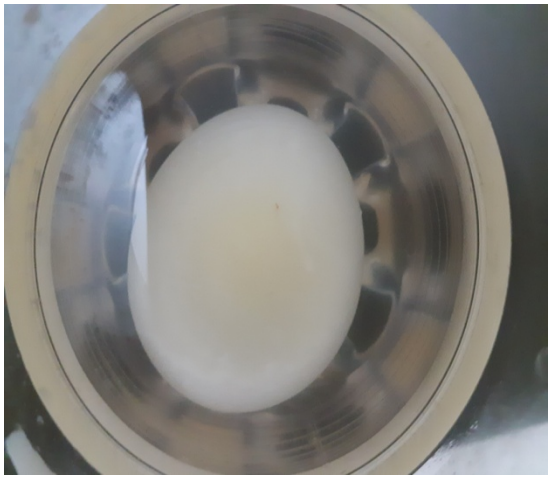


Fig (5): Observation when kept in water.

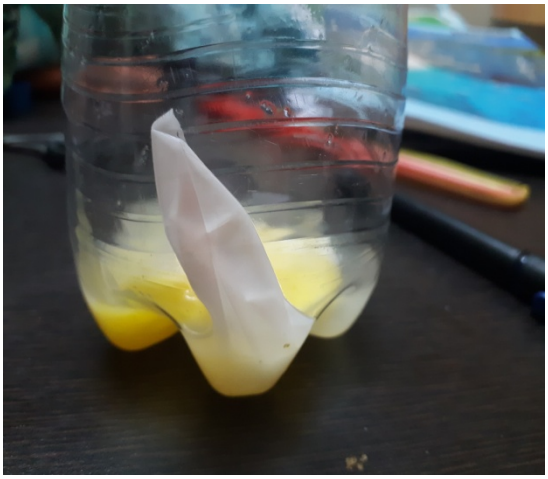


Fig (6): Observation of the egg when broken.

This fig is like the egg just removed from the vinegar solution. Fig (6) supports the concept that vinegar egg is not a rubber egg but a water balloon egg. This is because it just pops like water balloon and the yolk is just like water.

This was the science behind the Vinegar EGG. The Vinegar egg also has many medical uses just by changing some components the vinegar egg can help the body to get cure from many diseases.

Recipes made from VINEGAR EGG using some remedies for various ailments:

Chest pain

Beat one egg in a bowl. Add 60ml vinegar and a little black sugar. Stir and drink. Drink every day until the pain has gone. Having this helps one to get relieve from chest pain.

Difficulties during birth or dysentery with blood after giving birth

Take three egg yolks; mix with 50ml vinegar and drink.

Malaria

Beat three eggs in an earthen pot and pour in 100ml vinegar. Cook for five minutes and drink when hot. At first, you will shiver before becoming hot and sweaty. When the fever stops, you will have a headache and vomit. This helps one to cure from malaria.

Hepatitis

Burn one whole egg including the shell until it looks like coal. Pound and stir with vinegar. Drink once a day.

Diabetes

A diabetes patient is recommended to beat five chicken eggs in a bowl. Add 150ml vinegar and stir. Leave for 36 hours. Add 250ml vinegar and continue to stir. Drink 15ml in the morning and evening.

Persistent cough

Make the egg vinegar mixture using 60ml vinegar and one egg. Drink over one month. Doing this feels a person free from cough.

Seasonal asthma

Put one egg in a pot and boil in vinegar for five minutes. Shell the egg, boil again with vinegar for five minutes and eat. Eat one egg twice a day.

Diarrhea

Beat two eggs and put in a glazed terracotta or porcelain pot. Pour in 100ml vinegar and boil until the eggs are done. Drink the mixture to stop diarrhea. If it doesn't work, try again.

Bronchitis

Pour 40ml sesame oil in a pot and heat. Beat two eggs and add them to the oil. Pour in enough vinegar to cook the eggs. Wait until done. Eat one egg in the morning and one in the evening. Abstain from alcohol and tobacco. This helps to cure from bronchitis.

Morning sickness

Boil 60ml vinegar and add 30g white sugar. Stir until the sugar has dissolved. Then beat one egg and add to the vinegar to cook. Drink the remedy once a day for three consecutive days.

Dysentery

Take three beaten eggs and mix with 150g wheat flour. Knead and slice into small pieces. Fry the pieces in 30ml vinegar. Eat twice a day until dysentery stops. Help a person to cure from dysentery.

These were some recipes which help human body to cure from many common diseases. (6)

More uses of Vinegar-egg

The protein in **egg** helps to keep a person full of nutrient without having too much effect on your blood sugar. **Vinegar** reduces the risk of blood sugar to a person, especially after **eating** starchy food.

Vinegar-egg improves digestion of the person. It acts as a painkiller and breaks down fat molecules as well as healing surface injuries. It helps to reduce swelling around muscles and joints. Egg vinegar can also help to prevent cancer and it contains antibiotics and phospholipids which protects liver from getting damage. The mixture is rich in plasma protein which improves the immune system and metabolism. Egg vinegar can help to increase life span of a person.
During preparation, the eggshell is dissolved by the vinegar and on reaction it becomes calcium acetate, which is easily dissolved in water and absorbed by the small intestine. It is also an inorganic salt that helps body in developing bones and joints as well as prevents the risk high blood pressure.

Anticancer, Growth Inhibitor of leukemic U937 cells and its immunnomodulatory activity

According to the recent study it was discovered that the vinegar egg also has some properties by which under certain process it can be helped to resist as anti cancer, growth inhibitor of U937 cells, and also treat immunnomodulatory activity. This is treated using spray drying, freeze drying and vacuum concentration and used to stimulate human mononuclear cells. This can be explained by the fig given below.

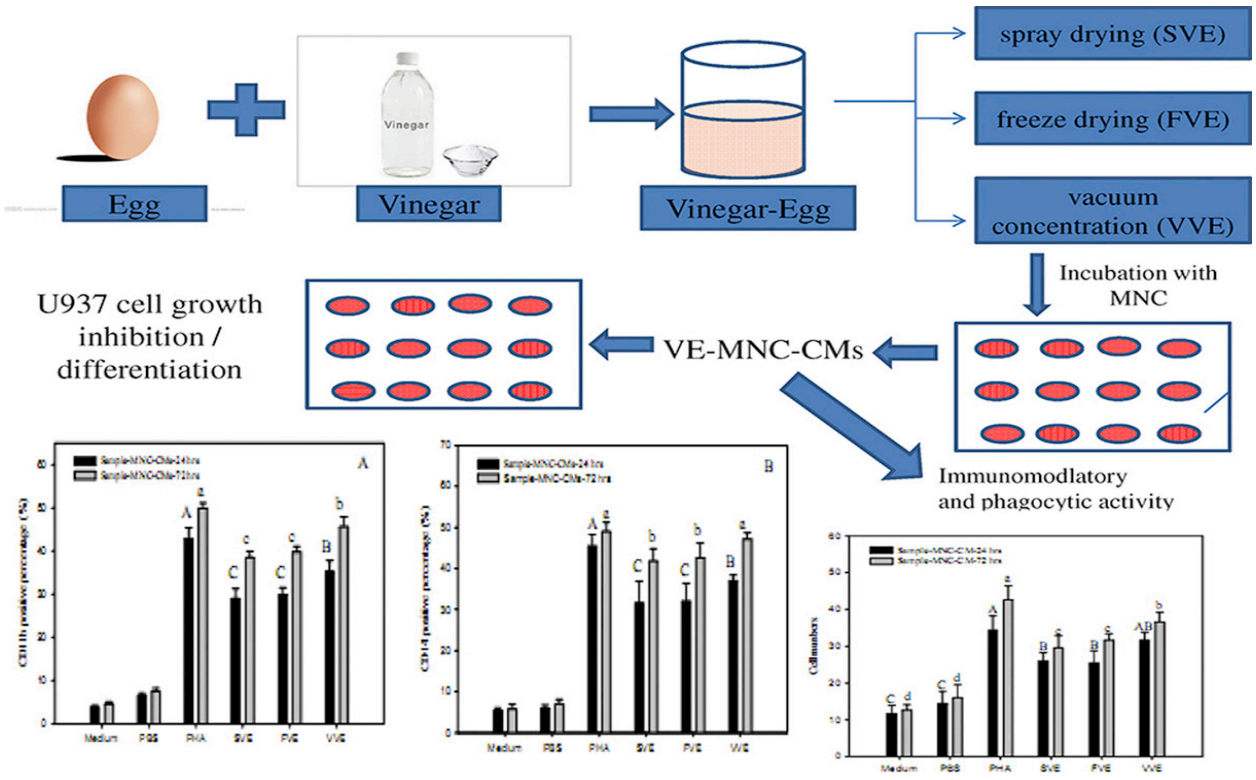


Fig (7): Various graphs of immunnomodulatory cell U937.

Side Effects of the Vinegar egg:

The Illinois Department of Public Health was notified by a local physician about a possible case of food borne botulism. This report summarizes the case investigation, which implicated home-pickled eggs as the cause.

On November 23, 1997, a previously healthy 68-year-old man became nauseated, vomited, and complained of abdominal pain. During the next 2 days, he developed diplopia, dysarthria, and respiratory impairment, necessitating hospitalization and mechanical ventilation. Physical examination confirmed multiple cranial nerve abnormalities, including extra ocular motor palsy and diffuse flaccid paralysis. Possible botulism was diagnosed, and a one-vial dose of trivalent (types A, B, and E) antibotulinum toxin was administered. A sample of the patient's serum collected before antitoxin administration demonstrated the presence of type B botulinum toxin. A food history revealed no exposures to home-canned products; however, the patient had eaten pickled eggs that he had prepared 7 days before onset of illness; gastrointestinal symptoms began 12 hours after ingestion. The patient recovered after prolonged supportive care.

Botulism

Botulism is a paralytic illness caused by the neurotoxin produced by the bacterium *C. botulinum*. Paralysis first affects the cranial nerves, then the skeletal muscles; untreated intoxications can lead to dense flaccid paralysis, respiratory failure, and death. (7)

Clostiridum Botulinum

It is the name of bacteria causing “Foodborne Botulism”. The effects of the Foodborne Botulism are found in a person within 18-36 hours of exposure. It lasts for 6 hours to 8 days.

Diagnosis

This disease is suspected in a person with gastro intestinal symptoms associated to drying of mouth, difficult focusing of eyes and cranial nerves dysfunction. The initial stage should be recognized by the history and physical findings of person. This should be done before confirmatory test as it takes several days to be performed. Stools and food consumed by person should be tested for the presence of botulinum.

First Aid Measures

The stomach of the person should be emptied by making him voit the food consumed. This should be done within an hour.

Antidote

One vial equine antitoxin should be administered by infusion. Conduct Sensitivity, Cutaneous, Serum reaction over equine tests.

C. Botulinum produces heat resistant pores. This spores increases in foods with higher pH and a lower salt content. The growth of this botulinum can be inhibited by high temperature, acidification, dehydration, salination, and certain food preservatives.

Conclusion

Vinegar and eggs have rich nutrients. In this study, the mixed form of derived products, vinegar–egg solution and its products helps to contradict the concept of the rubber egg and gives a stand to water balloon egg. The vinegar egg has high content of nutrients still many people don’t know about its medicinal use. The recipes if used properly then it can help to cure that particular disease. Every coin has two sides just like that it has side effects if the eggs are pickled for long time in vinegar solution then they can be rotten and eating such eggs can be harmful for the health. A frequent study found that this vinegar eggs can be used as anticancer. The study says that when the egg soaked from vinegar solution is kept open to atmosphere it becomes hard again which is contradictory. The egg shrinks as it losses the water content which it absorbed due to osmosis process from the vinegar solution. This egg when placed again in the water swells. This shows osmosis and reverse osmosis process takes place in this process. Also, if any color is added to vinegar solution then the egg gains the same color. This is because of the process of osmosis some

of the color enters in the membrane with the water. The egg is not only a rich source of nutrient but also resistant to many diseases. We hope it would be helpful for all the readers there are many other concepts yet to get still this small concept would help to resist from many common disease.

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He has also filed a patent.