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Research paper



Dispensing Device of Powder Salt

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Abstract

Background/Objectives:Spray device that dispenses powder salt throughout the air is able to inhale a fixed quantity of it in the air through respiratory organ. In order to not only sterilize but purify accumulates fine dust in a human lungs, automatic system with convergence of IT technology is developed to be able to dispense powder salt in the air.

Methods/Statistical analysis: In order to dispense power salt in the air it is configured as a feeder that provides a fixed quantity from powder salt supply container and dispenser that can spray powder salt. The injector is composed of crusher device to be able to prevent salt from sticking together and discharge device that is releasing powder salt outside by blowing up.

Findings: Powder salt dispenser makes salt powder equivalent to fine dust or ultra fine dust to dispense in the air for the purpose of improving immunity level and resistance to germs through sterilizing action in case of induction of inflammation due to harmful substance in blood vessel or skin problem. Injection quantity of powder salt is 2.5g/min and it will be a sufficient quantity to breathe in salt in an enclosed space of 6m*6m during two minutes.

Improvements/Applications: This device is design to decrease damage caused by occurrence of fine dust. In order to get rid of inhaled fine dust to human body salt is provided to be able to inhale condition. Particles of salt could not only wash off fine dust that causes various kind of disease but also improve sterilizing action and immunity level. It is available at a hospital or healing center as well.

Keywords : *Salt, Powder Salt , Fine Dust, , Dispenser, Salt Therapy*

1. Introduction

It is difficult to identify contamination in the atmospheric like fine dust or ultra fine dust to the naked eye. This causes a serious disease if it has entered inner parts of the body during breathing. Defense system of respiratory organs cannot completely wipe it out. Active method need to be devised to excrete accumulated waste from the body. Salt is known to the public as a strong sterilizing power. It's a natural material and has beneficial uses to clean things. Ingredients which are one of most commonly used sterilizer are salt. Salt cools heat in the blood and performs function of detoxification. It is also able to cure boil and heat rash. Salt intake has an effect on neutralization of fine dust in lungs.

2. Materials and Methods

2.1. *Related Works*

2.1.1. Effectiveness of Salt

Salt can remove fat when the chef is cooking or removing oils of meat and fish due to its characteristic of burning fat as well as adsorbing grease. Water has a function of not only carrying in oxygen and nourishment but excreting waste matter from the body.
According to study of relationship between water intake and colon cancer in Press Hutchison cancer research center in USA, people who drink over four cups of water a day has the incidence of bowel cancer with just 40 percentage compared those who have one cup of water a day.
Korea has banned the use of solar salt due to containing heavy metal as it was allowed to use salting process not for food like kimchi and soybean paste. Salt helps us to drink a lot of water to make blood cleaner. There is an electrolyte of 0.9% in our body. The more salt in the body the more water possess. Drinking a lot of water can help prevent various kind of cancer. Salt can adsorbs body fat to excrete salinity with urine or sweet. Good quality of salt is effective to adsorb fat and heavy metal. But unrefined salt usually has about eighty heavy metal such as mercury, lead, and cadmium. Salt containing heavy metal means disproof of what salt has a feature of pulling heavy metal. Sterilizing power of salt makes active oxygen increased. Fat is easily removed when the meat is marinated in salt. Salt water cleans mouth in case of catching cold. Preserving in salt can prevent decay due to sterilizing power while leaved fish in summer season is supposed to decay. It is also kind of weapon to attack cancer cell. When NK cell which can attack cancer cell without antibody attacks cancer cell, substance of perforin is secreted to attack cancer cell and sufficient saline can attack cancer cell effectively at this time.

2.1.2. Fine Dust

Fine dust named PM10 is defined as tiny dust particles with a diameter of below 10 ㎛ floating in the air due to air pollution caused by automobiles and factories which creates air pollution substance such as sulfurous acid gas, nitrogenous compound, lead, ozone, and carbon monoxide. PM2.5 with particles of dust below 2.5 ㎛ is called ultrafine particles with name of aerosol

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academically. Fine particles has been called by suspended particles or particulate matter which has different name according to characteristics. Particulate matter has a 10nm - 100 ㎛ of aeromechanical diameter and sinking effect caused by gravity makes particle stay time in the atmosphere shorten in case of bigger diameter.

2.1.3. Salt Spa

Thermal room of salt is not only mysterious healing space made of hexagonal salt tiles which eliminates impurities but also detoxify the body by salt. It is also improve immunity level with maintaining a normal body temperature as ultraviolet passes through skin to make cells vibrated. Thermal room of salt is considered as germ free due to anti-bacterial effect of brick made of salt. The effect of the reparative power of nature can be significant with emission of a negative ion which is good for blood circulation[1].

2.1.4. Mechanism of Salt Therapy

Asthma natural remedies now available to you.
The primary acting factor in haloterapy is dry salt aerosol.
Dry salt aerosol is created by a generator which by means of mechanical action crushes pharma grade salt grains (approved by Natural Health Products Directorate) into small particles the size of 1 to 5 micrometers. These small salt particles are smaller than particles contained in cigarette smoke.
These small particles of salt are negatively ionized and bear very high kinetic energy. This way it is guaranteed that it gets into the deepest and smallest parts of the lung. Negative ionization of salt aerosol increases the efficiency of healing.
Salt aerosol cleanses human air ways, like a tooth brash cleans teeth.
Dry salt aerosol produced by a generator contains 80% of respirable particles, which alleviate bronchial inflammation, remove pathogen agents (airborne pollen) and speed up mucociliary transport[2][3].
Bronchi before Halotherapy(Salt therapy) in figure 1

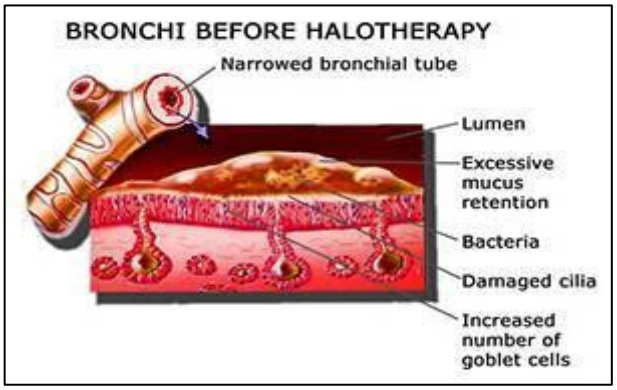


Figure1:.Bronchi before Halotherapy

Bronchi after completed Halotherapy(Salt therapy) in figure 2.

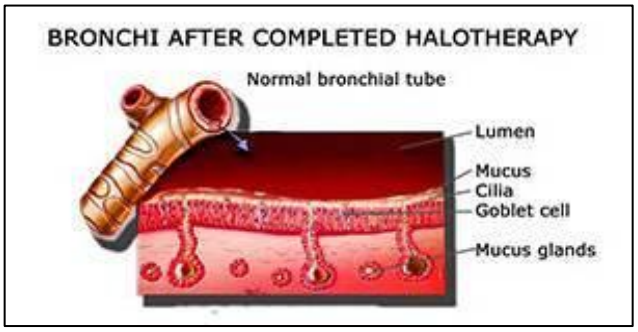


Figure 2:.Bronchi after completed Halotherapy

2.1.5. Sun Dried Salt

Salt is classified into sun-dried salt and refined salt. Sun-dried salt has a translucent hexagonal type crystal without any processing. It is made in salt field where sea water contained harmful ingredients is to evaporate by sun. Refined salt is obtained to electrolyze sea water. NaCI crystal is obtained by ion resins to get rid of heavy metal and impurities. Sun-dried salt in Korea is alkaline and salinity is about 88%. Sun-dried salt has not only a lot of minerals such as calcium, magnesium, zinc, potassium, and iron but also lots of water to pickle vegetables and fish. Harmful ingredients will be disappeared due to fermentation in case of making kimchi, soy source, and soybean paste. And it must keep to wrap airtight due to high moisture absorption property[4][5][6].

2.2. Powder Salt Supply Device

Powder salt supply device is composed of container that stores powder salt and feeder that provides a fixed quantity from powder salt.
There is a cover attached desiccant in powder salt storage container. Desiccant prevents powder salt clotting during exposure to the air due to characteristic of sponge absorbing moisture[7].
Salt supply tank as shown in Figure 3



Figure 3.: Salt Tank

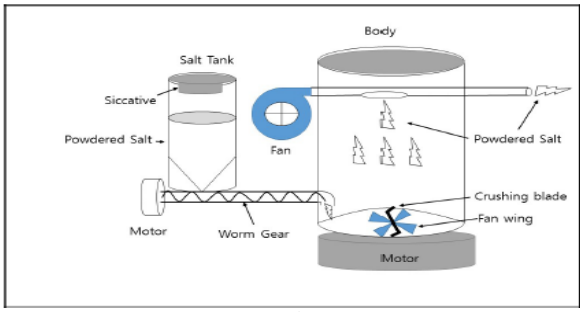


Figure4:. Structure diagram of powder salt ejection system

Powder salt is supplied to a grinder with an operation of worm gear through entering pipe that has built in worm gear when powder salt is supplied through the hole that is located in lower part of supply tank as shown in Figure 4. The edge of worm gear in supply pipe is fitted with stepping motor that is controlled by MCU and worm gear is rotating to supply a fixed quantity of powder salt[8].

2.3. Crushing Device

Powder salt that is supplied by powder salt supply unit is crushed again by the blade of grinder. Curdled salt with moisture is crushed and powder salt is floated inside grinder by fan wing installed in upper part of blade. It works along with blade and fan wing with high speed rotation not only to crush salt but to make

winds for floating. High speed motor is controlled by MCU to be able to be operated within setting time.

2.4. *Dispensing Device*

Floating powder salt in the grinder is entering inside a pipe which is attached upper part of grinder to be ejected outside by the fan installed the edge of pipe. Fan in eject device and a grinder are controlled by MCU at the same time

Rotor blade installed upper part of grinding blade is rotating together toward up direction to induce an air blast for the purpose of floating powder salt in the upper part of inner container. The method of dispensing powder salt is composed of blower fan, injector tube of salt particles, and opening part. High pressure wing when blower fan is starting is supposed to inject floating salt particles through injector tube with high pressure condition

2.5. *Control System*

This system is able to control the following; Output of powder salt supplied from powder container due to regulating the rotational speed of salt conveying unit, RPM in rotor blade and grinding blade installed inside container, blast volume in salt particle dispenser. Block diagram of control system is shown in Figure 5. Control unit is composed of the following; display with LCD screen, timer to adjust salt spray time, motor controller to control salt output through motor speed control, fan motor controller to control RPM of rotor blade and grinding blade inside container, and power supply[9].

Operating condition of each device which is operated by control commend in MCU is displayed to know operating status for user and operating time of device is controlled by timer. Motor controller not only controls RPM of conveying unit according to control commend in MCU to be able to adjust discharged quantity of salt from salt storage container but also controls rotation direction. Fan motor controller controls RPM of rotor blade and grinding blade inside container for adjusting salt output and floating of sub-micron sodium chloride particles. Speed control between fan motor controller and rotary motor can be controlled by synchronous method or asynchronous method.

Stepping motor that is located in lower part of powder salt supply device is controlled by MCU. To supply 2.5g of powder salt per minute, stepping motor is controlled. The motor attached grinder is designed for high speed rotation. MCU sends operation signal to operating power simultaneously. High speed motor and fan in the top of grinder are interlocked. High speed motor and fan are possible to set an operating time in units of 30 second. Function of control circuit is composed of RPM control of stepping motor in powder salt supply device, operation control in high speed motor of grinder, and setting time function[10].

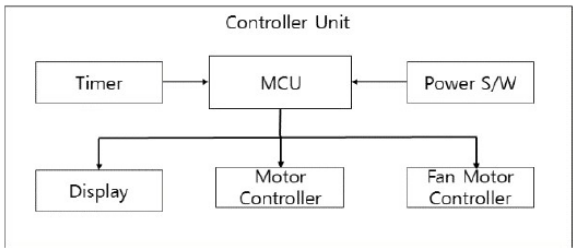


Figure5:. Control system block diagram

3. Results and Discussion

Automatically dispensingdevice of powder salt through electronic control can solve the problem that powder salt has a tendency to stick together for a hard mass after a period of time.

Dispensing quantity of powder salt is 2.5g per minute and this quantity is sufficient enough to inhale it in an enclosed space with 6m*6m during two minutes. Spray time of powder salt is two minutes and stopped. This device has proven to be reliability test.

4. Conclusion

Powder salt suction device is developed in this study not only to be able to inhale powder salt simultaneously in multiuse facilities but also to prevent infectious disease by dispensing powder salt in a fixed space. Application of dispensingdevice for powder salt is able to reduce harm damage due to fine dust. Accumulated fine dust in human lungs can be neutralized. This device has a high-value in practical use of healing center or general home because it has an effect on protection from heavy metal pollution caused by fine dusts. The value of salt in usage is enhanced by effectiveness of salt. Clinical test will be performed in the future for lung disease patients due to fine dust.

Acknowledgment

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