

## SUPERHEATED MEDICATED AIR IN DISEASES OF THE EAR AND NOSE\*.

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In making my report of over one year's experience with the superheated medicated air in the treatment of certain affections of the ear and nose, I desire to state at the outset that I do not claim originality of its use, nor do I claim that it is a panacea for all ailments and not the only treatment in the ear and nose affections. In fact, I have been unable to cure all my cases with its use, and bring an adverse report of its use in conditions in which it has been advocated, and great curative effects claimed, namely, in chronic catarrhal conditions of the middle ear.

I believe, however, that I have improved the method by which hot air can be applied and combined with medicinal substances, so that the results will prove to be superior from this agent than formerly; at any rate, I have found it a great adjuvant to the other already accepted methods of treatment.

Heat has been used in ear diseases as a therapeutic agent mainly to relieve pain, to stimulate absorption of pathological products, like connective tissue formation, or other deposits. It is used very frequently to promote suppuration in other parts of the body. I have employed it with this purpose in chronic suppurative processes in the ear.

The air itself serves as a drying agent. It also serves as a conductor for the medicinal substances.

Medicinal substances in gaseous forms and vaporized have been used in the diseases of the ear, as, for instance, chloroform, turpentine, and iodine.

The combination of these three agents, namely, air, heat and medicaments, I have applied in my experiments and treatment of my cases.

In order to make the heating and application of the air easy, I have devised this little air heater (Fig. 1), which consists of a metal cylinder mounted on a handle. The tip of this metal cylinder is mounted by wood fiber canula, two inches in length, which is detachable. Within this cylinder is an incandescent lamp, which car-

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ries a current of 115 volts, supplied with a switch at the handle to turn off or on the current by simple compression. At the back of this cylinder is an opening into which is inserted the nozzle of the compressed air tube. The medicator is within the cylinder; it is a small metal box, containing a piece of felt, which is saturated with the desired medicament, and it acts at the same time as a filter for the air.

As soon as the electric current is turned on, the metal cylinder begins to get hot, and within a minute or two it has acquired a sufficient heat to warm the air which passes through it from the air tubule. As soon as the current of air is allowed to pass through this heated chamber, it will come out in a concentrated warm stream from the tip of the wood fiber canula. It requires about two minutes to produce a very hot current, but the temperature can be regulated by the switch. The pressure of the air can also be regulated by the cut-off on the air tubes.

After experimenting with about fifteen different volatile medicinal substances, I have selected three which give the best results, namely, formalin, menthol and chloroform.

#### EXPERIMENTS.

*Thermal.* 1. By making contact for a half a minute, the temperature of the air current is brought up to the desired warmth, that is, 120 degrees F.

2. By keeping on the contact for six minutes, allowing the air to pass continuously, we get the maximum temperature, that is, 175 degrees F.

3. Making contact without allowing any air to pass through the heater for four minutes, we obtain then an air current of 265 degrees F.

4. It requires four minutes for the heater to cool by allowing the cold air to pass through when contact is taken off.

5. By making contact every half a minute and allowing the air to pass continually, we obtain a constant temperature of the air of from 120 to 130 degrees F.

#### BACTERIOLOGICAL EXPERIMENTS.

I will simply read the titles of the experiments; the detailed results will be published later. Suffice it to say, however, that the heated formalin filtered through a piece of felt in the manner described in the paper has distinct bactericidal properties, as these cultures show.

1. Cultures made of ordinary cold unfiltered compressor air.
2. Of filtered cold compressed air.
3. Of hot unfiltered compressed air.
4. Of hot filtered compressed air.
5. Of cold unfiltered formalin compressed air of 5, 10, 20, and 40 per cent.
6. The same, filtered.
7. Heated formalin compressed air unfiltered, at the above strengths.
8. The same, filtered.
9. Passing cold formalin compressed air at the above strengths over pure cultures of (a) staphylococcus; (b) streptococcus; (c) tubercle bacilli; (d) anthrax, and cultures made of them after that.
10. Same experiments with heated formalin.

For the application of this method of treatment, I have selected a number of affections of the ear and nose, but principally cases of chronic suppuration of the middle ear, and I shall describe the latter first. I divide the cases in two groups: (a) Those with bone involvement. (b) Those without bone involvement.

The differential diagnosis of these two conditions was made by the method of segregation, that is, washing out the cavity of the middle ear with sterile water and boric acid, by means of a Dickerman's canula. The washings were centrifuged and the sediment examined microscopically for bone dust and cholesterol, and cholesteotoma cells. The findings from these examinations were of great value for our prognosis. Where bone dust or cholesteotoma cells were found, the prospects for a cure were not encouraging. If, however, the findings were negative, the outlook for a cure was very promising, and even if bone dust was present, I am glad to state the results were far superior to the ordinary methods.

The application of this method of heated medicated air has a three-fold use.

1. It stimulates suppuration and helps to throw off pathological processes, thereby producing a healthy surface of healing. It produces epidermization more rapidly.
2. The cavity is dried, and produces a poor culture nidus for bacterial development.
3. The formalin in this gaseous state is forced into all crevices, and exerts its germicidal action more efficiently.

In order to describe the technique, I will report two cases, as illustrations.

Case 1. Miss C., 17 years old, suffered from a malodorous discharge from her right ear constantly for more than one year. Status: Right ear, membrana tympana fairly normal in appearance; membrana Schrapnelli has in its center a small perforation, through which oozes a small quantity of malodorous pus. The head of the hammer is visible, and a fine probe gives evidence to bare bone. A smear preparation shows but a few micro-organisms. Examination of sediment washings demonstrates bone dust. There are no marked obstructive changes in the nose, and the Eustachian tube is clear. Hearing is only slightly abnormal.

The usual method of treatment was carried out by myself for four months, without any improvement in the condition. July, 1902, after the usual cleansing and drying, I applied for the first time hot air with formalin, as follows: I directed the canula of the heater to the opening of the Schrapnell membrane, and allowed to pass into it a current of air of ten pounds pressure, at a temperature of 120 degrees F. The felt was saturated with a 40 per cent solution of formalin. The air was allowed to pass in it for three minutes, then the canal was gently packed with a gauze strip, and the patient sent home. The next day the ear was examined, she did not complain of pain, but the condition was not markedly changed. The treatment was repeated for four more days; the patient complained of some pain, and the discharge was more profuse, so that she took out the gauze packing, which she claimed was blood-stained. I found evidences of blood in the canal, but there was less odor to the discharge. From this day on, improvement followed, so that after three week's daily treatment, the discharge entirely disappeared. Anticipating, however, a return in these very unfavorable cases of perforation into Schrapnell's membrane, and the rarity of a cure without at least removal of the ossicles, I ordered the patient to return every month for examination, which she did, and I am glad to say that up to date there is no return of the discharge.

Case 2. Miss L., 26 years old; had running ear since childhood. The discharge would stop at times for a month or two, but always returned. Status: Pus abundant, and of a bad odor.

Microscopic examination.

Washing and sedimentation show no bone dust or cholesteotoma. I had been unsuccessful in the improvement of this condition after two months' treatment of the usual method. I, therefore, applied the super-heated formalin air, daily for five weeks, in precisely the same manner as in case 1, except that the time of application varied from five to ten minutes. The usual treatment of nose and throat

was carried out at the same time. The discharge entirely disappeared after five weeks. Five months have now elapsed, and no recurrence has yet taken place.

I have applied the superheated medicated air in twenty-three cases of otitis media; catarrhalis chronica, as described by Hopkins and Oaks, for the relief of deafness, and tinnitus, and I am sorry to state that I have not obtained satisfactory results; in fact, three patients have complained that whenever heat was used, the tinnitus was aggravated.

The use of heated air passed into the middle ear by means of the Eustachian cavity has given me the following experimental result:

A case of atrophic rhinitis, with a large perforation of the tympanic membrane was the subject. A thermometer was passed as far as possible into the meatus externus, and then the opening was plugged around the thermometer by a compound used by dentists, then a wood fibre catheter was warmed and passed into the Eustachian tube. The hot air, at the temperature of 120 degrees, was then allowed to pass into the catheter for more than seven minutes, until the patient complained of a hot sensation about the Eustachian opening. The thermometer did not show the slightest rise in temperature, and from this I concluded that the hot air introduced into the middle ear by this route is of no value, having cooled of before it reached the middle ear.

Other conditions for which I have used hot air by this method were acute salpingitis, earache in children, acute otitis media (in some, perforation followed), furunculosis, weeping eczema. In this latter condition, the results were gratifying. As a rule, itching was relieved, and the weeping eczema rapidly cured.

The superheated air in the treatment of nasal affections I have applied in two conditions: (1) Acute sinusitis without pus; (2) lupus of the alæ of the nose.

In the first stages of acute sinusitis with much pain, I have employed the heated air, medicated with menthol, of full strength, at the temperature of 105 degrees F., for ten minutes, the canula having been replaced by an olive tip. Treatment gave most satisfactory results. In one case of a physician whom I treated for three days by the usual method of mentholated steam inhalation and other local and general treatment was not relieved, but after one application of dry heat for ten minutes, the condition was very markedly improved. This may have been accidental, but in conjunction with my experience in other cases I am confident that dry hot air is preferable, and was the cause of the rapid change for the better.

In the case of lupus of the ala, I applied the formalin heated air, of a temperature of 230 degrees F., ten minutes at a time, for ten sittings, when the condition was perfectly healed. Lichtwitz reports a similar case, with same result, with the use of Hollander's apparatus.

In conclusion, I desire to say that not all cases which I treated with this method got well, as my full report of over thirty cases will show, nor that the cases of chronic suppurative ear disease which are now dry are permanently cured, but I have found this method an excellent addition to the non-surgical treatment of chronic suppuration of the middle ear, the condition which makes up such a large percentage of our cases.

Even when clear indications for operative interference exist, the patient will not always consent to it, and I believe that in such instances this method may be given a trial.

#### REPORT OF CASES.

Fourteen cases of otitis media catarrhalis chronica, varying from the age of twenty to fifty-four years, all having been complaining between one and ten years of deafness and noises in their ears. All gave a history of naso-pharyngeal trouble. All have a Rinné negative, and whisper reduced in varying degree. Improved some in hearing right after inflation, but this is not lasting. All were treated by the usual methods for from six weeks to six months, without any improvement, then added the use of superheated air to the tolerance of the patient, which was about 150 to 200 degrees F., for three to five minutes. Treatment lasted from six months to a year, twice a week. The general complaint during and a short time after the treatment was dizziness, in all the cases. There is no improvement in the hearing of any of the cases, the tinnitus was relieved in most of the cases, and three of the patients give a history of increase in the tinnitus after the treatments.

Fourteen cases of otitis media suppurative chronica, ranging from the age of nine to forty-three. All have had running ears for more than a year, and most of them for several years. The washings from the middle ear were sedimented and examined microscopically, and in five of the cases showed absence of either bone dust or cholesteotoma cells, while nine showed bone dust, but only three of those showed distinct epithelial cells of cholesteomatous nature, one giving the distinct chemical reaction. All these cases were treated previously by the usual accepted methods, with varying success, then using additionally superheated formalin air, with marked improvement.

Seven cases were cured, and remained so, the longest seven months, the shortest three and a half months. Of the remaining seven, five were markedly improved, and are still under treatment. Two were operated on (radical mastoid), and one ossiculectomy. Both still discharging and showing bone dust and epithelial cells microscopically in the sediment washing. All these cases are in private practice. Many cases treated clinically, but no record could be kept, owing to the irregularity of the coming, and many would stay away after a short period of treatment.

#### ACUTE OTITIS MEDIA (EAR-ACHE).

Four cases, all in children from three to seven years of age. Distinct history of adenoids. All relieved of pain after one or two applications of heat for three minutes, at the temperature of 120 degrees F. Three of these cases perforated, getting well by the usual mode of treatment after two to four weeks.

#### OTITIS EXTERNA FURUNCULOSA.

Two cases. Relieved of pain after the application of superheated air at the temperature of 200 degrees for five minutes, but incision was necessary to obtain a cure.

#### ACUTE SINUSITIS WITHOUT EVIDENCE OF PUS.

Three cases, in adults, using menthol, formalin alternately, in five per cent solution, the latter being very irritating. Every day for five minutes, for three days. All three cases very much relieved after treatment.

#### LUPUS OF THE RIGHT ALA.

One case; man, thirty years old; distinct lupoid tubercles treated for a period of six weeks by X-rays, with not marked improvement, and after eleven applications of superheated air, at a temperature of 255 degrees, the condition commenced to show improvement, and healing followed.

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