# Iodine: the Forgotten Weapon Against Influenza Viruses

David Derry, MD, PhD

332 – 425 Simcoe Street
Victoria BC V8V 4T3

*Correspondence:* Dr. David Derry dderry@shaw.ca

Received: August 29, 2009
Accepted: September 2, 2009

***Abstract.*** After the 1918 Influenza Pandemic which killed an estimated 30 million people, governments financed research on the Pandemic's causes. Over 25 years, influenza viruses were isolated and methods for killing them with various agents discovered. Iodine was the most effective agent for killing viruses, especially influenza viruses. Aerosol iodine was found to kill viruses in sprayed mists, and solutions of iodine were equally effective. In 1945, Burnet and Stone found that putting iodine on mice snouts prevented the mice from being infected with live influenza virus in mists. They suggested that impregnating masks with iodine would help stop viral spread. They also recommended that medical personnel have iodine-aerosol-treated rooms for examination and treatment of highly infected patients. Current methods of dealing with influenza infection are isolation, hand washing, antiviral drugs, and vaccinations. All of these methods can be improved by incorporating iodine into them. When impregnated with iodine, masks become much more effective, and hand washing is more effect when done with mild iodine solutions. Isolation techniques coupled with aerosol iodine would make them safer for patients, medical personnel, and all persons working with the public. Public health authorities could organize the distribution of iodine and at the same time educate the public in the effective use of iodine. Oral iodine might also boost body defense mechanisms in the upper oral and respiratory mucus. ***Conclusion:*** Iodine incorporated into masks, solutions, aerosols, and oral preparations could help to kill influenza viruses and fight off an H1N1 Pandemic.

***Keywords.*** H1N1 • Influenza virus • iodine • aerosols • immunization • isolations • masks • prevention

## *Influenza Pandemic History*

The 1918 Influenza Pandemic killed an estimated 30 million people within a year. In the quarter century following the Pandemic, governments financed intensive research into the Pandemic's causes and treatments for the viruses that cause influenza.[1] Iodine was the superior antiseptic that at low concentrations killed the airborne viruses that cause influenza. Iodine was without toxicity.[2-12]

The 1918 Pandemic was unusual in that it affected young healthy men, especially soldiers.[1] Normal flu infections are most virulent against young children and older persons.[14] H1N1 virus also concentrates its lethality on young healthy persons between ages 5 and 18, as reported by Dr. Thomas Frieden, director of the U.S. Centers for Disease Control and Prevention.[13-14] In this manner, the H1N1 virus resembles the 1918 virus.

The 1918 virus attacked again in the fall and over two-months killed millions of people. It is anticipated that the H1N1 virus may behave similarly, and public health authorities and the medical profession are bracing for this potential outcome.

## *Treatment and Prevention*

The time-tested weapons against influenza viruses are cleanliness, hand washing, isolation, masks, immunizations, and antiviral medications. In 1918, the last two were not available, and the other methods did little to stop viral spread. Washing hands in a standard 70% alcohol solution is effective against most pathogenic bacteria, but it has no effect on viruses, especially influenza viruses.

In a similar manner, masks used in 1918 showed barely detectable benefits in holding back influenza spread as viruses readily passed through the gauze. Isolation is difficult to institute and enforce in cities with large numbers of infected patients. In sparsely-populated communities such

as Alaska, isolation was beneficial but difficult to implement. Even in hospitals, large numbers of patients tend to overwhelm and compromise isolation techniques.[1]

Vaccines and antiviral drugs have been prepared and are available in many Western Countries. These interventions are of unknown benefit, as influenza viruses tend to mutate rapidly.

### Iodine

Iodine is the most effective broad-spectrum antiseptic with low toxicity.[21] Iodine has very high germicidal activity, and no organism develops resistance to iodine.[12]

Iodine has been used in various forms as an antiseptic for the skin, wounds, and mucous surfaces of the body. It has also been used to sterilize the air and inanimate objects such as catgut and surgical instruments. Moreover, it has been used as a prophylactic and therapeutic agent in diseases caused by bacteria, viruses, and fungi, and to sanitize eating utensils.[7,12] Iodine kills bacteria, viruses, fungi, protozoa, and even spores of bacteria and fungi, including anthrax spores. Iodine was used successfully against influenza, herpes, small pox, and chicken pox viruses.[7]

When iodine was suspended in a solution, viral inactivation occurred at dilutions of 1/1,000,000. Aerosols inactivated many viruses within 30 seconds or less.[7,8,12] Watery solutions such as Lugol's are the superior germicides.[12]

### New Findings Leading to Effective Therapy with Iodine

In 1945, a breakthrough occurred when J.D. Stone and Sir McFarland Burnet (who later went on to win a Nobel Prize for his Clonal Selection Theory) exposed mice to lethal effects of influenza viral mists. The lethal disease was prevented by putting iodine solution on mice snouts just prior to placing them in chambers containing influenza viruses.

Burnet and Stone wrote, "As a protection for doctors, nurses and others dealing with highly infectious patients (Pandemic Influenza) it should be relatively easy to design a gauze mask partially impregnated with iodine which should offer a greatly increased degree of protection to the wearer."[2,3]

Burnet and Stone also suggested, "it may be worth considering iodine vapor as a practical means of limiting indoor infection during an influenza epidemic"[2,3] Students in classrooms were protected from influenza by iodine aerosol therapy. Aerosol iodine also is effective against freshly sprayed influenza virus.[8]

### Iodine Body Properties and Distribution

Iodine has been known as a universal antiseptic for 150 years and has few side effects except in high doses. Iodine was introduced into our diets with iodized salt by David Marine in 1920.[21,26] This effectively eliminated goiter, cretinism, and mental retardation caused by inadequate iodine in our diet.[21,27,28]

Extremely high doses of iodine can have serious side effects, but only a small fraction of such extreme doses are necessary to kill influenza viruses. Iodine circulating in the blood is captured by many tissue sites and ends up in mucus secretions. The tissues include thyroid and salivary glands, nasal secretions, stomach, and lungs. Collectively, these tissues and mucus products contain free iodine which defends against invasion by bacteria and viruses.[16,20]

When dietary iodine is absorbed from the gut all the above sites along with urinary output compete for blood iodine. The most potent competitor is the thyroid glands, which uses iodine to make thyroid hormone. A constant percentage of dietary iodine is excreted in the urine.[16]

### Upper Respiratory and Oral Mucus Defenses

The salivary glands, nasal mucosa, and lungs all secrete mucus which contains iodine.[16] The lungs not only secrete mucus, but Salter thought volatile iodine mixes with alveolar air to enter the bronchioles.[17] If this is occurs, it would serve as an additional barrier to the invading air borne viruses in a manner similar to aerosol iodine.

Stomach mucosa captures iodine from blood and secretes it into stomach cavities. Free iodine in the stomach kills bacteria and viruses and it deactivates biological and chemical toxins. Dead viruses are still immunologically competent and thus antibodies can be made to dead viruses.[20, 22] Overall, we see there is a complex integrated system for protecting humans from viral or bacterial invasions via oral, nasal, and gastrointestinal routes.[16] This system depends on taking adequate

iodine orally.

### Current Iodine Doses and Doses Needed to Prevent Invasion

Our current recommended iodine intake by the WHO is 150 to 200 micrograms daily. This dose first started by David Marine in 1920 has successfully prevented goiters, cretinism, and mental retardation.[21] If the daily iodine dose is above 3 mg for over 2 weeks, the thyroid gland becomes saturated and no longer takes up much iodine.[25]

Then, dietary iodine goes to other sites named above and is excreted into the upper respiratory and gastrointestinal tract mucus.[16] It seems logical that air borne viruses become stuck in mucus and killed by free iodine.

Dietary iodine found in iodized salt is below the amounts needed to fill mucus defense roles. To protect themselves, people wishing to boost their defense against infections should supplement their diets with iodine in the form of Lugol's. Most people will probably be protected by an amount of Lugol's that provides the average amount of iodine ingested by Japanese populations for centuries. This amount is about 12 mg daily. Two drops of Lugol's daily in the liquid of their choice will provide 13 mg.

### Lugol's Iodine Solution

Lugol's iodine solution was discovered by Henri Lugol, a Paris physician,[21] more than 150 years ago. It has been used therapeutically since then. Lugol's consists of 5% free iodine and 10% potassium iodide in water. Lugol's has a distinct advantage over most other iodine oral medications by having a high level of free iodine, which is the active ingredient that kills viruses.[5,6,15]

Medical personnel and others interacting with highly infectious persons should consider protecting themselves with 2 drops daily of Lugol's iodine orally in the liquid of their choice, as all liquids work. At this dose, no noticeable side effects occur.

Free iodine is believed to react with the amino acids tyrosine and/or histidine at low concentrations. The reaction denatures proteins and causes the death of cells.[5,6,20,22] In Canada, Lugol's iodine solution can be bought over the counter and costs about 10 dollars for 100 ml. This amount will last one person 5 years.

### Iodine Well Tolerated by Humans

With few exceptions, humans tolerate well large doses of iodine.[18-24,29] High doses are not required to kill viruses. Aerosols can be effective in sterilizing a room at levels not detectable by humans.[7,4,8,12] In the 1930s, iodine's use therapeutically was stated in the US Pharmacopeia. The usual dose for treatment is 300 mgs (46 drops of Lugol's) to 1 gm (1000 mg, 154 drops). The maximum safe dose in 24 hours should seldom exceed 6 gm as at these extreme doses iodine is not without danger. Such high doses are not needed to prevent or treat influenza virus infections.

### Educating the Public

Supervised by Public Health Officials and physicians the lay public can be taught ways to use iodine. By using iodine correctly persons could protect themselves and their families. Stock piled concentrated solutions can be the source of more dilute solutions for distribution to the public.[7,12]

### Can Lugol's be Given to Treat Influenza Infection?

The author is not aware of any published data on treating viral infections with oral or intravenous Lugol's solution or any other medications with the exception of some topical iodine's use for herpes infections. As Lugol's is well tolerated both ways, it is a form of treatment that could be explored. It was standard practice to give high doses of iodine for Graves' disease prior to thyroidectomy and no serious side effects were noticed.[24]

### Why Did the Japanese not Fair Better in the 1918 Influenza Pandemic?

A possible explanation for Japanese citizens doing as badly as the rest of the world in 1918 is that in Japan, as well in Chile, citizens have the highest consumption of nitrates in the world. Nitrates in high doses competitively block membrane transport mechanisms that move iodine from the blood into the thyroid gland, salivary glands, and stomach mucus glands. This nitrate effect would interfere with body defense systems. No opportunity has arisen to test this possibility.

### Pre-planning in Catastrophes

Hard, fast, and exacting rules for preventing an Influenza Pandemic cannot be laid down. However,

definite, prearranged, overall systematic planning is necessary. All possible methods of prevention and intervention should be taken into consideration so that the greatest amount of good to the largest number of people results.[12]

The methods using iodine are untried in pandemic conditions. It is likely that trying the methods during pandemic will present new problems. Nor are these proven methods of protection, as no epidemic has been tested this way. However, data reviewed here indicate that this approach, done properly, could help arrest an epidemic and possibly save many lives, especially those of medical personnel, from this horrible disease.

For stock piling, it is more economical to store a supply of a mixture of iodine and a soluble iodide in glass bottles. The bottle sizes should be such as to make quickly available solutions of desired concentrations of free iodine without the necessity of weighing at the time of use. In this form the germicide shelf life is indefinite.[12]

## Conclusion

A medical literature review indicates the 1918 Influenza Pandemic was caused by viruses. In addition, iodine, as iodine solutions or aerosols, was superior in every respect to kill the flu viruses. These findings indicate that simple methods could help with the fight if an epidemic occurs.

Many forms of iodine have been available, but Lugol's iodine has stood the test of time and is standardized around the world. Lugol's has advantages. It has a high free iodine content, which suggests it may be a choice agent for fighting influenza virus. Using iodine has not been tried, but available data strongly suggests it should help.

## References


1. Crosby, A.W.: *America's Forgotten Pandemic: The Influenza of 1918*. New York, Cambridge University
2. Burnet, F.M., Holden, H.F., and Stone. J.D.: Action of iodine vapour on influenza virus in droplet suspension. *Austral. J. Sci.*, 7:125-126, 1945.
3. Stone, J.D. and Burnet. F.M.: The action of halogens on influenza virus with special reference to the action of iodine vapour on virus mists. *Austral. J. Exptl. Biol. Med*., 23:205-212, 1945.
4. Dunham, W.B. and MacNeal, E.J.: Inactivation of vaccinia virus by mild antiseptics. *J. Lab. Clin. Med*., 28:947-953, 1943.
5. Carrol, B., Keosian, J., and Steinman, I.D.: The mode of action of iodine on infectious agents. *J. Newark Beth Israel Hosp*., 6:129-140, 1955.
6. Carroll, B.: The relative germicidal activity of triiodide and diatomic iodine. *J. Bacteriol*., 69:413-417, 1955.
7. Gershenfeld, L.: Iodine. In *Disinfection, Sterilization, and Preservation*. Edited by S. S. Block. Philadelphia, Les & Febiger, 1977, pp.196-218.
8. Gershenfeld. L.: Iodine as a virucidal agent. *J. Am. Pharm. Assoc*., 44:177-182, 1955.
9. Dunham, W.B. and MacNeal, W.J.: Inactivation of vaccinia virus by mild antiseptics. *J. Lab. Clin. Med*., 28:947-953, 1943.
10. Faber, H.K. and Dong, L.: Virucidal activity of some common surface antiseptics with special reference to poliomyelitis. *Pediatrics*, 12:657, 1953.
11. Gerchenfeld, L.: Iodine. In *Antiseptics, Disinfectants, Fungicides, and Chemical and Physical Sterilization*, 2nd edition. Edited by G.F. Reddish. Philadelphia, Lea & Febiger, 1957.
12. Reddish, G.F.: *Antiseptics, Disinfectants, Fungicides, and Chemical and Physical Sterilization*. Philadelphia, Lea & Febiger, 1957.
13. Alphonso, C.: H1N1 virus hits children 5 to 18 the hardest. *The Globe and Mail Toronto*, Canada, Friday. Sept. 4, 2009.
14. Galson, S.K.: 2009 N1H1 flu: also known as swine flu/ May 1, 2009, FPC Briefing. U.S. Department of State. http://fpc.state.gov/122555.htm.
15. Gottardi, W.: Iodine and iodine compounds. In *Disinfection, Sterilization, and Preservation*, 4th Edition. Edited by S.S. Block. Philadelphia, Lea & Febiger 1991.
16. Brown-Grant, K.: Extrathyroidal iodide concentrating mechanisms. *Physiol. Rev*., 41:189, 1961.
17. Salter. W.T.: *The Endocrine Function of Iodine*. Cambridge, Harvard University Press, 1940.
18. Danowski, T.S., Johnston, S.Y., and Greenman, J.H.: Alterations in serum iodine fractions induced by the administration of inorganic iodide in massive dosage. *J. Clin. Endocrinol.*, 10:519, 1950.
19. Derry, D.M.: Successful human scar regeneration by topical iodine. *Med. Hypotheses*, 72:553-561, 2009.
20. Derry, D.M. Breast Cancer and Iodine. Trafford, Victoria Canada, 2001.
21. Kelly, F.C.: Iodine in medicine and pharmacy since its discovery, 1811-1961. Proceedings of the Royal Society of London—Series B: *Biol. Sci*., 54:831-836, 1961.
22. Heneine, I.F. and Heneine, L.G.: Stepwise iodination. A general procedure for detoxification of proteins suitable for vaccine development and antiserum production [comment]. *Biologicals*, 26

(1):25-32, 1998.
23. Salter, W.T.: *Endocrine Function of Iodine*. Cambridge, Harvard University Press, 1951.
24. Pennington, J.A.: A review of iodine toxicity reports. *J. Am. Diet. Assoc*., 90:1571-1581, 1990.
25. Wayne, E.J., Koutras, D.A., and Alexander, W.D.: *Clinical Aspects of Iodine Metabolism*. Philadelphia: F.A. Davis Company, 1964.
26. Matovinovic. J.: David Marine (1880-1975): Nestor of thyroidology. *Perspectives Biol. Med*., Summer:565-589, 1978.
27. Hetzel, B.S.: Iodine deficiency: a global problem. *Med. J. Australia*, 165(1):28-29, 1996.
28. Hetzel, B.S., Dunn, J.T., and Stanbury, J.B.: *The Prevention and Control of Iodine Deficiency Disorders*. Amsterdam, Elsevier, 1987.
29. Vagenakis. A.G. Effects of iodides: clinical studies. *Thyroid*, 1(1):59-63, 1990.