Hypertonic Saline for Inhalation: A Do It Yourself Recipe

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Bronchiolitis is one of the most common causes of infant and child hospitalization, and clinical practice guidelines have been developed in several countries [1,2]. Bronchiolitis is defined as a viral upper respiratory infection prodrome followed by respiratory effort and wheezing in children younger than 2 years of age.

During their first 2 years, about one-third of children develop bronchiolitis, with 10% of them requiring hospitalization. The cost of bronchiolitis admissions is enormous, amounting to more than US$1.5 billion annually. The underlying pathophysiology is inflammation of small airways due to viral infection, with edema, swelling of the mucosal epithelia, and accumulation of mucus secretions obstructing the airways [1]. As the airways become dehydrated and sodium is increasingly absorbed, the mucus plugs cause increased airway obstruction, atelectasis, and breathing difficulty. The clinical diagnosis of bronchiolitis is mainly based on medical history and physical examination (rhinorrhea, cough, crackles, wheezing, and signs of respiratory distress).

Over the years, many treatment modalities have been advocated. However, there is no evidence to support the use of bronchodilators, corticosteroids, chest physiotherapy, antibiotics, or antivirals. One of the most recent novel treatments has been the use of hypertonic saline (HS). HS hydrates the airway lumen and its air surface liquid and theoretically should improve mucociliary clearance [3]. Despite recent debates about the benefit of this treatment, there is still wide acceptance of this inexpensive and relatively adverse effects-free therapy [4,5].

HS has been used safely not only in bronchiolitis but also in many other respiratory indications such as cystic fibrosis (CF), non-CF bronchiectasis, tuberculosis, primary ciliary dyskinesia, and chronic bronchitis [6-12]. Moreover, HS has been also used routinely for sputum induction and as an aid to physiotherapy in many chronic airway diseases, including asthma [8-13].

While in the Western world HS may be considered a relatively available and cheap therapy for a majority of the population, the situation is, unfortunately, very different in developing countries. These countries tend to have poor access to medication due to limited resources [14-16], especially in the public sector. The majority of the population purchases medicines in the private sector, where generic medications are usually available, although prices are high. These countries also have higher rates of morbidity and mortality due to respiratory infections, particularly in those under 5 years of age [17]. This situation necessitates finding ways to increase the availability of medications.

The study by Elior and colleagues in this issue of *IMAJ* [18] suggests an innovative approach that may be most practical in these countries. Using inexpensive and readily available ingredients and simple, easily carried out preparations, the authors developed and validated a recipe for homemade HS using a microwave oven and demonstrated that these solutions were as sterile as those commercially produced. To further simplify HS preparation, perhaps the microwave oven could be replaced by another sterilization technique since many areas have poor access to electricity.

This study describes an innovative and inexpensive way of obtaining HS that should be evaluated by "real-world" clinical trials.

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Capsule

Following the immunological clock

Immune function is altered during pregnancy to protect the fetus from an immunological attack without disrupting protection against infection. **Aghaeepour** et al. used mass cytometry to examine the precise timing of these pregnancy-induced changes in immune function and regulation. They developed an algorithm that captured the immunological timeline during pregnancy, validating previous findings and shedding light on immune cell interactions during gestation. By defining this immunological chronology during normal pregnancy, they can now look for alterations associated with pregnancy-related pathologies.

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Eitan Israeli

Capsule

Metabolic programming of tissue APCs

Antigen-presenting cells (APCs) are scattered throughout the body in lymphoid organs and at the portals of pathogen entry, where they act as sentinels of the immune system. **Sinclair** and colleagues demonstrated that APCs at different sites have distinctive metabolic signatures and that the development and function of these cells are determined not only by their transcriptional program, but also by their metabolic state. The authors identified a central role for mechanistic target of rapamycin (mTOR) in mediating the metabolic adaptation of such tissue-resident APCs by influencing the immunological character of allergic inflammation. Thus, tissues endow resident APCs with distinctive metabolic characteristics that control APC development and function.

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Eitan Israeli

Capsule

Debugging a cancer therapy

Microbes contribute not only to the development of human diseases but also to the response of diseases to treatment. **Geller** et al. showed that certain bacteria express enzymes capable of metabolizing the cancer chemotherapeutic drug gemcitabine into an inactive form. When bacteria were introduced into tumors growing in mice, the tumors became resistant to gemcitabine, an effect that was reversed by antibiotic treatment. Interestingly, a high percentage of human pancreatic ductal adenocarcinomas, a tumor type commonly treated with gemcitabine, contain the culprit bacteria. These correlative results raise the tantalizing possibility that the efficacy of an existing therapy for this lethal cancer might be improved by co-treatment with antibiotics.

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Eitan Israeli

"A society which is mobile, which is full of channels for the distribution of a change occurring anywhere, must see to it that its members are educated to personal initiative and adaptability. Otherwise, they will be overwhelmed by the changes in which they are caught and whose significance or connections they do not perceive"

John Dewey, (1859–1952), American philosopher, psychologist, and educational reformer whose ideas have been influential in education and social reform