Salbutamol-Induced Desensitization and Attempts to Resensitize In Vitro

MOHAMMED SULTAN MOHIDDIN SAJID

For author affiliations, see end of text.

Received February 9, 2012; Revised June 29, 2012; Accepted August 12, 2012

This paper is available online at http://ijpt.iums.ac.ir

ABSTRACT

The study was carried out to desensitize spontaneously active isolated chick rectum with salbutamol in log doses starting from 100 nanogram and resensitize with various drugs as a result to revive the desensitized tissue and respond to Salbutamol. The tissue response after desensitization to alpha, beta adrenergic and muscarinic acetylcholine receptor antagonists was isotonically recorded for 10 minutes using thermostatically-controlled organ bath with aeration. The results with prazosin showed that the tissue recovered from desensitization and exhibited spontaneous motility and responded to salbutamol faster.

Keywords: Salbutamol, Chick rectum, Desensitization, Prazosin, Resensitization

Asthma, from the Greek (asthma) meaning gasp, is a common chronic inflammatory disease of the airways characterized by variable and recurring symptoms, including wheezing, coughing, chest tightness and shortness of breath. Medications used to treat asthma are divided into 2 general classes: relievers and maintainers. Quick-relief medications used to treat acute range of bronchial constrictor agents. By using these symptoms including Short acting beta-2 agonists medicines too frequently, the efficiency may decline, as such as salbutamol (Albuterol), producing desensitization resulting in an exacerbation of symptoms which may lead to refractory asthma and death. LABAs are similar in structure to SABAs but further exacerbations including inhaled corticosteroids have much longer side chains resulting in a 12-hour such as hydrocortisone and beclomethasone; inhaled effect. While patients report improved symptom control, long acting beta-2 agonists (LABA) such as salmeterol these drugs do not replace the need for routine rescuers and formeterol; inhaled anti-cholinergics such as and their slow onset means the short acting dilators are ipratropium and tiotropium; leukotriene modifiers such as still required. However for the past 4 decades, there is montelukast and zafirlukast; mast cell stabilizers such as has been a continuing debate concerning whether sodium cromoglicate and nedocromil sodium; methyl 60 regular chronic treatment with these drugs may be doing xanthenes such as theophylline and immunomodulators 61 more harm than good [8]. In 2005, the USFDA released such as omalizumab. 62 a health advisory alerting the public to findings that Beta-2-adrenoceptor (beta-2-AR) agonists are the show the use of LABA could lead to worsening of most commonly used bronchodilators in both the acute 64 symptoms and in some cases death. In 2008, members rescue and maintenance therapy of asthma. However, 65 of USFDA recommended withdrawing approval for chronic mono-therapy with long-acting and/or short- 66 these medications in children. In 2010, USFDA gave...
Effect of salbutamol (SAL) on isolated chick rectum and influence of prazocin (PRA) in vitro

Materials and Method

Animals

Freshly-removed intestine of chick slaughtered at a local chicken shop was immediately put into cold 500 ml Krebs solution, transferred to laboratory and aerated provided immediately.

Methods

The rectum, the end part of the gastro-intestinal tract, was identified; 2-3 cm portion was cut and transferred into Petri dish containing Krebs solution, aerated. Salbutamol (1 mg) did not produce any response showing desensitization (Fig 1).

Salbutamol produced initial contraction followed by relaxation. Salbutamol (300 μg) produced slight relaxation; salbutamol in log doses starting from 100 nanogram for 1 min each to record the tissue responses, until tissue regained its baseline. As shown in Fig 2, salbutamol (10 μg) produced a brief contraction followed by relaxation; with washings the tone did not rise and prepared different concentrations in micrograms.

Results

Salbutamol (SAL) in log dose range of 100 ng to 30 μg produced dose dependent relaxations; 100 μg of salbutamol (SAL) in log doses starting from 100 nanogram for 1 min each to record the tissue responses, until tissue regained its baseline and subsequent doses of 10 μg, 30 μg and 100 μg resensitized, salbutamol in microgram concentrations produced responses.

Published online: January 31, 2013

Mohiddin Sajid

Tyrodes solution (composition: sodium chloride 8.0 gm, potassium chloride 0.2 gm, magnesium chloride 0.1 gm, calcium chloride 0.2 gm, sodium bicarbonate 1.0 gm, dextrose 1.0 gm, distilled water 1 litre).

Krebs solution (composition: sodium chloride 6.9 gm, potassium chloride 0.35 gm, calcium chloride 0.28 gm, sodium bicarbonate 2.1 gm, magnesium sulphate 0.29 gm, potassium/sodium di-hydrogen phosphate 0.15 gm, dextrose 2.0 gm, distilled water 1 litre).

Salbutamol obtained as Asthelin respiratory solution purchased from drug store and prepared dilutions of 100ng, 300ng, 1μg, 10 μg, 30 μg, 100 μg, 300 μg and 1mg using distilled water. Prazosin tablets purchased from local drug store, dissolved in distilled water, filtered and prepared different concentrations in micrograms.

Drugs Solutions
Effect of cumulative doses of salbutamol (SAL) on isolated chick rectum and influence of various concentration of prazocin (PRA) in vitro

And finally prazocin 100 µg did not produce any response.

As shown in Fig 3, salbutamol (3 µg) produced relaxation, with washings the tone did not regain to the baseline. Subsequent addition of two doses of salbutamol (10 µg) produced slight relaxations. Prazocin (10 µg) produced tone and motility and in the presence of prazocin, SAL (10 µg) produced relaxations. Similarly prazocin in several fixed doses of 30 µg and a single dose of 10 µg produced tone and motility, followed by prominent relaxation with salbutamol (10 µg). Continuing in second tracing in the Fig 3, four doses of salbutamol 30 µg were added with intermittent washings, the first dose did not produce any response, the second dose produced some relaxation, third and fourth doses did not produce any response. Prazocin (30 µg) did not produce any response, a second higher dose of prazocin (100 µg) produced tone and motility and in the presence of 10 µg salbutamol-produced relaxation.

Similarly prazocin in different doses was added and produced tone and motility and in its presence salbutamol-produced relaxations.

As shown in Fig 4, first dose of 10 µg salbutamol produced relaxation; second dose of salbutamol (10 µg) produced slight relaxation. Subsequent three cumulative doses of 10 µg salbutamol did not produce any response could be due to desensitization. Prazocin (100 µg) did not produce any response, second dose of 30 µg prazocin produced contraction. Salbutamol (10 µg) produced relaxation. Subsequent addition of three cumulative fixed doses of 10 µg salbutamol did not produce any response but the tone fell down. Two sets of prazocin and cumulative doses of salbutamol produced contractions followed by relaxations respectively.

Discussions

Salbutamol produced desensitization at beta-2 receptor in Fig 1. Many of our experiments showed that salbutamol is not specific beta-2 adrenergic receptor agonist, it acts on both alpha and beta receptors i.e., producing immediate contraction followed by a slower relaxation and this could be the component which is responsible for sudden deaths in asthma patients [9-14]. Salbutamol produced response by acting on alpha-1 and beta-2 receptors till receptor saturation, Prazosin per se produced tone and motility, and it seems to facilitate relaxation. Combination of salbutamol-prazosin by alternate administration showed beneficial effects. This is fairly satisfactory combination which might help in preventing the desensitization. The numerous experiments are quite supportive that salbutamol and prazosin combination could be a suitable combination in the therapy of asthma. The actual mechanism involved in tissue resensitization is subject of further research.

It is concluded that to certain extent we succeeded in achieving our goal of finding out the possible combination of prazocin with salbutamol which can help the asthma patient in getting relief without any danger or emergencies.

References


CURRENT AUTHOR ADDRESSES

Mohammed Sultan Mohiddin Sajid, E-mail: sultanmsajidm@gmail.com