Salbutamol-Induced Desensitization and Attempts to Resensitize In Vitro

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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,44 responsiveness to allergen [5], poor asthma control [6] and even increased mortality [7]; effects which may be included wheezing, coughing, chest tightness and secondary to beta2-AR desensitization. SABAs are the shortness of breath. Medications used to treat asthma mainstay for the acute symptomatic treatment of asthma are divided into 2 general classes: and provide effective bronchial protection to a wide range of bronchial constrictor agents. By using these symptoms including Short acting beta-2 agonists medicines too frequently, the efficiency may decline, (SABA) such as salbutamol (Albuterol), producing desensitization resulting in an exacerbation levosalbutamol, terbutaline and bitolterol. of symptoms which may lead to refractory asthma and death. LABAs are similar in structure to SABAs but have much longer side chains resulting in a 12-hour duration 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 still be required. However for the past 4 decades, there as montelukast and zafirlukast; mast cell stabilizers such has been a continuing debate concerning whether as sodium cromoglicate and nedocromil sodium; methyl regular chronic treatment with these drugs may be doing xanthenes such as theophylline and imunomodulators more harm than good [8]. In 2005, the USFDA released such asomalizumab. a health advisory alerting the public to findings that Beta2-adrenoreceptor (beta2-AR) agonists are the show the use of LABA could lead to worsening of most-commonly used bronchodilators in both the acute symptoms and in some cases death. In 2008, members rescue and maintenance therapy of asthma. However, of USFDA recommended withdrawing approval for chronic mono-therapy with long-acting and/or short- these medications in children. In 2010, USFDA gave
rough the lumen to flush

Salbutamol (SAL) produced slight relaxation.

This tissue invariably had

salbutamol (SAL) did not produce any response

Material 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 aeration
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.
Salbutamol (1 mg) did not produce any
response showing desensitization (Fig 1).

solution was slowly passed through the lumen to flush.
As shown in Fig 2, salbutamol (10 μg) produced a
brief contraction followed by relaxation; with washings
repeatedly passed through organ bath and aerated. The
tone of the tissue went up to half the original
response was isotonically recorded (tension
baseline. Salbutamol (30 μg) produced relaxation, with
weight 1 gm, magnification 10 times) in non-cumulative
washings the tone did not regain its baseline.
and cumulative manner that this tissue invariably had
Salbutamol (100 μg) did not produce any response
spontaneous motility. The rectum was exposed to
showing desensitization. Prazocin (10 μg) produced
Salbutamol in log doses starting from 100 nanogram for
tone and motility, then 10 μg salbutamol produced some
1 min each to record the tissue responses, until tissue
relaxation, with washings the tone regained its baseline
stopped responding which is said to be desensitized.
and 10 μg salbutamol produced prominent relaxation.
Continuing further, tissue responses with prazocin (PRA) in different microgram concentrations were
observed for 5-10 minutes. Finally, once the tissue
dose of prazocin (10 μg) reproduced tone and motility,
regained the original baseline and motility which can be
and subsequent doses of 10 μg, 30 μg and 100 μg
resensitized, salbutamol in microgram concentrations
salbutamol produced relaxations. Prazocin (30 μg) did
produce any response, with wash, the tone went up

Results

Salbutamol (SAL) in log dose range of 100 ng to 30
μg produced dose dependent relaxations; 100 μg of
Salbutamol produced initial contraction followed by
relaxation. Salbutamol (300 μg) produced slight
relaxation; Salbutamol (1 mg) did not produce any
trimmed off from the mesentery and other tissues. Krebs
solution was slowly passed through the lumen to flush.
As shown in Fig 2, salbutamol (10 μg) produced a
brief contraction followed by relaxation; with washings
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salbutamol produced relaxations. Prazocin (30 μg) did
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Resensitizing Salbutamol-Induced Desensitization

Fig 3. Effect 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 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 relaxation;

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


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