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Illegal Use of Clenbuterol in Cattle Production in México

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Abstract

Slaughtered cattle (*n* = 582) from México State were bled for a serological screening of clenbuterol residues, using a commercial enzyme-linked immunosorbent assay (ELISA). Clenbuterol residues were found in a total of 153/582 (26.2%) sera analysed. These results reinforced the assumption of the illegal use of clenbuterol in cattle production in México; therefore, routine screening examinations in slaughtered cattle were strongly advised considering the toxic potential for humans.

Keywords

Clenbuterol; ELISA; Cattle; México

1. Introduction

The clenbuterol is white, anhydrous, very soluble in water and has a highly stable dust to room temperature; its fusion point goes of 174˚C to 175.5˚C. It has one structure chemistry related to catecholamine's able to interact with adrenergic receivers, generally of the type ß2. Chemically amino metil alpha butilamino T3 is amino 4, 5

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diclorobenzil alcohol. It owns an average life of prolonged action, with the particularity of being able to store in liver and kidney and metabolizes by means of glucoronics reactions of N-oxidation in hidroxyclenbuterol and conjugated [1]-[4] (**Figure 1**).

Long-acting β-adrenergic stimulating drugs such as clenbuterol are illegally used to promote animal growth, causing a considerable increase in muscular mass and, at the same time, a decrease in fat accumulation [1].

The effects derived from the product ingestion contaminated with CCL are muscular sleepiness of the hands, tremors, muscular nervousness, and headaches. In acute-extreme overdoses, not derived from the product ingestion with residues but a product of pharmaceuticals, an accidental overdose of the human line that contains clenbuterol, one accentuates the tachycardia, the sleepiness, the nervousness, the tremors and can have necrosis of the myocardium by diminution of the perfusion generated by the shortening of the diastole, the stage in which the irrigation of the myocardium by the coronary ones is carried out [2]-[4].

Doubtless for the producers, the inclusion of CCL in the diet of bovines has generated important gains economically; nevertheless the problems in public health and in health animal require that specialist in the sector veterinary health, doctors and epidemiologists work together to safeguard the collective health. And the SAGARPA at Federal State level also must maintain operative of monitoring and the control, for the eradication in the use of this substance [4] [5].

To authors' knowledge, data on the illegal use of clenbuterol in cattle production in México had been carried out only at the Yucatán Peninsula [6]. The present study was undertaken with the aim to identify the presence of clenbuterol residues in cattle at the slaughterhouse in México State, Central México.

2. Materials and Method

Between September 2012 to March 2013, blood samples were collected from 582 cattle at the Toluca slaughterhouse, México. For each sampled animal, municipality origin was recorded.

Cattle handling procedures were performed with the license of the owners. Approximately 3 ml of blood was collected from the jugular vein.

All sera were tested for clenbuterol residues by a commercial enzyme-linked immunosorbent assay (ELISA) (RIDASCREEN® Clenbuterol Fast, R-Biopharm AG, Darmstadt, Germany) [7]. ELISA was performed by using 20 µl of serum according to manufacturer's instruction. Absorbances (A) were read at 450 nm using a BIO-TEK microplate reader (USA). Obtained percentage absorbance values were transformed to parts per trillion (ppt) of clenbuterol and ranked as 2000 - 4000, 4001 - 6000, 6001 - 8000, and >8001 ppt.

3. Results and Discussion

In all ELISA assays, negative and positive control suspensions (supplied in the kit) were run in each test. Clenbuterol residues were found in 153/582 (26.2%) sera analysed. **Table 1** shows the frequency values according to ELISA ranked results according with the municipality origin of cattle.

Clenbuterol has been elsewhere recognized as a cause of poisoning clinical disease in humans for many years [8] [9]. In México, up to April 2002, a total of 132 cases were recorded and related with bovine liver consumption [10]. In Mérida, Yucatán, 138 liver samples from slaughtered cattle were negative to clenbuterol residues by the gass/mass method [6]. Nowadays, clenbuterol use in cattle production is prohibited by official regulation [5].

The major advantage of ELISA in clenbuterol detection is rapid analysis and relatively simple, cheap system for detection (especially when residue levels are high), and easy to perform even with large batches [11]. These characteristics made ELISA an attractive tool for serological clenbuterol residues detection in many laboratories worldwide.

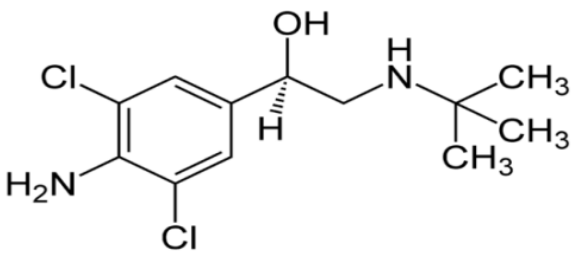

Figure 1. Chemical structure of the molecule of clenbuterol.

Table 1. Clenbuterol residues results by ELISA, according to the Mexico state municipality of the cattle included in the study.

Municipality	Number of sera samples	Number of positivity	Percentage of positivity	Clenbuterol ppt in sera			
				2000 to 4000	4001 to 6000	6001 to 8000	>8001
Almoloya de Juárez	52	9	17.3	6	1	1	1
Amecameca	2	2	100.0	0	0	0	2
Ecatepec	7	6	85.7	1	0	1	4
Ixtlahuaca	16	11	68.7	4	1	4	2
Jocotitlán	55	10	18.1	6	1	1	2
Luvianos	13	5	38.4	3	0	0	2
San Felipe del Progreso	38	6	15.7	5	1	0	0
San José del Rincón	20	6	30.0	2	3	1	0
San Simón de Guerrero	7	3	42.8	2	1	0	0
Soyaniquilpan	9	1	11.1	1	0	0	0
Tejupilco	21	4	19.0	1	1	2	0
Temoaya	93	19	20.4	10	0	3	6
Tenancingo	3	1	33.3	1	0	0	0
Toluca	150	44	29.3	15	13	5	11
Valle de Bravo	1	1	100.0	0	0	0	1
Villa de Allende	17	1	5.8	0	1	0	0
Xonacatlán	33	15	45.4	10	0	2	3
Zinacantepec	45	9	20.0	3	2	0	4
Total	582	153	26.2	70	25	20	38

The high percentage of clenbuterol seropositive samples (26.2%) indicates its illegal use in cattle production in Central México. The findings of the present survey indicate the need for monitoring slaughtered cattle for human consumption.

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