

Alternative methods for replacing propellants in the medical form "spray"

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Recently, the range of medicines is expanding its nomenclature more and more with medicines and medical products in the form of pressure spray. We decided to analyze the Ukrainian market for the presence of ozone-depleting components - propellants in this dosage form. Since this problem was relevant, the possibility of using the modern packaging system was analyzed.

Keywords – nasal spray, propellant, ozone layer, packaging system, chladone.

Introduction

Sprays are solutions, emulsions or suspensions, they are intended for local application on the skin, mucous membranes or for inhalations. Important for the delivery of the product from the container are scattering or evacuation gases, through which the inside of the containers creates pressure. These gases are called propellants. Propellants are classified by the size of the pressure of saturated vapors, at aggregate state under normal conditions and by chemical nature.

The results and discussion

Literary sources indicate, that in drugs under pressure, liquefied gases - chladones - are most commonly used. It is known that chladones adversely affect the protective ozone layer of the Earth. The high chemical stability of the chladones creates the possibility of their gradual accumulation in the troposphere and the achievement of the Earth's ozone layer [1]. After analyzing the pharmaceutical market, we realized that spray and aerosol production still had harmful spells, which led us to find alternative and advantageous replacement manufacturers. Table 1 presents pharmaceutical products of the Ukrainian pharmaceutical market, containing chladones [2].

Table 1

List of drugs containing chladones as propellant

Name of the drug	Medical form	Propellant	Manufacturer
Hepiderm forte	Spume on the skin	Chladon 134a	«Zdorovya»
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Since the abandonment of harmful propellants is essential, we have decided to describe the cheapest and most modern way of releasing liquid from the packaging.

This is a study on the replacement of ozone-depleting substances in aerosols by mechanical valves-dispersal systems: mechanical pumps, compression cylinders and barrier partitions. The advantages of such packages are full explosion safety, reusability of use, the possibility of more effective use of the internal volume of the bottle [1].

Using a mechanical pump, the output of the bottle content is by compressed air. With the aid of a micropump, the air pressure inside is increased to 5 atm, which provides the exact dose of drugs and homogeneity of their dosage. These parameters make this type of packaging alternative of any propellant product.

In addition to mechanical pumps, compression cylinders are used which are made of elastic polymers. The principle of their work is based on the actions of the muscular force of compression and squeezing the product through a nozzle with a small section. Such packages are the cheapest, since they do not require the cost of other component packages.

The above-mentioned containers have one common drawback - the inability to achieve sufficient internal pressure, comparable to the pressure created by conventional containers with liquefied propellants [1].

In view of this, we have reviewed the most advanced packaging options for sprays. Nowadays, a new packaging, known as "barrier", has become widespread. Its essence lies in the fact that the product is separated from the propellant by a movable partition, which prevents the contact between them - the chemical interaction between the propellant and the product, as well as the flow of propellant into the atmosphere, is excluded. Structurally two-chamber packages are executed in different variants: with a piston, with an insert, with an inner bag (more commonly known as Bag-On-Valve technology) [1]. Figure 1 shows that the BOV system, as a modern packaging system, is an alternative and promising, since many manufacturers already use this type of packaging.

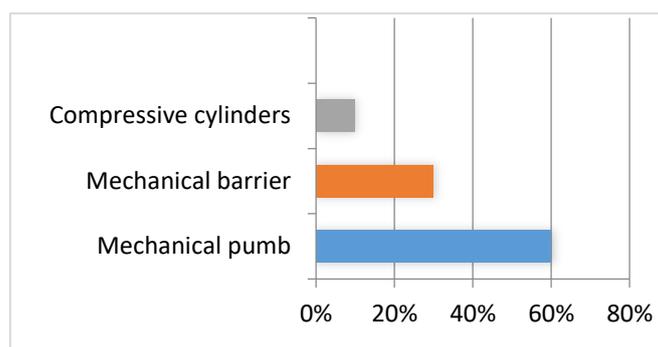


Fig.1. Availability of mechanical packaging systems in the pharmaceutical market of Ukraine

Conclusion

The using of new formulations of drugs and modern equipment allows the introduction of environmentally safe packaging systems for pharmaceutical sprays and aerosols, thereby significantly reducing the detrimental effects of propellants on the ozone layer of the Earth. In contrast to the use of propellant in production, we proposed to pay attention to the transition of manufacturers to the modern packaging system, or to separate the propellant from the product mechanically, thus preventing the penetration of the propellant into the atmosphere.

References

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