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# INNOVATIVE PHARMACEUTICAL PACKAGING TECHNOLOGY

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## ABSTRACT

The packaging can be defined as an economical means of providing presentation, protection, identification information, containment, convenience and compliance for a product during storage, carriage, display and until the product is consumed. Packaging must provide protection against climatic conditions biological, physical and chemical hazards and must be economical. Pharmaceutical packaging is a multiphase broad process which is classified into primary, secondary and tertiary level. Presently, numerous advancements and changes are taken into consideration for product safety, stability and patient's compliances. An important role of pharmaceutical packaging is to transform the formulation into an attractive and marketable product. So many issues regarding the pharmaceutical product like stability, sale, patient compliance etc are related with the packaging and in regard to this; present review is done on the various advancements in the packaging techniques and selection of packaging material. The review details several of the recent pharmaceutical packaging trends that are impacting packaging industry, and offers some predictions for the future.

**KEYWORDS:** Pharmaceutical packaging, Packaging materials, Recent advances.

## INTRODUCTION

Pharmaceutical packaging may be defined as the science, art and technology of enclosing or protecting products from distribution, storage, sale and usage including printed material employed in the finishing of a pharmaceutical product. Packaging must provide protection against climatic conditions biological, physical and chemical hazards and must be economical. Stability of the product throughout the shelf life. Package should provide adequate information related to the contents including legal requirements, route of administration, storage conditions, batch number, expiry date, and manufacturers name and address and product license number. Package should assist in patient compliance. Package should preferably have an aesthetically acceptable design. The primary packaging consist of those packaging components which have a direct contact with the product (i.e. bottle, cap, cap liner, label etc.) The main functions of the primary package are to contain and to restrict any chemical, climatic or biological or occasionally mechanical hazards that may cause or lead to product deterioration. Packaging must also function as a means of drug administrations. The packaging external to the primary package is known as the secondary packaging. The secondary packaging mainly provides the additional physical protection necessary to endure the safe warehousing and for refill packaging.

"Need is mother of all Inventions", phrase is best describing the emerging technologies towards pharmaceutical packaging. Indian packaging market is expected to grow up to US 55 billion to by 2020 from the 2009 levels of US 12.6 billion, as per a McKinsey and company report titled "India Pharma 2020: Propelling access and acceptance realising true potential".

## IDEAL QUALITIES OF A PHARMACEUTICAL PACKAGING

1. It should have sufficient mechanical strength so as to withstand handling, filling, closing and transportation.
2. It should not react with the contents stored in it.
3. It should be of such shape that can be elegant and also the contents can be easily drawn from it.
4. It should not leach alkali in the contents.
5. The container should not support mould growth.
6. The container must bear the heat when it is to be sterilized.

7. The contents of container should not be absorbed by the container.
8. The material used for making the container should be neutral or inert.
9. Any part of the container or closure should not react with each other.
10. Closure should be of non toxic nature and chemically stable with container contents.

**FUNCTIONS OF PHARMACEUTICAL PACKAGING**

**1. Containment**

The containment of the product is the most fundamental function of packaging for medicinal products. The design of high-quality packaging must take into account both the needs of the product and of the manufacturing and distribution system. This requires the packaging: not to leak, nor allow diffusion and permeation of the product, to be strong enough to hold the contents when subjected to normal handling and not to be altered by the ingredients of the formulation in its final dosage form.

**2. Protection**

The packaging must protect the product against all adverse external influences that may affect its quality or potency, such as light, moisture, oxygen, biological contamination, mechanical damage and counterfeiting/adulteration.

**3. Presentation and information**

Packaging is also an essential source of information on medicinal products. Such information is provided by labels and package inserts for patients.

**4. Identification**

The printed packs or its ancillary printed components serves the functions of providing both identity and information.

**5. Convenience**

The convenience is associated with product use or administration e.g., a unit dose eye drop which both eliminates the need for preservative and reduces risks associated with cross infection, by administering only a single dose.

**PROPERTIES OF PACKAGING MATERIAL**

The materials selected for packaging must have the following characteristics:

1. Mechanical properties
2. Physical properties
3. Chemical properties
4. Biological properties
5. Economical aspects.
6. Pharmaceutical properties.
7. They must be non-toxic.

**TYPES OF PACKAGING MATERIALS**

The following materials are used for the construction of containers and closures.

1. Paper and board
2. Rubber
3. Glass
4. Plastic
5. Metal

**ADVANCES IN PHARMACEUTICAL PACKAGING**

- **CYPAK'S ADVANCED MEDICATION MONITORING AND REPORT CARD SYSTEMS**

This is an advanced packaging technology can enable to patients to communicate with healthcare professionals through printed technology. This record the time and data that a pill was taken based on when it is removed from its blister pack. This allows the patients to log their feedback on side effects and treatment efficacy and upload it. This technology holds significant potential for new levels of patient-doctor interface to workout best treatment plan. Sensor-based packaging concepts are best applied in clinical trials. This helps in drug development to establish whether a drug is ineffective or simply not being taken properly.

Cypak’s advanced medication technology is used in targeting clinical trials market, as poor date resulting from non-compliance can be financially devastating in this context.

**Fig. No.1: Cypak's advanced medication monitoring and report card systems.**

- **BURGOPAK'S SLIDING CR BLISTER PACK**

Burgopak healthcare and technology- won the award for the "Most Innovative Child Resistant Packaging Design" at the Pharmapack Paris exhibition. The Burgopak's sliding CR blister pack can only be opened by applying force at two different points on the packaging.

The blister pack and leaflets are coordinated with the outer box, which insures the product is never separated from its packaging.


**Fig. No.2: Burgopak's Sliding CR Blister Pack.**

- **PHARMA SMALL HANDS RESISTANT (SHR): A RE-CLOSED AND TEAR RESISTANT CARTON**

A reclosable and tear-resistant carton is ideal for highly toxic drugs. Stora Enso and Bosch launched Pharma small hands resistant (SHR). Stora Enso Pharma SHR is a child restraint reclosable carton. It is ideal for highly toxic drugs and it is easy to use for senior adults. It is tested with the highest F=1 rating in the US. It is an innovative paperboard package system it only requires simple squeeze and pull manoeuvre.


**Fig. No.3: Pharma Small Hands Resistant (SHR): A re-closed and tear Resistant Carton.**

- **ECOSLIDE -RX SUSTAINABLE COMPLIANCE PACKAGING**

The pack is made from 100% recycled material using unbleached paperboard and clay coated surface designed to house blister packaging with a low of unsustainable film and foil. The slide package is very useful and it meets modern expectations for child-resistance and accessibility for seniors. It doesn't require heat sealing in the manufacturing process that reduces both cost and energy usage.


**Fig. No.4: Ecoslide -RX Sustainable Compliance Packaging.**

- **SYREEN PREFILLED SYRINGE DESIGN**

Environmental awareness is even starting to extend to the syringe market. It replaces glass with cyclic olefin polymer (COP). This material has allowed secondary packaging altogether as the COP design forms its own outer shell. The ability of packed syringes to clip into place eliminates the need for packaging materials like cardboard.

**Fig. No.5: Syreen Prefilled Syringe Design.**

- **STORA ENSO – PHARMA DDSI WIRELESS**

This technology is based on conductive ink on a carton board-based blister inlay, which is connected to a cellular module embedded in the package.

- The removal of pills is tracked and the information can be sent to an electronic database automatically via GSM or GPRS cellular networks.
- A doctor can simply use the packaging data to track a patient's medication intake.
- The system can also issue phone calls and text messages to the patient, healthcare professionals and even relatives.

Even voice and sound-based packaging system have been developed to help blind and illiterate patients take their medicines safely.

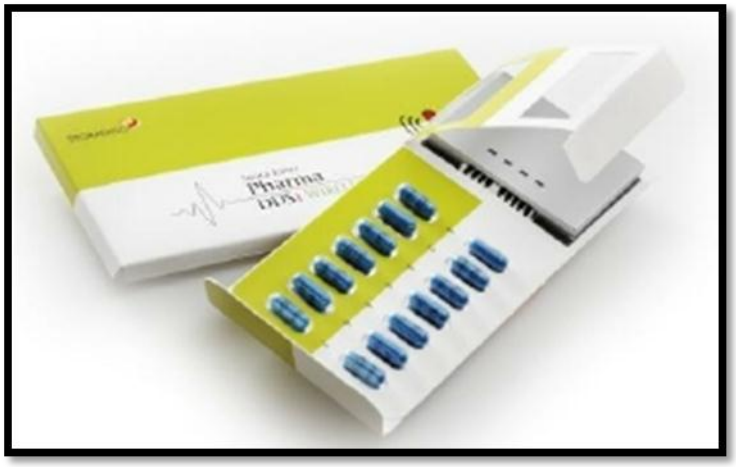

**Fig. No.6: Stora Enso- Pharma DDSI Wireless.**

## CONCLUSION

As the packaging of the pharmaceutical products is very important with regard to its stability, acceptance to the patient, transport, etc. There is always scope for advancement and improvement of the pharmaceutical packaging. Therefore, new techniques like Cypak's advance medication, Syreen prefilled syringe design, etc. Seems to be promising in pharmaceutical products packaging.

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