Why do foods for special medical purposes use plastic packaging?

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The term foods for special medical purposes (FSMPs) covers a range of products for use by patients whether in hospitals, care homes or at home. Many of those products are packaged in plastic. With sustainability so high in the public conscience, you may ask, why? Let's start by understanding what we mean by foods for special medical purposes.

FSMPs are made to provide the nutritional needs of patients with a wide range of clinical conditions. Anything from powdered thickeners to make drinking and eating safer for patients with swallowing difficulties, or products for children with severe food allergies, through to highly specialised feeds for tube feeding. Despite the wide range of clinical needs provided for, all FSMPs have some common requirements:

- They are intended for patients who have an impaired ability to consume normal foods or have medically determined nutrient requirements resulting from a disease, disorder or medical condition[1]
- They must be used under medical supervision
- They have very specific labelling requirements to ensure appropriate use
- Like all foods, FSMPs must be safe. Safe is a broad concept covering the use of appropriate ingredients for the nutritional need, as well as processing to ensure they are microbiologically safe.

This is where packaging plays a critical role.

Packaging is more than just a box for transporting a product from one place to another. For FSMPs it can be the delivery mechanism too. That delivery mechanism may be a small pouch with just the right amount of a product ready for consumption on the go, such as some of the foods for inborn errors of metabolism; it could be a bottle of an oral nutritional supplement, just the right size for an elderly patient needing extra calories at home or it could be a feed ready for use with a tube or percutaneous endoscopic gastrostomy (PEG) tube. Packaging is not simply the wrapper; it is an integral part of the product. The range of products and ways they are consumed present a unique set of challenges for the FSMP industry.

Whatever the material used it needs to meet some key criteria when used for FSMPs.

Materials must be:

- Safe and suitable for use with FSMPs
- Hygienic
- Suitable for use with FSMPs that need to be sterilised
- Suitable for use with giving sets for enteral nutrition, or with a PEG
- Easy and safe for use by caregivers and patients.

Many FSMPs were previously packaged in glass. The move to plastic packaging followed that for many regular foods. Not only is plastic very light, but it has many properties that make it particularly suited to the production of FSMPs:

- Lightweight – so more product can be transported in fewer vehicles, with resulting savings in energy and cost
- Strong – so less liable to breakage in manufacture, transport and use, making it safer
- Opaque – means light sensitive nutrients can be protected from damage
- Oxygen barrier – to prevent oxygen transfer to a product and resulting spoilage
- Hygienic – can withstand sterilisation, which is particularly important for the most fragile patients
- Durability – so product can have a relatively long shelf life, as FSMPs are produced in much smaller quantities than normal foods
- Versatile – can be made into a variety of forms from a plastic bottle that is easy to hold, to a bottle or pouch for tube feeds that connects easily and hygienically with giving sets or PEGs.

So, there are a range of reasons why plastic can be helpful in the production and use of FSMPs but is their use sustainable?

Sustainable development is defined in the Bruntland Commission Report as development that *"meets the needs of the present without compromising the ability of future generations to meet their own needs"*.[2] Companies can use a variety of approaches to quantifying sustainability, but two of the most widely known are Carbon Footprinting or Life Cycle Analysis. The basis of both is thinking about the life cycle of the product, from raw material extraction, through manufacture, distribution and ultimately disposal.

The fundamental principles in life cycle thinking are or course, ***Reduce***, ***Reuse*** and ***Recycle***. By moving from glass packaging to plastic, FSMPs reduced the weight of the product packaging, the first and perhaps most simple way to improve sustainability. However, more can be done to reduce the amount of plastic used. Redesigning a product's shape can reduce the quantity of plastic needed, while still providing a safe and suitable container.

A significant number of FSMPs are designed for single use. This is fundamental to the safety of the patient who needs safe, hygienically prepared nutrition. This means the second fundamental principle is not generally desirable for FSMPs, and infection control in hospitals and other care settings would certainly preclude ***reuse*** of packaging. Which means the obvious question is can the plastic packaging be recycled. The answer is *"it depends"*.

Plastics, whether made from fossil fuels or plants all start life in the same way – as hydrocarbon monomers – a carbon atom with hydrogen atoms. Through ***polymerisation*** they are turned into long chains or rings (polymers) *each with their own specific properties*. For example, ethylene is used to produce polyethylene, propylene to produce polypropylene (PP). These basic polymers, or resins, are then mixed with additives to produce a plastic material with the qualities needed for specific applications. Pellets of the plastic material can then be converted into the desired packaging format such as a bottle, film, pouch, tray, etc.[3]

Once used, to be recycled, the packaging must first be collected.

As consumers, we are used to sorting out our packaging and depending where we live may be able to recycle a wide range of plastics. Plastic bottles, meat trays or plastic films, many of these can be recycled, but what happens to our plastic after it is collected?

Recycling of plastic follows one of three paths.

Mechanical recycling

Material is collected from consumers as well as businesses then taken to a processing facility to be sorted by type of plastic, e.g. polyethylene terephthalate (PET), PP etc., and separated. The resulting material is shredded and washed before it is melted.[3] However, the material loses some functional performance e.g. it may be coloured rather than clear, the mechanical properties may be compromised, and additives cannot be removed. This means recycled material may not be able to go back into the food packaging chain.

Chemical recycling

After collection, sorting and shredding the material is chemically *"broken down"* back to monomers - reversing the process. Yields can be low, and the process is much more costly than mechanical processing.[3] However, the resulting monomer may be suitable for reuse in the food packaging chain.

Feedstock recycling

Sorted plastic waste can be thermally decomposed, either:

- In the absence of air – Pyrolysis
  - Producing monomers, paraffins, olefins and gas
- In the presence of oxygen, air, oxygen enriched air and/or steam – Gasification
  - Producing synthesis gas (Syngas) and fuel gas.

Until recently, feedstock recycling has not been economically attractive, but commercial scale plants are coming onstream, so we may see more of this recycled material available.[3]

But, is recycled plastic safe?

In Europe food safety is a major priority of the European Commission. Since 2008, recognising that recycling of materials, while highly desirable from a sustainability point of view, must be safe for the consumer, Europe requires plastic recycling processes to be authorised following evaluation by the European Food Safety Agency (EFSA).[4]

In 2012, EFSA adopted its first three scientific opinions on the safety of processes for recycling PET for use in food contact materials.[5] To date, around 140 opinions have been issued, though the European Commission is yet to authorise these processes.[6] Instead national rules apply, making it difficult for companies to have a coherent policy on using recycled plastic where some markets may not accept the materials from a particular recycling process.

So, where does that leave the use of plastic for packaging FSMPs?

FSMPs pose a unique set of challenges due to their composition, format, use and users. As the industry looks to what it can do with reduction of materials used, or use of recycled materials, safety remains paramount. Reduction in the thickness of plastic must not compromise the product's overall safety. We can reduce by redesigning packaging to use less material, but that needs testing to ensure it still delivers product correctly for the patient.

In terms of recycled materials, FSMPs are designed for a vulnerable group – patients – so industry may not adopt recycled materials before they have demonstrated not just their chemical safety, but their long-term durability and ability to protect the product. We can and we will make changes where they are safe and sensible to do so, but plastics are amazing, multipurpose materials that enable us to safely nurture some of the most vulnerable in our society, from babies to the elderly, from the sick to the injured, plastic has revolutionised the way we present and consume FSMPs. It will remain an invaluable tool, but the emphasis must be on responsible and sustainable use that *"meets the needs of the present without compromising the ability of future generations to meet their own needs"*.[2]

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