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Proceedings

Physicochemical characterization of *Sus Scrofa Domesticus* fat and release profiles of ibuprofen matrix granules formulated from it

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Abstract

Purpose: To investigate the physicochemical characteristics and drug release profiles of *Sus Scrofa Domesticus* (SSD) fat and its potential application as matrix former in formulation of ibuprofen granules.
Methods: *Sus Scrofa Domesticus* fat was obtained from domestic edible pig and extracted by boiling with water. Organoleptic and physicochemical tests were carried out. Batches of Ibuprofen granules were prepared by melt granulation using varying concentrations of the extracted SSD fats and carnauba wax as standard matrix former while conventional granules were formed with maize starch as binder for control. Resulting granules were evaluated for flow property, bulk and tap densities and encapsulated in hard gelatin capsules and *in vitro* drug release studies was carried out.
Results: The physicochemical properties of the SSD fat were within acceptable limits. Granules formulated with SSD fat exhibited poor flow properties with angle of repose ≥ 36°, and Carr's index ≥ 29%, while granules formulated with the standard carnauba wax were free flowing with angle of repose ≤ 31° and Carr's index ≤ 19%. Dissolution profiles for conventional granules showed a maximum drug release of 98% in 1 h for SSD fat at concentration of 2.5 %w/w and 90% for carnauba wax at the same concentration.
Conclusion: Formulation of ibuprofen granules by melt granulation modified the drug release profiles by the SSD and carnauba waxes.

Keywords: *Sus Scrofa Domesticus*, carnauba wax, ibuprofen, matrix granules, release profiles

Indexing: Index Copernicus, African Index Medicus

Background

Pharmaceutical excipients are components other than the active pharmaceutical ingredient that is included in the manufacturing process or is contained in the finished pharmaceutical dosage forms. In recent times there has been an increasing search for pharmaceutical raw materials from locally available plants and animal sources, which are cheap, affordable and, environmentally friendly. Nigeria is over dependent on imported raw materials and pharmaceutical product, hence, this has led to depletion of foreign reserve.

Sus Scrofa Domesticus fat is the fatty substance obtained from the adipose tissue of domestic pig after removal of the meat (pork) and is often disposed off as waste or by-product in abattoirs in our country, Nigeria. Proper physicochemical characterization of *Sus Scrofa Domesticus* fat will justify its suitability as a pharmaceutical excipient. Ibuprofen is a non-steroidal anti-inflammatory drug (NSAIDS), widely used in the management of arthritis or osteoarthritis with short biologic half-life of about 1.8-2 h and administered orally at a dose of 200-400 mg every four to six hours. The dosing frequency of Ibuprofen makes it an ideal drug candidate that requires modified or sustained release.

Aim/Objectives

This study was carried out to investigate the physicochemical characteristics and drug release profiles of *Sus Scrofa Domesticus* (SSD) fat and its potential application as matrix former in formulation of ibuprofen granules.

Materials and Methods

Sus Scrofa Domesticus fat was obtained from domestic edible pig and extracted by boiling with water. Organoleptic and physicochemical tests such as texture, odour, taste, colour, acid value, peroxide value, saponification value, smoke points and melting points were carried out. Batches of Ibuprofen granules were prepared by melt granulation using varying concentrations (2.5 – 10 %w/w) of the extracted SSD fats and carnauba wax as standard matrix former while conventional granules were formed with maize starch as binder for control. Resulting granules were evaluated for flow property, bulk and tap densities, and encapsulated in hard gelatin capsules and in-vitro drug release studies was carried out.

Results

SSD fat was odourless, tasteless and snow white in colour, generally soluble in organic solvents and buffered pH of 7.2 but insoluble in water. The physicochemical properties were within acceptable limits. The pH of the fat was 7.4 ± 0.5, viscosity 147.4 millipascal at 30 °C, peroxide value was 11 meq/kg, acid value 3.4 and saponification value 196.3 with slip melting point of 30-32 °C, and smoke point 121 °C. Granules formulated with SSD fat exhibited poor flow properties with angle of repose ≥ 36°, and Carr's index ≥ 29 %, while granules formulated with the standard carnauba wax were free flowing with angle of repose ≤ 31° and Carr's index ≤ 19 %. Dissolution profiles for conventional granules showed a maximum drug release of 98 % in 1 h, 55 % in 4 h for SSD fat at concentration of 2.5 %w/w and 90 % for carnauba wax at the same concentration of 2.5 %w/w.

Discussion

The yield of the fat is considered high for natural products and hence desirable for use as an excipient in pharmaceutical industries. Similar studies could be conducted for the extraction of other natural waxes to reduce cost with possibility of increasing yield. The angle of repose of the extracted SSD fat is an indication that the fat does not have a good flow. The angle of repose is affected by particle shape, particle size and size distribution. Femi-Oyewo *et al.,* [1] reported that the higher the particle size, the lower the angle of repose. The percentage compressibility (Carr's Index) is a qualitative descriptive assessment of the compressibility and flowability of powder while the Hausner ratio is indicative of interparticulate friction [2]. As their values increase, the flow of the powder decreases. The Carr index value of the Ibuprofen granules formulated with SSD fat showed that they were not compressible as revealed from poor flow properties.

The SSD fat had Carr's index value above 21% and Hausner ratio above 1.25 suggesting poor flow. The *in vitro* release profile for the Ibuprofen encapsulated granules formulated with the purified SSD fat at concentrations 2.5-10 %w/w showed prompt release within the first 5 minutes. According to Eichie *et al.,* [3], the retarded release exhibited by fat may be attributed to poor influx of aqueous leaching fluid into the matrix core since fats and waxes are hydrophobic in nature, they impair influx of the leaching fluid into the matrix structured core.

Conclusion

The physicochemical properties of SSD fat compared favourably with the standard fats and oils. Formulation of Ibuprofen granules by melt granulation modified the drug release profiles by the SSD and carnauba waxes and hence SSD fat has a potential application as a matrix former in controlled release formulation.

References

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