# Effect of Calcium Salts on Swelling and Erosion of Xanthan Gum Matrix Systems

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**Purpose**

Bivalent cations within the Xanthan gum (XG) matrix or in the dissolution medium affect the swelling and erosion profiles of XG matrix system. This study aims to study the swelling and erosion behaviors of XG based cylindrical matrices loaded with two different calcium salts.

**Methods**

XG based cylindrical matrices consisting of either calcium aminosalicylate (Ca4ASA) or calcium chloride (CaCl2), were prepared using a single punch tableting machine. The ratios of Ca4ASA to XG were 1:5 and 1:3 while CaCl2 to XG were ~3:50 and ~3:20. The target weight of the matrices was adjusted to ~300mg. The swelling and erosion profiles of the matrices were determined in pharmacopoeia buffer media adjusted to an ionic strength of 0.155M at pH values of 1.2 and 6.8. The swelling index (SI) and erosion index (EI) of the matrices at the given time intervals were determined (up to 6 hours). For each set of study, a plot of SI or EI vs. √time was constructed and the slope from the plot represented the rate parameters.

**Results**

The matrices containing CaCl2 showed greater swelling and erosion rates than those containing Ca4ASA. Swelling rate was greater in pH 6.8 regardless of salt types. The matrices swell more than erode during the observed period. In contrast to published results, the swelling and erosion of matrices containing CaCl2 were directly proportional to the salt contents. This is partly because highly soluble CaCl2 leaches out rapidly and prevents from condensing onto the ionized carboxyl moieties of the XG chains. Higher CaCl2 content also weakened forces exerted by the networks of XG chains leading to faster erosion. Ca4ASA has a much lower solubility than CaCl2. The greater the number of solid drug particles that are embedded within the polymer network, it is more difficult for the water molecules to diffuse into the matrix and interact with the polymer chains to induce swelling. Consequently, swelling and erosion of the matrices reduced as the Ca2+ ions would interact more strongly with the exposed XG polymer chains.

**Conclusion**

Solubility and amount of calcium salts as well as pH of the medium influence the physical structure of the XG matrices.