Development of Amorphous Fenofibrate Loaded Mesosilica by Melt-Adsorption Using Supercritical Carbon Dioxide
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Purpose
The aim of this study was to enhance the bioavailability of fenofibrate, a poorly water-soluble drug, using a melt-adsorption method with supercritical CO2.

Methods
Fenofibrate was loaded onto Neusilin® UFL2 by melt-adsorption using supercritical CO2. For comparison, fenofibrate-loaded Neusilin® UFL2 was prepared by solvent evaporation and hot melt-adsorption methods. The fenofibrate formulations prepared were characterized by differential scanning calorimetry, powder x-ray diffractometry, specific surface area, pore size distribution, scanning electron microscopy, and energy-dispersive x-ray spectrometry. In vitro dissolution and in vivo bioavailability were also investigated.

Results
Fenofibrate was distributed into the pores of Neusilin® UFL2 and showed reduced crystal formation following adsorption. In crystallinity evaluation, it was observed that when the fenofibrate loaded Neusilin® UFL2 by the supercritical method, both the endothermic peak of DSC and the diffraction peaks of PXRD patterns did not appear. Supercritical CO2 facilitated the introduction of fenofibrate into the pores of Neusilin® UFL2. Compared with raw fenofibrate, fenofibrate from the prepared powders showed a significantly increased dissolution rate and better bioavailability. In particular, the SC prepared by using the supercritical method exhibited a faster dissolution rate than the raw fenofibrate and commercial product, with approximately 1.89- and 1.25-fold. And the area under the drug concentration-time curve and maximal serum concentration of the powders prepared using supercritical CO2 were 4.62-fold and 4.52-fold greater than the corresponding values for raw fenofibrate.

Conclusion
In this study, an amorphous fenofibrate formulation was successfully prepared by melt adsorption using supercritical CO2. Fenofibrate adsorbed onto Neusilin® UFL2 exists in an amorphous form and exhibits an enhanced dissolution rate and bioavailability.