Introduction: 3D printing using edible material feedstocks has predominantly focused on the creation of macrostructural geometries with either paste-like or melting and hardening behaviour (for extrusion processes) or simple sugar powders (for binder jetting and sintering processes). We have demonstrated binder jetting of a predominantly cellulosic powder and high viscosity ink jet printing of agar fluid gels.

Binder Jetting of Cellulose/Glucomannan:
- Powder Component: 90% SolkaFloc 300 cellulose (SF300), 10% konjac glucomannan (KGM), ball milled to reduce crystallinity <5% (predominantly amorphous).
- Ink Component: 1% ball milled xanthan gum (800rpm, 120min), 78.5% water, 20% ethanol, 0.5% Tween 20.

High Viscosity Jetting of Agar Fluid Gels:
- Luxara 1253 (Arthur Branwell, UK) and agar-agar for microbiology (Sigma Aldrich, UK).
- Fluid gels (FG) created in jacketed vessel with magnetic flea at 1000rpm and rheometer with cone and plate geometry at 400s⁻¹, both cooling at 1.5°Cmin⁻¹.

Phase contrast microscopy (2a) shows larger, ‘hairier’ FG particle morphology of Luxara. Particle size decreased in rheometer method.

Identification of plateau region after reheat to 80-85°C, linked to constrained reordering within FG particle (2c).

Jetting (2d,e) of agar fluid gel material onto agar-coated glass slide.

Temperature control based on known thermal and rheological properties gives structure variation of printed objects.

ESEM printed ambient (2f) vs. 70°C (2g).

Conclusion: Material design for 3D printing influences microstructure of printed objects. This provides alternatives for food materials in 3D processes other than those outlined in introduction, increasing potential applications in the area.