Table3 Scaffolds loaded with BMP-2 genetic engineering methods for spatial and temporal control

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| Control release  methods | Materials | Manufacture process | Spatial control | Temporal control (Cumulative release) | Mechanical properties | Results | Reference |
| In vivo gene therapy | Bioglass;  Chitosan | 3D printing fiber deposition technology | Cube:  Dimension: 10 × 7 × 5 mm  Pore size: 500 μm | Not reported | compressive strength: 10.31 ± 1.21 MPa | scaffold promoted osteogenic properties in the alveolar bone defects model of the primate rhesus monkey. | [[109](#_ENREF_109)] |
| In vitro gene therapy | Lentiviral vector;  Gelatin | Visible-light-based projection stereolithography | Cylinder:  Diameter: 5 mm  Height: 2 mm | BMP-2 continual release heavily up to 56 days | compressive modulus: 25 KPa | The composite scaffold showed long-term BMP-2 production and strongly promoted bone formation in vitro and in vivo. | [[108](#_ENREF_108)] |
| In vitro gene therapy | Lentiviral vector;  HAP;  PCL | Extruded-based bioprinting | Cylinder:  Length: 6 mm  Height: 6.25 mm | Not reported | Not reported | The experimental and positive control groups loaded with rhBMP-2 revealed statistically similar radiographic and histologic repair of the defect site. | [[116](#_ENREF_116)] |