**Supplemental 1-Additional information of the methods**

**Interventions and Control**

(1) Drug vs Control;

There was no restriction on the specific type of drug, including TCM (matrine, quercetin, fucoidan, modified lichongtang, atractylon, euphorbia factor L2, nemopilema nomurai jellyfish venom, 8-methoxypsoralen, arctigenin) and Western medicine (LY294002, metformin, somatostatin, 5-fluorouracil, bethanechol chloride, nicotine, suberoylamilide hydroxamic acid, sorafenib, gemcitabine, doxorubicin). Moreover, there were no restrictions on the method, dosage, frequency, and time of drug intervention.

(2) Gene vs Control;

There was no restriction on the specific type of gene, include genetic intervention (epidermal growth factor, histone deacetylase 6, IQ motif containing GTPase-activating proteins, transforming growth factor beta1, prolyl 4-hydroxylase beta polypeptide, zinc-α2-glycoprotein 1, RAS-association domain family 6, C-C motif chemokine receptor 4, cyclovirobuxine D) and gene knock out/down (damage-regulated autophagy modulator 1, snail, XB130, SEMA 4A, glypican-3, CK2 alpha, trophoblast cell surface antigen 2, beta-1,3-glucuronyltransferase-3). Moreover, there were no restrictions on the method, dosage, frequency, and time of gene intervention.

(3) Tumor microenvironment vs Control;

There was no restriction on the specific type of tumor microenvironment, including hypoxia (CoCI2, Hypoxia) and other factors (acetylcholine, substance P, IL-8, hepatocyte growth factor). Moreover, there were no restrictions on the method, dosage, frequency, and time of tumor microenvironment intervention.

(4) ncRNAs vs Control;

There was no restriction on the specific type of ncRNAs, including the overexpression of ncRNAs (microRNA-19a, microRNA -503, microRNA-16, microRNA-424-5p, microRNA-199b-5p, microRNA-98, long non-coding RNA-n335586, long non-coding RNA-CRNDE, long non-coding RNA-FEZF1-AS1) and ncRNA silencing (microRNA-27a-3p, long non-coding RNA-PTTG3P, long non-coding RNA-DUXAP10, long non-coding RNA-PTTG3P, long non-coding RNA-AK021443, long non-coding RNA-MALAT1). Moreover, there were no restrictions on the method, dosage, frequency, and time of ncRNA intervention.

Negative control refers to untreated or empty vector-transfected HepG2 cells.