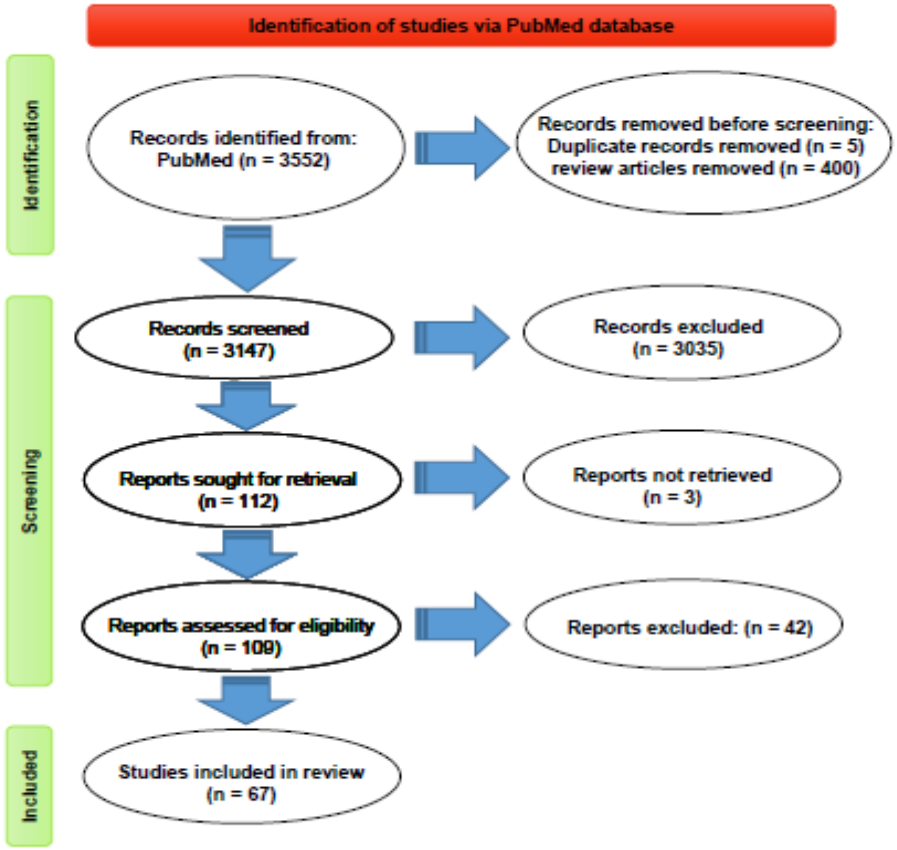
Appendix 1. Search strategies of searching keywords in PubMed database.

Data base		Search strategy	Results
PubMed	#1	(("Breast Neoplasms"[MeSH Terms] OR "Breast Cancer"[Title/Abstract] OR "Breast Neoplasm"[Title/Abstract] OR "Breast Neoplasms"[Title/Abstract] OR "Breast Tumor"[Title/Abstract] OR "Breast Tumors"[Title/Abstract] OR "Breast Malignant Neoplasm"[Title/Abstract] OR "Breast Malignant Neoplasms"[Title/Abstract] OR "Breast Carcinoma"[Title/Abstract] OR "Breast Carcinomas"[Title/Abstract] OR "Breast Malignant Tumor"[Title/Abstract] OR "Breast Malignant Tumors"[Title/Abstract]))	488,087
	#2	(("anticancer peptide"[Title/Abstract] OR "anticancer peptides"[Title/Abstract] OR "anti-cancer peptide"[Title/Abstract] OR "anti-cancer peptides"[Title/Abstract] OR "peptide"[Title/Abstract] OR "peptides"[Title/Abstract]))	636,740
	#3	((((((((((((((((((((("in vivo"[Title/Abstract]) OR (animal[Title/Abstract])) OR (animals[Title/Abstract])) OR (mouse[Title/Abstract])) OR (mice[Title/Abstract])) OR (rat[Title/Abstract])) OR (rats[Title/Abstract])) OR (rabbit[Title/Abstract])) OR (rabbits[Title/Abstract])) OR (pig[Title/Abstract])) OR (pigs[Title/Abstract])) OR ("Guinea pigs"[Title/Abstract])) OR ("Guinea pig"[Title/Abstract])) OR (dog[Title/Abstract])) OR (dogs[Title/Abstract])) OR (monkey[Title/Abstract])) OR (monkeys[Title/Abstract])) OR (zebrafish[Title/Abstract])) OR (xenograft[Title/Abstract])) OR (xenografts[Title/Abstract])) OR (clinical[Title/Abstract])) OR (preclinical[Title/Abstract])) OR ("pre-clinical"[Title/Abstract]))	9,440,659
	#4	#1 AND #2 AND #3	3,552

Appendix 2.


Identification of studies via PubMed database
Identification
Records identified from:
PubMed (n = 3552)
Records removed before screening:
Duplicate records removed (n = 5)
review articles removed (n = 400)
Screening
Records screened
(n = 3147)
Records excluded
(n = 3035)
Reports sought for retrieval
(n = 112)
Reports not retrieved
(n = 3)
Reports assessed for eligibility
(n = 109)
Reports excluded: (n = 42)
Included
Studies included in review
(n = 67)

Appendix 3. In vitro/in vivo properties of anticancer peptides

Peptide Name	Source	Sequence	In vitro					*In vivo*			Ref
			Cancerous		Normal		Mechanism	Model	Dose	Mechanism	
			Cell line	Conc	Cell line	Conc					
Bovine Lactoferricin (LfcinB)	derived from lactoferrin	FKCRRWQWRMKKLGAPSITCVRRAF	MDA-MB-231	~80% cell death at 200 µg/ml	MCF-10A	Only 10% cell death at 300 µg/ml	- induced apoptosis - Inhibition of the invasion	MDA-MB-231-GFP-luc2 mouse xenograft models	4 mg or 5 mg/mouse	- Impairment of tumour growth - Induction of apoptosis	(40)
			MDA-MB-468	~60% cell death at 300 µg/ml							
			MCF-7	~50% cell death at 300 µg/ml							
			SKBR3	Cell death induction: ~80% at 100 µg/ml							
dimeric	LfcinB	(RRWQWRFKKLG)2-K-Ahx	MCF-7	IC_{50}: 23	fibro	IC_{50}:	-	CD1	LD50:	-	(46)

peptide 26[F]				μM	blasts	35 μM	induced early apoptosis	mice	70 - 140 mg/kg		
					HEK-293	IC_{50}: 59 μM					
					erythrocytes	IC_{50}: >58 μM					
Melittin	honeybee venom	GIGAVLKVLTTGLPALISWIKRKRQQ-NH2	MCF7	IC_{50}: 1.64 μM	HDFa	IC_{50}: 2.62 μM	- reduce breast cancer viability - induce breast cancer cell death - suppress RTK phosphor	T11 mouse modela	5 mg/kg	- reduced the tumor cell proliferation - reduced PD-L1 expression - reduced phosphorylation levels of EGFR and	(50)
			MDA-MB-231	IC_{50}: 1.14 μM							
			MDA-MB-453	IC_{50}: 1.42 μM	MCF-10A	IC_{50}: 1.03 μM					
			SKBR3	IC_{50}: 1.26 μM							
			T-47D	IC_{50}: 3.64 μM							
			SUM149	IC_{50}: 0.94 μM	MCF-12A	IC_{50}: 2.07 μM					
			SUM159	IC_{50}: 1.49 μM							

							ylation			HER2	
p28	Azurin	LSTAADMQGVVTDGMASGLDKDYLKPDD	-	-	-	-	-	MDA-MB-231 mouse xenograft models	5, 10 or 20 mg/kg	- reduced tumor proliferation and growth	(53)
NRC-03	-	GRRKRKWLRRIGKGVKIIGGAALDHL-NH2	SKBR3	75% cytotoxicity at 50 µM	HMECs	46% cytotoxicity at 50 µM	- killed breast cancer cells - caused breast cancer cell-membrane damage	MDA-MB-231 mouse xenograft models	mice received 0.5 mg NRC-03 or NRC-07 on days 1, 3, and 5	- inhibited tumor growth	(54)
			MDA-MB-468	86% cytotoxicity at 50 µM							
			4T1	94% cytotoxicity at 50 µM	Fibroblasts	2% cytotoxicity at 50 µM					
			MDA-MB-231	2.5- to 10-fold more NRC-03 to cause significant cytotoxicity							
			T-47D		HUVECs	19% cytotoxicity at 50 µM					
			MCF-7								

NRC-07			RWGKWFKKATHVGKHVGKAALTAYL-NH2	SKBR3	87% cytotoxicity at 50 µM	HMECs	47% cytotoxicity at 50 µM	- caused mitochondrial membrane damage and ROS production				
				MDA-MB-468	88% cytotoxicity at 50 µM							
				4T1	94% cytotoxicity at 50 µM	Fibroblasts	0% cytotoxicity at 50 µM					
				MDA-MB-231	2.5- to 10-fold more NRC-03 to cause significant cytotoxicity							
				T-47D		HUVECs	17% cytotoxicity at 50 µM					
				MCF-7								
[D]-NRC-03	NRC-03	-	GRRKRKWLRRIGKGVKIIGGAALDHL-NH2	MDA-MB-468	% cytotoxicity: - 5 ± 3% at 5 µM - 51 ± 6% at 10 µM - 84 ± 3% at 25 µM - 85 ±	PBMCs	% cytotoxicity: - 1 ± 6% at 5 µM - 23 ± 7% at 10 µM - 67 ±	- killed breast cancer cells	MDA-MB-231 mouse xenograft models	mice received 0.5 mg NRC-03 or 0.125 mg [D]-NRC-03 on days 1,	- inhibited tumor growth - increased necrosis in	(55)

					4% at 50 µM		5% at 25 µM - 88 ± 1% at 50 µM			3, and 5	tumors	
				MCF-7	-	HMECs	% cytotoxicity: - 2 ± 1% at 5 µM - 11 ± 5% at 10 µM - 47 ± 1% at 25 µM - 77 ± 2% at 50 µM					
				MDA-MB-231								
				SKBR3		HDFs	% cytotoxicity: - 1 ± 1% at 5 µM					

							- 1 ± 1% at 10 µM - 5 ± 2% at 25 µM - 21 ± 3% at 50 µM					
				4T1								
				T47-D		HUVECs	% cytotoxicity: - 1 ± 1% at 5 µM - 1 ± 1% at 10 µM - 1 ± 1% at 25 µM - 27 ± 3% at 50 µM					

	[D]-NRC-03		[D]- GRRKRKWLRRIGKGVKIIGGAALDHL-NH2	MDA-MB-468	% cytotoxicity: - 50 ± 9% at 5 µM - 86 ± 3% at 10 µM - 83 ± 5% at 25 µM - 83 ± 5% at 50 µM	PBMCs	% cytotoxicity: - 34 ± 1% at 5 µM - 45 ± 2% at 10 µM - 82 ± 2% at 25 µM - 90 ± 2% at 50 µM					
				MCF-7	-	HMECs	% cytotoxicity: - 19 ± 7% at 5 µM - 65 ± 2% at 10 µM - 81 ± 1% at 25					

							µM - 80 ± 1% at 50 µM					
				MDA-MB-231		% cytotoxicity: - 15 ± 3% at 5 µM - 28 ± 7% at 10 µM - 67 ± 4% at 25 µM - 75 ± 2% at 50 µM						
				SKBR3		HDFs						
				4T1		% cytotoxicity: - 1 ± 1% at 5 µM - 1 ± 3% at						
				T47-D		HUVECs						

							10 µM - 20 ± 4% at 25 µM - 24 ± 2% at 50 µM					
A7R		-	ATWLPPR	-	-	-	-	-	MDA-MB-231 mouse xenograft models	20 mg/kg	- decreased tumor growth	(56)
TE-64562		-	Tat-RRRHIVRKRTLRRLLQER	MDA-MB-231	EC_{50}: 12.6±2.3 µM	NR6 NIH/ 3T3 fibroblasts	EC_{50}: 104.9 ±9.0 µM	- Inhibits Viability of Human Cancer Cell Lines - Inhibite	MDA-MB-231 mouse xenograft models	40 mg/kg (7 µmol/ kg)	- Stalls Xenograft Tumor Growth - Inhibits Akt and Erk Signaling	(57)
				SK-BR-3	EC_{50}: 9.2±1.3 µM							
				MDA-MB-468	EC_{50}: 11.9±0.7 µM							
				MDA-MB-435	EC_{50}: 9.9±1.5 µM							
				BT-474	EC_{50}: 40.3 ±22 µM							

							d Colony Formation in Soft Agar - Induces Non-apoptotic Cell Death After Several Hours and Apoptosis with Overnigh				

							t Treatment - Binds to EGFR and Inhibits Dimerization - reduced phosphorylated and total EGFR levels				
DPT-C9h	-	VKKKKIKREIKI YVETLDDIFEQWAHSEDL	-	-	-	-	- blocks the casp	HBCx-3 and HBCx-12A mouse	5 mg/kg	- induced tumour	(58)

							ase-9/PP2Ac interaction in breast cancer cell lines - increased caspase-9 activity - induced apoptosis - induced mitocho	xenograft models		growth inhibition (TGI)	

							ndrial membrane depolarization and cytochrome c release				
SP2043	collagen IV	LRRFSTAPFAFIDINDVINF	MDA-MB-231	:IC_{50} 22.1 ± 5.2 µM	-	-	- blocks viability, adhesion, migration and tube formation of lympha	MDA-MB-231 mouse xenograft models	10, 20 mg/kg	- inhibits tumor growth - inhibits the amount of p-Met - inhibits Blood vessel	(59)
			MCF-7	:IC_{50} 37.9 ± 4.9 µM							
			SUM-149	:IC_{50} 11.8 ± 4.3 µM							

							tic and blood end othe lial cells - bloc ks IGF1 R and Met sign als in lym pha tic and bloo d end othe lial cells - CD5 8, CD1 55,			(lecti n- positi ve) and lymp hatic vessel (LYVE- 1 positi ve) forma tion - reduc tion of blood and lymp hatic vascul ature - inhibi ted metas tasis	

							and ADAM17 are targeted by SP2043 and dissociated from both the IGF1R and Met receptor complexes - inhibits viability of MDA-				

							MB-231, MCF-7, and SUM-149 breast cancer cells - inhibits HGF induced phospho-Met				
ES-Zn	endostatin	A native Zn binding endostatin peptide	-	-	HUVEC	IC_{50}: 6 × 10-8 M	- inhibited the tube formatio	BALB/c mice	50 µg/kg	- inhibited tumor growth and produ	(60)

ES-SS		A variant including a disulfide loop but incapable of Zn binding				IC_{50}: 7×10^{-8} M	n of HUVECs in a concentration-dependent manner - inhibition of HUVEC proliferation		2.5 mg, 0.5 mg and 50 μg/kg	ced a significant growth delay - reduced CD31-positive vessels	
TAT–DV1–BH3	antagonist of CXCR4	RRRQR RKKRG GGGLGASW HRPDK CCLGY QKRRL PGGGLRRMA DDLNA QY	MDA-MB-231	Survival rates: 93.81±15.84 at 20 μM 68.29±11.21 at 40 μM 28.67±8.22 at 80 μM	HEK-293	Survival rates: 90.31 ±3.60 at 20 μM 81.80 ±7.83 at 40 μM	- inhibits the growth of breast cancer	MDA-MB-231 mouse xenograft models	1.2 mM/100 μL, once every 2 days	- inhibits tumor growth - inhibits metas	(61)

			MCF-7	Survival rates: 93.88±11.97 at 20 µM 73.70±10.38 at 40 µM 36.97±4.22 at 80 µM		69.85 ±8.02 at 80 µM	lines - entered into cells and largely distributed in the cytoplasm and were found to colocalize with mitochondria - exerts			tasis	

							proapoptotic effect - inhibits the migration and invasion				
WVLGE-containing polypeptide	derived from a cell-penetrating peptide derived from the azurin protein	LSTAADMQGVVTDGMASGLDKDYLKPDDAWVLGEA	MCF-7 MDA-MB-231	-	MCF-10A	-	- correlates with small GTPase Rac1 - can be introduced into breast	MCF-7 mouse xenograft models	50 nmol/site	- suppressed the growth of tumors - cells treated with WVLGE-containing polypeptid	(62)

							cancer cell lines - decreased the active Rac1 level - inhibited phosphorylation of STAT3 (Y705), ERK, and GSK-3β (S9), depend			e possess fewer parenchymal cells at the cancer foci - decreased β-catenin expression level and numbers of Ki-67-positive cells	

							ed on Rac1 activity - increased phosphorylation of β-catenin (S33/S37/T41) and a decrease in the total β-catenin level - supp				

							ressed the colony formation of MCF-7 and MDA-MB-231				
AD-01	FKBPL's peptide derivative	-	MCF-7	-	-	-	- targeted and inhibited CSCs - reduced migration and invasion	MDA-MB-231 mouse xenograft models	0.3 mg/kg	- inhibited metastasis	(63)

ALM201			MDA-MB-231				- targeted and inhibited CSCs	MCF-7 mouse xenograft models		- delayed tumour recurrence	
sea cucumber intestinal peptide (SCIP)	sea cucumber intestines	-	MCF-7	27.8, 83.3, and 250 μg/ml	-	-	- Inhibited the proliferation - induced apoptotic cell death via inactivation of PI-3K/AKT sign	MCF-7 zebrafish xenograft models	27.8, 83.3, and 250 μg/ml	- inhibited tumour growth	(64)

							aling path way				
M1-21	-	[d] RRRQRRKKRG-QTQPRLGPPQTPAGGCSILIF	MDA-MB-231	IC_{50}: 33.78 µM after 48h IC_{50}: 24.25 µM after 72h	MCF-10 A	did not inhibit at the doses of 0, 10, 20, 30, 40, 50 µM	- inhibited proliferation and migration - interacted with multiple regions of FOXM1 protein and inhibited FOX	Mouse models	30 mg/kg	- inhibited cancer proliferation and metastasis	(65)
			ZR-75-30	IC_{50}: 12.92 µM after 72h							

							M1-related transcriptional activities - the gene set of the WNT signaling pathway was inhibited by M1-21				
Mastoparan	wasp venom	INLKALAALAKKIL-NH_2	MDA-MB-231	% Cytotoxicity after 24h: 20 ± 1 at 10 µM 62 ± 2 at	Jurkat	% Cytotoxicity after 24h: 64 ±	- induced cell death by a	4T1 BALB/c mouse models	6 mg/kg	- decreased tumor volume and	(66)

				25 µM 96 ± 1 at 50 µM		7 at 10 µM 95 ± 4 at 25 µM 97 ± 1 at 50 µM	lytic mechanism, with more toxicity to cancer cells than normal cells			mass but not statistically significant	
			SKBR3	-	PBMCs	% Cytotoxicity after 24h: 13 ± 5 at 10 µM 29 ± 7 at 25 µM 49 ± 3 at 50 µM					
			MDA-MB-468								
			T47D		HMECs	% Cytotoxicity					
			4T1								

						after 24h: 16 ± 1 at 10 µM 37 ± 7 at 25 µM 67 ± 14 at 50 µM					
TAT-NLS-BLBD-6	-	H-TAT-NLS-ATDEMIPF-NH2	MCF-7	-	-	-	- inhibited breast cancer cell growth, invasion, migration, and colony	MCF-7-YFP or MDA-MB-231-GFP mouse xenograft models	1 and 10 mg/kg	- inhibited tumor growth	(67)
			MDA-MB-231					MCF-7-GFP or MDA-MB-231-GFP zebrafish models	100 µmol/l		

							formation - promoted sub-G1 cell cycle arrest - induced apoptosis				
Foxy5	WNT5A - derived hexapeptide	Formyl-Met-Asp-Gly-Cys-Glu-Leu	4T1	-	-	-	- inhibited migration and invasion - did not indu	Mouse models	40 µg	- inhibited metastasis	(68)

							ced apoptosis - did not inhibited proliferation				
PFISED	V. cholerae hemagglutinine protease (HAP)	PFISED	MCF-7	25 µM, 50 µM, 100 µM and 200 µM	MCF-10A	25 µM, 50 µM, 100 µM and 200 µM	- induced apoptosis - caused PAR 1 overexpression and NFκB, MAP kinase	EAC	500 µl of 100 µM peptide	- induced apoptosis - increased the survival	(69)
					MCR-5						
			EAC		Normal mouse peritoneal macrophage cells						

							activation - increased cellular ROS level				
([(LLKK)2]2κC)2	de novo designed synthetic α-helical CAPs	([LLKKLLKK]2kC-S-SCk[KKLLKKLL]2	BCap37	- Cell Viability (%) at 30 µg/mL: 51.4 ± 4.2 - IC_{50}: 27.5± 2.9 mg/L	HL-7702	Cell Viability (%) at 30 µg/mL: 84.1 ± 1.4	- inhibited cell viability - induced apoptosis	BCap37 mouse xenograft tumors	10 and 20 mg/kg	- reduced tumor growth - could be retained at the tumour sites	(71)
			Bads200	IC_{50}: 23.7 ± 1.6 mg/L							
PKHB1	a thrombospondin-1 peptide mimic	KRFYVVMWKK	MCF-7	CC_{50}: 200 µM	-	-	- induced cell death	4T1 mouse models	400 µg daily	- reduced tumor growt	(72)
			MDA-MB-231	CC_{50}: 200 µM							
			4T1	CC_{50}: 300 µM							

							- induced loss of mitochondrial membrane potential, ROS production, and intracellular Ca2+ accumulation - induced calre			h and weight	

							ticulin (CALR), HSP 70, and HSP 90 exposure and release of ATP and HMGB1				
Juxtamembrane 2 (JM2)	a Cx43 mimic peptide	rrrrrrrr-VFFKGVKDRVKGRSDC	4T1	50, 100, 150, and 200 μg/mL	-	-	- inhibited proliferation - induced mitochondria-	4T1 mouse models	2.5 mg/kg	- inhibited the growth	(73)

								mediated apoptosis - suppressed the migration and invasion - caused S-phase cell cycle arrest				
NAF-1^{44-67}	L-NAF-1^{44-67}	derived from the human protein	FLGVLALLGYLAVRPFLPKKKQQK	MDA-MB-231	- IC_{50}: 18.3 ± 0.4 µM - 40% reductio	MCF-10A	The viability remained	- selectively per	MDA-MB-231 mouse xenograft	-	- inhibited tumor	(74)

		NAF-1/CISD2			n in viability at 10 µM after 3 days and 80% after 5 days		unaffected	meated and killed cancer cells - targeted the mitochondria and ER of cancer cells	models		growth - reduced tumor weight	
	D-NAF-1^{44-67}		flgvlallgylavrpflpkkkqqk		IC_{50}: 12.8 ± 0.2 µM		-			-		
	3D-NAF-1^{44-67}		FLGVLALLGyLAVRPfLPKkKQQK		IC_{50}: 12.5 ± 0.6 µM		-			6 doses of 50 µM (0.875 mg/kg)		
NBD		a synthetic peptide corresponding to the S100A4-binding domain	-	MDA-MB-231-Luc-D3H2LN MDA-MB-468	5 µg/well	293	5 µg/well	- inhibited cell motility - downregulat	MDA-MB-231-Luc-D3H2LN mouse models	NBD-GlycoLipos: - lipid concentration: 3.6 mg/ml - peptide	- inhibit metastasis	(75)

	of MetAP2 (170-229)						ed MMP-14 and Sp1 expression - increased MMP-1 and TIMP expression levels		concentration: 0.32 mg/ml		
CPP-4-2	derivative of peptide 4-2, designed by using SN1/2 domain of SND1 as bait	RR-TAT - RRRKKRRQRRRQFDYDHFLMWYS	MDA-MB-231-GFP-Red-FLuc	IC_{50}: 22.4±1.0 μM	-	-	- induced cell death - downregulated	MDA-MB-231-GFP-Red-FLuc mouse models	50mg/kg	- inhibited the growth - reduced tumor	(76)
			MCF7	IC_{50}: 18.7±0.2 μM							

	in a phage display screening		MDA-MB-468	IC_{50}: 15.9±6.2 μM			SND1 and disrupted SND1-MTDH interaction			volume and weight	
GQ86	Derived from CST6 protein	GELRDLSPDDPQVQKAAQAAVASYNMGSNSIYYFRDTHIIKAQSQLVAGIKYFLTMEMGSTDCRKTRVTGDHVDLTTCPLAAGAQQ	-	-	-	-	-	SCP2 mouse models	1 mg/kg	- suppressed CTSB - inhibited osteoclastogenesis - inhibited bone metastasis and osteoclast	(78)
DQ51		DTHIIKAQSQLVAGIKYFLTMEMGSTDCRKTRVTGDHVDLTTCPLAAGAQQ									

										maturation	
RF16	Derived from Interleukin-8 (IL-8; CXCL8)	6RCQCIKTYSKPFHPKF21	MCF-7 MDA-MB-231	did not induce cytotoxicity at 0.001–100 µM	-	-	- inhibited MCF-7 and MDA-MB-231 cell growth but did not induce cytotoxicity - suppressed IL-8-induced migratio	MDA-MB-231 mouse xenograft models	5 mg/kg	- slightly increased the survival rate - reduced tumor volume and weight	(79)

							n and EMT in MDA-MB-231 cells				
RP7	RAGE antagonist peptide	-	MDA-MB-231	IC_{50}: 77.4 μM at 24h IC_{50}: 24.5 μM at 48h IC_{50}: 39.3 μM at 72h	-	-	- suppressed the proliferation - inhibited Erk1/2/NF-κB pathway - induced apoptosis -	MDA-MB-231 mouse xenograft models	15 and 30 mg/kg	- inhibited the growth - reduced tumor volume and weight - induced apoptosis	(80)

							inhibited migration and invasion				
PA3264	possible active ingredient of Squama Manis	D-Tyrosine-L-serine	MDA-MB-231	IC_{50}: 23.03 mM	-	-	- inhibited cell viability - inhibited migration - inhibited PI3K/AKT/NF-κB signaling	4T1 mouse models	100 mg/kg	- reduced tumor volume and weight	(81)
			4T1	IC_{50}: 25.17 mM							

							pathway				
9S1R	-	RRRRRWCMNW	MDA-MB-231 4T1.2-Luc	-	-	-	- inhibited cell viability - reduced mitochondrial membrane potential - increased ROS levels	4T1.2-Luc mouse TNBC model	100 mg/kg	- reduced growth in early-stage cancer	(82)
mL7N PA-	-	TEGMLLNVTSNLRVNA	-	-	-	-	-	4T1 mouse models	2 mg/kg 0.5 to	- inhibited	(83)

mL7N									8 mg/kg	tumor growth	
Folligen	Synthetic GnRH analog	(D-Phe6,Gln8,desGly10)-GnRH-ethylamide	MDA-MB-231	-	-	-	- Inhibits tyrosine kinase activity - alters PKC localization - modulates signal transduction pathways	DMBA-induced mammary carcinoma (rat model)	10 µg/day	Suppresses tumor growth, inhibits proliferation, maintains ovarian function	(84)
Peptide	Gastroi	-	MCF-7	40%	-	-	-	Athymic	400	Reduc	(85)

YY (PYY)	ntestinal hormone			growth inhibition at 1.25 pmol/mL			Reduces intracellular cAMP levels - suppresses cell proliferation	nude mouse xenograft (MCF-7 breast cancer)	pmol/kg/h	es tumor weight and volume, decreases intracellular cAMP levels	
Anastellin (III1-C)	Fibronectin-derived peptide	76-aa fragment from Type III repeat 1 of fibronectin	MDA-MB-435	-	HUVEC	No systemic toxicity observed	- Binds ECM components - blocks integrin activation -	Nude mouse xenograft (MDA-MB-435 breast cancer)	600 µg/mouse	Suppresses tumor growth, reduces vascular density, inhibits lung metas	(86)

							inhibits angiogenesis			tasis	
AFP-derived peptides	Alpha-fetoprotein (AFP)-derived	-	MCF-7	-	-	-	- Interferes with estrogen receptor signaling - reducing cancer cell proliferation	Xenograft	-	Estrogen receptor modulation leading to tumor growth suppression	(87)
AFPep		Glu-Met-Thr-Hydroxyproline-Val-Asn-Gly)	MCF-7 MDA-MB-231 T47D	-	-	-	- Inhibits estrogen-	Xenograft model	1 µg per injection	Suppresses estrogen-dependent	(88)

							stimulated proliferation without interfering with estradiol binding to ER			tumor growth, effective against tamoxifen-resistant ER^+ tumors	
AFPep		Cyclo(EKTOVNOGN)	MCF-7 T47D MDA-MB-231	-	-	-	- Suppresses ER phosphorylation - increases p53	Rat	0.1 mg/animal/day	Delays tumor onset, reduces tumor incidence and tumor	(89)

							phosphorylation-inhibiting tumor proliferation			burden via estrogen receptor modulation	
GIP (C-peptide)		LSEDKLLACGEGAADIIIGHLCIRHEMTPVNPGV	MCF-7	-			-	-	-	-	
A-peptide	GIP analog (Cys → Ala)	Modified GIP sequence (alanine-substituted)	MCF-7	70% inhibition at 10^{-5} M	-	-	Structural modifications enhance cell binding and proliferation inhibitio	mouse	1 µg/day	Tumor suppression via structural modifications affecting proliferation and α-helical	(90)

							n			stability	
K237	Phage-displayed peptide library	HTMYYHHYQHHL	-	-	NIH-3T3 HUVECs	no effect observed	- Blocks VEGF-KDR interaction - suppressing VEGF-induced - endothelial cell proliferation	SCID mouse xenograft	60 µL/mouse	Inhibits tumor growth and metastasis and anti-angiogenic effects	(91)
Å6	Urokinase (uPA)-derived peptide	KPSSPPEE	Mat B-III (ER^+ rat breast cancer)	Significant inhibition observed	-	-	- Reduces VEGF rece	Syngeneic Fischer rat	75 mg/kg/day	Inhibits tumor growth and	(92)

							ptor (flk-1) expression - inhibiting angiogenesis and invasion			metastasis via anti-angiogenic and pro-apoptotic effects	
C16Y	Laminin-1 derived peptide	DFKLFAVYIKYR	MDA-MB-231	No inhibition observed at 100 µg/ml	-	-	- Blocks endothelial cell attachment to laminin-1 - disr	Nude mouse xenograft	1 mg/kg/day	Inhibits tumor vascularization, reducing angiogenesis and suppressing tumor	(93)

							upting angiogenesis			growth (	
Valorphin	β-hemoglobin-derived peptide	VVYPWTQ	-	-	L929	Inhibited 53% at 0.1 µM	- Induces S-phase cell cycle arrest - leading to temporary proliferation inhibition	BLRB mice	1 mg/kg	Inhibits tumor progression by opioid receptor-mediated proliferation arrest	(94)
ATN-161	Fibronectin-derived	Ac-PHSCN-NH_2	MDA-MB-231	not inhibit prolifera	-	-	Binds α5β	BALB/c nude mouse	0.05–1 mg/kg	Inhibits tumo	(95)

	peptide			tion at 100 μM			1 and αvβ3 integrins, reduces MAPK phosphorylation	xenograft		r growth, reduces skeletal and soft tissue metastases, decreases angiogenesis and tumor proliferation (Ki-67 suppression)	
D-K6L9	Synthetic host defense-like lytic peptide	LKLLKKLLKKLLKLL-NH_2 (D-amino acid modified)	MDA-MB-231	LC_{50}: 3 μM	NIH-3T3	No significant toxicity at 100 μM in	Selectively binds to phosphatidyl	BALB/c nude mouse xenograft model	9 mg/kg	- Reduces tumor growth -	(96)

						normal cells	serine-rich tumor membranes - induces rapid depolarization and necrosis			inhibits metastasis - suppresses angiogenesis	
Hecate-βCG	Synthetic lytic peptide	FALALKALKKALKKLβCG	MDA-MB-435S MCF-7	-			Binds LH/CG receptors - disrupts membrane	Nude mouse xenograft	8 mg/kg	Tumor regression, inhibition of metastasis, and induction of	(97)

							integrity-induces necrotic cell death			widespread tumor necrosis	
Phor21-βCG(ala)		KFAKFAKFAKFAKFAKβCG	-				More efficient membrane lysis, increased cytotoxicity vs. Hecate-βCG		0.08 mg/kg	More potent tumor necrosis, superior metastasis suppression at lower doses	
Resistin-13-Peptide	Human resistin	GQVTGLGRSPLSP	MDA-MB-231	40% inhibition at 50 ng/ml			Suppresses MMP-2	Nude mouse xenograft (MDA-MB-231	2.5 or 5 mg/kg	Suppresses tumor growt	(98)

							and MMP-9 - upregulates TIMP-1 and TIMP-2 - reducing adhesion and invasion	breast cancer)		h (~50 % reduction), inhibits invasion by MMP regulation, with no observed organ toxicity	
EGEVGLG Peptide	Phage display-selected peptide	EGEVGLG	MDA-MB-231 MCF-7	Selective binding observed, no cytotoxic effect reported	HUVEC	No significant toxicity observed	Binds selectively to therapy-responsive tumor	Nude mouse xenograft (MDA-MB-435, MCF-7 breast cancer)	40 mg/kg sunitinib	Enhances tumor response detection by selectively bindi	(99)

							vasculature - showing increased interaction in sunitinib - treated tumors			ng to treated tumor vasculature, correlating with therapy effectiveness	
Melittin	Apis mellifera venom	GIGAVLKVLTTGLPALISWIKRKRQQ-NH_2	MDA-MB-435	-	2F2B	IC_{50} = 2.21 µM, free	Selectively binds to tumor cell membranes - indu	C57BL/6 mouse xenograft (MDA-MB-435 breast cancer)	2.5 mg/kg	Induces tumor necrosis, suppresses metastasis, avoids syste	(100)

							cing apoptosis via cytochrome c release - reduces hemolysis compared to free melittin			mic toxicity	
SP2012	Collagen IV-derived peptide	Modified 20-mer (Cys → L-α-amino-n-butyric acid)	MDA-MB-231	migration/adhesion inhibition at 50 µM	HUVEC	IC_{50} = 32.9 µM	Blocks αVβ1 integrin signaling - downreg	SCID mouse xenograft (MDA-MB-231 breast cancer)	10 mg/kg	Reduces tumor microvascular density , inhibits	(57, 101)

							ulates VEGFR2 - inhibits endothelial cell proliferation - migration and tube formation			tumor growth, down regulates VEGFR2 signaling	
Nef-M1	HIV-1 Nef protein (aa 50–60)	-	MDA-MB-468	89.3% apoptosis at 100 ng/mL	HME	No apoptosis at 100 ng/mL	- Antagonizes CXCR4 - induces apo	SCID mouse xenograft (MDA-MB-231 breast cancer)	2 µg/mouse	Prevents tumor growth and metastasis, reduces	(103)
			MDA-MB-231	No apoptosis at 100 ng/mL							
			MCF7	20.5% apoptosi							

				s at 100 ng/mL			ptosis via caspase-3 activation - no effect on CXCR4-negative cells			tumor volume and metastatic burden	
			DU4475	Apoptotic response observed at 100 ng/mL							
SP6001	Serpin-derived (DEAH box helicase)	EIELVEEEPPF	MDA-MB-231	-induces peak apoptosis at 1 µM -Inhibits migration at 100 µM -Sustains FAK phosphorylation at 10 µM	HUVEC	-	No significant toxicity observed	SCID mouse xenograft (MDA-MB-231 breast cancer)	5 mg/kg	Reduces tumor volume, decreases angiogenesis	(102)
Chalone 19-	Tumstatin-	-	MDA-MB-231	-	Hepatocyt	-	Induces	Nude mouse	6.6 mg/kg	Reduces	(104)

Peptide	derived (collagen IVα3, aa 185–203)				es		apoptosis via PTEN/Akt signaling - upregulates caspase-3 - downregulates PCNA and pAkt	xenograft (MDA-MB-231 breast cancer)		tumor volume, prevents metastasis, enhances apoptosis	
TP-Tox	Synthetic bi-functional peptide	LTVSPWY-GG-$(KLAKLAK)_2$	MDA-MB-435S	EC_{50} : 2.5 µM	HUVEC	No significant toxicity observed	- Induces apoptosis via mito	Nude mouse xenograft (MDA-MB-435S breast cancer)	250 µg per mouse	Inhibits tumor growth, increases	(105)
			SKBR3	EC_{50} : 2.5 µM							
			MCF-7	EC_{50} : 50 µM							
			MDA-	EC_{50} :							

			MB-453	80 µM			chondrial membrane disruption - activates caspase-3 - enters cells via clathrin-mediated endocytosis			survival, promotes apoptosis and tumor necrosis	
			T47D	EC_{50} : 60 µM							
A7RC	NRP-1 targeting peptide (modifi	ATWLPPRC	MDA-MB-231 (high NRP-1 expressi	-	HUVEC	No significant toxicity	- Targets NRP-1	Nude mouse xenograft (MDA-MB-231	-	-	(106)

	ed A7R)		on)			observed in normal tissues	- inhibits endothelial tube formation (anti-angiogenic effect)	breast cancer)			
			MCF-7 (low NRP-1 expression)								
LDFI	Leptin binding site I-derived peptide	Leu-Asp-Phe-Ile	MCF-7	-	-	-	- Blocks leptin receptor (Ob-R) - inhibits JAK2/STAT3, AKT, and	Nude mouse xenograft (SKBR3 breast cancer)	1 and 10 mg/kg/day	Reduces tumor growth, decreases Ki-67 expression, suppresses STAT3, AKT, and	(107)
			SKBR3								

							MAPK phosphorylation - suppresses cyclin D1 expression			MAPK activation	
HBP	BMP4-derived heparin-binding peptide	RKKNPNCRRH	MDA-MB-231	-	HUVEC	No significant toxicity observed in normal tissues	- Inhibits angiogenesis by blocking HSPG-growth factor interactions	Nude mouse xenograft (MDA-MB-231 breast cancer)	1 mg/kg	Inhibits tumor growth, suppresses angiogenesis, selectively accumulates in tumors	(108)

							- downregulates FAK, ERK, and AKT phosphorylation - reduces MMP2 and MMP9 expression				
C2ORF40MPF	C2ORF40-derived tumor suppressor peptide	SPYGFRHGASVNYDDY	BT549	IC_{50}: 106 µM	-	-	- Induces G2/M arrest - inhi	Nude mouse xenograft (MDA-MB-231 breast cancer)	30 mg/kg	Suppresses tumor growth, reduces tumo	(109)
			MDA-MB-231	IC_{50}: 93 µM							

							bits proliferation, migration, and invasion			r weight and volume, induces mitotic arrest	
Pep5	Cyclin D2-derived intracellular peptide	WELVVLGKL	MDA-MB-231	Effective at 25 µM	-	-	- Induces ERK 1/2 activation - disrupts cytoskeletal integrity - promotes G1/S-spec	Nude mouse xenograft (MDA-MB-231 breast cancer)	25 µM	Reduces tumor viability, disrupts cytoskeletal structure, induces apoptosis in G1/S phase cells	(110)

							ific apoptosis				
GK-1	Parasite-derived peptide (Taenia crassiceps)	GYYYPSDPNTFYAPPYSA	4T1	-	-	-	- Enhances T-cell activation - stimulates antigen-presenting cells - promotes $CD8^+$ T-cell proliferation and	BALB/c mouse xenograft	10, 50, or 100 µg per mouse	Suppresses tumor growth, reduces metastasis, increases tumor necrosis, enhances anti-tumor immune response	(111)

							cytokine secretion				
UP-7	Urokinase-derived peptide (UK1 kringle domain)	PWCYVQVGLKPLVQE	MDA-MB-231	IC_{50} : 123 μM	HUVEC	IC_{50}: 40 μM (VEGF)	- Inhibits FAK and ERK 1/2 phosphorylation - disrupts cytoskeletal organization - reduces focal adhesion form	nude mice LM-MDA-MB-231 breast cancer metastasis model	10, 30, or 100 mg/kg	Suppresses tumor angiogenesis, reduces metastasis, inhibits tumor growth via FAK inactivation and endothelial dysfunction	(112)
			LM-MDA-MB-231	IC_{50} : 190 μM							

							ation - suppresses endothelial and tumor cell migration				
NKp44-Pep8	NKp44-derived PCNA-binding peptide	EASALVCIRLVTSSKPRTVA	4T1	ED_{50}: 3.78 µM	-	-	- Binds PCNA - inhibits DNA replication and repair - bloc	BALB/c xenografts (4T1 breast cancer)	5 mg/kg	Suppresses tumor growth, increases apoptosis, inhibits PCNA function	(113)
			MDA-MB-231	ED_{50}: 4.07 µM							

							ks NKp 44– PCN A inter acti on - indu ces apo ptos is				
KLVFF	Synthe tic self- assemb ling peptide	KLVFF	4T1	-	-	-	- For ms β- shee t nan ofib ers - phys icall y enca psul ates tum or cells	BALB/c mouse xenogra ft (4T1 breast cancer)	2 mg/kg	Suppr esses metas tasis, reduc es platel et- tumo r cell intera ctions , forms long- lastin g tumo r-	(114)

							- blocks platelet aggregation and CTC adhesion			localized nanofibers	
AXT201	Synthetic 20-mer peptide	LRRFSTAPFAFININNVINF	4T1	-	HUVEC	No significant toxicity observed in normal tissues	- Disrupts integrin co-receptor signaling - inhibits endothelial proliferation and	BALB/c mouse xenograft	20 mg/kg	Inhibits tumor angiogenesis, normalizes vasculature, enhances $CD8^+$ T-cell infiltration, suppresses Tregs	(115)

							migration			and PD-L1 expression	
AAN-FnBPA5	Synthetic dual-targeting peptide	CGGGQVTTESNLVEFDEESTKGIVTGAVSDHTTVEDTK-NAA	4T1	IC_{50} : 6.41 μg/mL	3T3	No systemic toxicity observed	- Targets TAMs, CAFs, and ECM; disrupts fibronectin/collagen network - blocks TGF-β1-induced fibroblast	BALB/c mouse xenograft (4T1 breast cancer)	5 mg/kg	Suppresses tumor growth, reduces ECM stiffness, depletes TAMs and CAFs, remodels the TME for improved therapeutic response	(116)

							activation				
PDBAG1	Synthetic peptide from GPD1	GRKKRRQRRRPPQQASKKVCIVGSGNWGSAIA	MDA-MB-231 MDA-MB-468	IC_{50}: 30 µM	-	-	- Targets C1QBP - induces mitochondrial dysfunction - suppresses HR repair	Nude mouse xenograft (MDA-MB-231 breast cancer)	10 mg/kg	Suppresses tumor growth, inhibits OXPHOS, induces metabolic stress, synergizes with PARP inhibitors	(117)
Mastoparan-M (Mast-M)	Vespa magnifica venom-derived peptide	INLKALAALAKKIL-NH_2	4T1 MDA-MB-231	IC_{50} : 2.7 µM	MCF-10A	No systemic toxicity observed	- Induces mitochondrial dysf	BALB/c mouse xenograft (4T1 breast cancer)	2.7 mg/kg	Disrupts mitochondrial membrane,	(118)

							unction - ROS generation, and caspase-3 activation - leading to apoptosis			enhances ROS production, promotes apoptosis, inhibits tumor growth	