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Technical Information

NpFlamma® MMP series

Overview

BioActs developed NpFlamma® MMP series, MMP-activatable polymeric *in vivo* fluorescent probes, for early diagnosis and for visualization of overexpressed MMPs related diseases. The probes consist of a fluorescent dye that connected to a quencher through a MMP-cleavable peptide, and a chitosan based nanoparticle (CNP). The one end of peptide is chemically conjugated to a chitosan based nanoparticle. NpFlamma® MMPs are optically silent in their inactivated state yet would be highly fluorescent following MMP-cleaved activation. CNP can selectively accumulate in cancer tissues due to high permeability for loose new blood vessels around cancer tissues and retention effect. The polymeric nanoparticles form self-aggregates size of several hundred nanometers in the aqueous system accumulate only in vicinity of cancer tissues. Thus, CNP enables to bring up the probe to tumor cells, and the cleavage of the peptide by MMPs allows to selective detection of tumor by realizing fluorescence imaging.

NpFlamma® MMP series equipped with several different MMPs (MMP-2, -3, -7, -9, -13) cleavable peptides that enable to detect a wide range of diseases. Since self-assembled CNPs have already been used as vehicles for hydrophobic drug delivery, and have shown therapeutic efficacy for mouse tumors. Therefore, the role of NpFlamma® MMP series might be extended as theranostic agents, which enabling simultaneously monitoring therapeutic responses and delivering therapy. BioActs offers NpFlamma® MMP series as smart fluorescent probes for monitoring MMP-related diseases such as cancer progression, invasion and metastasis, rheumatoid arthritis, pulmonary diseases and areas of cardiovascular disease, and also for evaluating the potential therapeutic efficacy of drugs targeting for these diseases.

Table 1. NpFlamma® MMP product list

Cat. No.	Product name	Ex (nm)	Em (nm)	Common filter set	Excitation source
PNM0103	NpFlamma® MMP-2,9 648	653	670	Cy 5	594, 633 nm
PNM0104	NpFlamma® MMP-2,9 675	683	694	Cy 5.5	633, 680 nm
PNM0105	NpFlamma® MMP-2,9 749	760	778	Cy 7	785 nm
PNM0106	NpFlamma® MMP-2,9 774	793	810	Cy 7.5	785 nm
PNM0101	NpFlamma® MMP-2,9 ICG	798	835	Cy 7.5	785 nm
PNM0203	NpFlamma® MMP-3,7 648	653	670	Cy 5	594, 633 nm
PNM0204	NpFlamma® MMP-3,7 675	683	694	Cy 5.5	633, 680 nm
PNM0205	NpFlamma® MMP-3,7 749	760	778	Cy 7	785 nm
PNM0206	NpFlamma® MMP-3,7 774	793	810	Cy 7.5	785 nm
PNM0201	NpFlamma® MMP-3,7 ICG	798	835	Cy 7.5	785 nm
PNM0303	NpFlamma® MMP-13 648	653	670	Cy 5	594, 633 nm
PNM0304	NpFlamma® MMP-13 675	683	694	Cy 5.5	633, 680 nm
PNM0305	NpFlamma® MMP-13 749	760	778	Cy 7	785 nm
PNM0306	NpFlamma® MMP-13 774	793	810	Cy 7.5	785 nm
PNM0301	NpFlamma® MMP-13 ICG	798	835	Cy 7.5	785 nm

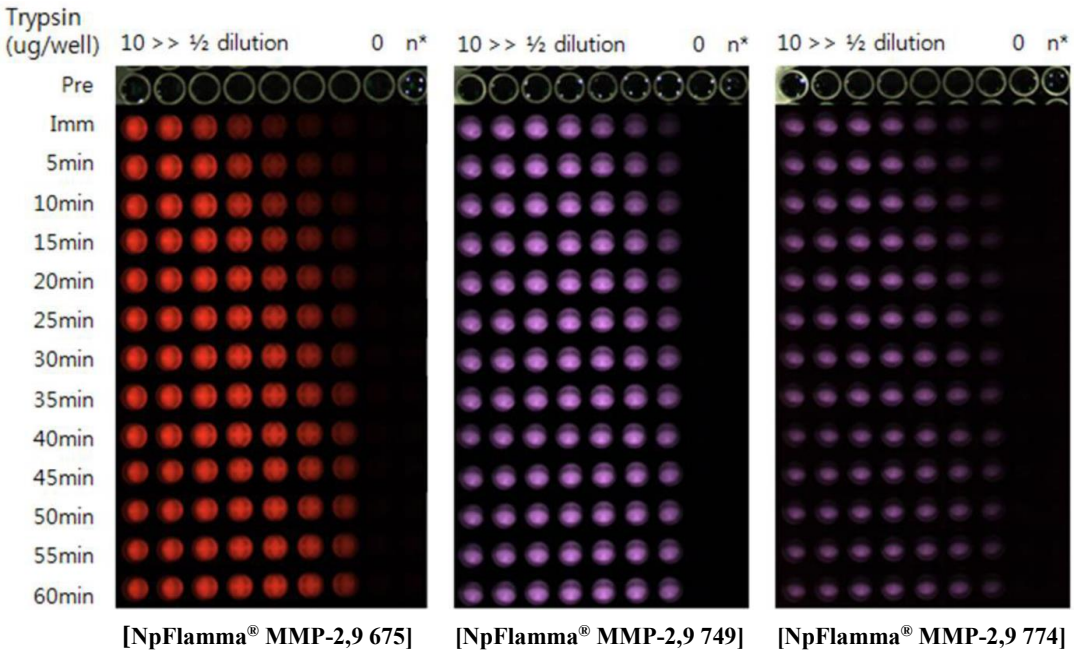
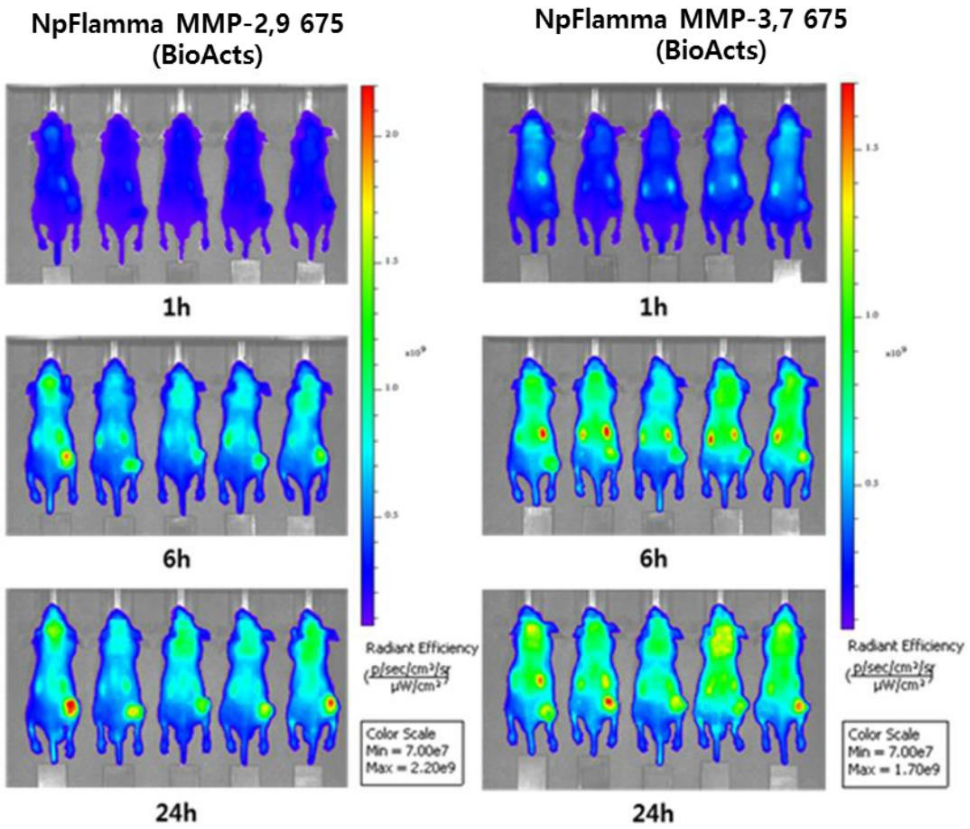


Figure 1. Activation of NpFlamma® MMP series with Trypsin



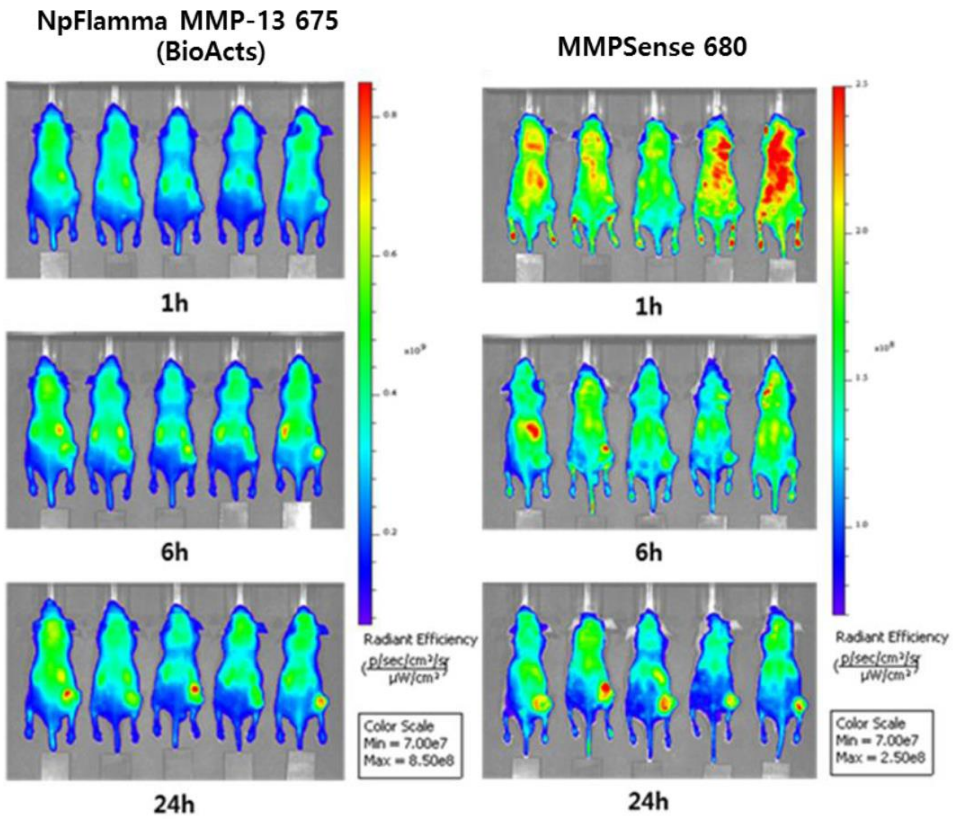
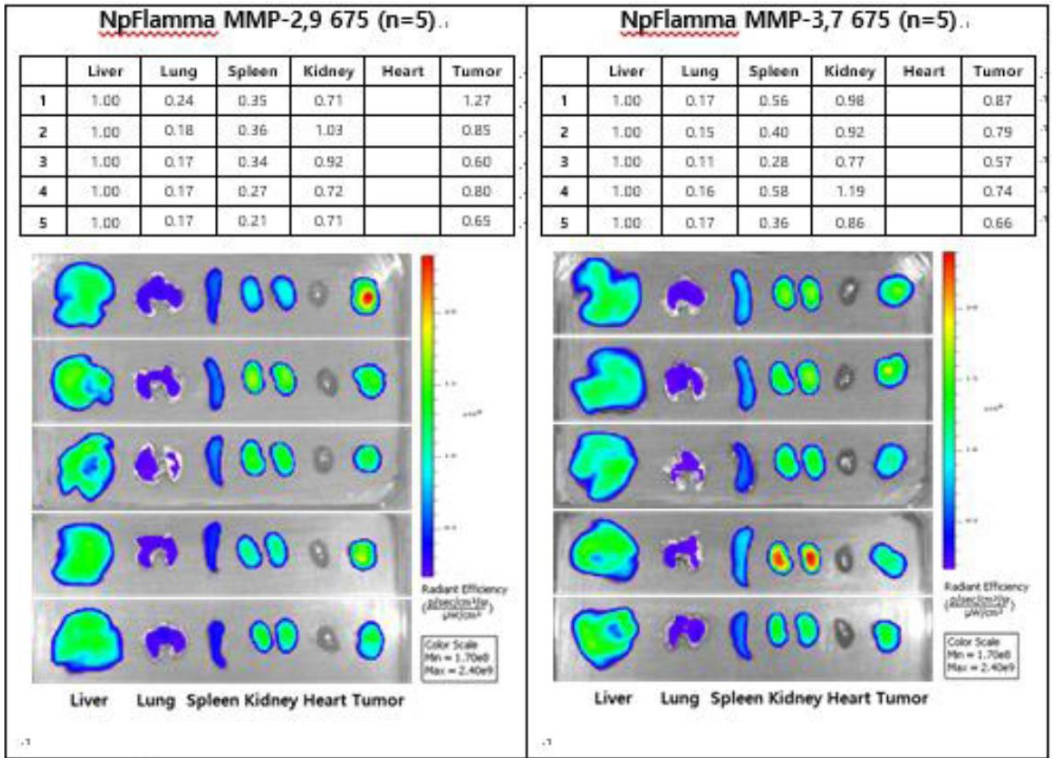
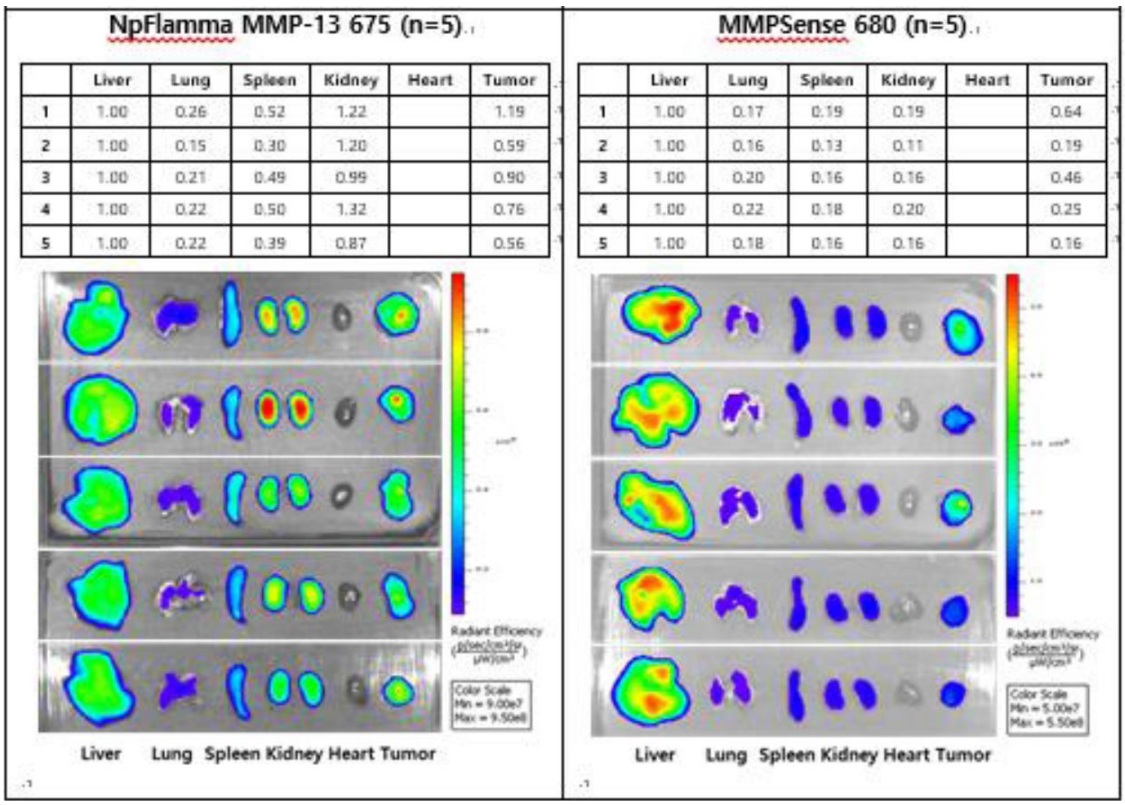


Figure 2. Comparison of in vivo imaging of three NpFlamma® MMPs and MMPSense 680



	Liver	Lung	Spleen	Kidney	Heart	Tumor
1	1.00	0.24	0.35	0.71		1.27
2	1.00	0.18	0.36	1.03		0.85
3	1.00	0.17	0.34	0.92		0.60
4	1.00	0.17	0.27	0.72		0.80
5	1.00	0.17	0.21	0.71		0.65

	Liver	Lung	Spleen	Kidney	Heart	Tumor
1	1.00	0.17	0.56	0.98		0.87
2	1.00	0.15	0.40	0.92		0.79
3	1.00	0.11	0.28	0.77		0.57
4	1.00	0.16	0.58	1.19		0.74
5	1.00	0.17	0.36	0.86		0.66



	Liver	Lung	Spleen	Kidney	Heart	Tumor
1	1.00	0.26	0.52	1.22		1.19
2	1.00	0.15	0.30	1.20		0.59
3	1.00	0.21	0.49	0.99		0.90
4	1.00	0.22	0.50	1.32		0.76
5	1.00	0.22	0.39	0.87		0.56

	Liver	Lung	Spleen	Kidney	Heart	Tumor
1	1.00	0.17	0.19	0.19		0.64
2	1.00	0.16	0.13	0.11		0.19
3	1.00	0.20	0.16	0.16		0.46
4	1.00	0.22	0.18	0.20		0.25
5	1.00	0.18	0.16	0.16		0.16

Figure 3. Comparison of ex-vivo imaging of three of NpFlamma® MMPs and MMPSense 680
NpFlamma® MMP series displays higher tumor cell accumulation than that of MMPSense 680

In vivo Imaging Protocol

General

- Prepare the fluorescent probe solution by adding DW or PBS to the NpFlamma® MMP series powder and vortex the mixture (1does = 120 μg per 100 μL)
- Fluorescent substances are unstable under light, they should be stored in the dark.
- Mouse fur may cause scattering or absorption of excitation of light during optical imaging process. Use nude mouse or remove the mouse fur in advance.
- It is recommended to use 31 G syringe needle.
- Prepare 5 week-old male Balb/c-nude mouse.

Typical procedure for mouse model tumor imaging with NpFlamma® MMP

- Inject SCC7 cell line ($1x10^6$ per 0.1 mL) into subcutaneous of Balb/c-nude mouse.
- When the volume of tumor cell reaches to 60~80 mm^3, take the zero time image of each subject.
- Inject NpFlamma® MMP series (120 μg per 100 μL) intravenously to mouse.
- The optimal interval for fluorescence imaging is 1 h, 3 h, 6 h, 9 h, and 24 h after injection.
- After take the 24 h imaging, extract major organs (e.g liver, lung, spleen, kidney, heart) and tumor cell, and perform the ex-vivo imaging process.

Custom Labeling Service

Based on accumulated know-how and technologies, BioActs provide a wide range of custom services such as protein fluorescence labeling, organic synthesis, oligonucleotide synthesis upon customers' request. Our reliable technology has acknowledged by our clients from domestic and overseas universities, institutions, in vitro diagnostic and pharmaceutical companies and has enabled to steadily conduct their requirements. In addition, we can introduce fluorescent materials to many other compounds such as organic and inorganic compounds, drugs, hormones, polymer, peptides, proteins, antibodies, etc. We also can provide chemical and optical analytical data, along with cell and animal experiments.

Technical Support

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SDS (Safety Data Sheets) You can find SDS at www.bioacts.com, the official website of BioActs.
CoA (Certificate of Analysis) provides detailed quality information of each product. To see CoA, check the lot number written on each product's page at www.bioacts.com, when having trouble with check, contact to our technical support team

This product can be used only for research purpose, and it can't be used to treat or diagnose human body or animals.
The product cannot be resold to other regions except for South Korea.
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