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Supplementary Figure Legends

Supplementary Figure 1. Experimental protocols for the treatments in $ApoE^{-/-}$ mice. At 16-18 weeks of age, mice began receiving the HFD. After 4 weeks of the experimental diet, all mice were infused with angiotensin II dissolved in phosphate-buffered saline (PBS) at 1.9 mg/kg per day.

Protocol 1. Animals were divided into 2 groups at the beginning of angiotensin II infusion: (i) adoptively transferred $CCR2^{+/+}$-inflammatory macrophages from $ApoE^{-/-}$ mice (1×10^6 cells/ 200 μl PBS) and (ii) adoptively transferred $CCR2^{-/-}$-leukocytes from $ApoE^{-/-}CCR2^{-/-}$ mice (1×10^6 cells/ 200 μl PBS).

Protocol 2. Animals were divided into 2 groups at the beginning of angiotensin II infusion: (i) the FITC-incorporated NP group (1.3 mg PLGA/ 200 μl PBS) and (ii) the 7ND-incorporated NP group (5 μg 7ND plasmid/ 200 μl PBS). NPs were administered by weekly intravenous injection.

Protocol 3. Animals were divided into 4 groups at the beginning of angiotensin II infusion: (i) the no treatment group, (ii) the FITC-incorporated NP group (0.1 mg PLGA/ 200 μl PBS), (iii) the pitavastatin-only group (0.012 mg pitavastatin/ 200 μl PBS), and (iv) the pitavastatin-incorporated NP group (0.1 mg PLGA/ 0.012 mg pitavastatin/ 200 μl PBS). NPs were administered by weekly intravenous injection.

Protocol 4. Animals were divided into 2 groups at the beginning of angiotensin II infusion: (i) oral daily administration of pitavastatin at a low dose (0.1 mg/kg/day) and (ii) oral daily administration of pitavastatin at a high dose (1.0 mg/kg/day). Pitavastatin was daily administered by oral gavage.

The no treatment group in protocol 2 was also used as the control group in protocols 1. and 4.

Supplementary Figure 2. Characteristics and kinetics of adoptive transferred macrophages. (**A**) Quantitative flow cytometric analysis of the number of $F4/80^+CD115^+$ macrophages in the peritoneal cavities of $ApoE^{-/-}$ or $ApoE^{-/-}CCR2^{-/-}$ mice induced by intraperitoneal injection of thioglycollate (TG). (**B**) Quantitative analysis of the mean

fluorescence intensity (MFI) of Ly-6C expression in the $F4/80^{+}CD115^{+}$ macrophages from the peritoneal cavities of the $ApoE^{-/-}$ mice. The data are reported as the mean±SEM. (**C**) Left panel: A fluorescence photomicrograph of the brachiocephalic artery of an $ApoE^{-/-}$ mouse from the no treatment group. Upper middle and right panel: PKH fluorescence photomicrographs of the brachiocephalic artery of an $ApoE^{-/-}$ mouse transferred with PKH-labeled activated macrophages. Lower middle and right panel: FITC autofluorescence photomicrographs of the brachiocephalic artery of an $ApoE^{-/-}$ mouse transferred with PKH-labeled activated macrophages. Right panel: An expanded image of the red square area in the middle panel. The nuclei were stained with DAPI. The scale bar indicates 100 μm.

Supplementary Figure 3. The adoptive transfer of splenic monocytes accelerates plaque destabilization and rupture in the brachiocephalic arteries. (A) Left panel: Representative flow cytometry dot plots of splenic leukocytes from $ApoE^{-/-}$ mice. Middle panel: The Representative flow cytometry dot plots of splenic leukocytes negatively selected with antibodies against the leukocytes other than monocytes from $ApoE^{-/-}$ mice. Right panel: The Representative histogram of Ly-6C expression on negatively selected splenic monocytes. (B) Upper panel: Photomicrographs of atherosclerotic plaques in the brachiocephalic artery stained with elastica van Gieson (EVG) in the No Treatment (N) and the Monocytes (M) groups. Arrowheads indicate disrupted/buried fibrous caps. The scale bar indicates 100 μm. Lower panel: Quantitation of the number of disrupted/buried fibrous caps and fibrous cap thickness. The data are reported as the mean±SEM. $*P<0.05$ versus the No Treatment group. There were no statistically significant differences in fibrous cap thickness between the two groups.

Supplementary Figure 4. Cellular uptake and *in vitro* kinetics of the NPs in macrophages. (**A**) Fluorescence photomicrographs of murine peritoneal macrophages incubated with FITC-NPs for 24 hours. An inset depicts a photomicrograph of macrophages incubated without FITC-NPs. (**B**) A fluorescence confocal microscopy image of RAW264.7 cells

incubated with FITC-NPs for 24 hours. (**C**) Electron microscopy image of RAW264.7 cells incubated with OsO_4-NPs for 24 hours. (**D**) Upper panel: Time course of the FITC signal retained in RAW264.7 cells after a 2-hour incubation with FITC-NPs or FITC (0.3, 1, 3, 10, 30, 100 μM) followed by a washout period. Cells were observed at 0, 24, 72 hours, and 1 week of washout. Lower panel: Quantitative analysis of relative fluorescence units (RFUs) of RAW264.7 cells incubated with FITC-NPs (green lines) or FITC (blue lines). *P<0.01 and **P<0.001 versus FITC (N = 4 per group). Data were compared using two-way ANOVA followed by Bonferroni's multiple comparison tests.

Supplementary Figure 5. Effects of daily oral administration of pitavastatin (0.1 or 1.0 mg/kg per day) on atherosclerotic plaque rupture in the brachiocephalic arteries. (**A**) Upper panel: Photomicrographs of atherosclerotic plaques stained with elastica van Gieson (EVG), Mac3 or MCP-1 in the No Treatment (N), pitavastatin 0.1 mg/kg (0.1), and pitavastatin 1.0 mg/kg (1.0) groups. Arrowheads indicate disrupted/buried fibrous caps. The scale bar indicates 100 μm. Lower panel: Quantitation of the number of disrupted/buried fibrous caps, fibrous cap thickness and Mac3- and MCP-1-positive areas. The data are reported as the mean±SEM. †P<0.05 versus the No Treatment group using one-way ANOVA followed by Dunnett's multiple comparison tests. **P<0.01 versus the No Treatment group using one-way ANOVA followed by Bonferroni's multiple comparison tests. (**B**) Upper panel: Photomicrographs of the intraluminal surface of the total aorta stained with oil red O. Lower panel: Quantitation of the percentage of the plaque area compared with the total luminal surface area. The data are reported as the mean±SEM. *P<0.05 versus the No Treatment group. (C) Upper panel: Photomicrographs of atherosclerotic plaques in the aortic root stained with EVG or Mac3. Lower panel: Quantitation of plaque size and Mac3-positive areas. The scale bar indicates 200 μm. The data are reported as the mean±SEM. †P<0.05 versus the No Treatment group using one-way ANOVA followed by Dunnett's multiple comparison tests.

Supplementary Tables

Supplementary Table 1. Body weight, heart rate, systolic blood pressure, and lipid profiles in the no treatment, $CCR2^{+/+}$ inflammatory macrophage, and $CCR2^{-/-}$ leukocyte groups.

	No Treatment (N= 9)	$CCR2^{+/+}$ Inflammatory Macrophage (N= 5)	$CCR2^{-/-}$ Leukocyte (N= 8)
Body Weight (g)	33±1	35±3	34±3
Heart Rate (beat/min)	650±20	640±40	580±40
Systolic Blood Pressure (mmHg)	120±2	112±8	115±9
Total Cholesterol (mg/dl)	660±30	710±100	720±60
Triglyceride (mg/dl)	65±9	74±16	69±5

The data are expressed as the mean±SEM. The mean values were compared using ANOVA and Bonferroni's multiple comparison tests, and there are no significant differences for any of these parameters among these groups.

Supplementary Table 2. Body weight, heart rate, systolic blood pressure, and lipid profiles in the no treatment, FITC-NP, pitavastatin, and pitavastatin-NP groups.

	No Treatment (N= 9)	FITC-NP (N= 7)	Pitava (N= 6)	Pitava-NP (N= 10)
Body Weight (g)	33±1	30±1	34±1	32±1

Heart Rate (beat/min)	650±20	630±30	650±20	590±20
Systolic Blood Pressure (mmHg)	120±0	110±10	12±10	120±0
Total Cholesterol (mg/dl)	660±30	670±50	610±50	710±40
Triglyceride (mg/dl)	65±9	60±5	53±5	70±6

The data are expressed as the mean±SEM. The mean values were compared using ANOVA and Bonferroni's multiple comparison tests, and there are no significant differences for any of these parameters compared with the No Treatment group.

Supplementary Table 3. Body weight, heart rate, systolic blood pressure, and lipid profiles in the FITC-NP and 7ND-NP groups.

	FITC-NP (N= 9)	7ND-NP (N= 10)
Body Weight (g)	28±1	25±1
Heart Rate (beat/min)	640±30	680±10
Systolic Blood Pressure (mmHg)	130±10	120±10
Total Cholesterol (mg/dl)	720±60	730±20
Triglyceride (mg/dl)	47±11	53±18

The data are expressed as the mean±SEM. The mean values were compared using the unpaired *t*-test, and there are no significant differences for any of these parameters between these 2 groups.

Supplementary Table 4. Body weight, heart rate, systolic blood pressure, and lipid profiles in the no treatment, pitavastatin 0.1 mg/kg, and pitavastatin 1.0 mg/kg groups.

	No Treatment (N= 9)	Pitavastatin 0.1 mg/kg (N= 10)	Pitavastatin 1.0 mg/kg (N= 11)
Body Weight (g)	33±1	30±1*	32±0
Heart Rate (beat/min)	650±20	610±20	630±10
Systolic Blood Pressure (mmHg)	120±0	110±0	120±0
Total Cholesterol (mg/dl)	660±30	780±20	800±50
Triglyceride (mg/dl)	65±9	82±15	43±5

The data are expressed as the mean±SEM. *P<0.05 versus the No Treatment group. The data were compared using ANOVA followed by Bonferroni's multiple comparison tests.

Supplementary Table 5. Serum biomarkers in the no treatment, $CCR2^{+/+}$ inflammatory macrophage, and $CCR2^{-/-}$ leukocyte group.

		No Treatment (N= 7)	$CCR2^{+/+}$ Inflammatory Macrophage (N= 5)	$CCR2^{-/-}$ Leukocyte (N= 7)
Apo A1	**μg/mL**	48±6	39±6	38±3
CD40	**pg/mL**	87±9	160±40	75±9
CD40 Ligand	**pg/mL**	2600±300	5700±400**	4600±700*
CRP	**μg/mL**	11±1	10±1	11±2

EGF	**pg/mL**	16±1	23±1**	21±1**
Endothelin-1	**pg/mL**	18±1	21±2	17±2
Eotaxin	**pg/mL**	320±20	330±50	380±30
Factor VII	**ng/mL**	14±1	19±1*	18±1
FGF-basic	**ng/mL**	7.0±0.6	11±1*	9.0±0.8
GCP-2	**ng/mL**	31±7	13±7	5±1**
Haptoglobin	**μg/mL**	140±20	190±30	200±20
IFN-γ	**pg/mL**	N.D.	23±8	N.D.
IgA	**μg/mL**	42±5	52±9	60±7
IL-10	**pg/mL**	430±20	N.D.	N.D.
IL-11	**pg/mL**	N.D.	490±430	85±29
IL-17	**ng/mL**	N.D.	N.D.	0.01±0.00
IL-18	**ng/mL**	18±1	30±1***	27±0***
IL-1α	**pg/mL**	260±72	160±45	94±15
IL-1β	**ng/mL**	17±1	20±1	20±1
IL-5	**ng/mL**	N.D.	0.73±0.23	0.61±0.12
IL-6	**pg/mL**	11±2	15±4	N.D.
IL-7	**ng/mL**	0.18±0.06	0.22±0.12	0.18±0.07
IP-10	**pg/mL**	68±9	230±140	54±3
LIF	**pg/mL**	1200±0	1500±100	1200±100
Lymphotactin	**pg/mL**	120±50	180±40	100±20
MCP-1	**pg/mL**	130±10	220±30**	110±10
MCP-3	**pg/mL**	400±30	700±100**	490±40
MCP-5	**pg/mL**	21±2	49±6**	37±6

M-CSF	**ng/mL**	5.2±0.3	8.2±0.4***	6.0±0.1
MDC	**pg/mL**	460±20	580±70	560±40
MIP-1α	**ng/mL**	2.4±0.3	4.1±0.2***	4.0±0.2***
MIP-1β	**pg/mL**	190±40	410±50**	280±20
MIP-1γ	**ng/mL**	50±3	67±7	52±7
MIP-2	**pg/mL**	18±4	28±3	21±2
MIP-3	**ng/mL**	2.3±0.2	3.5±0.3**	2.4±0.3
MMP-9	**ng/mL**	110±20	210±20**	140±20
MPO	**ng/mL**	110±20	200±10**	160±10*
Myoglobin	**ng/mL**	320±260	260±200	78±32
OSM	**ng/mL**	0.15±0.03	N.D.	0.03±0.01**
RANTES	**pg/mL**	0.64±0.20	N.D.	N.D.
SAP	**μg/mL**	47±2	35±1*	38±4
SCF	**pg/mL**	310±40	230±30	190±20*
SGOT	**μg/mL**	51±9	50±5	73±4
TIMP-1	**ng/mL**	4.9±0.7	5.2±0.9	4.7±0.6
Tissue Factor	**ng/mL**	8.6±0.3	11±2	7.5±1.0
TNF-α	**ng/mL**	0.11±0.02	N.D.	N.D.
TPO	**ng/mL**	110±10	150±10**	130±0*
VCAM-1	**ng/mL**	2200±100	3500±700*	2700±100
VEGF	**pg/mL**	290±40	200±10	190±10*
vWF	**ng/mL**	150±10	330±130	160±20

The data are expressed as the mean±SEM. The means were compared by means of

ANOVA and Bonferroni's multiple comparison tests. **P*<0.05 versus the No Treatment group, ***P*<0.01 versus the No Treatment group, ****P*<0.001 versus the No Treatment group. Multiplex immunoassay was performed using the Luminex LabMAP instruments by Charles River Inc. Apo A1 (Apolipoprotein A1), CD (Cluster of Differentiation), CRP (C Reactive Protein), EGF (Epidermal Growth Factor), FGF-9 (Fibroblast Growth Factor-9), FGF-basic (Fibroblast Growth Factor-basic), GCP-2 (Granulocyte Chemotactic Protein-2), GM-CSF (Granulocyte Macrophage-Colony Stimulating Factor), GST-α (Glutathione S-Transferase alpha), IFN-γ (Interferon-gamma), IgA (Immunoglobulin A), IL (Interleukin), IP-10 (Inducible Protein-10), KC/GROα (Melanoma Growth Stimulatory Activity Protein), LIF (Leukemia Inhibitory Factor), MCP (Monocyte Chemoattractant Protein), M-CSF (Macrophage Colony-Stimulating Factor), MDC (Macrophage-Derived Chemokine), MIP (Macrophage Inflammatory Protein), MMP-9 (Matrix Metalloproteinase-9), MPO (Myeloperoxidase), OSM (Oncostatin M), RANTES (Regulation Upon Activation, Normal T-Cell Expressed and Secreted), SAP (Serum Amyloid P), SCF (Stem Cell Factor), SGOT (Serum Glutamic-Oxaloacetic Transaminase), TIMP-1 (Tissue Inhibitor of Metalloproteinase Type-1), TNF-α (Tumor Necrosis Factor-alpha), TPO (Thrombopoietin), VCAM-1 (Vascular Cell Adhesion Molecule-1), VEGF (Vascular Endothelial Cell Growth Factor), vWF (von Willebrand Factor). N.D. (Not Detected).

Supplementary Table 6. Serum biomarkers in the FITC-NP and pitavastatin-NP groups.

		FITC-NP (N= 6)	Pitava-NP (N= 9)
Apo A1	**μg/mL**	45±2	46±2

CD40	**pg/mL**	110±10	90±11
CD40 Ligand	**pg/mL**	1900±100	1400±100*
CRP	**μg/mL**	7.6±0.8	7.5±0.8
EGF	**pg/mL**	26±3	24±1
Endothelin-1	**pg/mL**	24±2	24±1
Eotaxin	**pg/mL**	370±10	420±20
Factor VII	**ng/mL**	28±2	28±1
FGF-basic	**ng/mL**	17±2	17±0
GCP-2	**ng/mL**	39±5	35±4
Haptoglobin	**μg/mL**	150±10	150±10
IgA	**μg/mL**	44±12	32±3
IL-10	**pg/mL**	N.D.	N.D.
IL-11	**pg/mL**	120±60	61±9
IL-18	**ng/mL**	18±1	16±1
IL-1α	**pg/mL**	440±130	200±40
IL-1β	**ng/mL**	7.9±0.3	7.8±0.6
IL-4	**pg/mL**	71±28	59±6
IL-5	**ng/mL**	0.80±0.12	1.1±0.2
IL-6	**pg/mL**	N.D.	12±4
IL-7	**ng/mL**	0.082±0.018	N.D.
IP-10	**pg/mL**	40±3	47±7
LIF	**pg/mL**	1900±100	1900±100
Lymphotactin	**pg/mL**	80±9	82±7
MCP-1	**pg/mL**	130±10	110±0*

MCP-3	**pg/mL**	380±30	320±20
MCP-5	**pg/mL**	28±4	30±2
M-CSF	**ng/mL**	7.3±0.1	7.5±0.2
MDC	**pg/mL**	650±40	840±70
MIP-1α	**ng/mL**	3.3±0.2	3.2±0.1
MIP-1β	**pg/mL**	200±30	180±10
MIP-1γ	**ng/mL**	54±4	45±3
MIP-2	**pg/mL**	28±2	22±2
MIP-3	**ng/mL**	2.0±0.1	2.1±0.1
MMP-9	**ng/mL**	130±10	120±10
MPO	**ng/mL**	140±20	120±10
Myoglobin	**ng/mL**	240±60	360±150
OSM	**ng/mL**	0.05±0.01	N.D.
SAP	**μg/mL**	32±2	30±2
SCF	**pg/mL**	280±10	240±10*
TIMP-1	**ng/mL**	5.0±0.7	4.3±0.5
Tissue Factor	**ng/mL**	14±1	12±0
TPO	**ng/mL**	30±3	32±2
VCAM-1	**ng/mL**	2600±100	2500±200
VEGF	**pg/mL**	200±20	150±10*
vWF	**ng/mL**	180±10	150±10*

The data are expressed as the mean±SEM. The mean values were compared using an unpaired *t*-test. *$P<0.05$ versus the FITC-NP group.

Supplementary Table 7. Plasma concentration of pitavastatin in the pitavastatin and pitavastatin-NP groups.

	2 hours	6 hours	24 hours
Pitavastatin (ng/mL)	1.3±0.2	N.D.	N.D.
Pitavastatin-NP (ng/mL)	2.5±0.2*	N.D.	N.D.

The data are expressed as the mean±SEM. The mean values were compared using an unpaired *t*-test. *$P<0.05$ versus the Pitavastatin group.

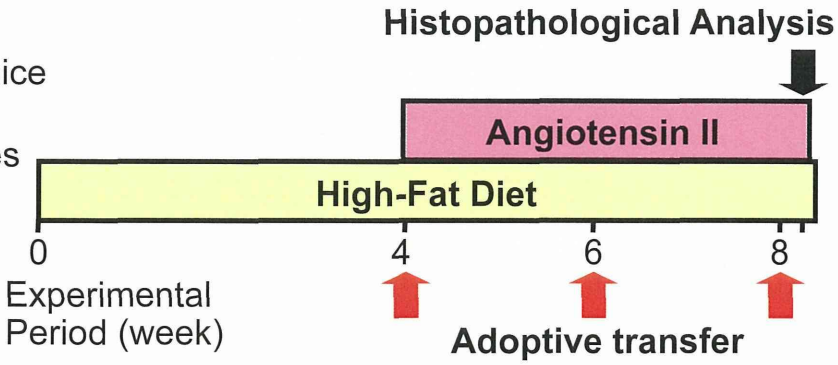
Supplementary Figure 1, Katsuki S et al

Experiment Protocol 1

ApoE$^{-/-}$mice or ApoE$^{-/-}$CCR2$^{-/-}$mice
Thioglycollate-induced
peritoneal macrophages

↓

ApoE$^{-/-}$mice
18 weeks of age

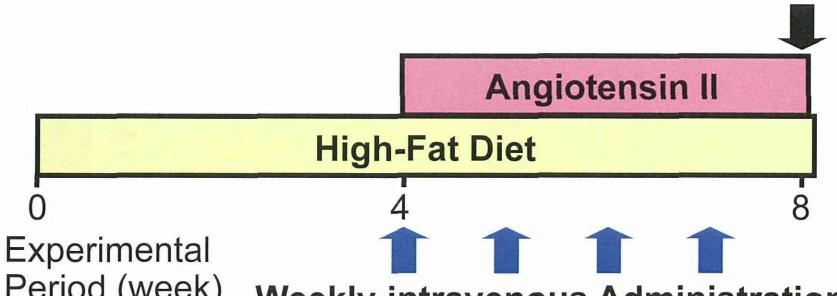


Treatment Group

1. CCR2$^{+/+}$-Inflammatory Macrophage (1x10^6 cells/ 200 μL PBS)
2. CCR2$^{-/-}$-Leukocyte (1x10^6 cells/ 200 μL PBS)

Experiment Protocol 2

ApoE$^{-/-}$mice
16 weeks of age

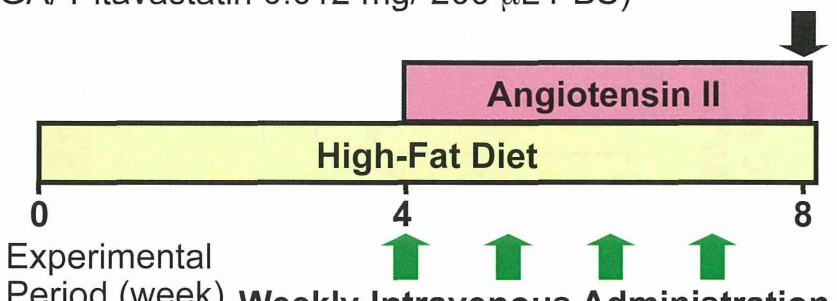


Treatment Group

1. No treatment
2. FITC-NP (0.1 mg PLGA/ 200 μL PBS)
3. Pitavastatin (Pitavastatin 0.012 mg/ 200 μL PBS)
4. Pitavastatin-NP (0.1 mg PLGA/ Pitavastatin 0.012 mg/ 200 μL PBS)

Experiment Protocol 3

ApoE$^{-/-}$mice
16 weeks of age

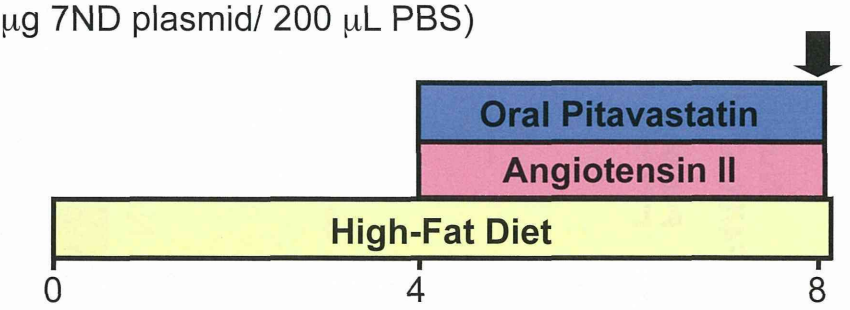


Treatment Group

1. FITC-NP (1.3 mg PLGA/ 200 μL PBS)
2. 7ND-NP (1.3 mg PLGA/ 5 μg 7ND plasmid/ 200 μL PBS)

Experiment Protocol 4

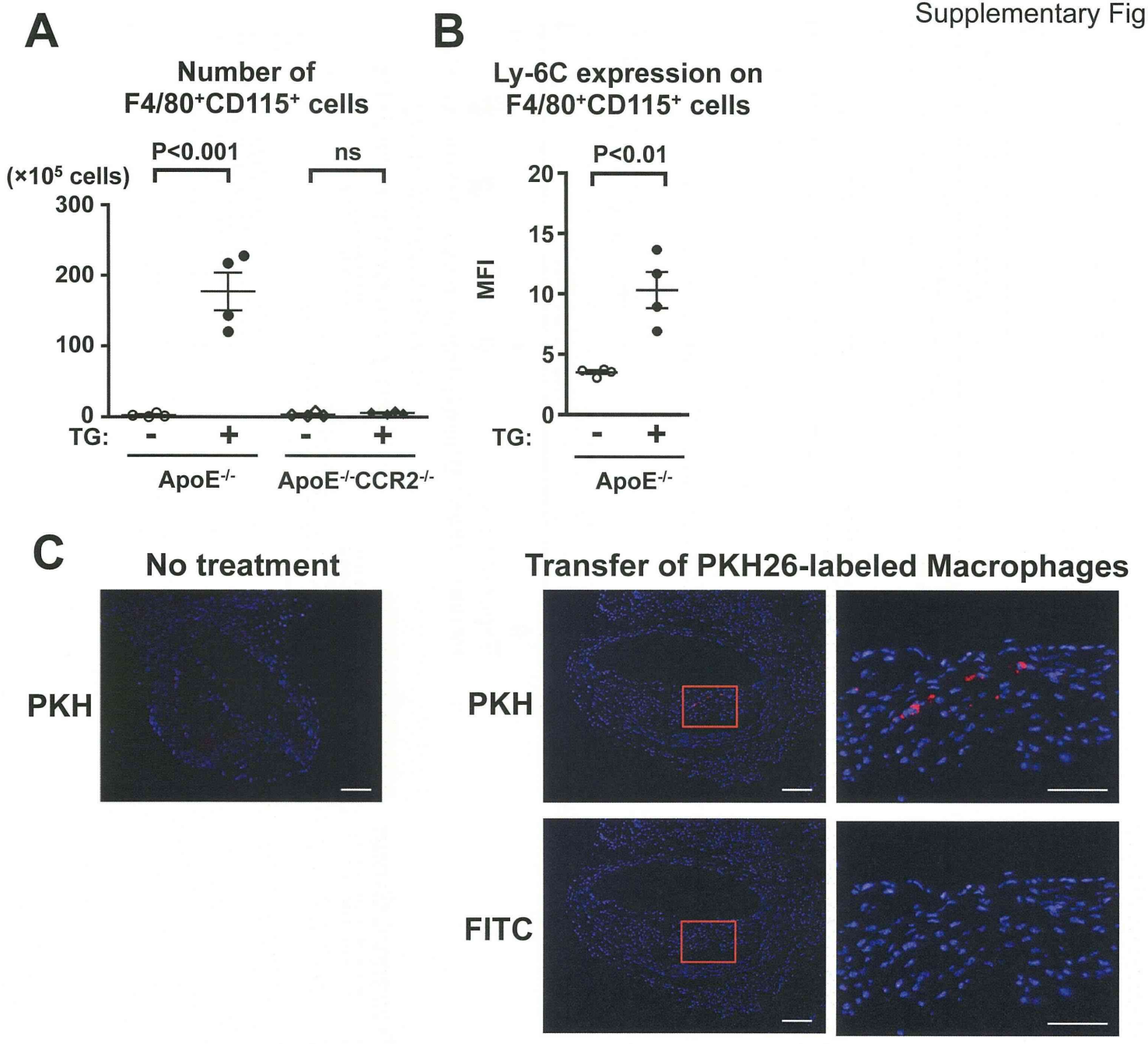
ApoE$^{-/-}$mice
16 weeks of age



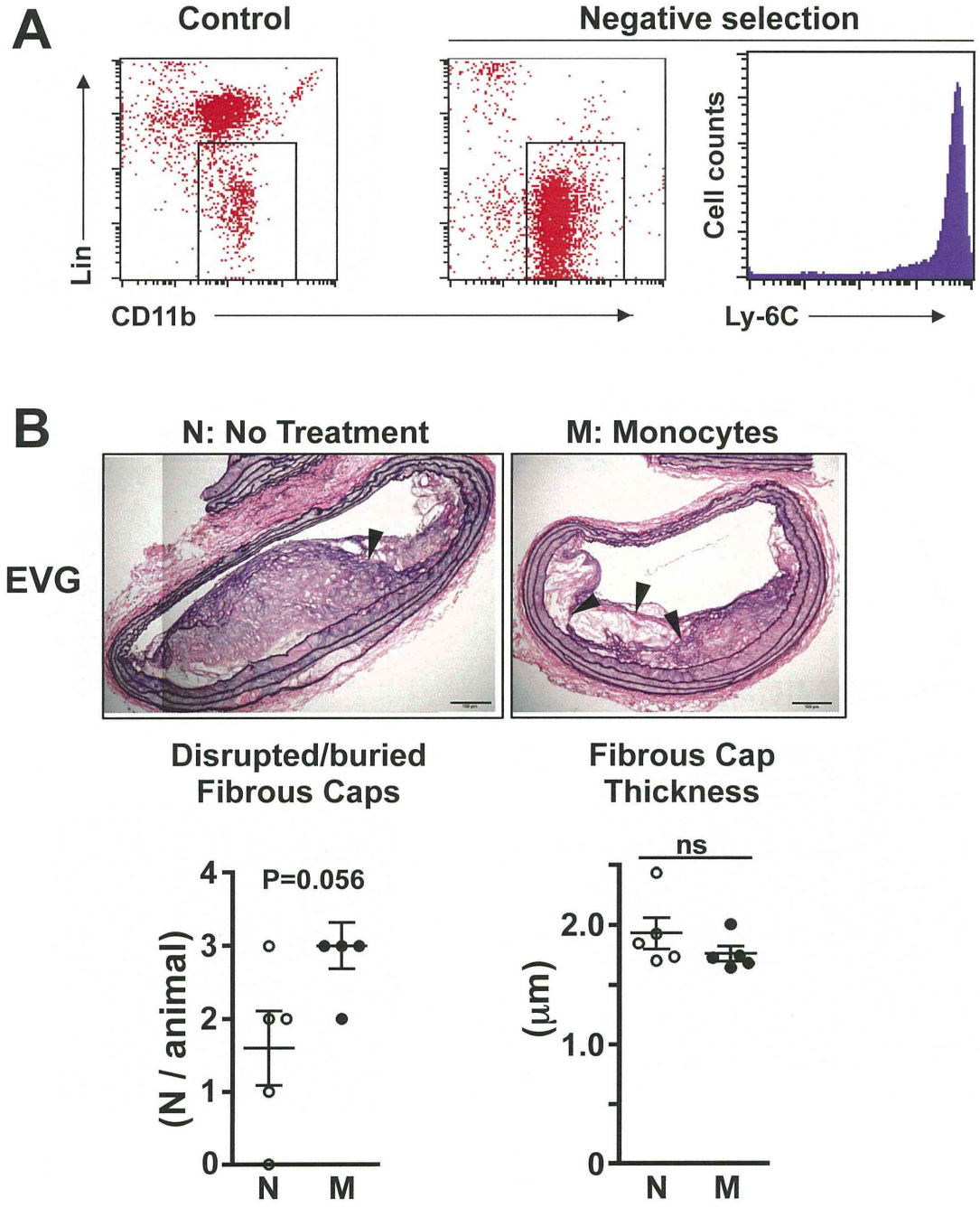
Treatment Group

1. Pitavastatin (Lower dose: 0.1 mg/kg/day)
2. Pitavastatin (Higher dose: 1.0 mg/kg/day)

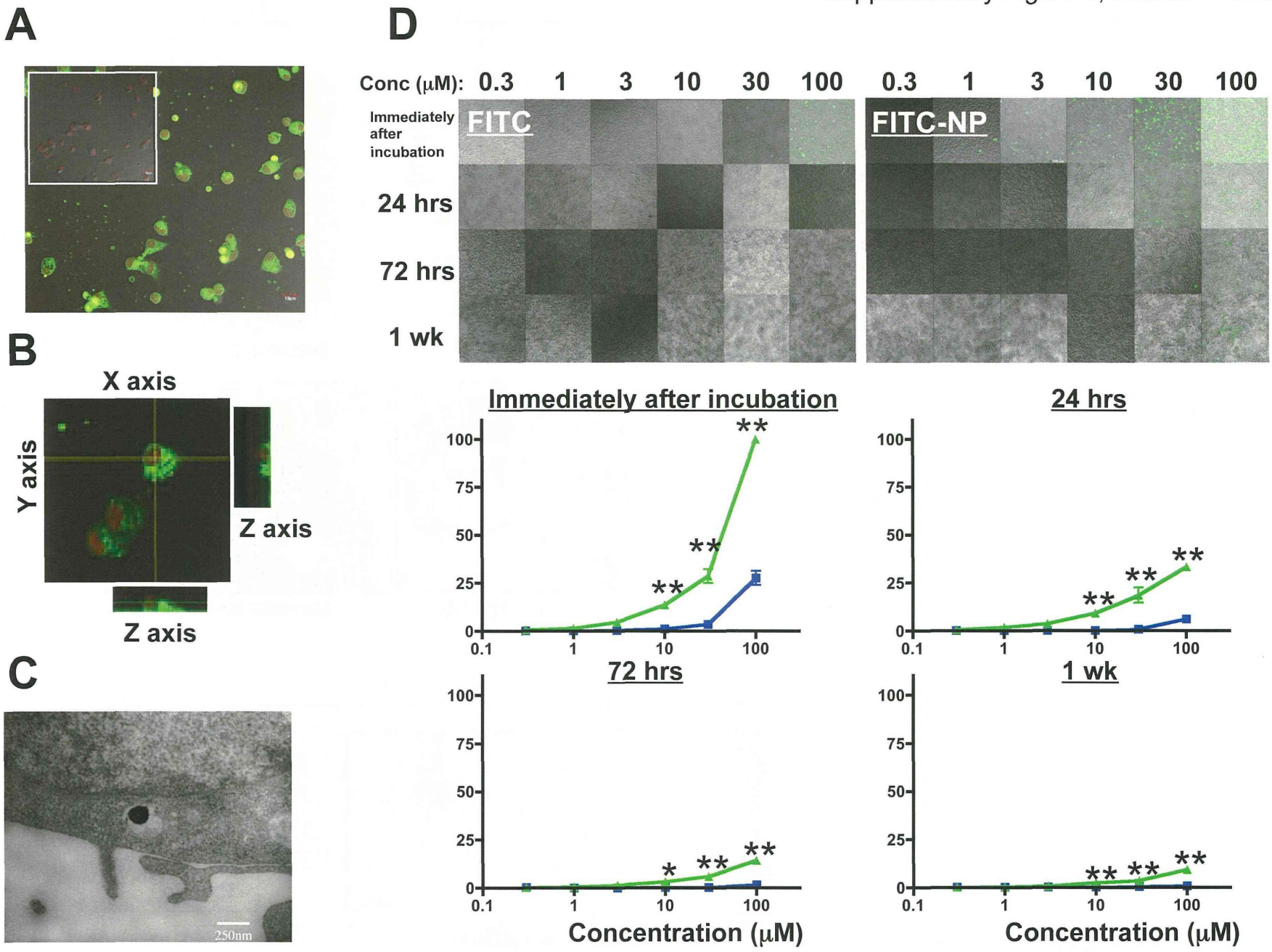
Supplementary Figure 2, Katsuki S et al



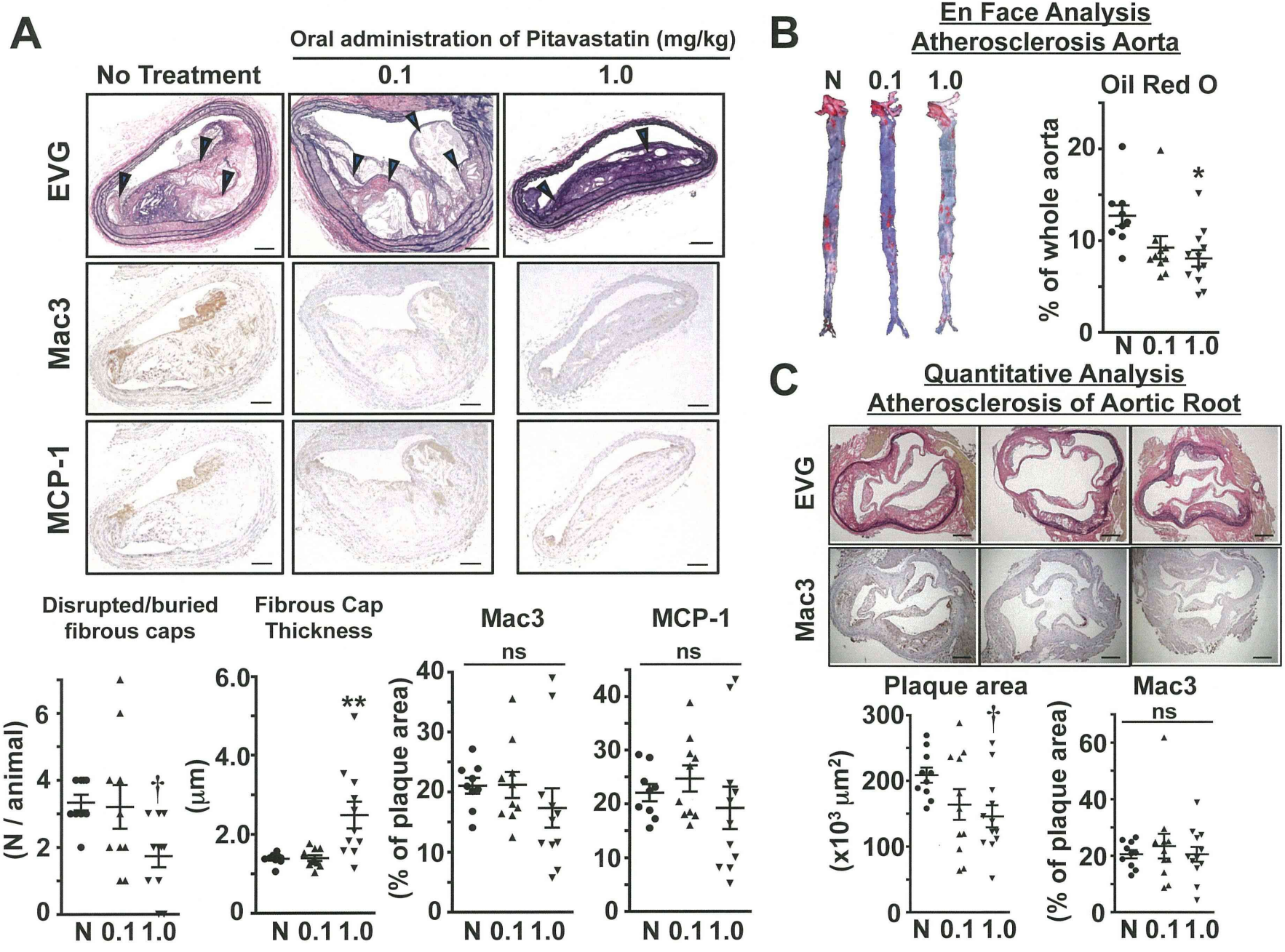
Supplementary Figure 3, Katsuki S et al



Supplementary Figure 4, Katsuki S et al



Supplementary Figure 5, Katsuki S et al



重症肺高血圧症用ナノ粒子製剤の実用化と臨床試験

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はじめに

重症肺高血圧症は生活の質（QOL）の悪化をもたらす生命予後不良の希少難治性疾患であり、かつ、効果的治療法が無い疾患です。ホスホジエステラーゼＶ阻害薬、エンドセリン受容体拮抗薬などの血管拡張薬が新しい治療法として導入されていますが、その効果は限定的（5年生存率<50%）です。従って、肺小動脈病変の進行を阻止し、さらには、治癒に導く事の出来る、効果的かつ安心安全の医薬品の実用化が期待されています。

スタチン封入PLGAナノ粒子製剤の開発

重症肺高血圧症に対する新規治療法開発のために、生体吸収性高分子ポリマー（PLGA）製ナノ粒子を用いたドラッグデリバリーシステム（DDS）を開発しました。このナノDDSによって、治療薬を肺動脈病変（肺動静脈平滑筋細胞、炎症性細胞など）へ安定送達がさせる事が出来ます。私たちは、LDL-コレステロール低下薬として世界で広く用いられているスタチン（HMG-CoA還元酵素阻害薬）の血管保護作用に注目しました。スタチンには、LDL-コレステロール低下作用とは独立した多面的作用として血管内皮細胞機能改善作用、血管平滑筋細胞増殖抑制作用、抗炎症作用を有しています。

基礎研究の結果、（１）ピタバスタチンがもっとも強力な血管保護作用を有すること、（２）培養ヒト肺動脈平滑筋細胞においてピタバスタチン封入ナノ粒子製剤はピタバスタチン単独と比較して、より優れた細胞増殖抑制作用を示すこと、（３）本製剤の静脈内投与によって肺高血圧症モデルの病態が著明に改善すること、を明らかにしました（図１）。

臨床への橋渡し研究

ピタバスタチン封入PLGAナノ粒子製剤を臨床応用するために、GLP（Good Laboratory Pracitce）準拠での各種安全性試験、安定性試験、治験薬のGMP（Good Manufacturing Pracitce）準拠での製造等を行ってきました。その結果、治験薬としての安全性に大きな問題はないことを明らかにしました。規制当局である独立行政法人医薬品医療機器総合機構（PMDA）との2回にわたる対面助言を行い、現状の非臨床試験の成果をもとにして、医師主導治験（健常成人男性を対象とした第Ｉ相試験）を実施する事に科学的、倫理的に問題はないことを合意いたしました。本治験は、健康成人男性日本人志願者を対象として、本製剤の安全性および薬物動態を検討することを目的としています。九州大学病院ARO次世代医療センターの支援を受けて治験の準備を進めています。平成26年度中には医師主導治験が終了し、その安全性を明らかにする予定です。医薬品として承認申請を得て、実用化に結びつくまでの道のりは未だ長く、少なくとも5年以上を要すると思われます。

本剤が実用化されれば、重症肺高血圧症に対する革新的低侵襲治療法となり、患者のQOL・生命予後の改善や早期社会復帰を可能とする高効果・低副作用の低侵襲医療が達成できるでしょう。日

本発の革新的低侵襲ナノ治療が創出される点で臨床的意義は大きいと期待されます。

また、本剤は肺高血圧症以外の難治性肺疾患（特発性間質性肺炎・肺線維症、びまん性汎細気管支炎）や閉塞性肺疾患、肺ガンの治療にも応用できることから、重要性が高いとされています。

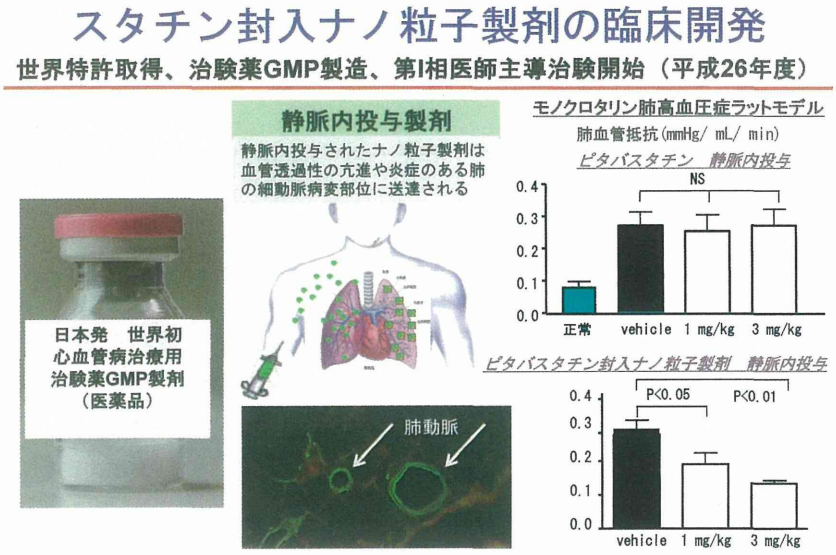
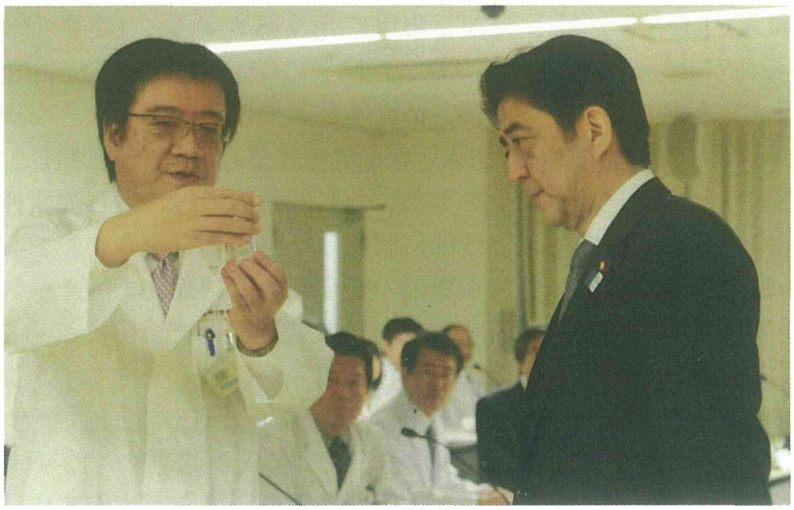


図1

本研究は革新的技術の開発を阻害している要因を克服するため、研究資金の特例や規制を担当する部局との並行協議などを試行的に行う「先端医療開発特区」、いわゆる「スーパー特区」の研究課題の一環として行われていることから、政府からもその進捗状況、研究開発内容について注目されています。

平成25年 5月19日、安倍晋三内閣総理大臣が九州大学病院と医学研究院を視察のため訪れました。有川総長、久保病院長、片野医学研究院長等の挨拶を受けた後、本研究概要説明をいたしました。安倍総理自ら実験装置の前に立ち、日本発世界で最初のナノ粒子製剤を手に取り、ご確認されました。また、日本の国策として難病の先端医療研究の重要性について、活発な意見交換を行いました。

さいごに重症肺高血圧症という難病で希少疾病に対する新規医薬品を臨床開発し、実用化するまでにはいくつもの大きなハードルをクリアしていく必要がありますが、一刻も早く本疾患で苦しまれている患者様やそのご家族様に本製剤を還元し、生命予後改善、QOL向上をめざして、一心に取り組みたいと思っております。



江頭健輔教授による説明