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FIG. 1A

Flowchart for Patch Grafts on Pig Livers

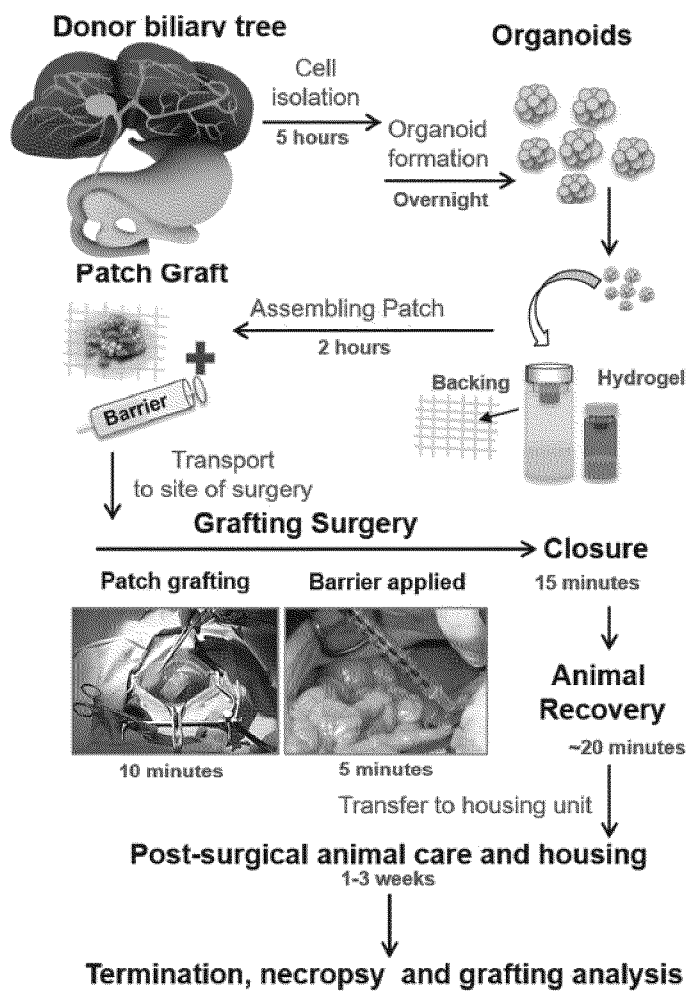


FIG. 1B

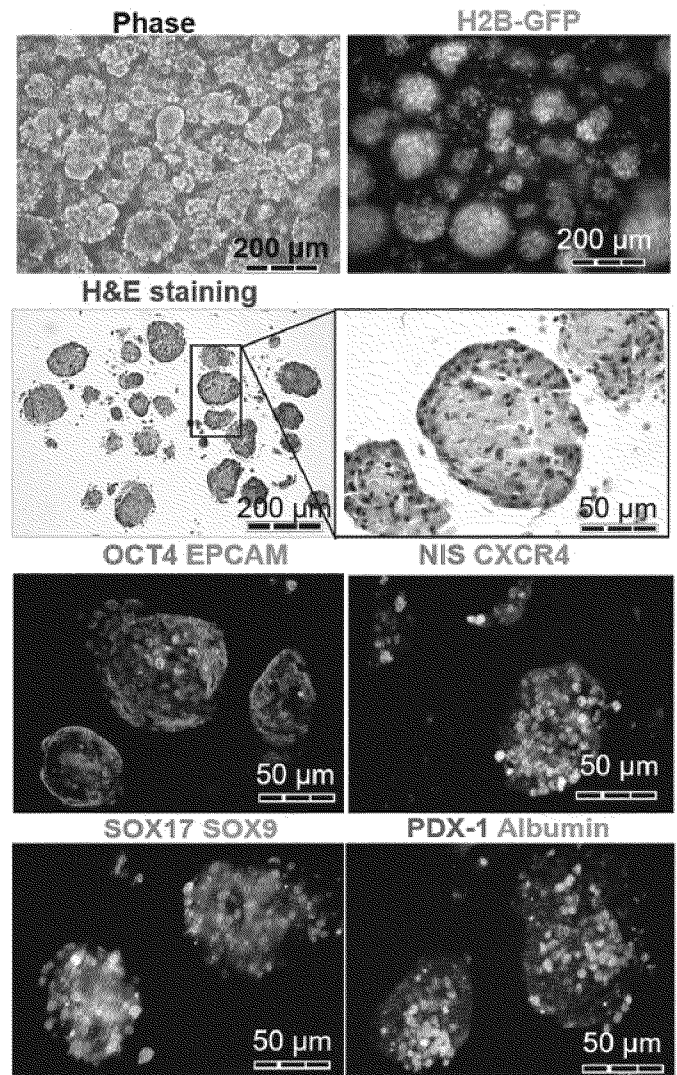
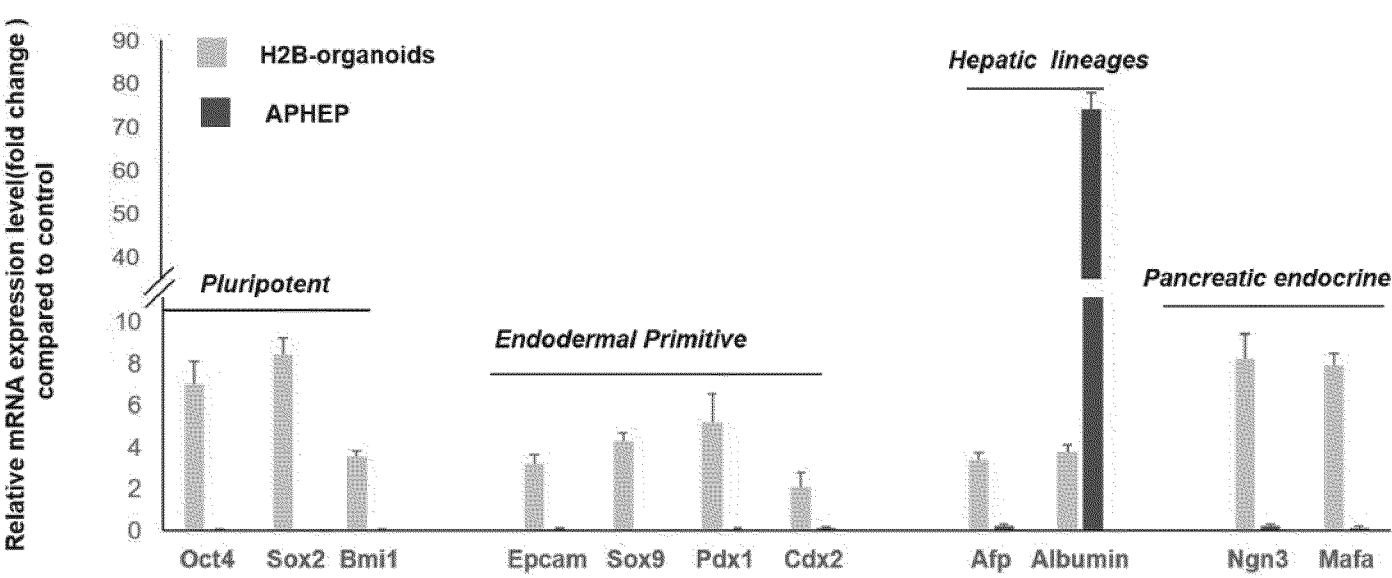


FIG. 1C

Fig. 1D



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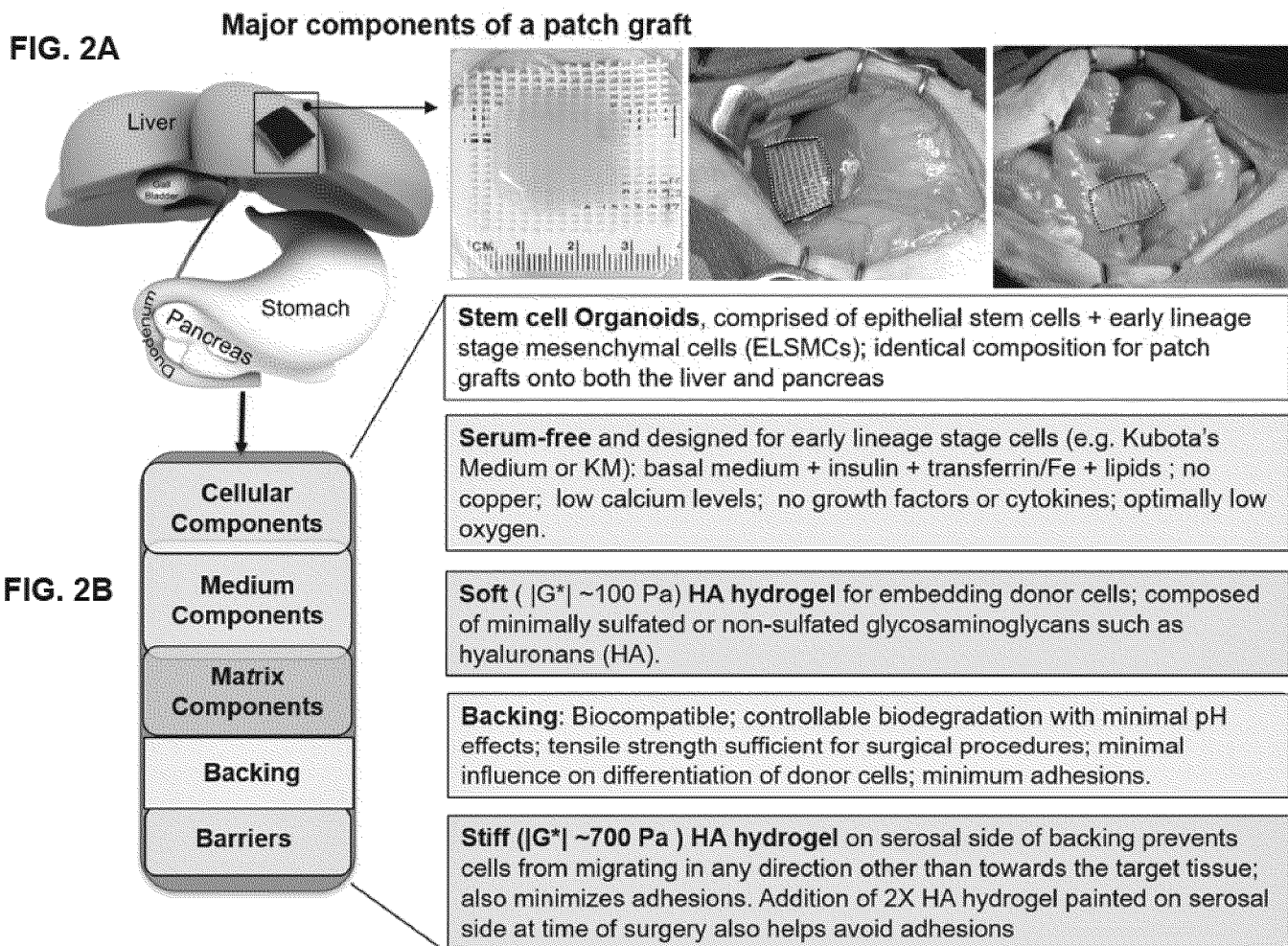


FIG. 2C

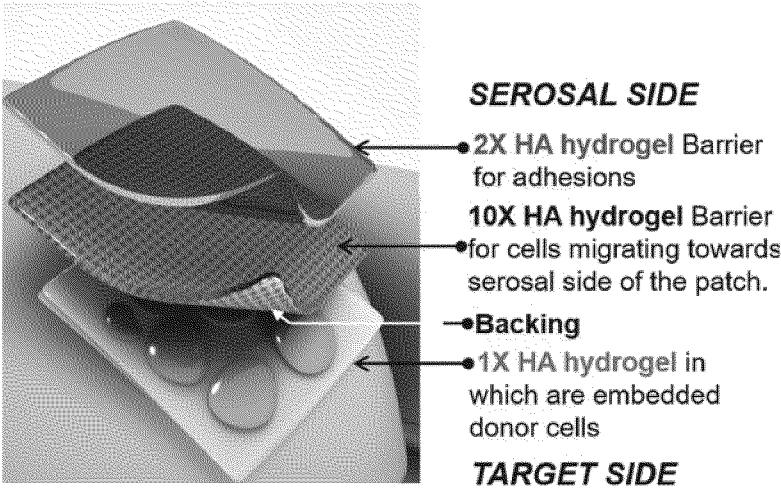


FIG. 2D

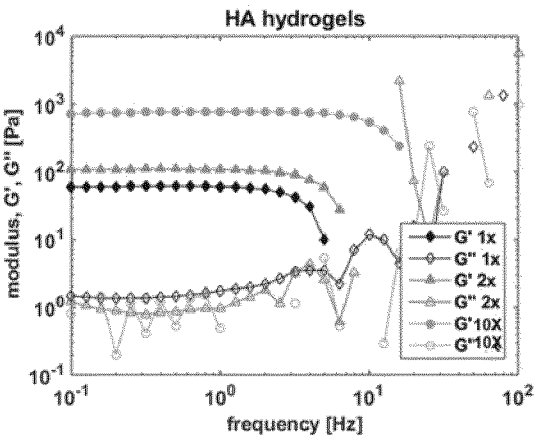
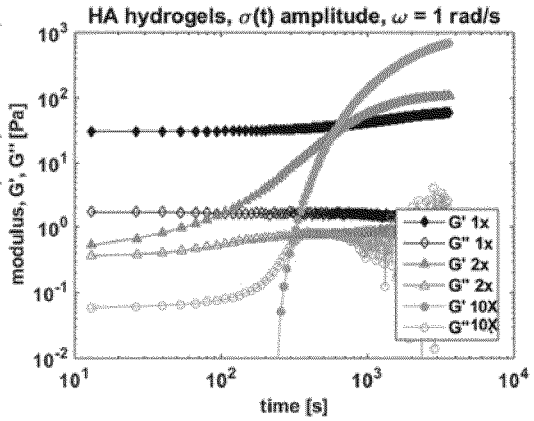


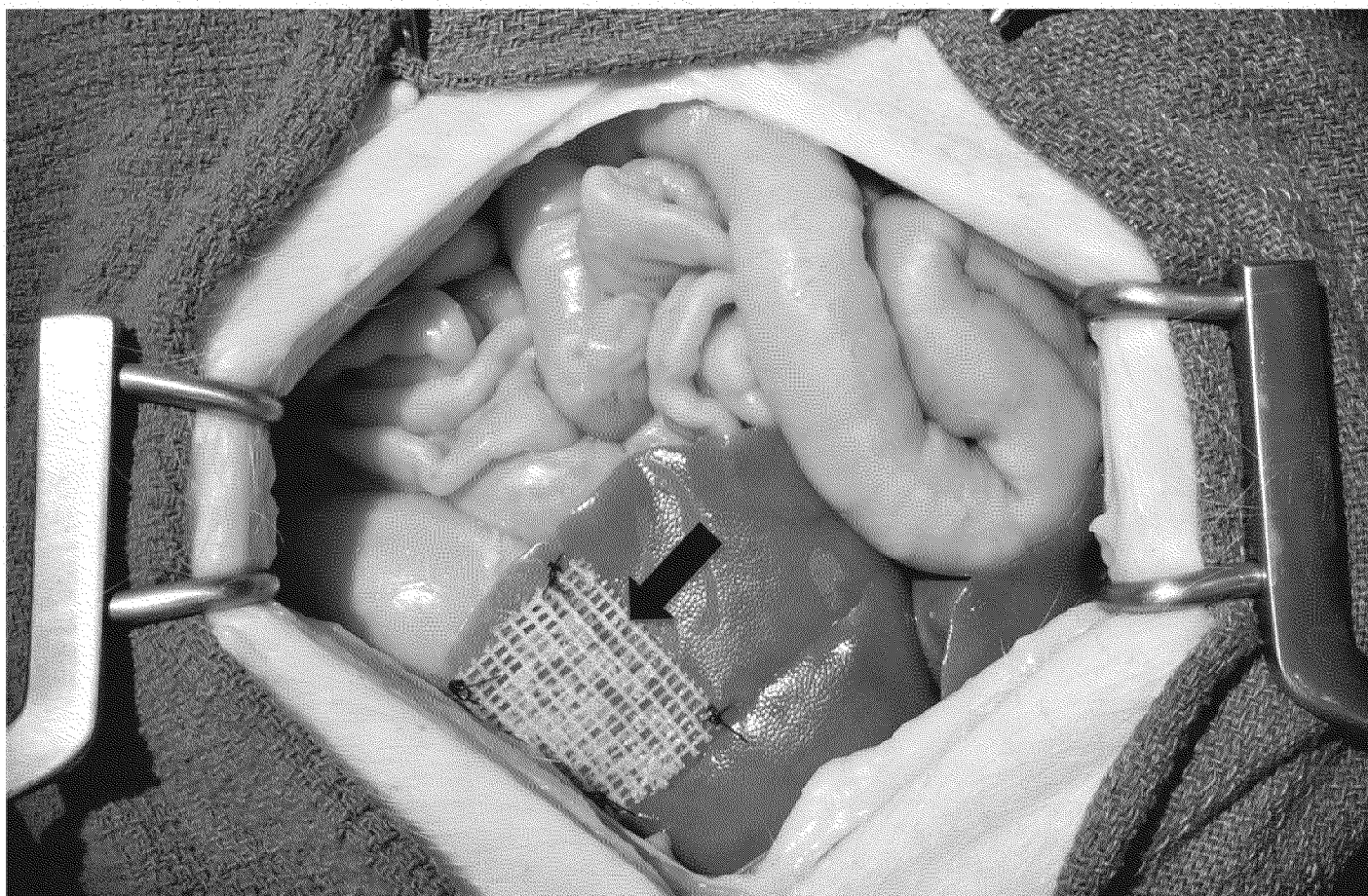
FIG. 2E Formulations and Rheological Features of HA Hydrogels
 $|G^*| = \sqrt{G'^2 + G''^2}$

PEGDA Initial Solution 0.5% (w/v)		Final Composition and Stiffness (G^*) by Mixture of Glycosil and PEGDA at the ratio (v/v)	
		4:1	2:1
Glycosil® Hyaluronic Acid Initial Solution	1.0% (w/v)	1XHA ($G^*=60$ Pa) Glycosil 0.8% (w/v) PEGDA 0.1% (w/v)	2X HA($G^*=107$ Pa) Glycosil 0.67% (w/v) PEGDA 0.16% (w/v)
	2.0% (w/v)	/	10X HA ($G^*=760$ Pa) Glycosil 1.33% (w/v) PEGDA 0.16% (w/v)



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FIG. 2F



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FIG. 3A

1 week

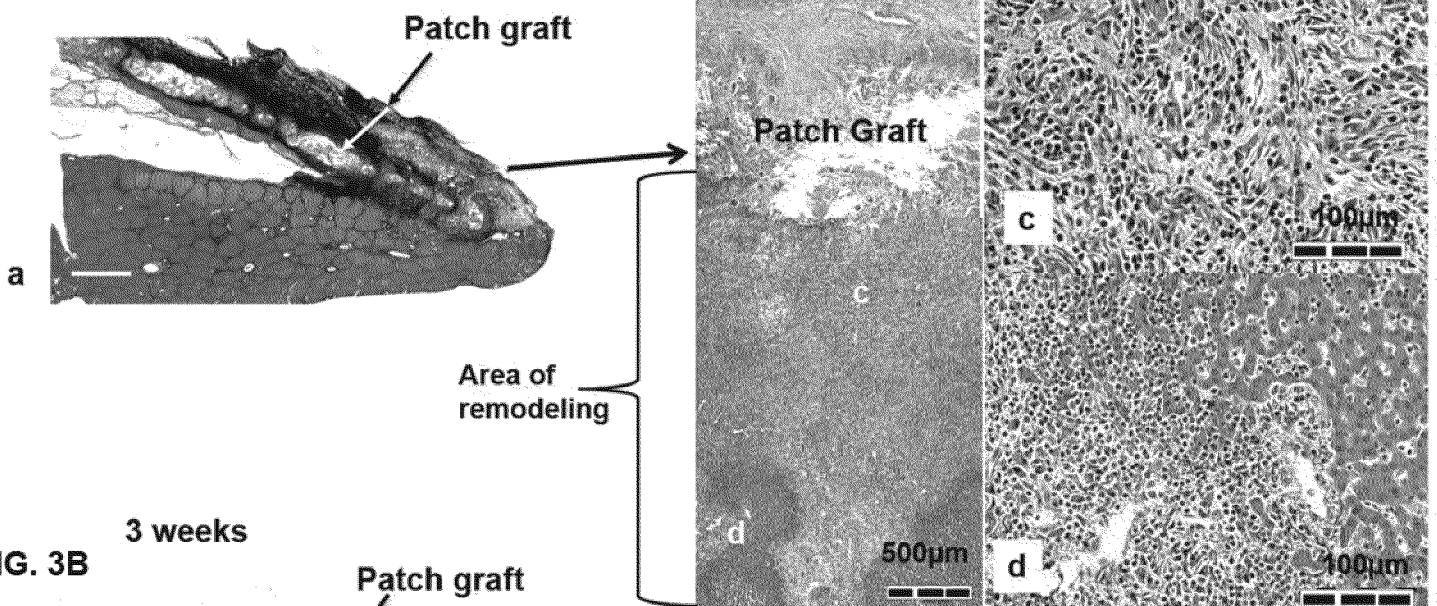
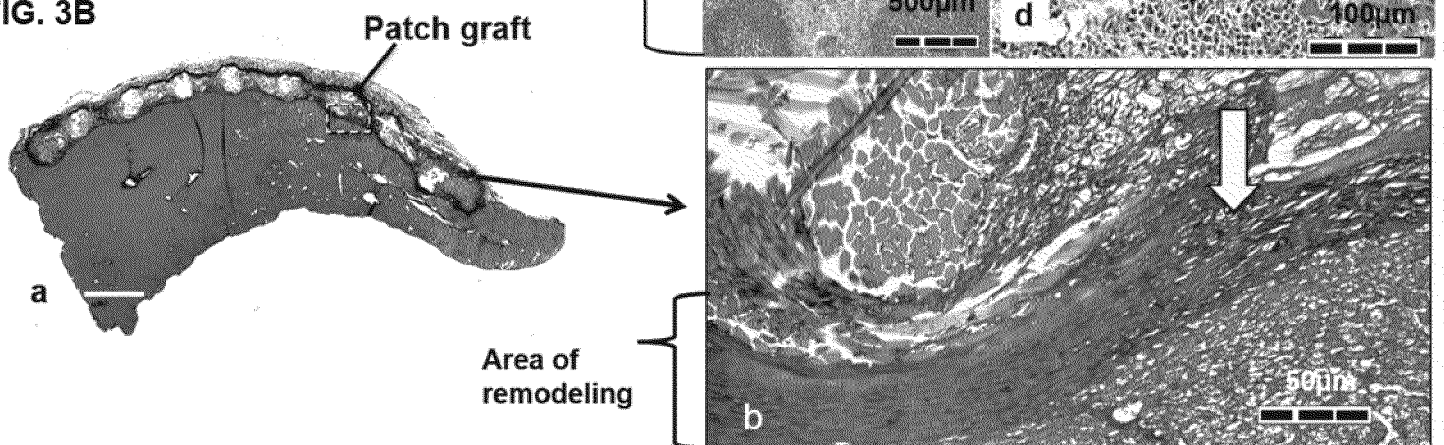


FIG. 3B

3 weeks



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FIG. 3C

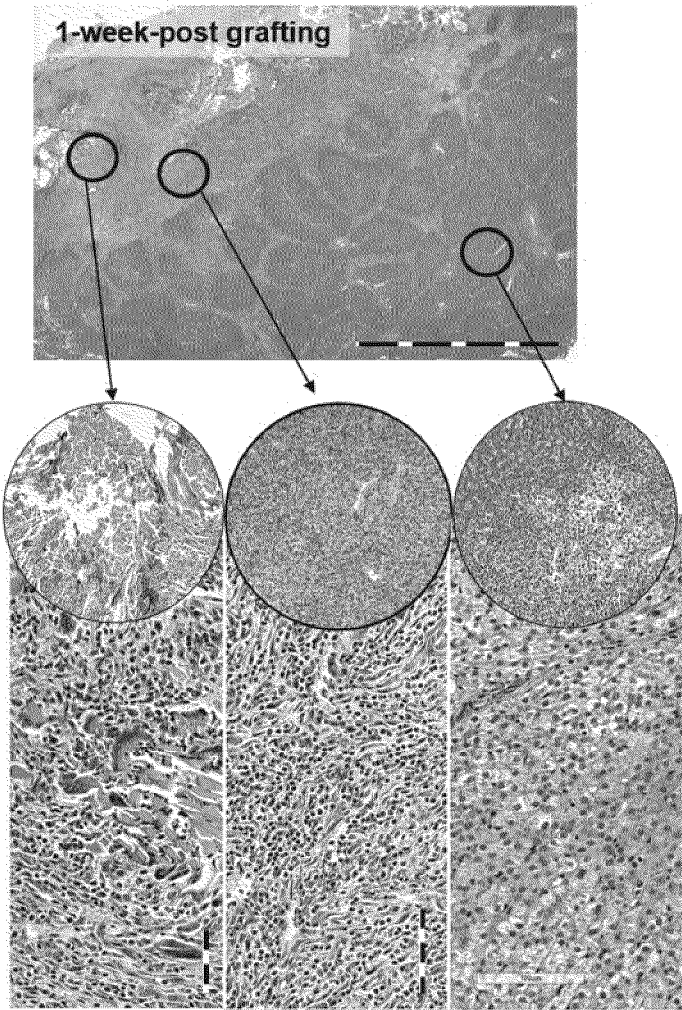
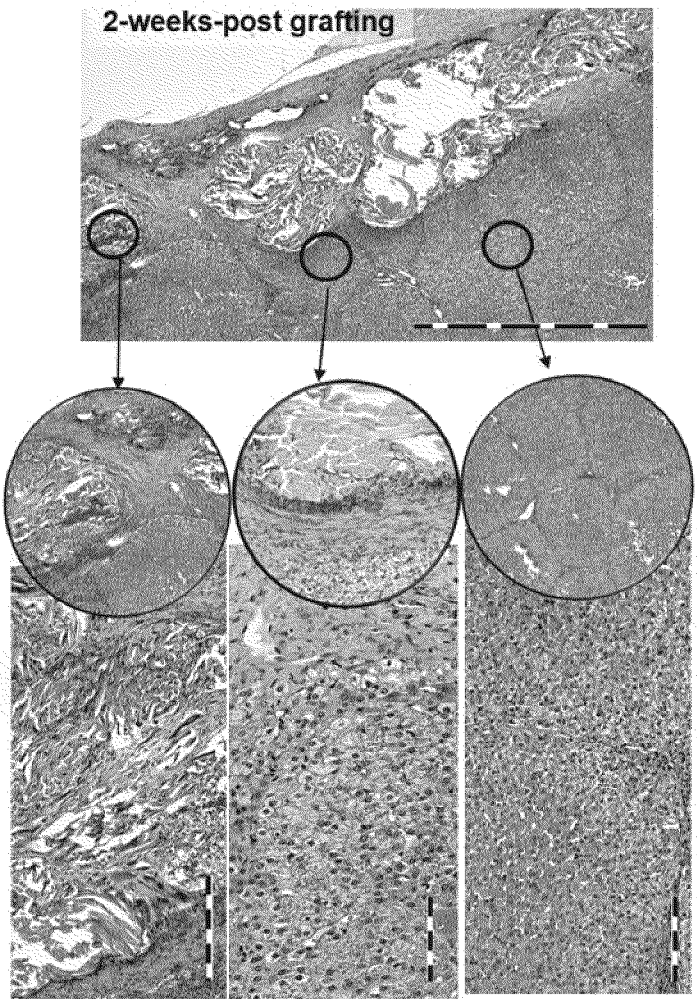
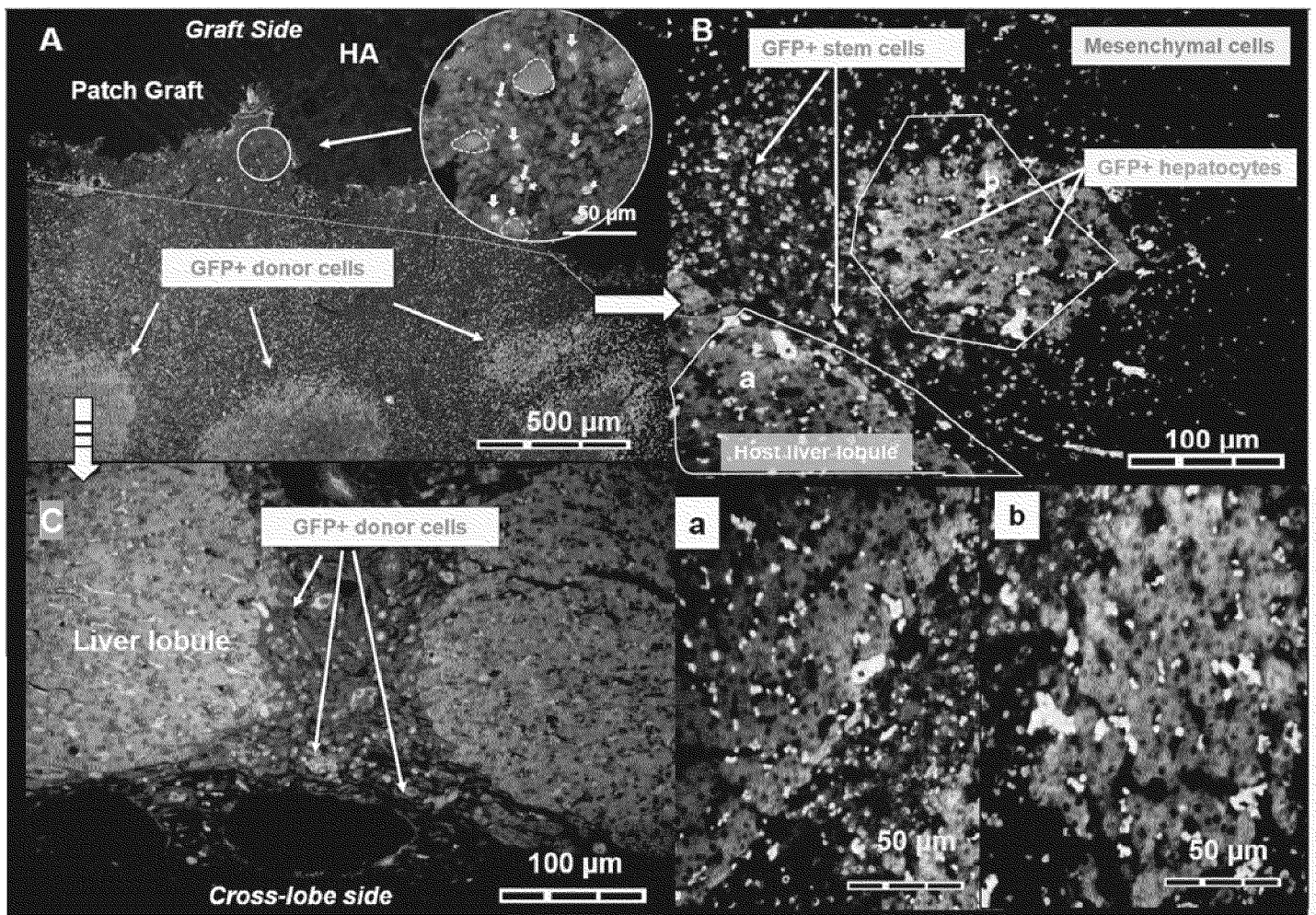


FIG. 3D



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FIGS. 4A-4C



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FIG. 5A
One Week

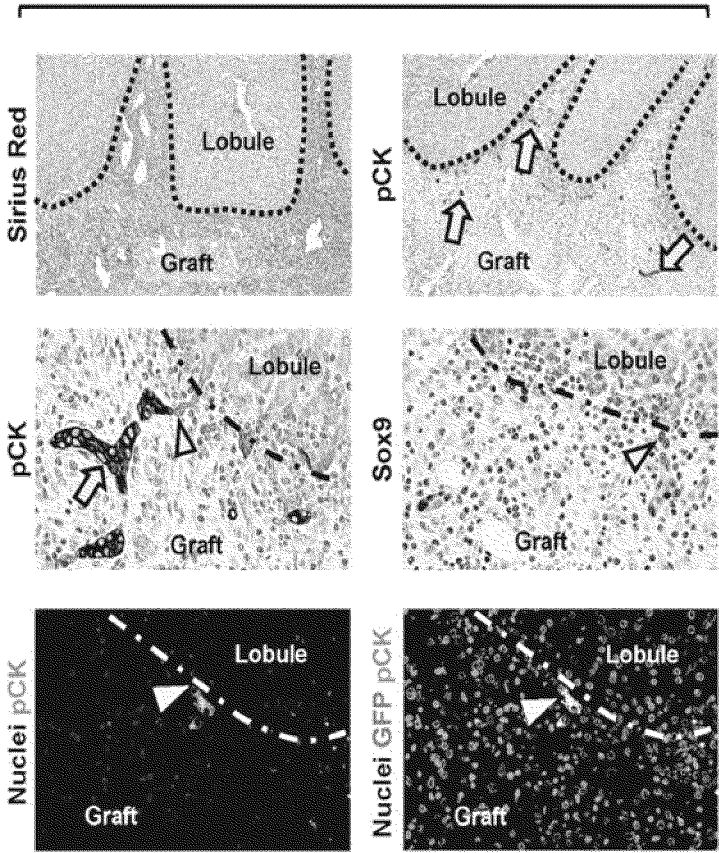
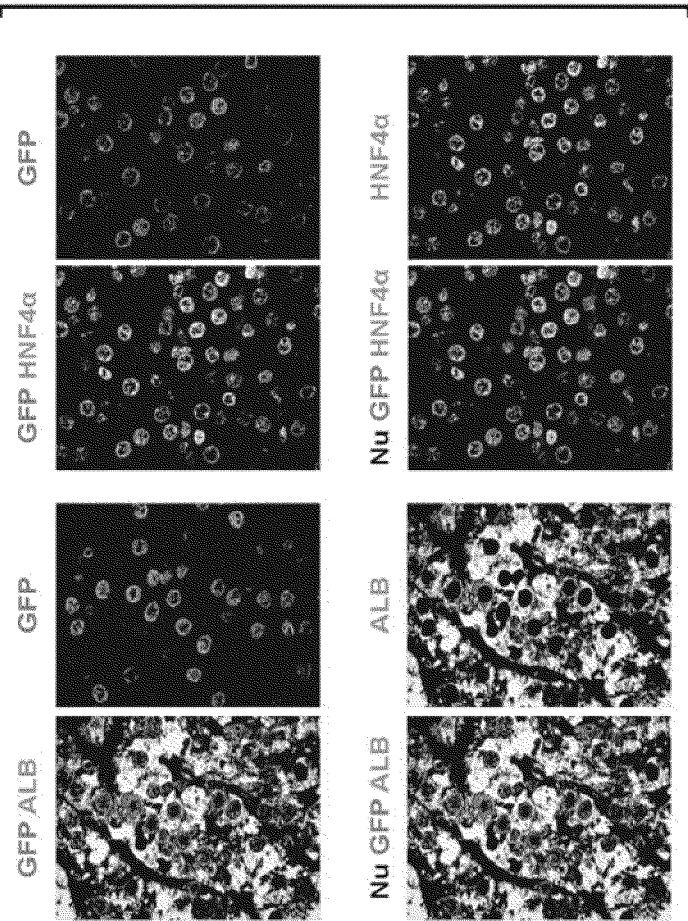
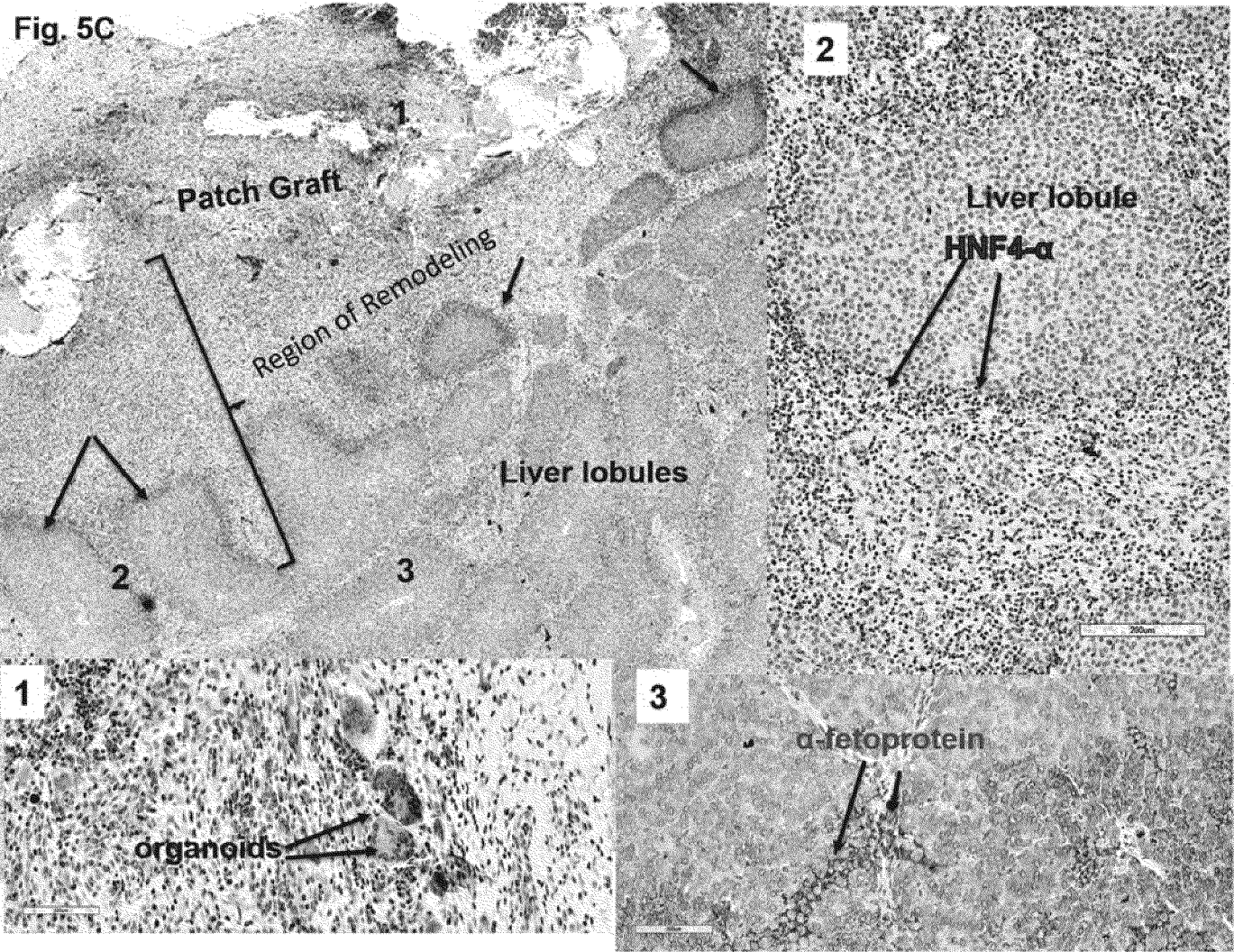


FIG. 5B
Two Weeks

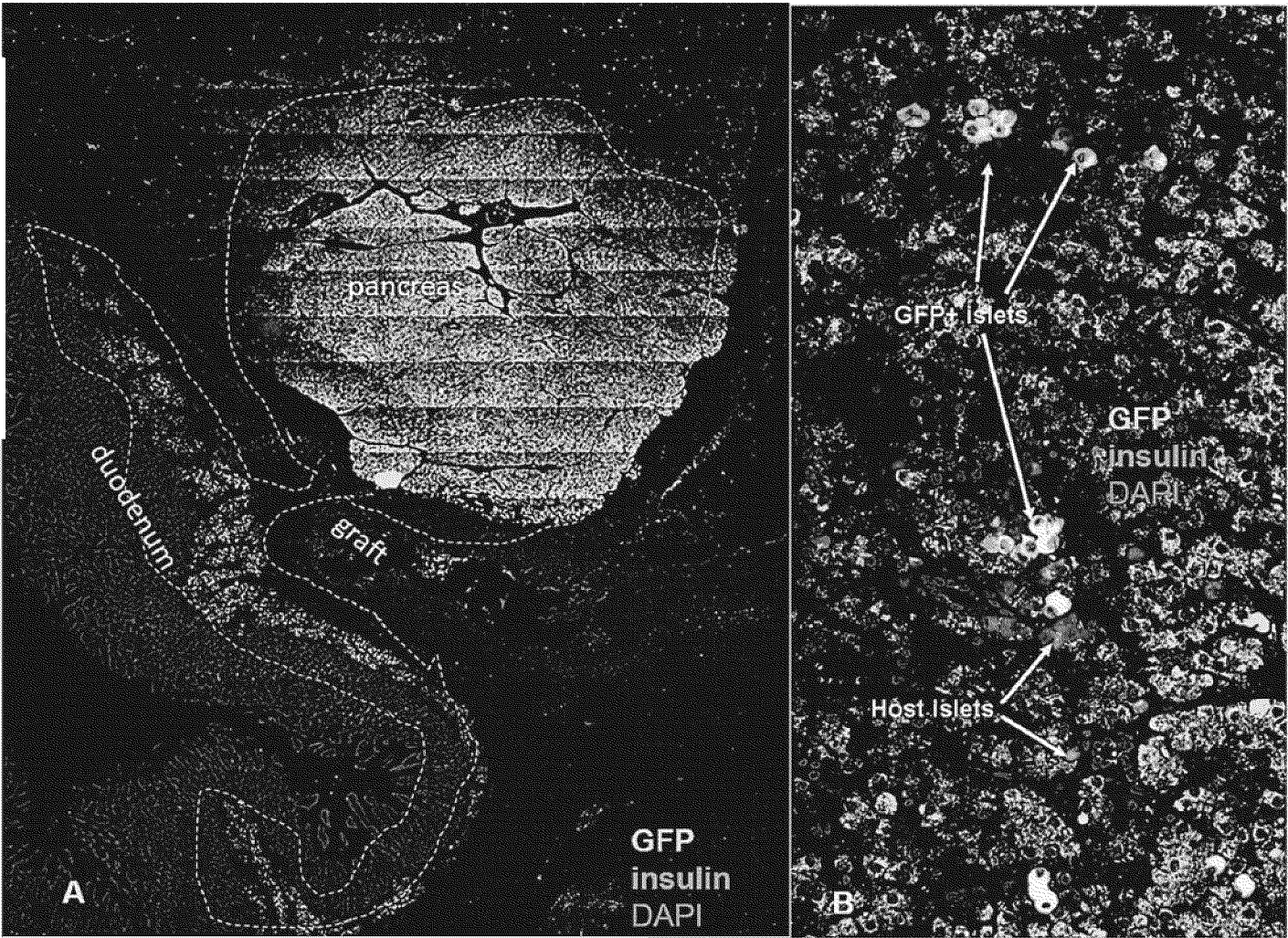


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FIGS. 6A-6B



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FIGS. 6C-6D

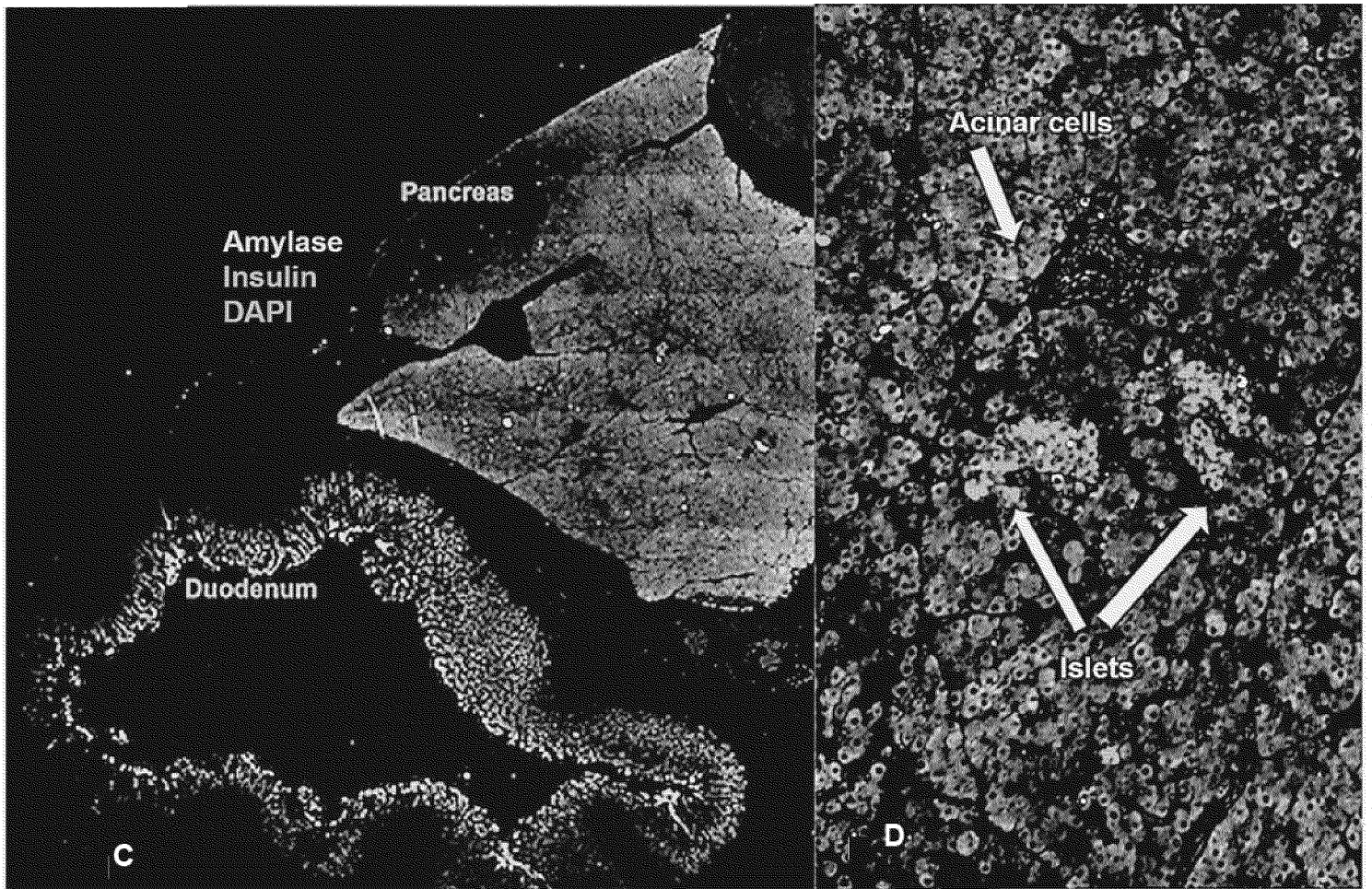


FIG. 7A

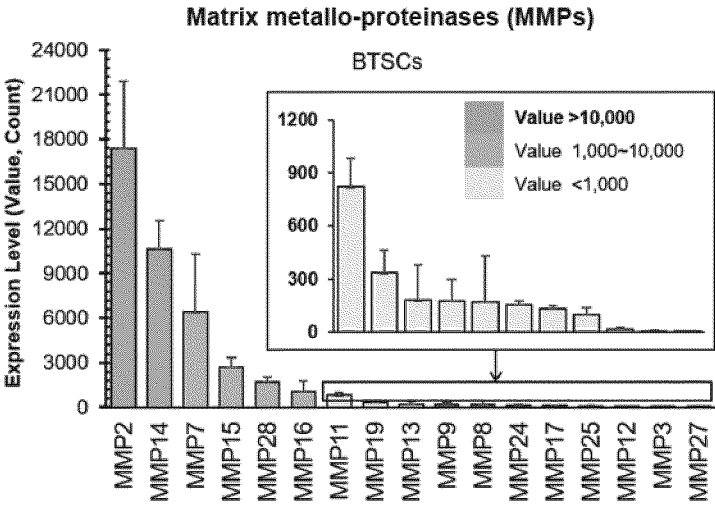


FIG. 7B

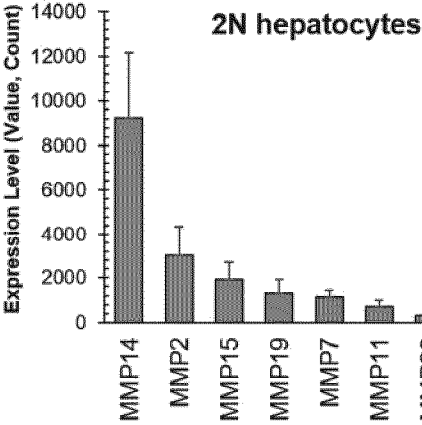
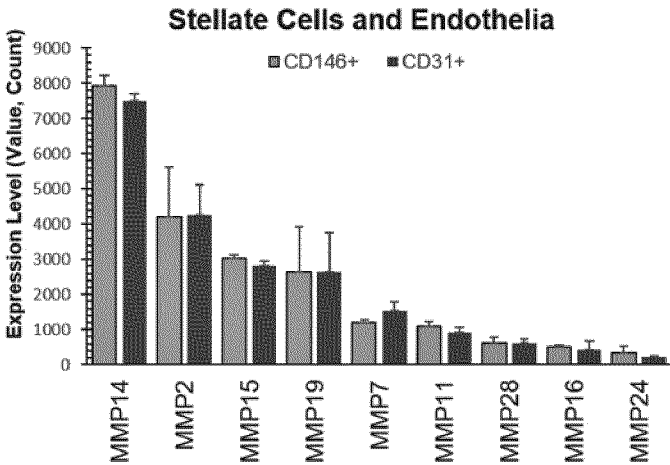


FIG. 7C

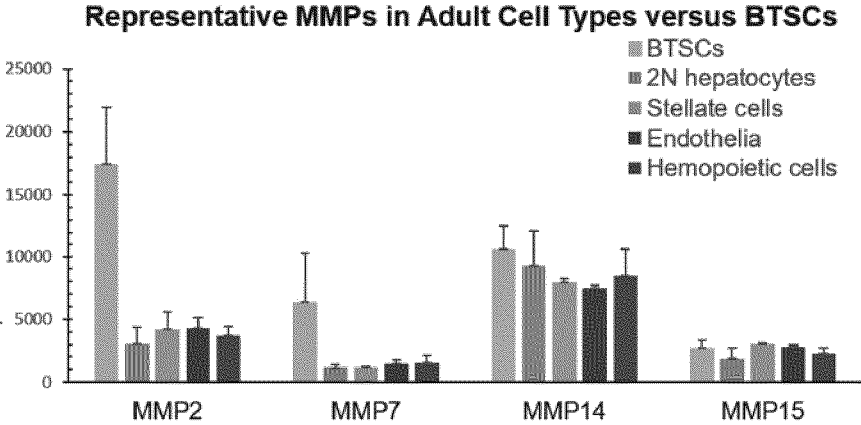
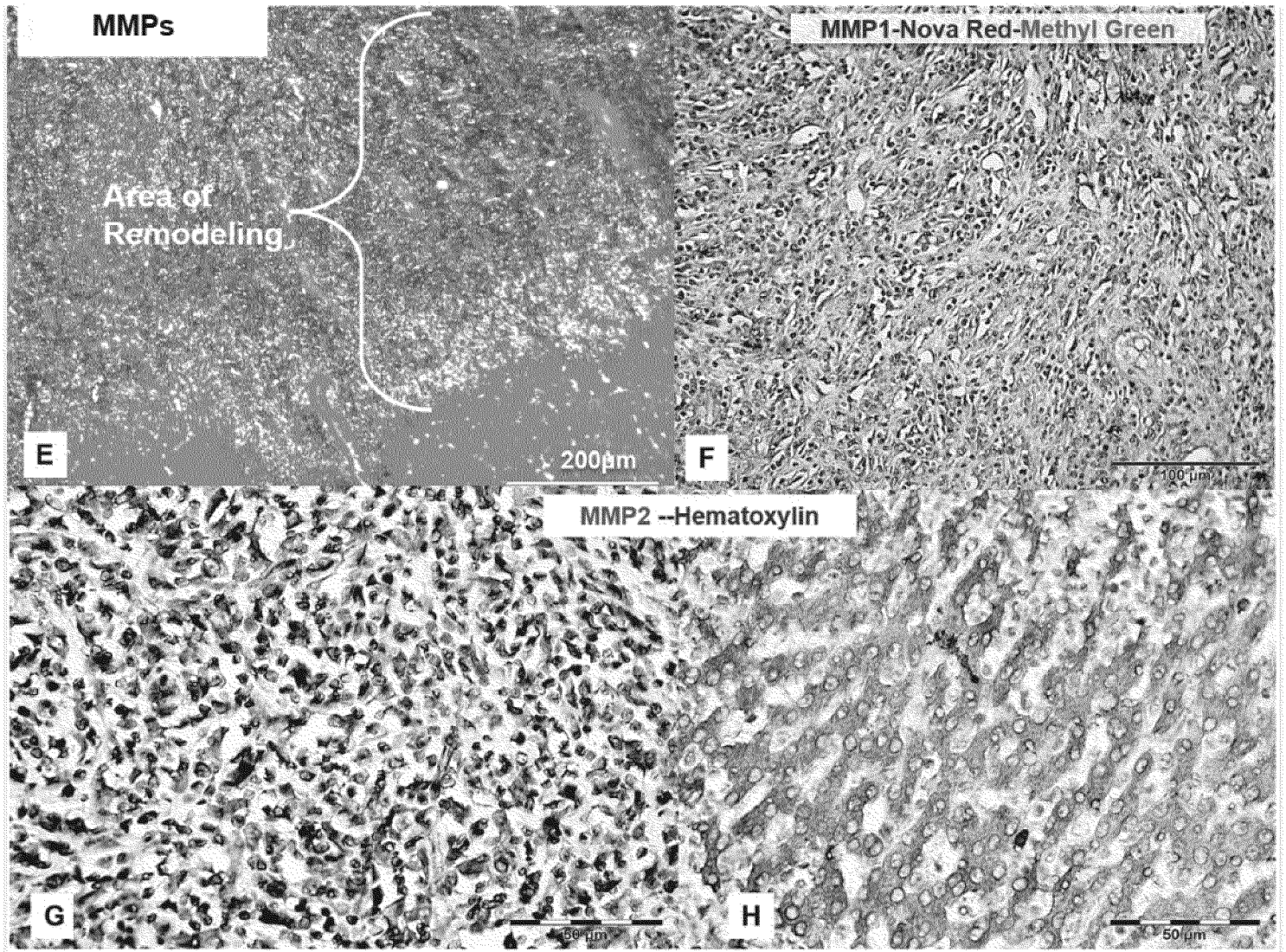


FIG. 7D

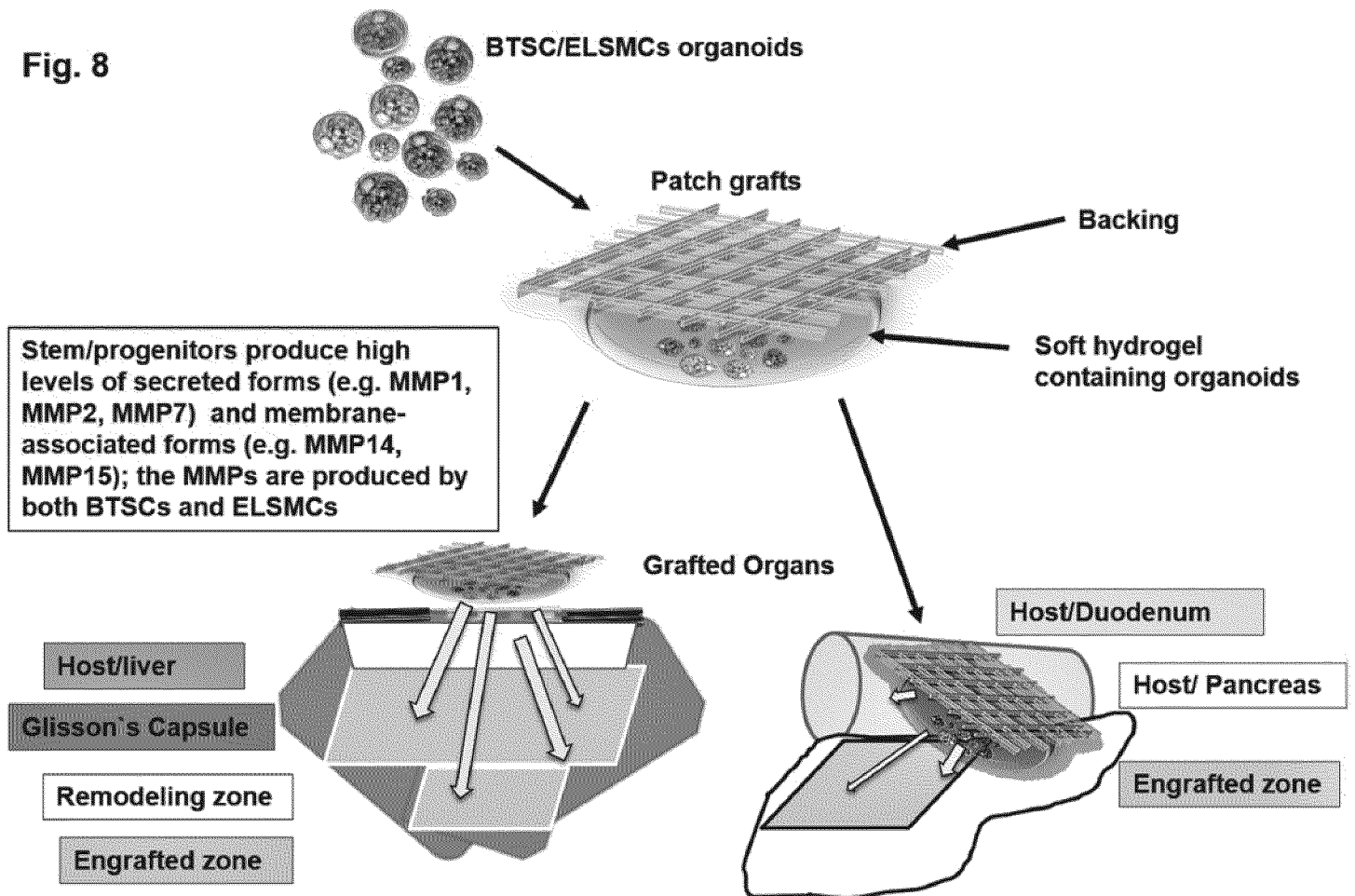
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FIGS. 7E-7H
MMPs



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Fig. 8



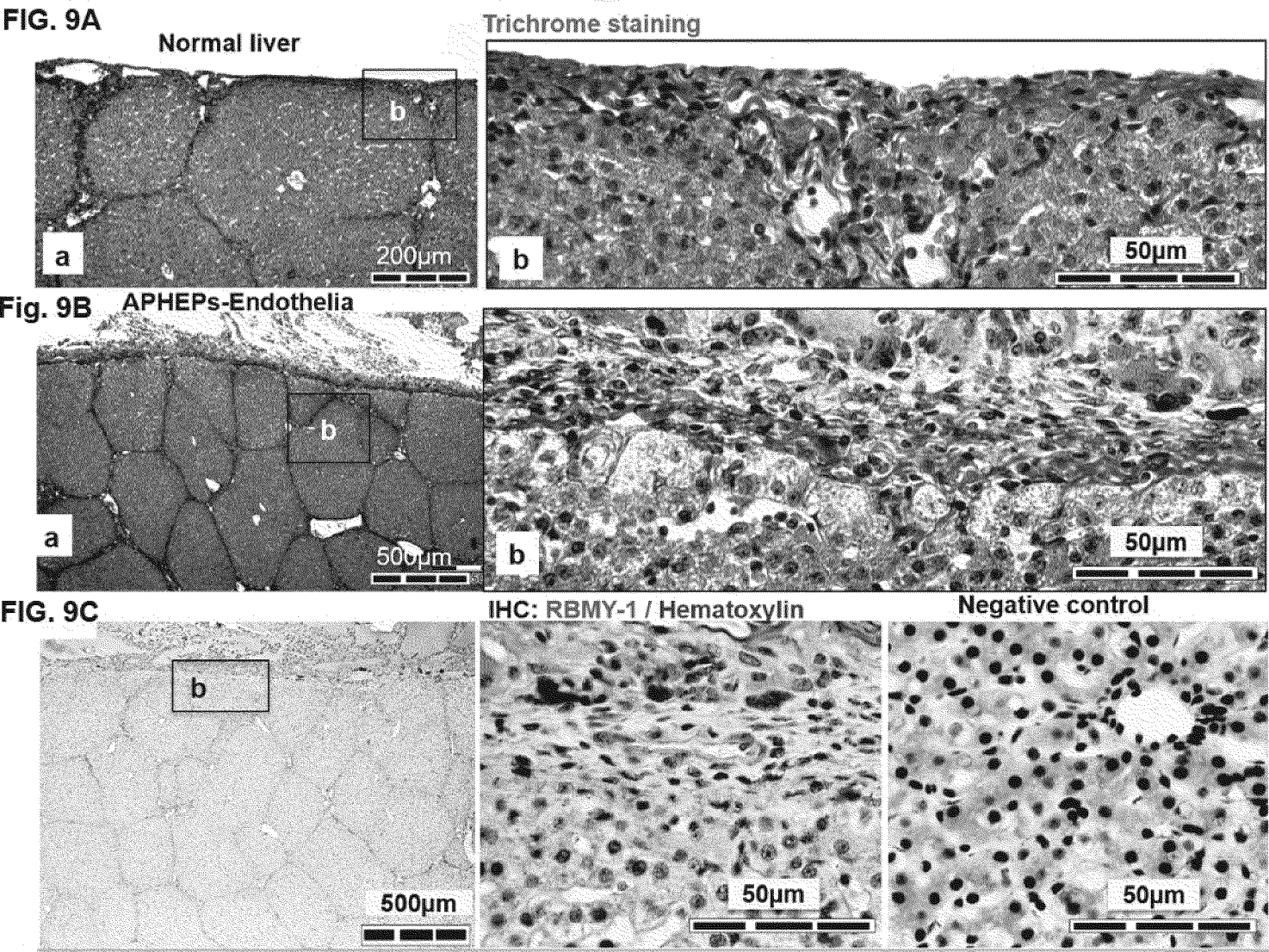


FIG. 9D

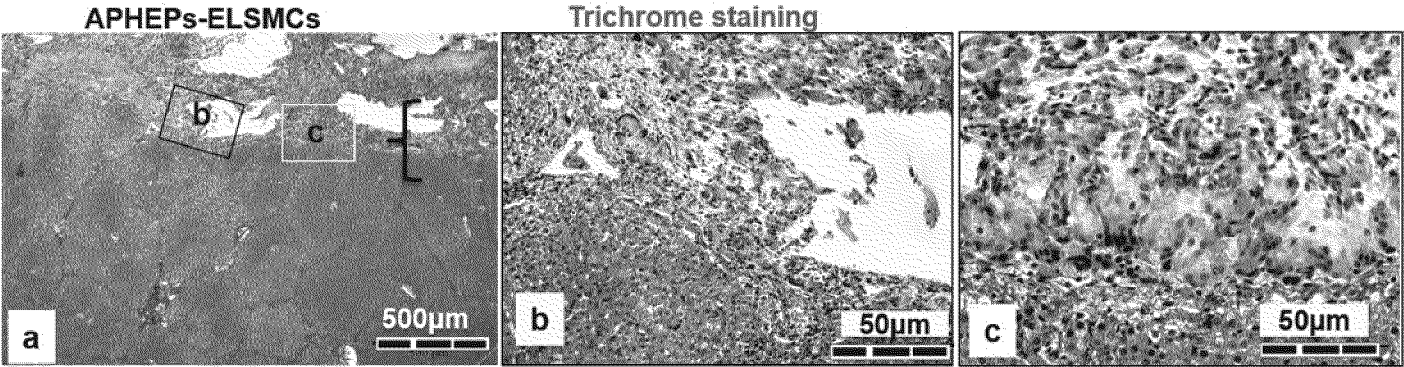
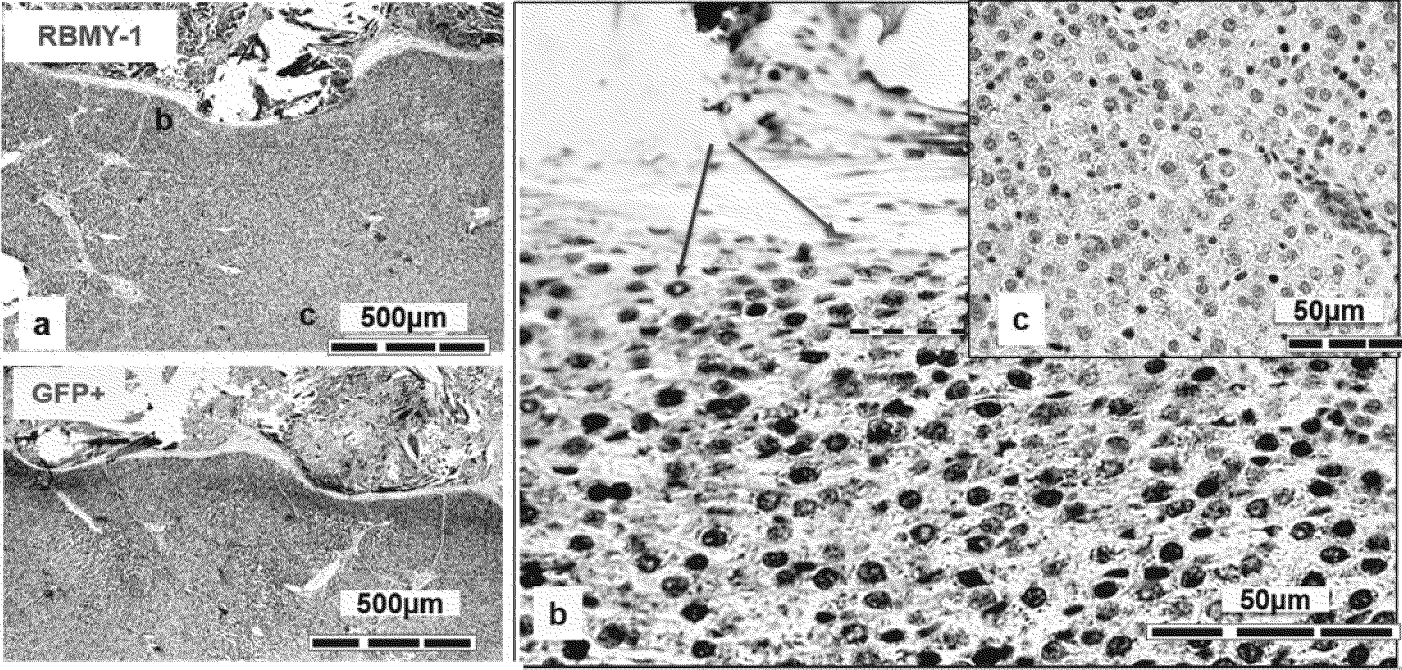


FIG. 9E APHEPs-ELSMCs



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Fig. 10

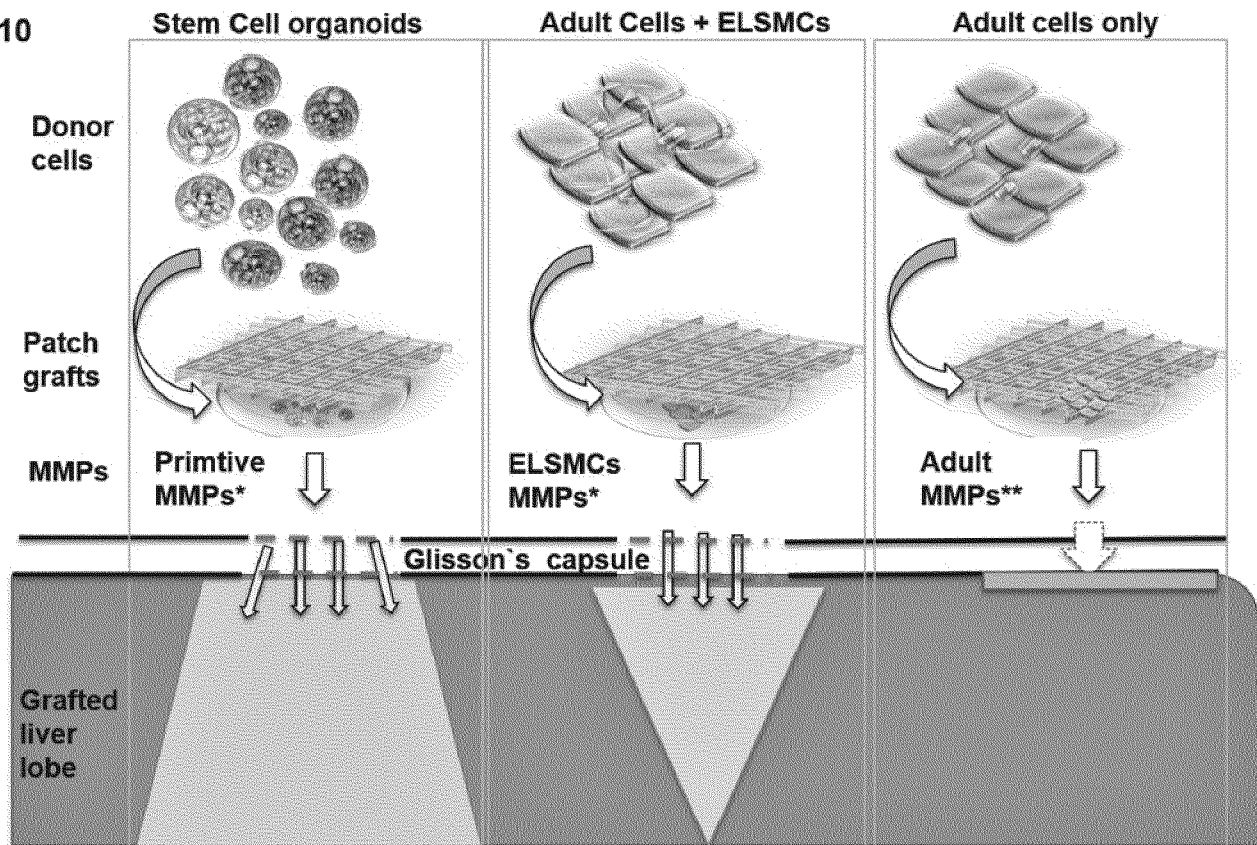
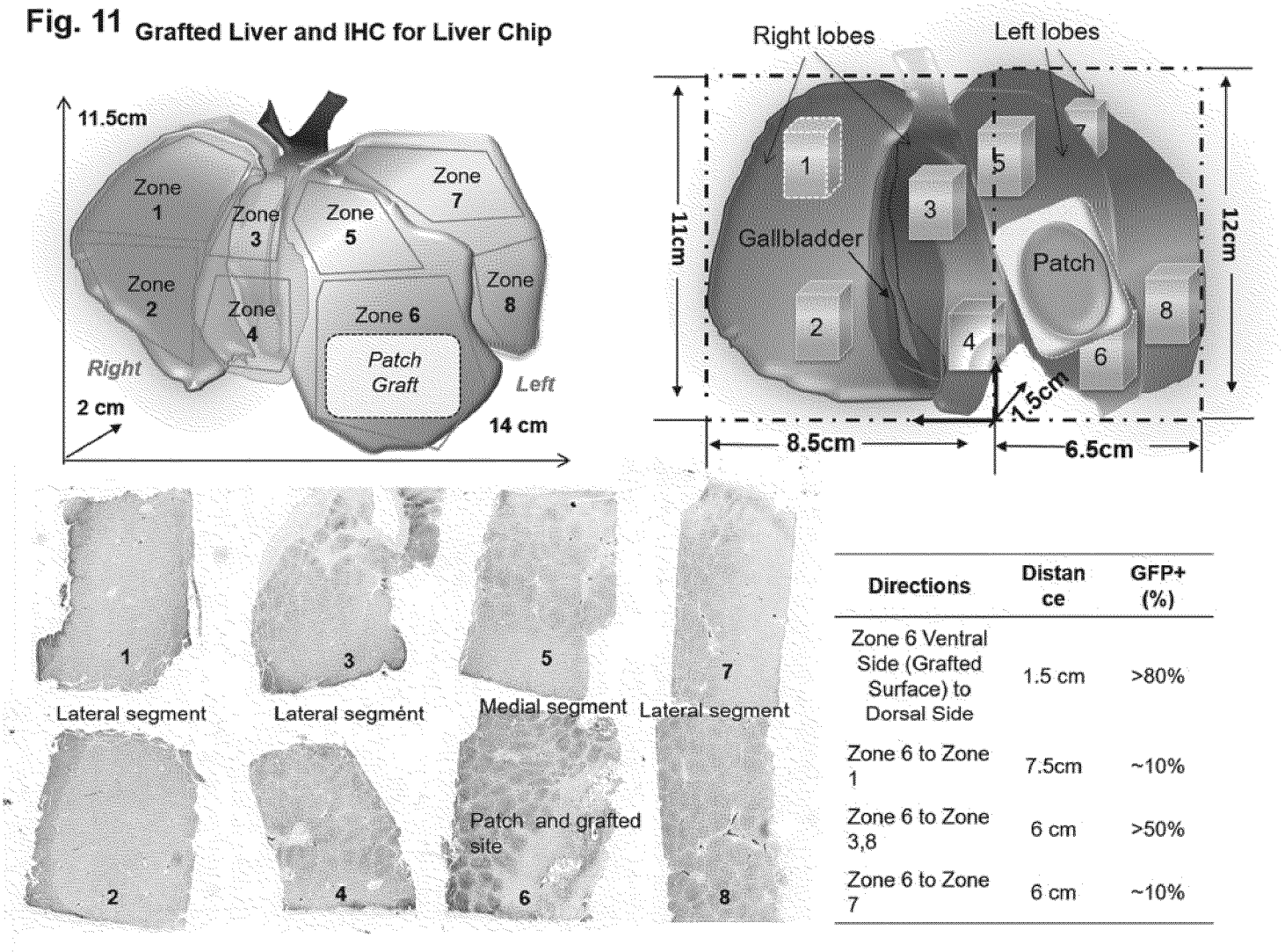
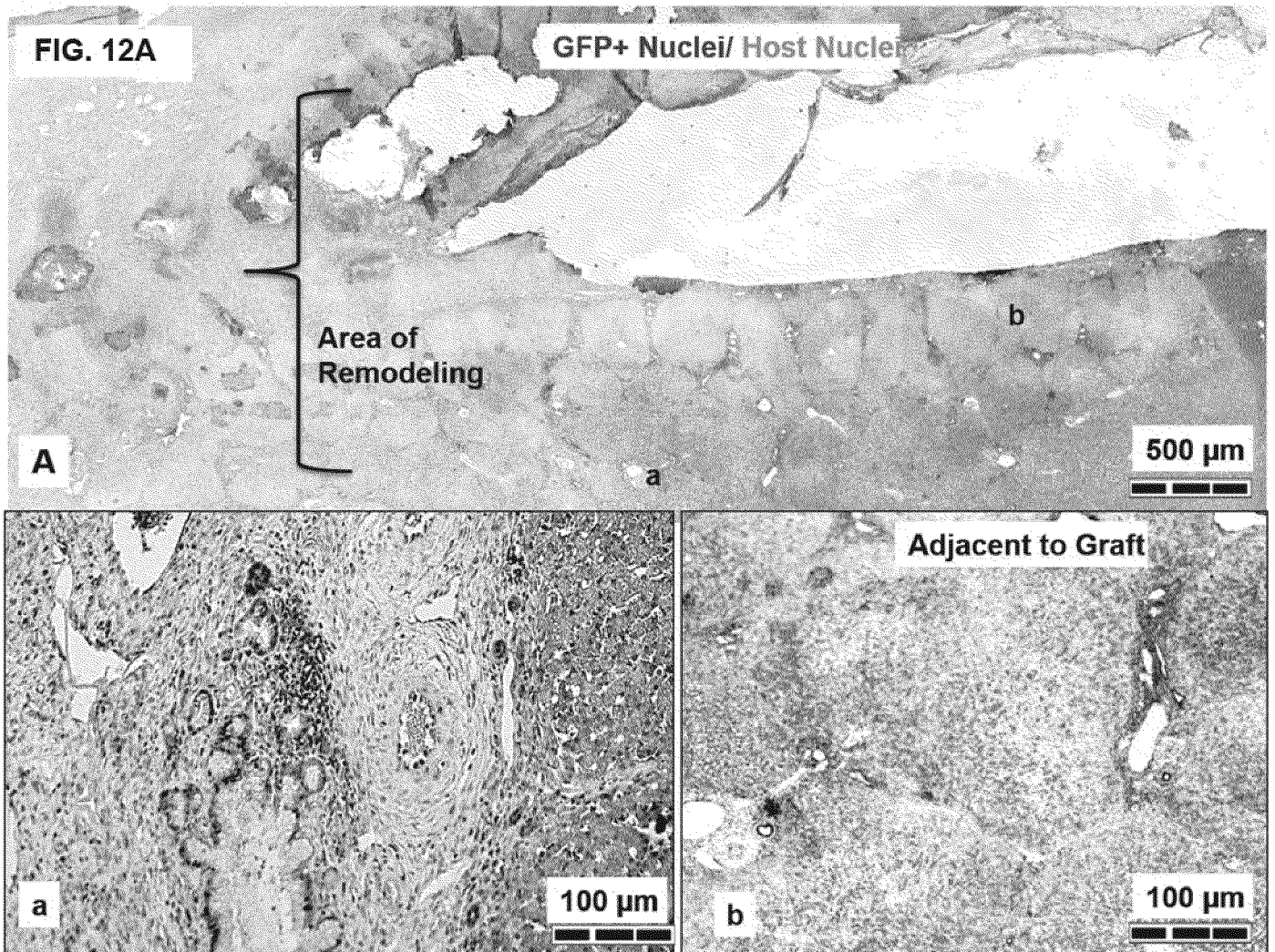


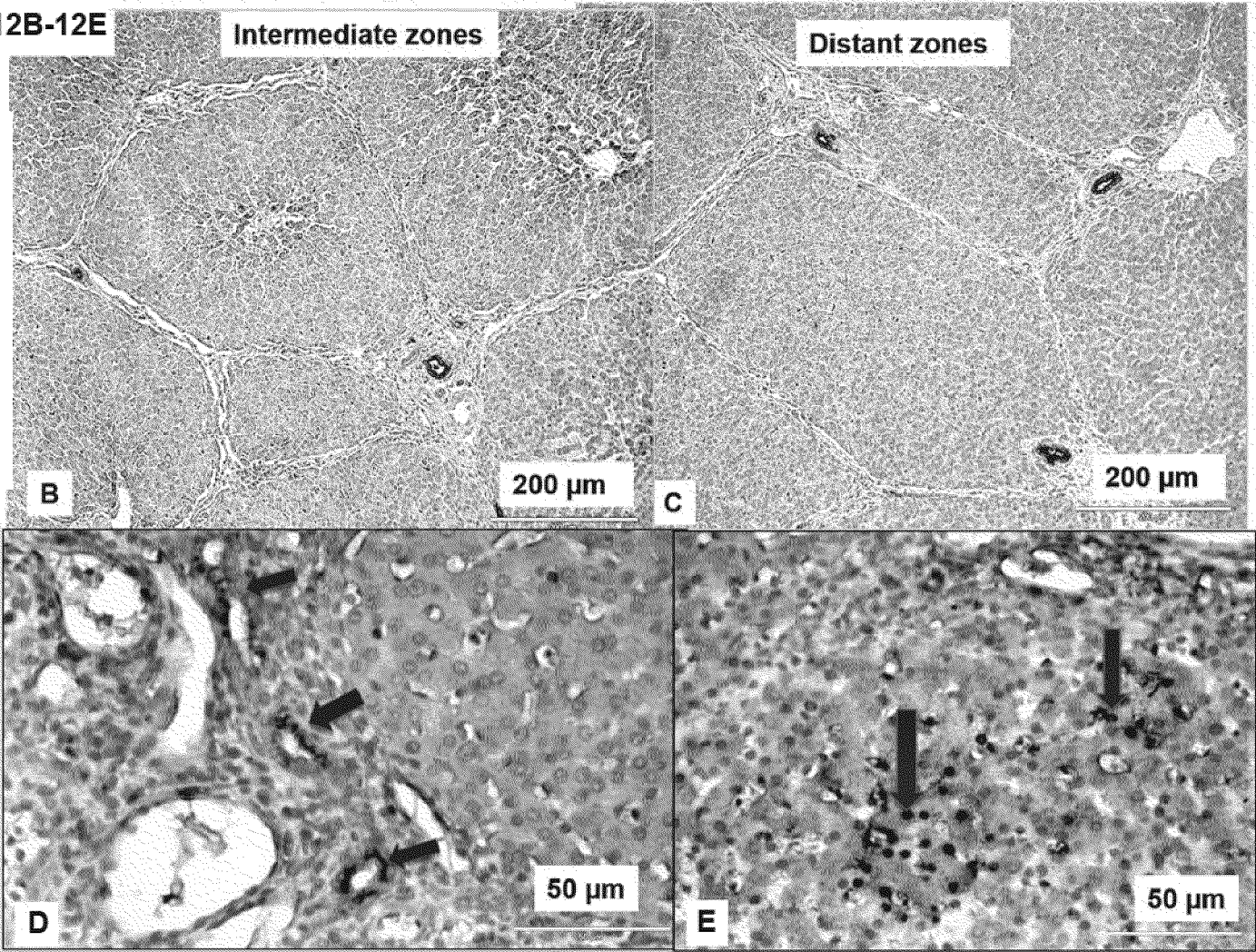
Fig. 11 Grafted Liver and IHC for Liver Chip



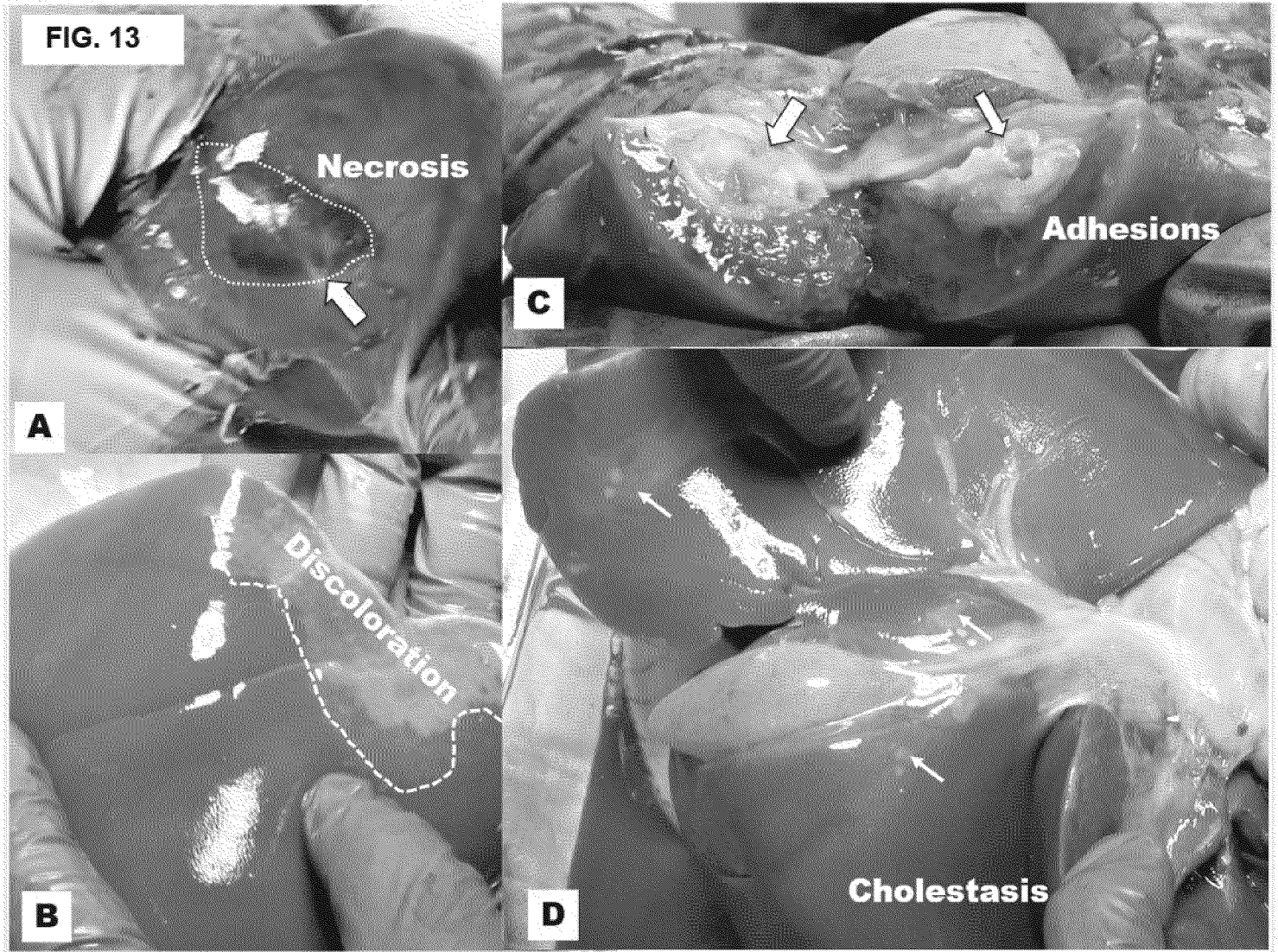
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FIGS. 12B-12E



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FIG. 14A

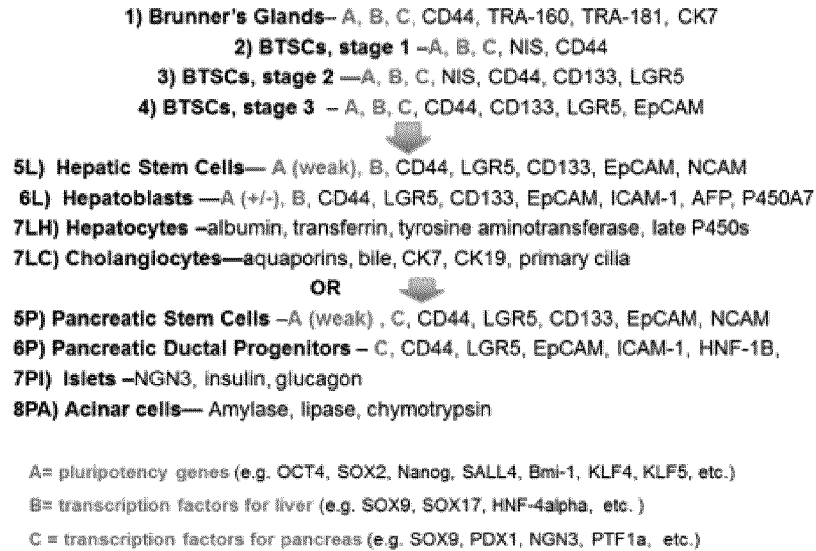


FIG. 14B

**Stages 1-5 (both 5L and 5P) of the epithelia are partnered with "early lineage stage mesenchymal cells" (ELSMCs):
 All of these 3 cellular sub populations have negligible MHC antigens, have low forward scatter (that is have a small diameter, typically below 10 um) and low side scatter (meaning high nucleus to cytoplasmic ratio) ; they are comprised of at least 3 subpopulations:

Angioblasts—CD117+, CD133+, VEGFr+, Van Willebrand factor+ (vWF), but negative for CD31 (also called PECAM)
Precursors to endothelia—CD133+, VEGFr+, vWF+, CD31 +/- (i.e. low)
Precursors to stellate cells —CD146+, alpha smooth muscle actin (ASMA)+, desmin+, ICAM-1+VCAM-1+ β3-integrin+, but negative or minimally expressing vitamin A



Pancreatic Ductal Progenitors —
Precursors to endothelia—CD133+, VEGFr+, vWF+, CD31+
Precursors to stellate cells —CD146+, alpha smooth muscle actin (ASMA)+, desmin+, ICAM-1+VCAM-1+ β3-integrin+, vitamin A (low)

Islets
Endothelia— CD133+, VEGFr+, vWF+, CD31+++ (also called PECAM), caveolin-1, basement membrane components (i.e. basal lamina containing type IV and VI collagen, laminin and forms of Heparan sulfate/Heparin proteoglycans (glypicans, syndecans)

Acinar cells
Stellate cells—CD146+, alpha smooth muscle actin (ASMA)+, desmin+, ICAM-1+VCAM-1+ vitamin A+, HGF, fibrillar collagens (type I and 3) , chondroitin sulfate proteoglycans (degree of sulfation of the proteoglycans increases with maturational stage, so late stage ones will be dermatan sulfate proteoglycans)

**Stages 1-5 (both 5L and 5P) of the epithelia are partnered with "early lineage stage mesenchymal cells" (ELSMCs):
 All of these 3 cellular sub populations have negligible MHC antigens, have low forward scatter (that is have a small diameter, typically below 10 um) and low side scatter (meaning high nucleus to cytoplasmic ratio) ; they are comprised of at least 3 subpopulations:

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Hepatoblasts

Precursors to endothelia—CD133+, VEGFr+, vWF+, CD31+
Precursors to stellate cells —CD146+, alpha smooth muscle actin (ASMA)+, desmin+, ICAM-1+VCAM-1+ β3-integrin+, vitamin A (low)

Diploid Hepatocytes

Endothelia— CD133+, VEGFr+, vWF+, CD31+++ (also called PECAM), caveolin-1, basement membrane components (i.e. basal lamina containing type IV and VI collagen, laminin and forms of heparan sulfate proteoglycans (HS-PGs) that increase in sulfation with maturation.

Polypliod Hepatocytes

Fenestrated endothelia— CD133+, VEGFr+, vWF+, CD31+++ , caveolin-1, but absence of basement membrane though presence of HS-PGs that are highly sulfated and so are referred to as heparin proteoglycans

Cholangiocytes

Stellate cells—CD146+, alpha smooth muscle actin (ASMA)+, desmin+, ICAM-1+VCAM-1+ vitamin A+, HGF, fibrillar collagens (type I and 3) , chondroitin sulfate proteoglycans (degree of sulfation of the proteoglycans increases with maturational stage, so late stage ones will be dermatan sulfate proteoglycans)

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FIG. 15

