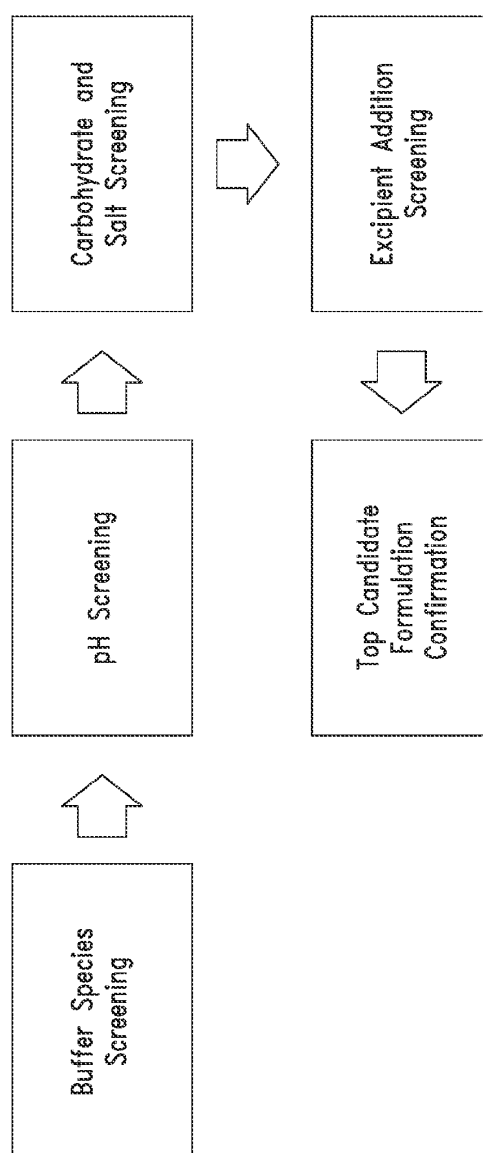


*FIG. 1*

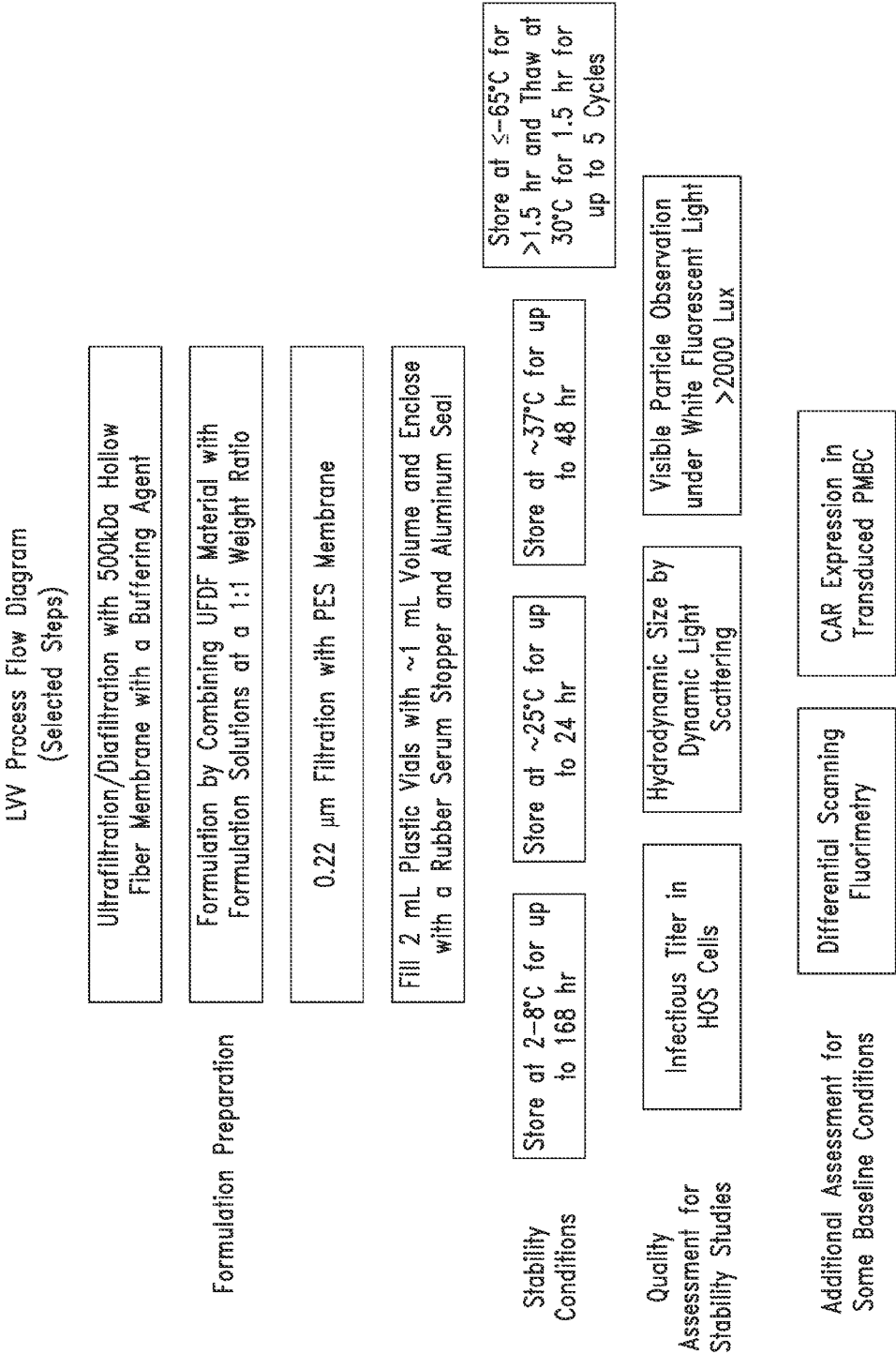
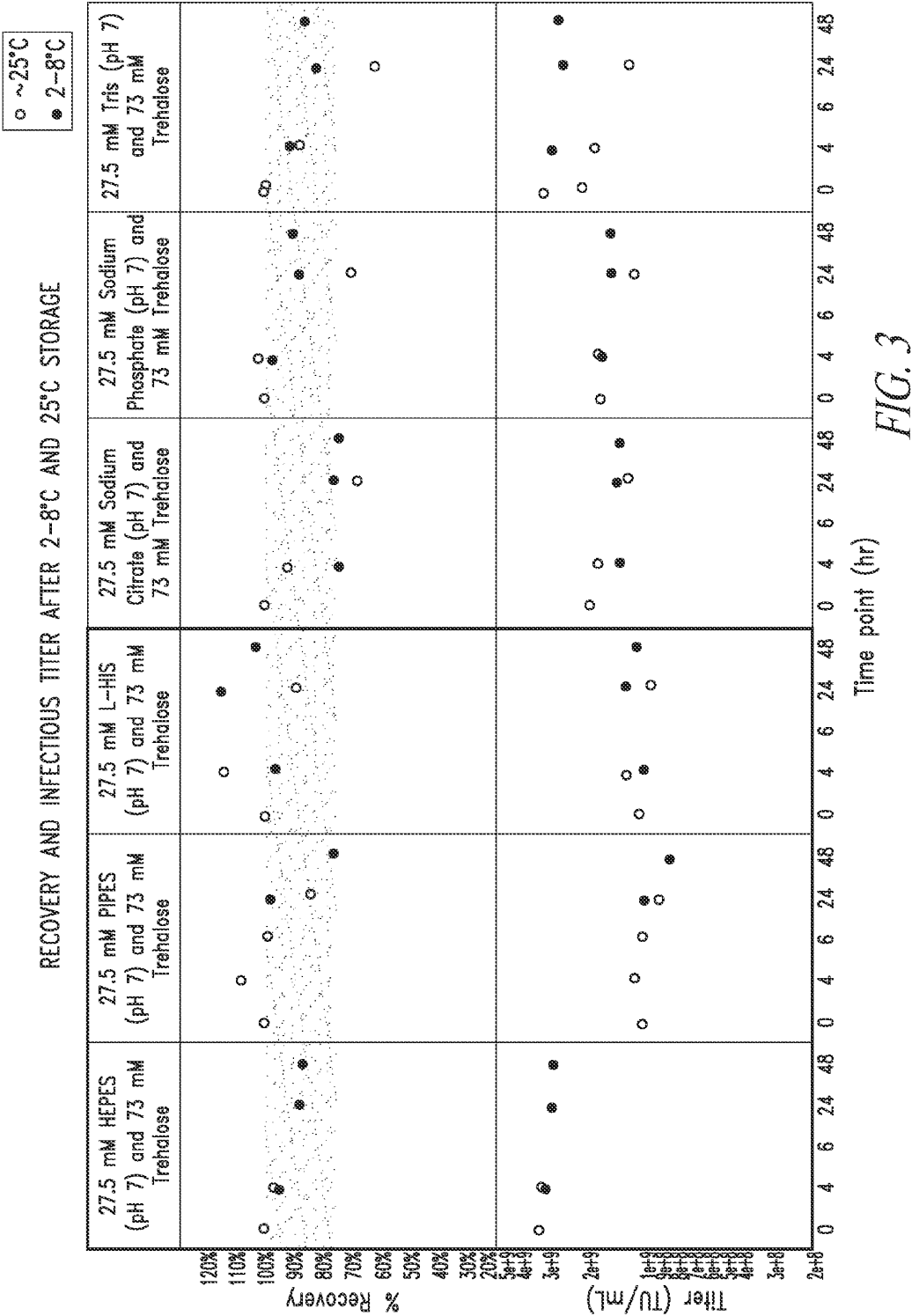
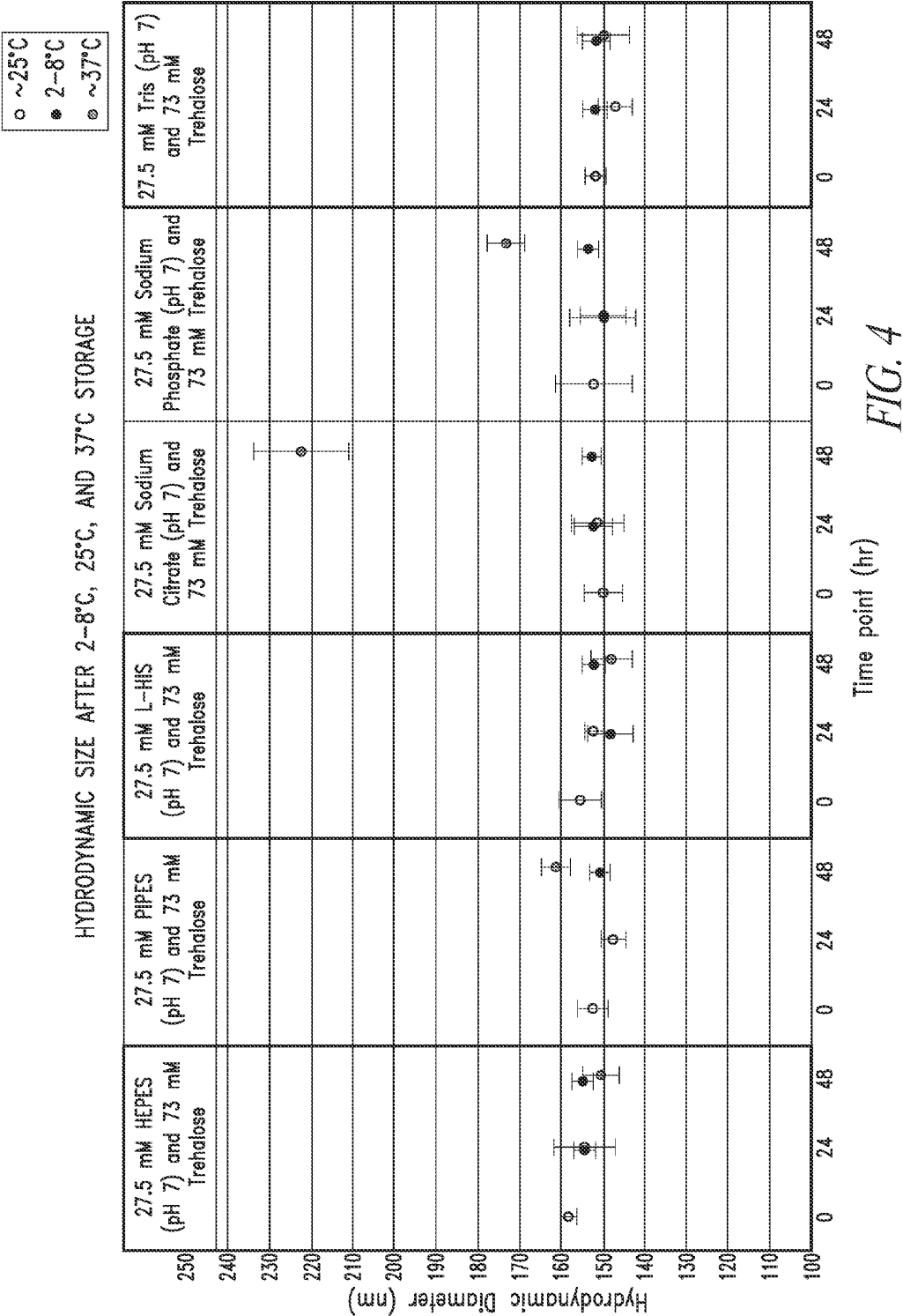


FIG. 2





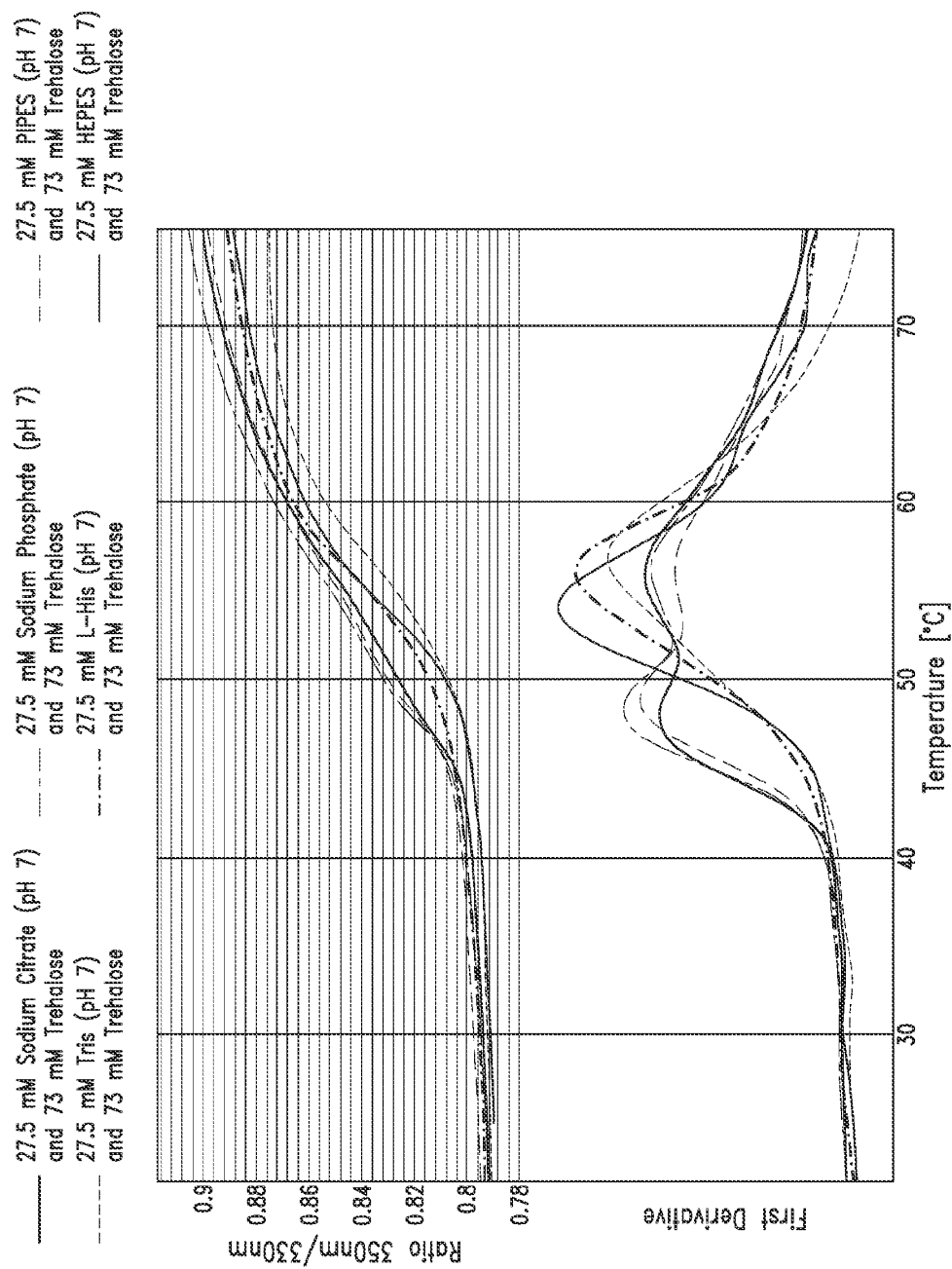


FIG. 5

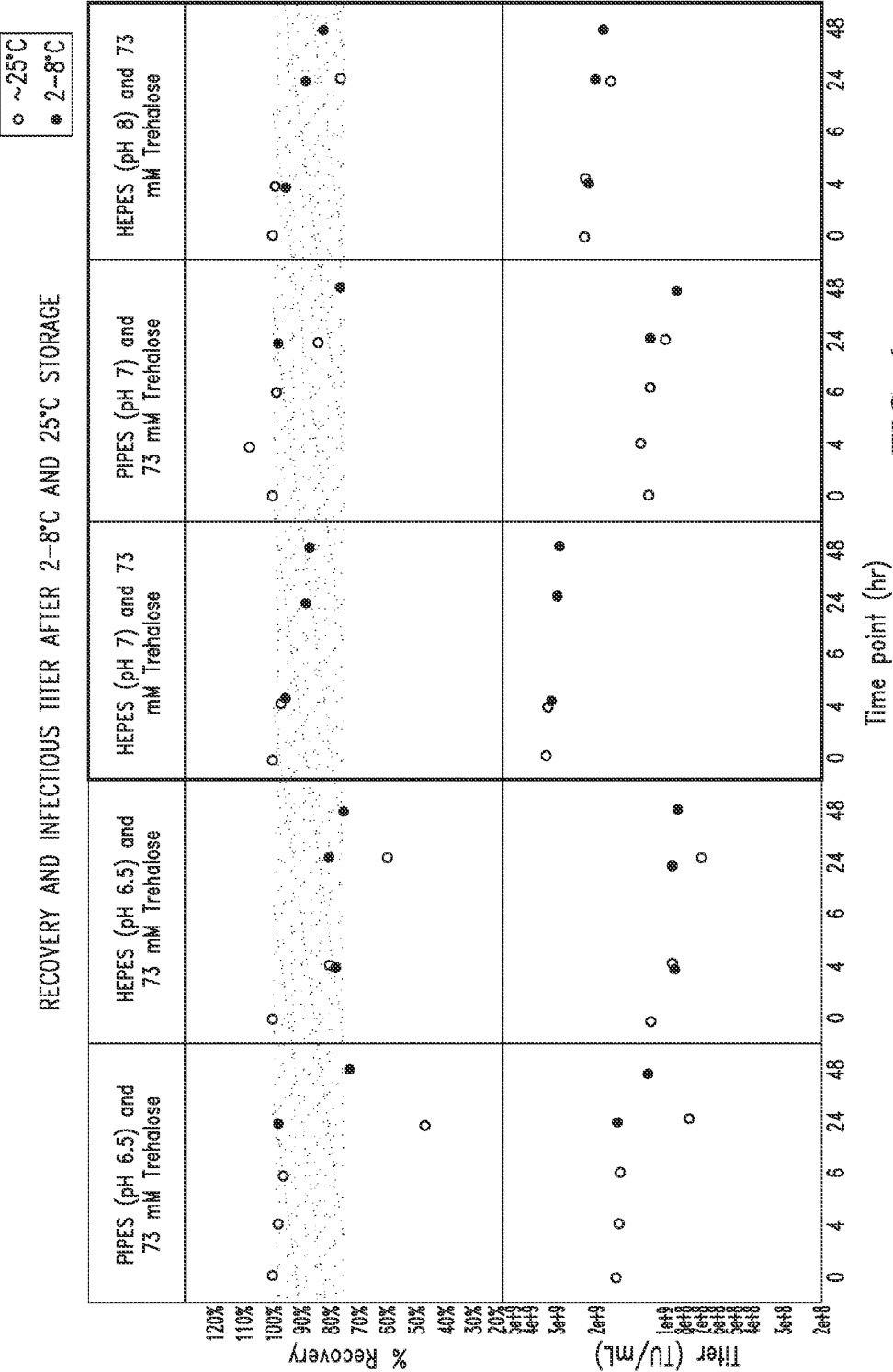
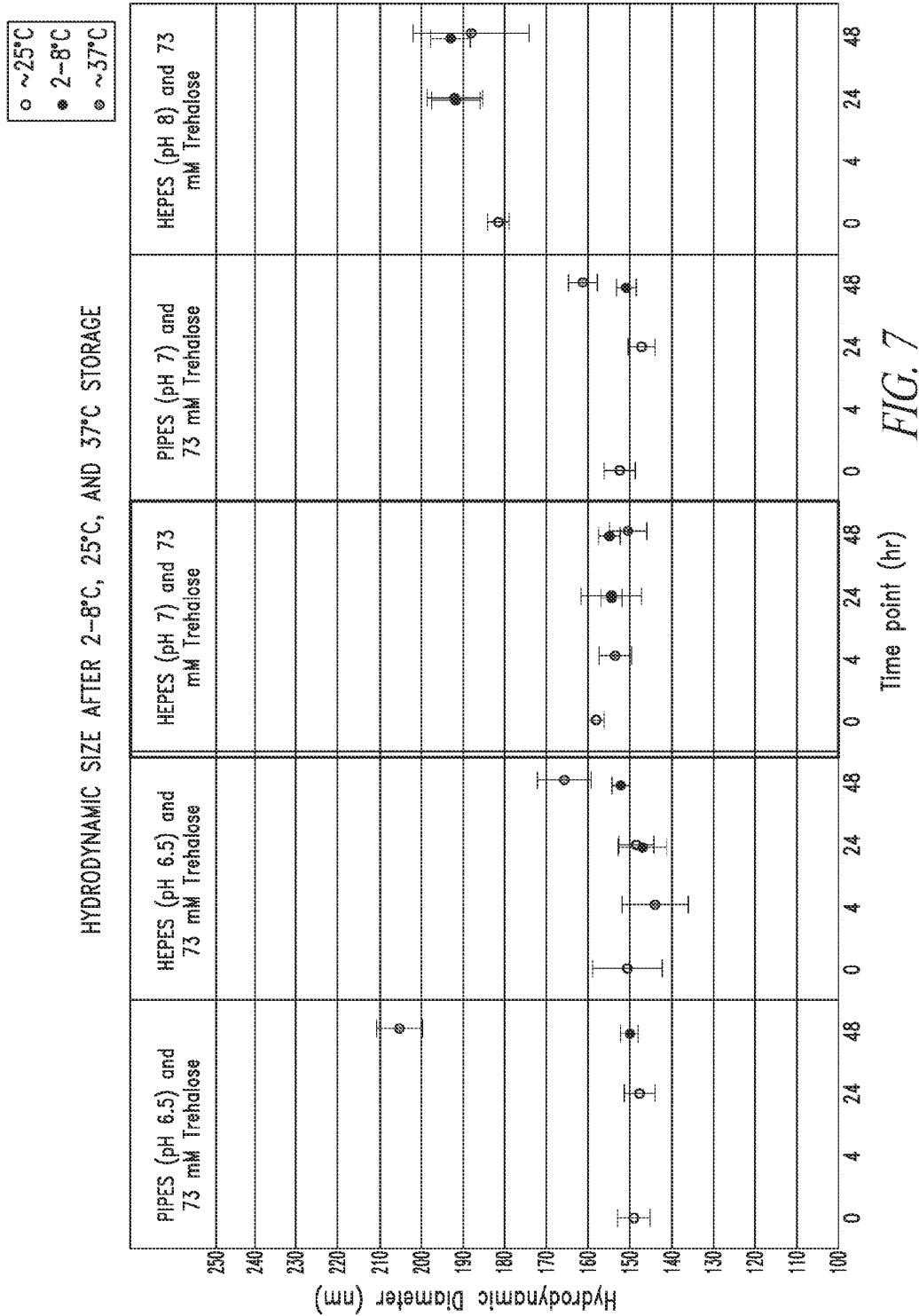
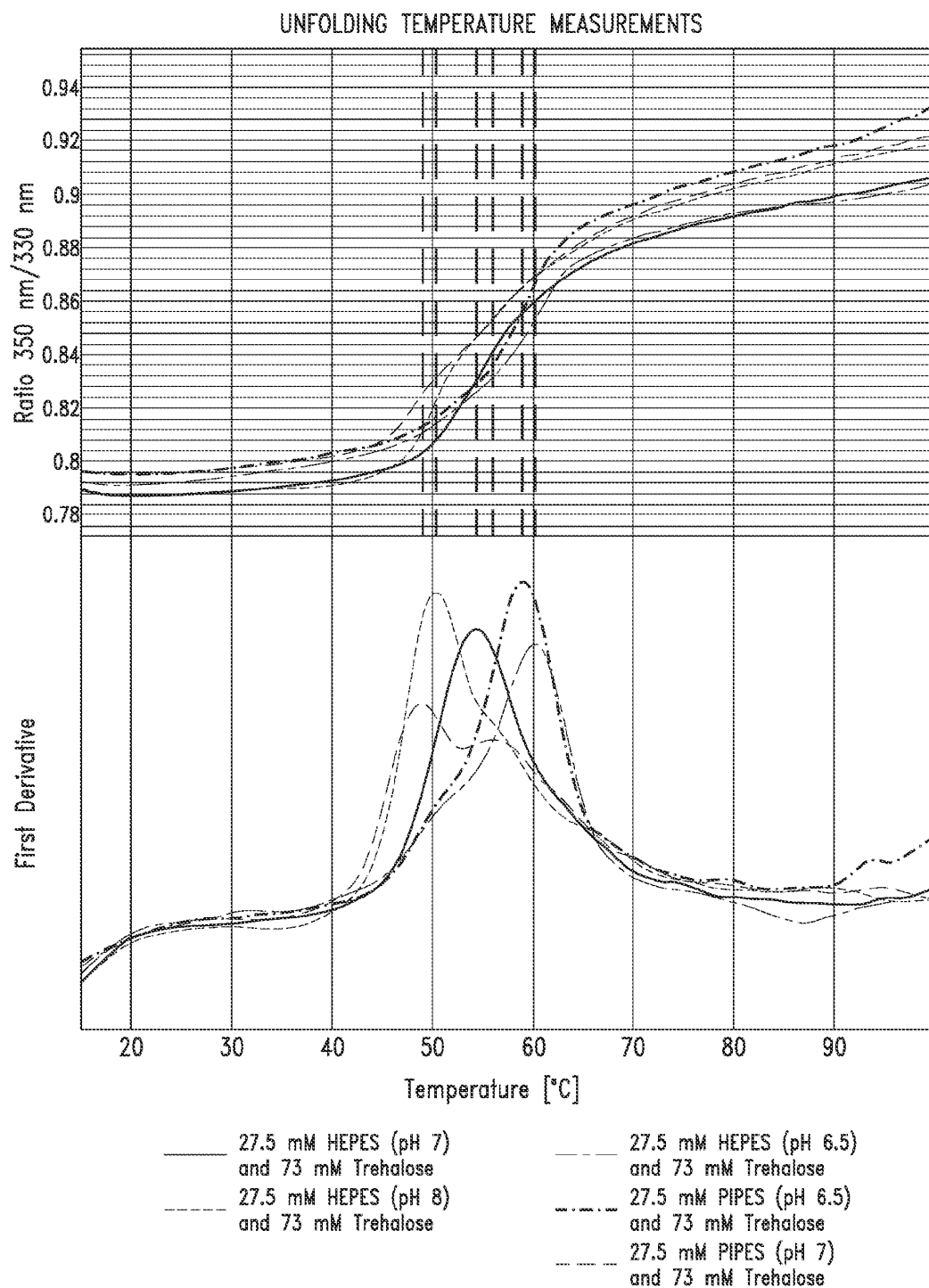


FIG. 6



*FIG. 8*

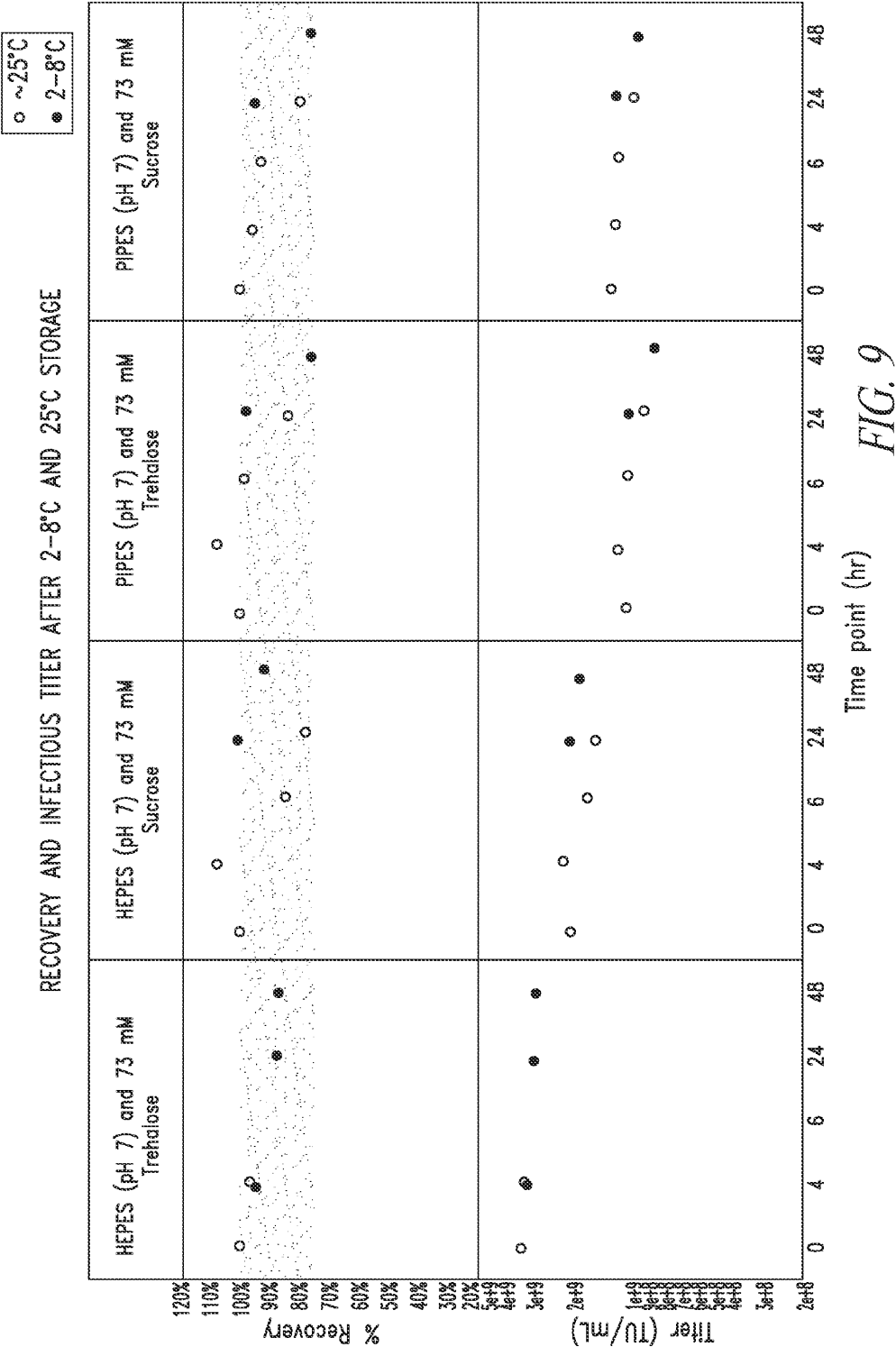
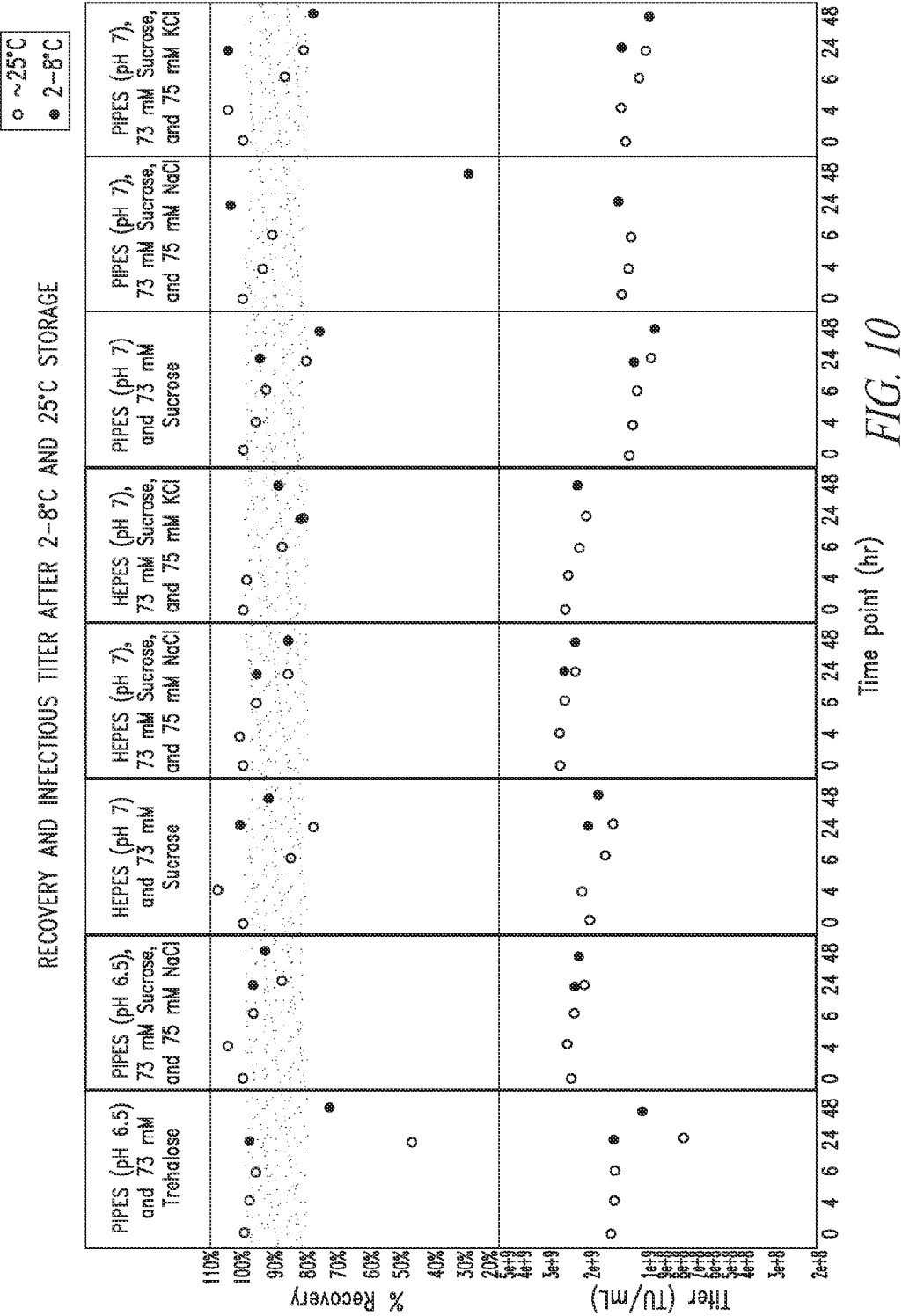


FIG. 9



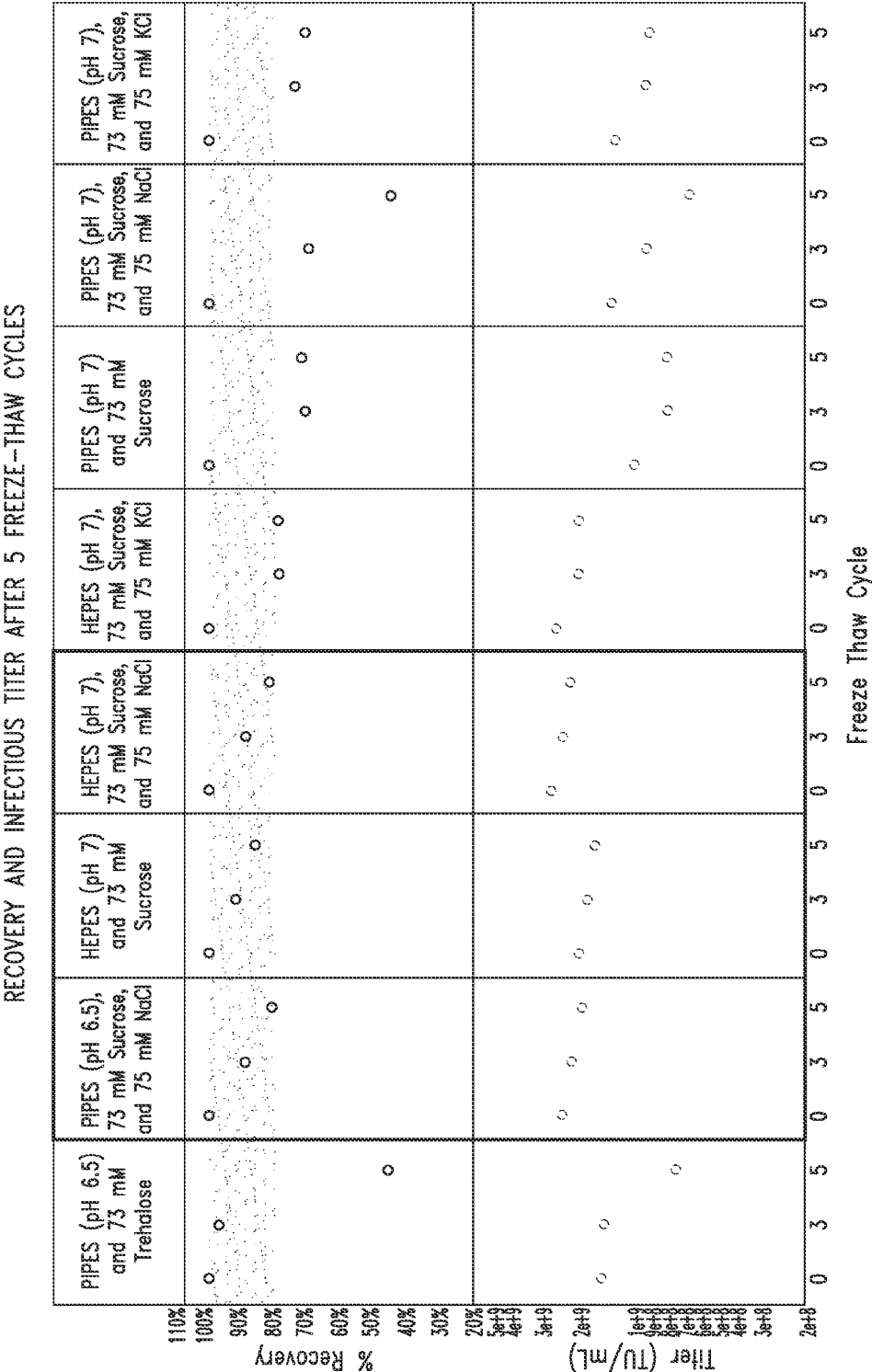
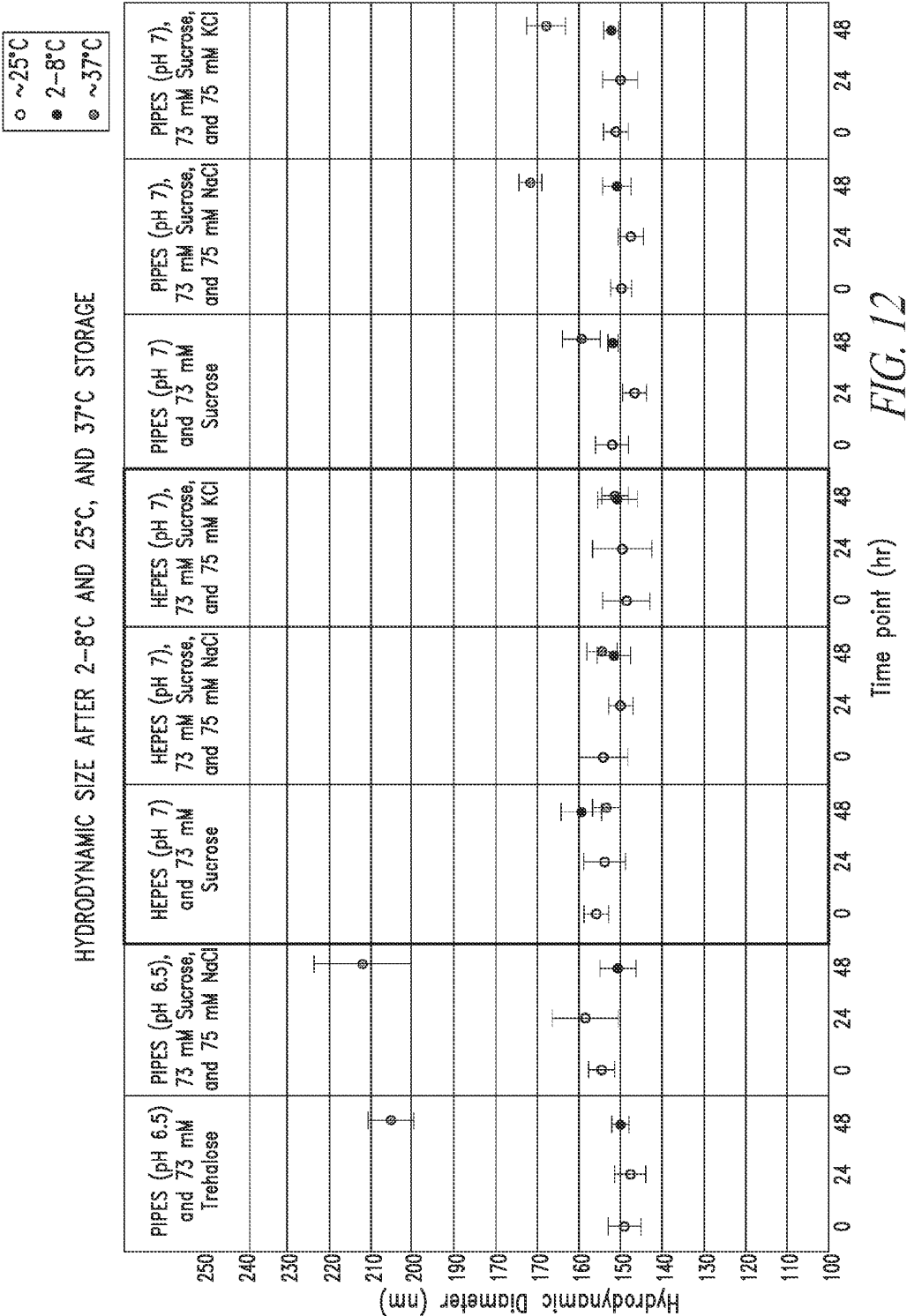
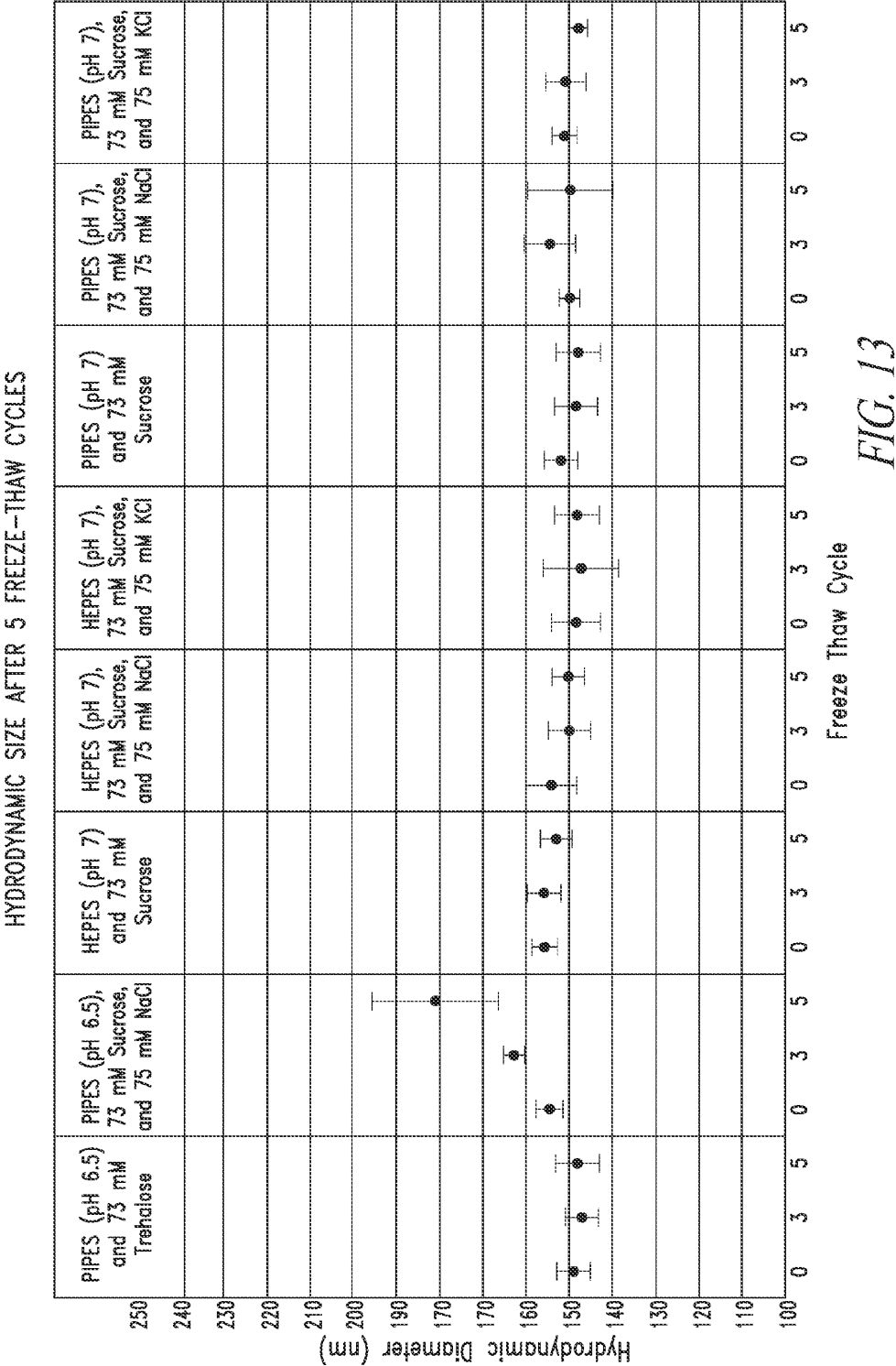
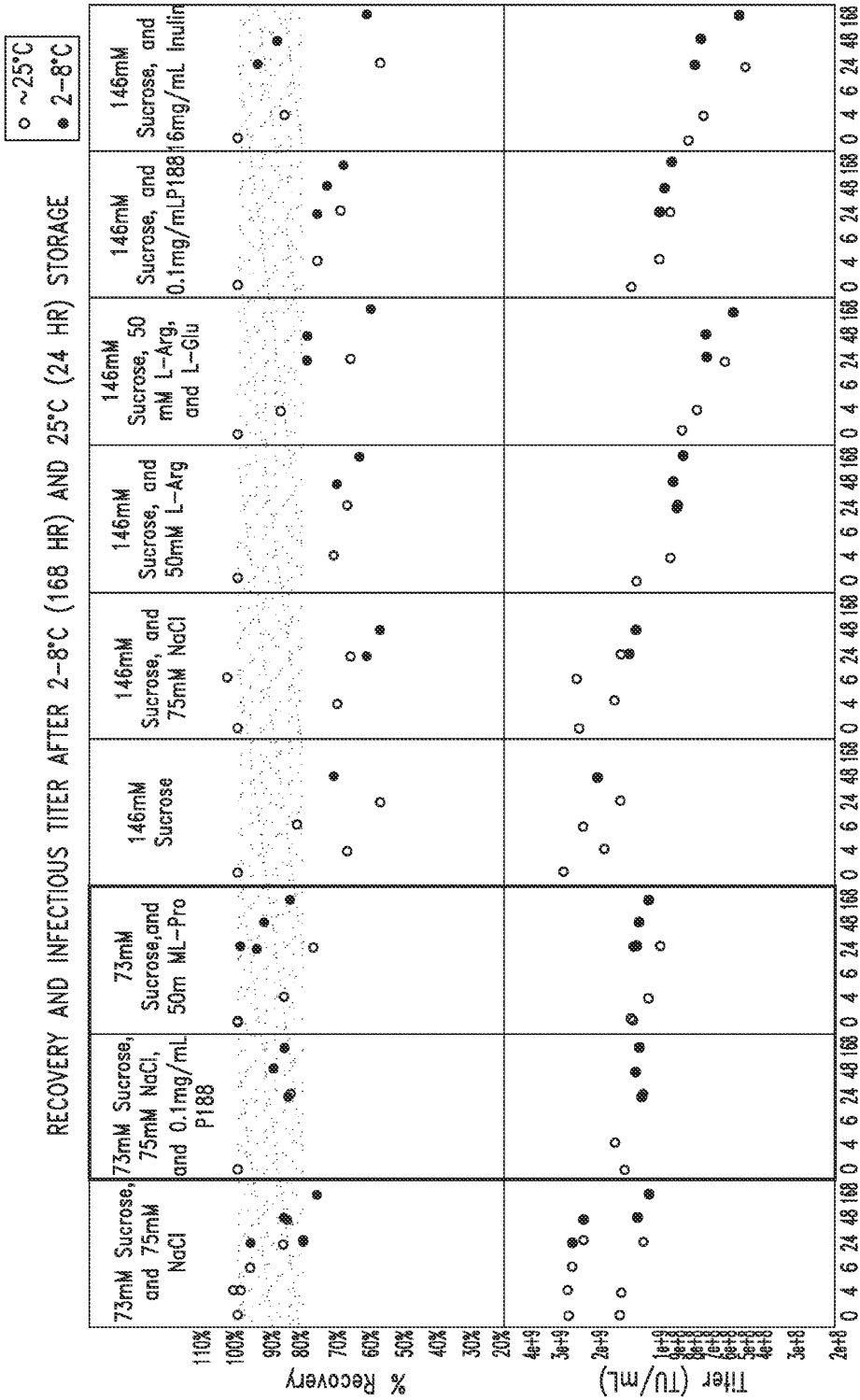


FIG. 11

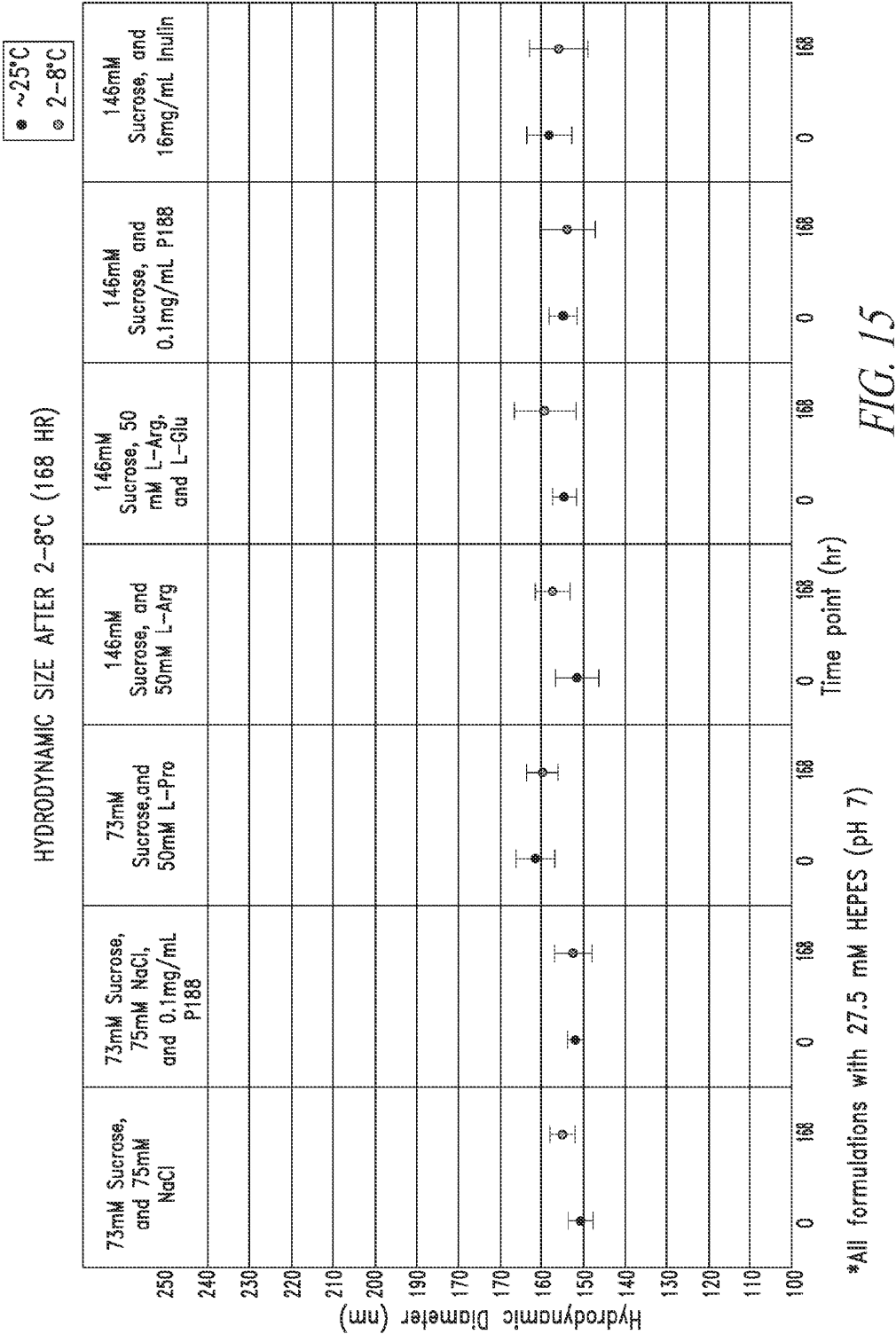






*All formulations with 27.5 mM HEPES (pH 7)

FIG. 14



Formulation	Timepoint			
	Baseline	48hr	96hr	168hr
73 mM Sucrose, and 75 mM NaCl	1 translucent fiber	A few translucent wispy fibers	Several wispy translucent particles	Several wispy fibers
73 mM Sucrose, 75 mM NaCl, and 0.1 mg/mL P188	No particles	No particles	1 wispy translucent particle and speck	1 wispy fiber
73 mM Sucrose, and 50 mM L-Pro	No particles	No particles	1 flaky particle	1 white speck
146 mM Sucrose	No particles	No particles	Not Tested	Not Tested
146 mM Sucrose, and 75 mM NaCl	2 white specks	1 wispy flake	Not Tested	Not Tested
146 mM Sucrose, and 50 mM L-Arg	1 translucent wispy fiber	2 translucent wispy fibers	Many translucent particles and fibers	Many translucent wispy particles and fibers
146 mM Sucrose, 50 mM L-Arg, and L-Glu	1 translucent wispy particle	Few translucent wispy chunks	1 white speck	1 large wispy translucent particle
146 mM Sucrose and .01 mg/mL P188	No particles	No particles	No particles	No particles
146 mM Sucrose and 16 mg/mL Inulin	1 translucent wispy particle	No	1 translucent wispy particle	1 translucent wispy particle

*All formulations with 27.5 mM HEPES (pH 7)

FIG. 16

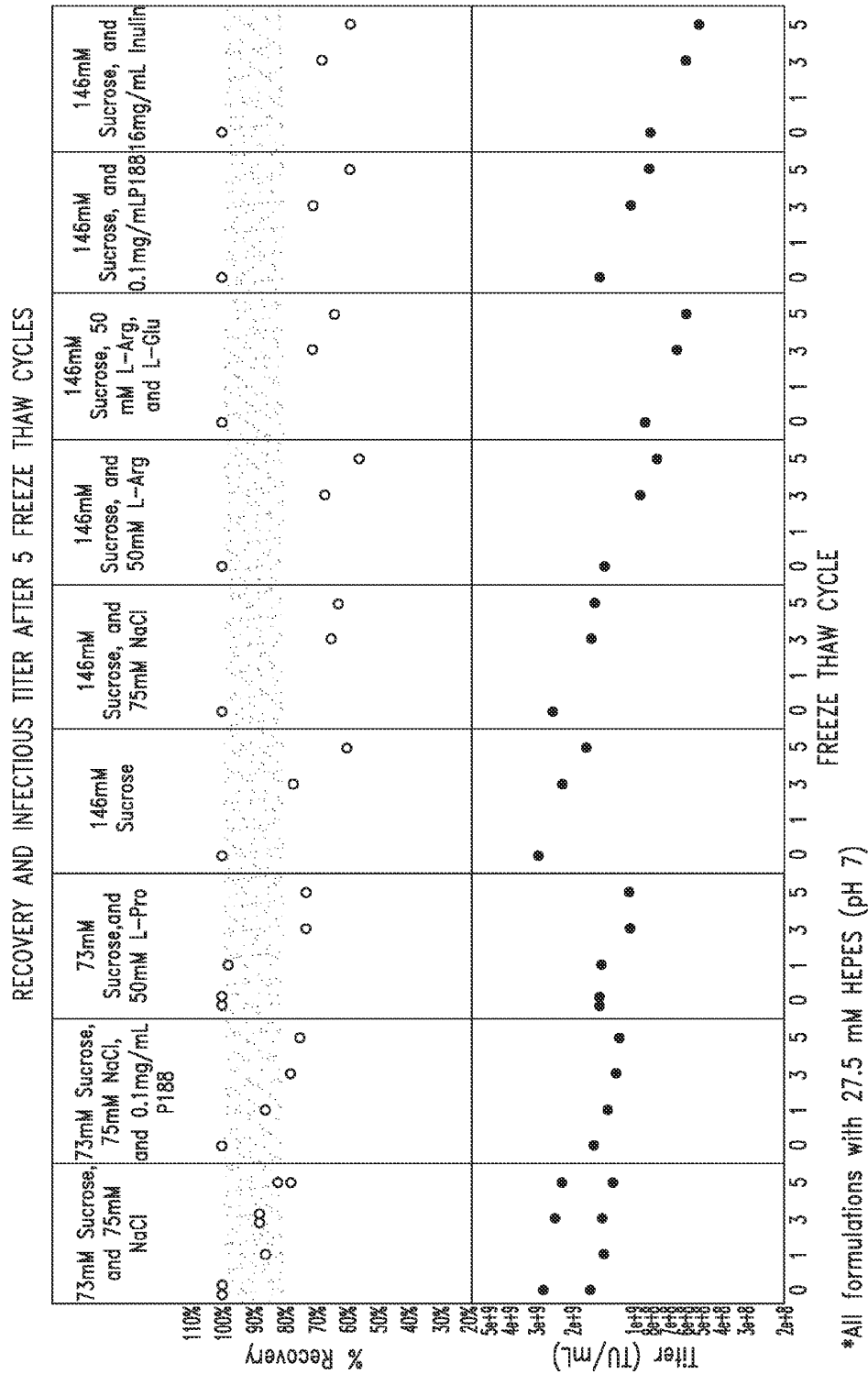


FIG. 17

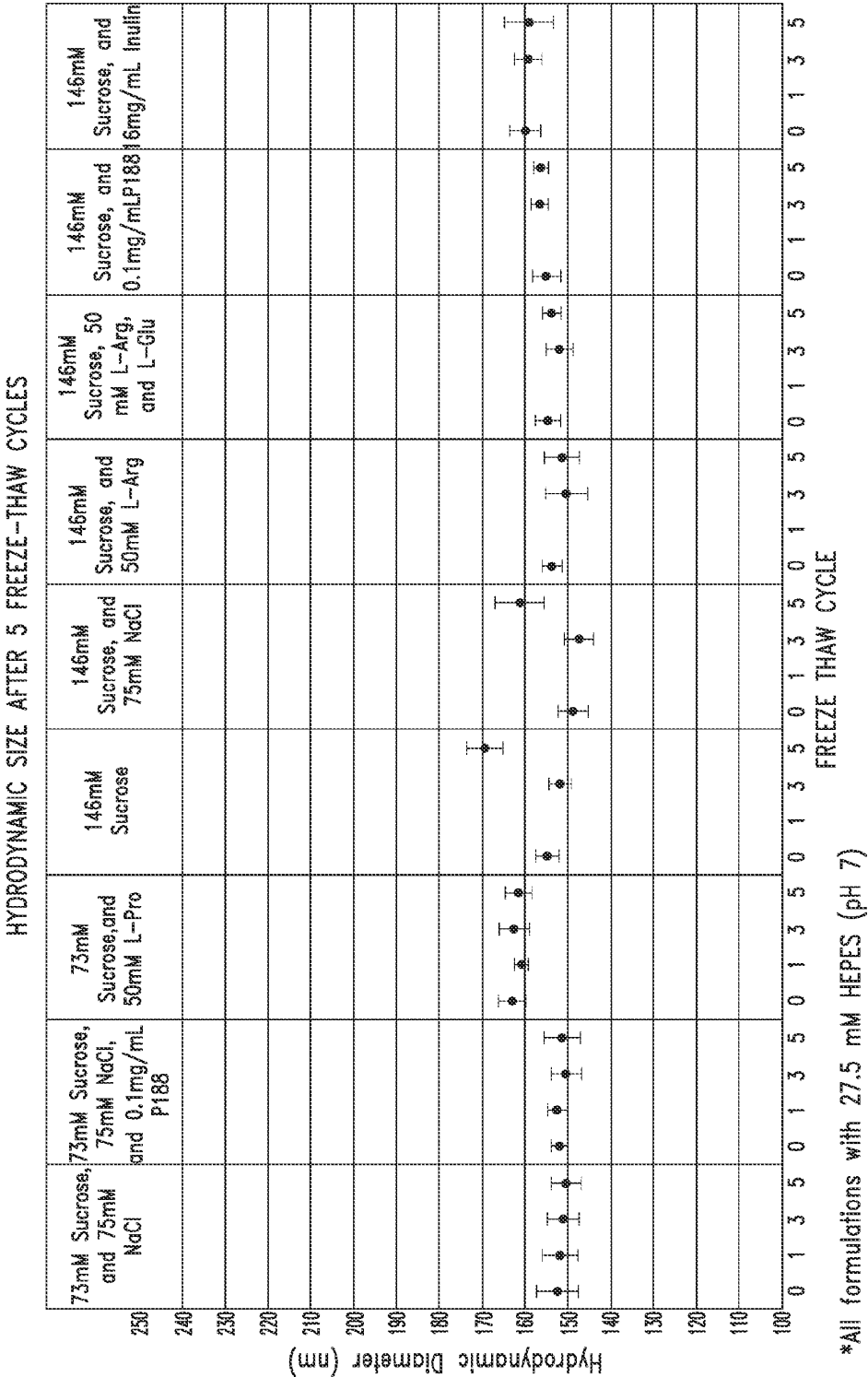
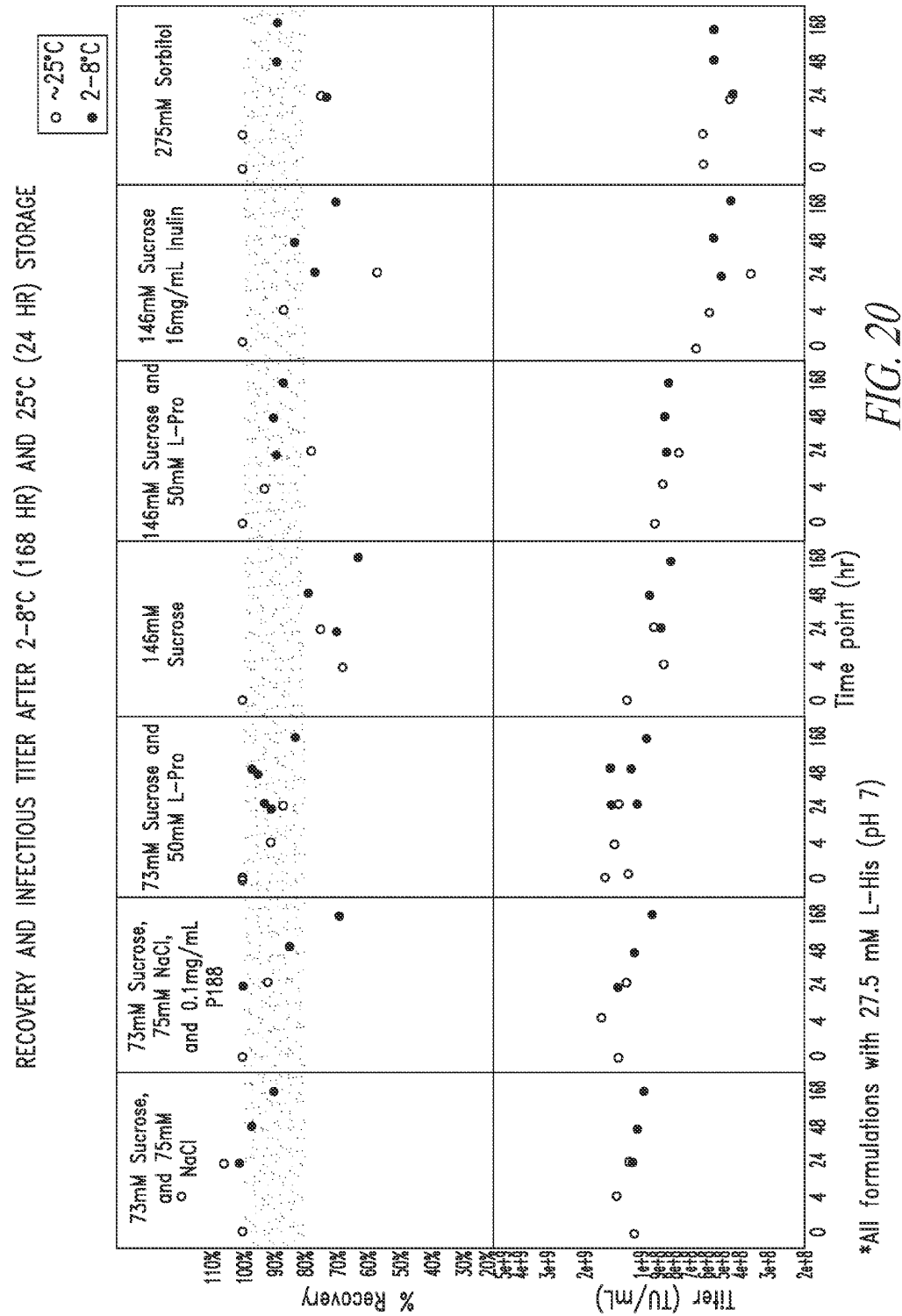


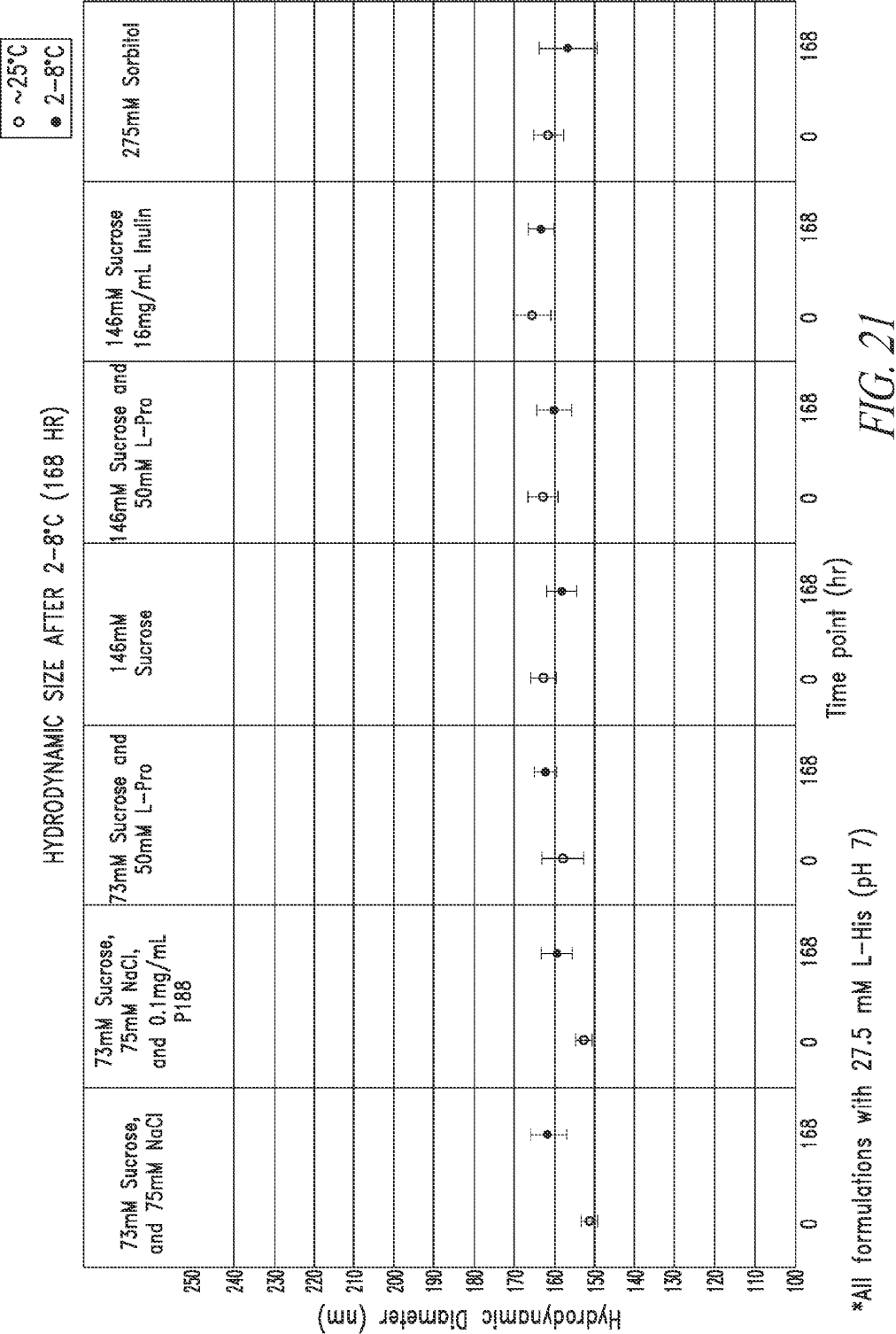
FIG. 18

Formulation	Freeze-Thaw Cycle			
	Baseline	1XFT	3XFT	5XFT
73 mM Sucrose, and 75 mM NaCl	1 dust-like fiber	No particles	No particles	1 long wispy particle and a few fine particles
73 mM Sucrose, 75 mM NaCl, and 0.1 mg/mL P188	No particles	No particles	No particles	1 long wispy particle
73 mM Sucrose, and 50 mM L-Pro	1 dust-like fiber	No particles	No particles	1 long wispy particle
146 mM Sucrose	No particles	Not Tested	No particles	No particles
146 mM Sucrose, and 75 mM NaCl	No particles	Not Tested	No particles	No particles
146 mM Sucrose, and 50 mM L-Arg	1 translucent wispy fiber	3 translucent wispy fibers	2 translucent specks	Many thin translucent fibers
146 mM Sucrose, 50 mM L-Arg, and L-Glu	2 translucent wispy fibers	1 translucent wispy fiber	small translucent fibers and specks	No
146 mM Sucrose and .01 mg/mL P188	No particles	No particles	No particles	No particles
146 mM Sucrose and 16 mg/mL Inulin	1 translucent wispy particle	1 translucent long fiber	few translucent fibers and specks	No particles

*All formulations with 27.5 mM HEPES (pH 7)

FIG. 19



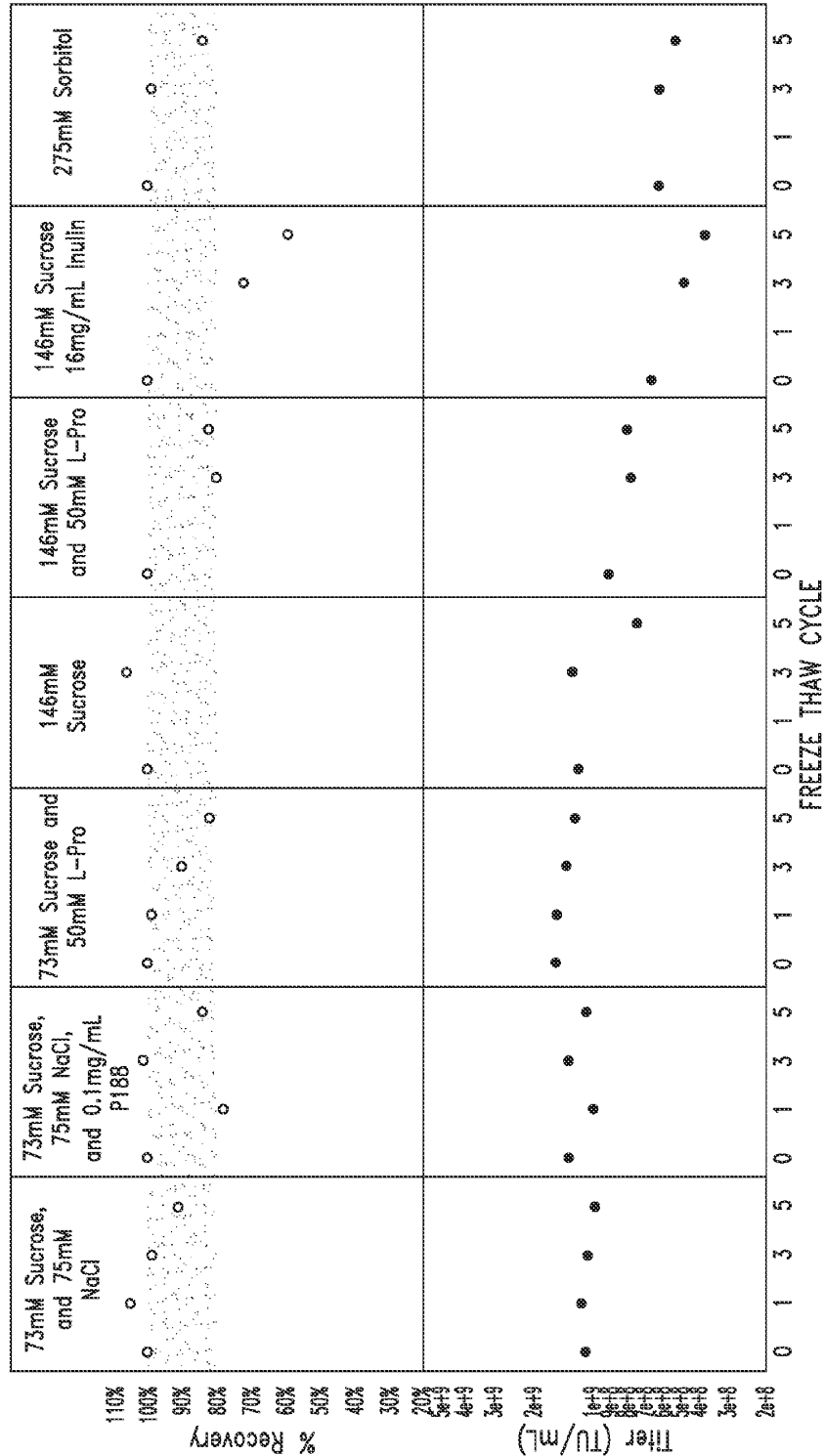


Formulation	Timepoint			
	Baseline	48hr	96hr	168hr
73 mM Sucrose, and 75 mM NaCl	No particles	A few translucent wispy fibers	Several wispy translucent particles	2 fine stringy fibers
73 mM Sucrose, 75 mM NaCl, and 0.1 mg/mL P188	No particles	No particles	1 wispy translucent particle and speck	No particles
73 mM Sucrose, and 50 mM L-Pro	No particles	No particles	1 flaky particle	No particles
146 mM Sucrose	No particles	No particles	No particles	No particles
146 mM Sucrose, and 50 mM L-Pro	No particles	No particles	No particles	No particles
146 mM Sucrose, and 16 mg/mL Inulin	No particles	2 stringy fibers	No particles	1 translucent fiber
275 mM Sorbitol	No particles	No particles	No particles	A translucent speck

*All formulations with 27.5 mM L-His (pH 7)

FIG. 22

RECOVERY AND INFECTIOUS TITER AFTER 5 FREEZE THAW CYCLES



*All formulations with 27.5 mM L-His (pH 7)

FIG. 23

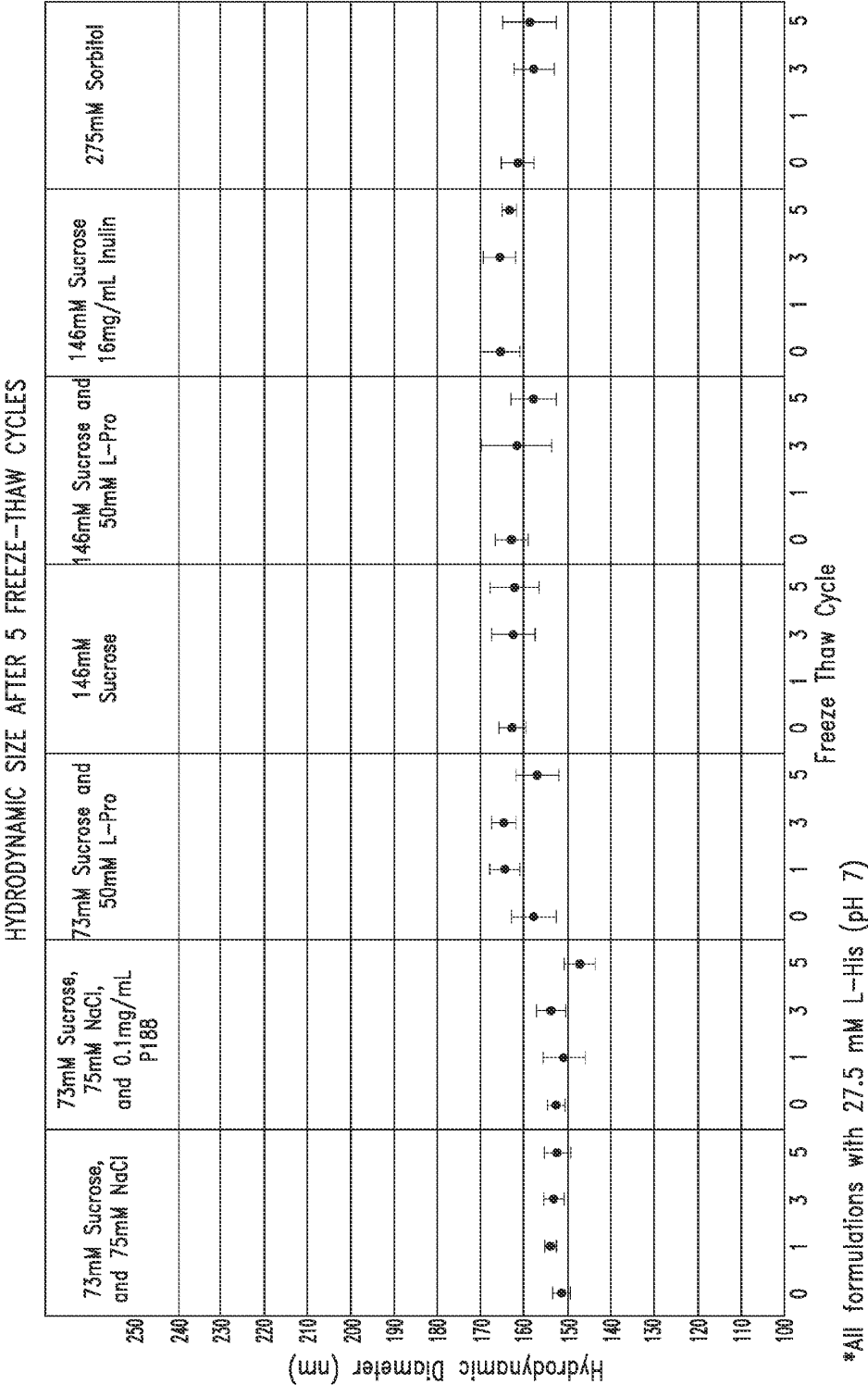


FIG. 24

Formulation	Freeze-Thaw Cycle			
	Baseline	1XFT	3XFT	5XFT
73 mM Sucrose, and 75 mM NaCl	1 dust-like fiber	No Particles	No Particles	1 long wispy particle and a few fine particles
73 mM Sucrose, 75 mM NaCl, and 0.1 mg/mL P18	No Particles	No Particles	No Particles	1 long wispy particle
73 mM Sucrose and 50 mM L-Pro	1 dust-like fiber	No Particles	No Particles	1 long wispy particle
146 mM Sucrose	1 translucent speck and 1 translucent fiber	No Particles	No Particles	a few tiny white specks
146 mM Sucrose and 50 mM L-Pro	No Particles	No Particles	No Particles	No Particles
146 mM Sucrose and 16 mM/mL Inulin	No Particles	No Particles	Wispy white particles	2 small translucent fibers
275 mM Sorbitol	No Particles	A few thin stringy fibers	No Particles	Many translucent fibers and specks

*All formulations with 27.5 mM L-His (pH 7)

FIG. 25

One way ANOVA analysis of intermediate bulk titer recovery during 2–8°C hold across different vectors

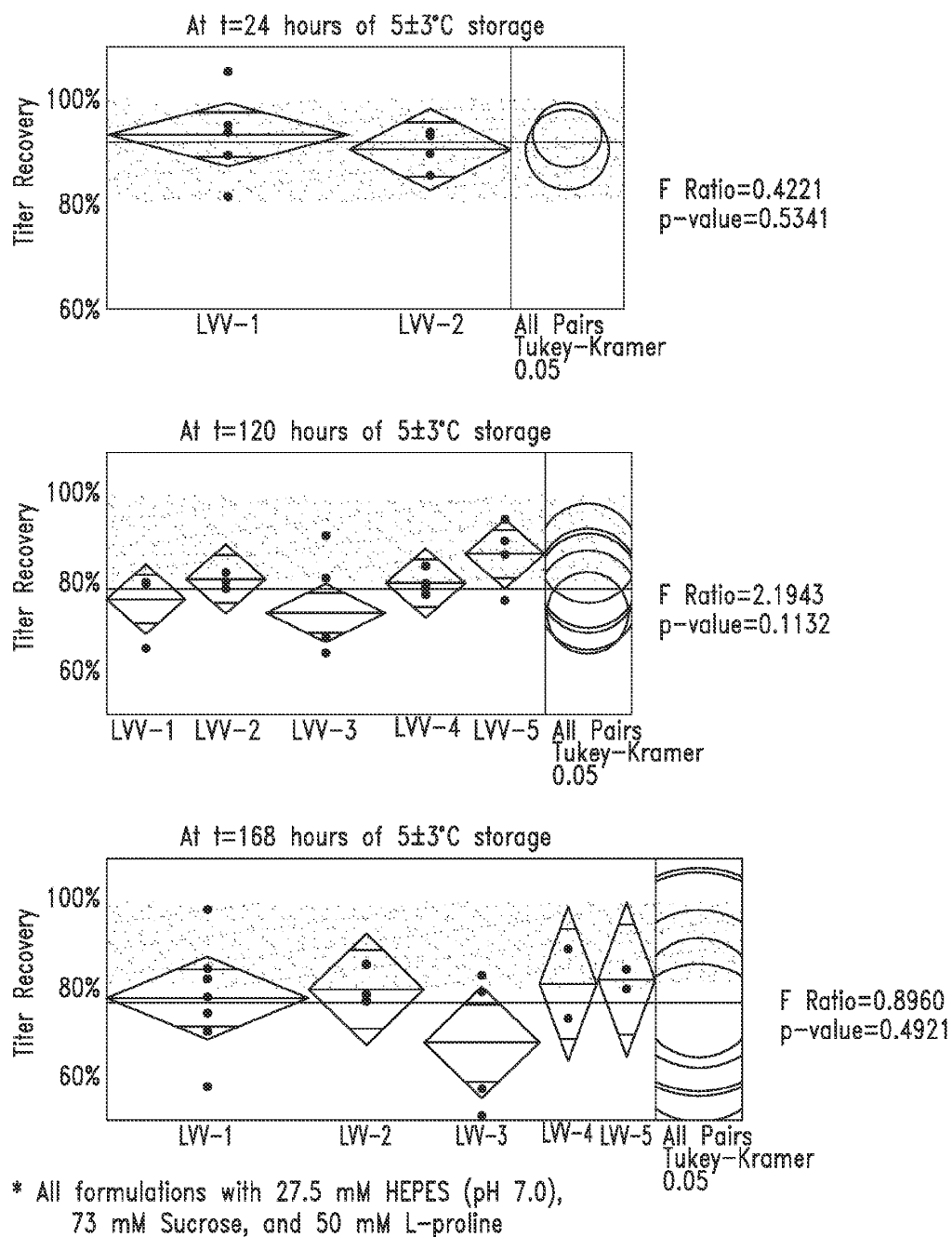


FIG. 26

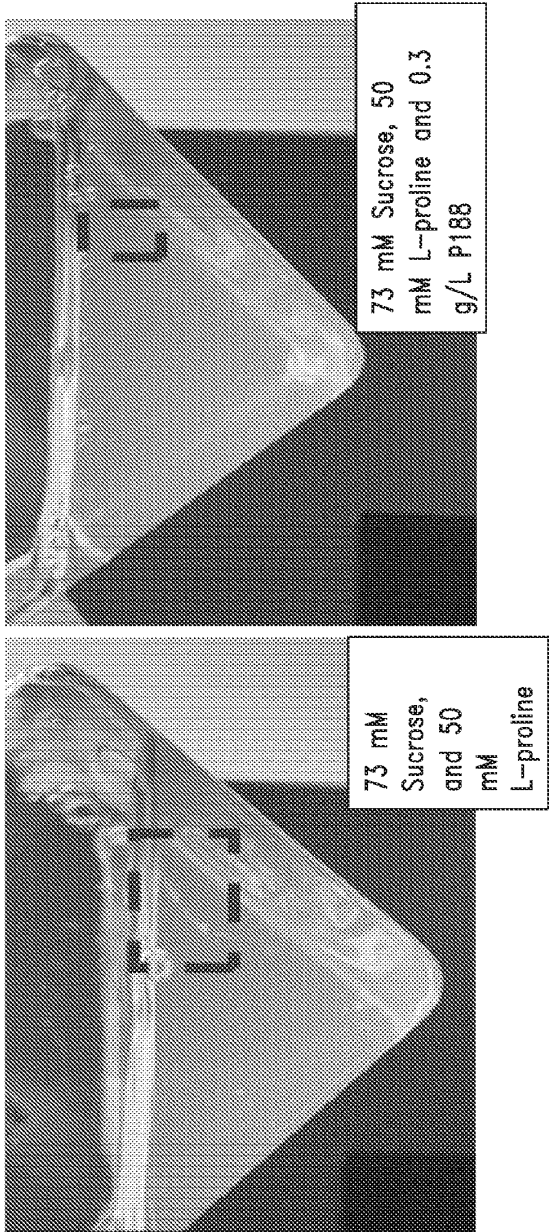
Visual observations from appearance testing with and without P188

Formulation	Baseline	24 hours	120 hours	168 hours
73 mM Sucrose, and 50 mM L-proline	Two long wispy strings and few small translucent particles	Two long wispy fibers and few translucent short fibers	Three long wispy fibers and several short wispy fibers	Four long threadlike wispy fibers
73 mM Sucrose, 50 mM L-proline, and 0.08 g/L P188	No particles	Few tiny specks	Few tiny specks	Not recorded
73 mM Sucrose, 50 mM L-proline, and 0.3 g/L P188	No particles	No particles	Few specks	Not recorded
73 mM Sucrose, 50 mM L-proline, and 0.8 g/L P188	No particles	No particles	1 dust like particle and few specks	1 short translucent fiber and few tiny specks

*All formulations with 27.5 mM HEPES (pH 7.0)

FIG. 27

Visual observations after 120 hours of 2–8°C storage for LVV–1 formulated with and without P188



*All formulations with 27.5 mM HEPES (pH 7.0)

FIG. 28

Recovery and infectious titer after 2–8°C storage for HSP and HSP P188 formulated LVV–1

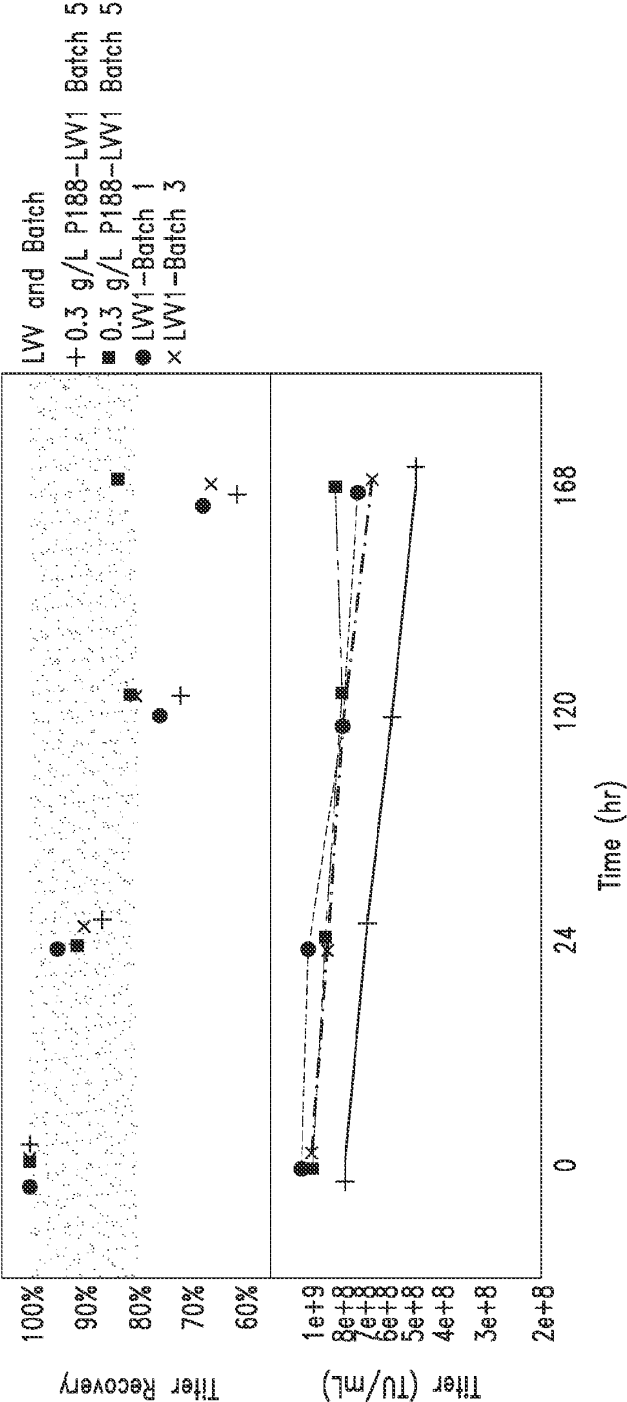
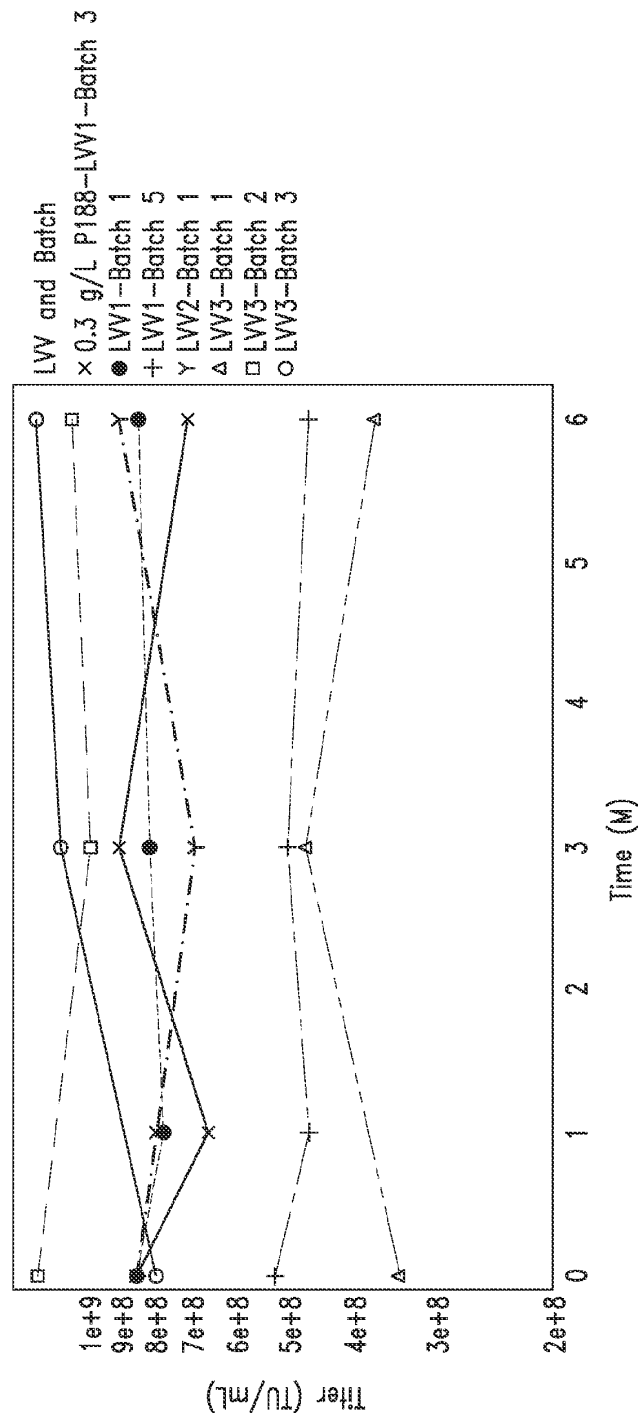


FIG. 29

Infectious titer after 6-month storage at $\leq -65^{\circ}\text{C}$ for HSP and HSP P188 formulated LVV



*All formulations with 27.5 mM HEPES (pH 7.0), 73 mM Sucrose, and 50 mM L-Proline

FIG. 30

LVV IN THE TARGET FORMULATIONS MAINTAIN CAR EXPRESSION IN PBMCs

LVV Formulation	Relative Potency
27.5 mM HEPES (pH 7), 73 mM Sucrose, and 75 mM NaCl	78
27.5 mM HEPES (pH 7), 73 mM Sucrose, 75 mM NaCl, and 0.01% P188	85
27.5 mM HEPES (pH 7), 73 mM Sucrose, and 50 mM L-Pro	85
27.5 mM L-His (pH 7), 73 mM Sucrose, and 50 mM L-Pro	85

FIG. 31