Whole Heart Experiment

Write this up as a standard short lab report (Intro, methods, results, and conclusions) using the guidelines provided by Dr. Sanguinetti.

Rationale: Premature ventricular contractions (PVCs) are difficult to reproduce in the experimental setting. In order to study PVCs, one needs a reproducible model. It is known that digoxin increases the incidence of PVCs but the timing of such phenomenon appear random.

In this laboratory, you will take optical maps of Langendorff perfused guinea pig hearts with di-4-ANEPPS in the absence and presence of 0.75μM digoxin.

Specific Objectives:

1. Quantify the time to the first PVC and QRS duration of the first PVC after variable pacing cycle lengths.
2. Determine the region of the heart where the first beat originates

Protocol (Group 1)

1. The heart will be hanging and the cameras will be setup for your experiment when you enter.
2. Perfuse di-4-ANEPPS into the heart.
3. After the dye is perfused and the heart has recovered for a few minutes, begin the protocol on the attached sheet.
    a. You will need one person to take the recording (sitting at the computer)
    b. One person to change the pacing rate (Stimulator)
    c. One person to measure time to first beat and QRS interval from the oscilloscope.
    d. You may choose to rotate who does what

Protocol (Group 2)

1. If the first group has not finished the control recordings, group 2 will finish those recordings using the same distribution of labor as outlined above in point 3 a-d
2. Once all control recordings are completed, group 2 will perfuse 0.75 μM digoxin into the heart for 20 minutes.
3. If time permits, group 2 will continue to fill out the sheet.

Protocol (Group 3)

1. If the 2nd group has not finished the digoxin recordings, group 2 will finish those recordings using the same distribution of labor as outlined in group 1, points 3 a-d

Tasks: Whole Heart Lab.

At the end of the entire experiment, everyone will be given the same copy of the data which has pacing rate, time to first beat, and QRS width.

Results 1: Here is the data for past control experiments (time to first beat). Please add your data as the 5th experiment

BCL	Exp 1	Exp 2	Exp 3	Exp 4
350	790	600	600	720
300	820	620	630	850
280	2680	660	680	950
260	2840	680	700	1010
250	3720	720	730	1130
240	3720	740	750	1160
230	4880	800	810	
220	5160	820	970	
200	5440	900	2360	
180			3060	
160				
150				

Here is the data for past 0.75μM digoxin experiments (time to first beat). Please add your data as the 4th experiment.

BCL	11031001	11031002	110910
350	620	540	520
300	640	560	530
280	680	460	550
260	500	480	440
250	400	380	520
240	360	360	320
230	280	310	320
220	240	270	240
200	240	250	240
180	220		280
160	220		280
150	240		260
140	210		260
130	250		230

Plot the mean and standard error for these two graphs (Time to 1st beat vs. Basic Cycle Length [BCL]).

Results 2: Plot your data for QRS as a function of BCL. There is no previous data on this

Results 3: You will receive 4 files, which are movies of the recordings you've made for specific conditions and pacing rates.
Determine which part of the heart the first spontaneous beat originated.

Discussion/Conclusion:
Discuss whether your data fit previous trends or significantly deviated. Use appropriate statistical analysis to determine whether there are any changes in time to 1^{st} beat as a result of the digoxin.
Discuss which pacing rates produce significantly different results.

Research and discuss whether the time to first beat results for all experiments is consistent with what is in the literature, and what the mechanism is.

With digoxin, discuss a mechanism why it may have modified time to first beat if your statistics support that finding.

Last, consider what QRS duration means and explain why QRS duration may have been different as a result of pacing rate and digoxin.