Lab report the effects of drugs on cardiac physiology assignment

Psychology

The second part of this lab was a computer simulation program to illustrate a frog's electrocardiogram using various drugs in an isolated setting. The computer program entitled " Effects of Drugs on the Frog Heart" allowed experimental conditions to be set for specific drugs. The different drugs used were calcium, digitalis, application, atropine, potassium, epinephrine, caffeine, and nicotine. Each of these drugs caused a different electrocardiogram and beats per minute reading. The calcium-magnesium ration affects " the permeability of the cell membrane"(Fox).

When calcium is placed directly on the heart it results in three histological functions. The force of the heart increases while the cardiac rate decreases. It also causes the appearance of " octopi pacemakers in the ventricles, producing abnormal rhythms" (Fox). Digitalis' affect on the heart is very similar to that of calcium. It inhibits the sodium-potassium pump activated by TAP that promotes the uptake of extracurricular calcium by the heart. This in return strengthens myocardial contraction (Springiness). Application on the other hand acts to decrease the heart rate.

It achieves this by assisting in the release of acetylene's from the vague nerve. Atropine on the other hand block acetylene's receptors thus decreasing cardiac rate. By placing potassium directly on the heart, its extracurricular concentration increases thus decreasing the resting potential. This brings the resting potential closer to threshold and weakens myocardial contractions. Epinephrine's action increases the strength of contraction and of the cardiac rate. Caffeine is a stimulant that also increases the strength of contraction and of the cardiac rate.

It inhibits postmistresses that breaks down cyclic AMP thus causing an increase in camp levels. Nicotine actively minds to the nicotine receptors causing stimulation of the parasympathetic ganglia. This in returns slows the heart rate. By listening to chest one can hear the actual mechanical contraction of the heart. Upon the closure of the valves a lube can be heard and the semiannual valves shut a dub is heard. Using this technique, diagnosis of a heart murmur can be made. The relative opening of the foremen oval can cause this condition.

Adding a device known as a sphygmomanometer and listening to the brachia artery is how blood pressure is taken. Blood pressure is highly dependent on cardiac output and peripheral assistance. Cardiac output is the amount of blood pumped by the heart per minute. The resistance the blood receives flowing through the arterioles is peripheral resistance. As a result of this, blood pressure can be controlled by dilation and constriction of arterioles. Upon measuring blood pressure, on should be able to hear five phases of sound. These phases are: 1. A loud clear tapping. 2. A sequence of murmurs. Cardiac Physiology 4 3.

A loud thumping following the murmurs. 4. The sound becomes muffled. 5. Silence. In determining how fit we are a number of test can be used. This can include but is not limited to the EGG, blood pressure, and/or pulse rate. By taking the pulse under various conditions the maximum cardiac rate can be estimated. Trend wise, a non-athlete will reach their maximum cardiac output at a lower workload than an athlete. Although not completely accurate, this can be a very good indicator fitness. MATERIALS AND

METHODS EGG In order to carry out the electrocardiogram experiment a number of materials needed to be obtained.

Three disposable electrodes along with the electrode gel were needed. The BIOPIC program, Mac Computer, and the AS AL lead black, red, white) were used to collect data on the subject. The electrodes were connected to the body (skin). The black lead was placed on the anterior right leg just above the ankle joint. The same was done with the red lead expect placement was on the left leg. The white lead was placed on the right wrist just above the palm. After correct placement of these electrodes, the AS AL lead was connected to the CHI 2 port. Lesson 3 was opened and the setup icon was clicked.

After the setup as completed, record was clicked and the EGG recorded for 30 seconds. This was done while the subject was sitting relaxed. Using the I-beam tool, peak-to-peak measurements were taken. This value was the inter-beat interval. With that number, beat per minute was found (BPML = 60 / 181). The second phase of the experiment was to connect the pulse transducer to the index finger or the right hand. The AS AL lead was disconnected from CHI 2 and placed in the CHI 1 port. The AS 41 lead was then connected to the CHI 2 port. Lesson 6 was opened on BIOPIC and setup was clicked.

Again, after that was completed, record was clicked and it recorded for 30 seconds. The area between the peak of the R wave and the peak in the pulse group was highlighted using the I-beam tool. This number was used to calculate feet per second that the pulse waveform took to travel form your

heart to arm. This value was then used to calculate miles per hour. Heart Sounds and Blood Pressure A stethoscope, sphygmomanometer, alcohol swabs, and a subject were first obtained. The earpieces on the stethoscope were first cleaned with the alcohol swabs.

The diaphragm was then placed on the bicuspid area to hear the heart sounds. Also, the diaphragm was placed on the aortic and pulmonary areas. During these three auscultations, the heart sounds were compared during quiet reheating, slow and deep inhalation, and slow exhalation. The results were recorded. Focus was then switched to blood pressure. The subject sat on a chair with their left arm resting on a table. The blood pressure cuff was wrapped just above the elbow. The diaphragm of the scope was then placed at the site on the chital Foss where the arterial pulse was felt.

The valve was screwed shut and the pump pressure was pumped until no sounds were heard. The screw was slightly loosened allowing the air to slowly come out. The first sound (systole) was recorded and when the sound disappeared diastole). This was done during three different times. Once while the subject was in four positions: standing, reclining, sitting down, and after five minutes of motionlessness. These values were recorded. The pulse pressure was calculated (systolic – diastolic). Using this value, the mean arterial pressure was calculated (diastolic + 1/3 pulse pressure).

The values were recorded. Sticking with the theme of blood pressure individuals pulses were taken. One extra piece of material was needed which was an 18″ high chair. The subject laid flat and then counted their pulse for thirty seconds. This number was multiplied by two and recorded.

Immediately standing up, the subject took their pulse in the same manner. The difference of the two was noted. Next the subjects stood up on an 18″ high chair and lowered themselves five times. Upon completing their pulse was taken for 15 seconds and multiplied by four. This value was recorded.

Successively, the pulse was taken for 30, 60, 90, and 120-second increments. These were also recorded. The normal pulse rate was then subtracted from the exercise pulse rate and recorded. The difference from reclining systolic and rising systolic was calculated and recorded. Each of the results received a numerical value from the chart corresponding to in the lab manual. Effects of Drugs on the Frog Heart The materials for the computer simulated experiment was an IBM personal computer that had the Virtual Physiology Lab CD installed onto the hard drive. For this experiment the frog was virtually prepared.

A probe was inserted into the foremen magnum into the skull and then into the spinal cord. The skin of the frog was cut down Cardiac Physiology 7 the mid-thorax area. The body cavity was then exposed by further cutting through which exposed the sternum. Peeling this back exposed the frog’s heart. The frogs heart was then connected to a virtual physiographic to record its contractions. The frog’s normal heart contractions were recorded. The heart was then rinsed thoroughly with Ringer’s solution. Each drug was placed on the heart in the following concentrations: 2. 0% calcium chloride, 2. % digitalis, 2. 5% application, 5. 0% atropine, 2. 0% potassium chloride, an epinephrine solution, an caffeine solution, and 0. 2% nicotine. Between each drug, the heart was washed thoroughly with Ringers solution before the

next drug was applied. The results were recorded. RESULTS Figure 1 shows the normal electrocardiogram wave for a human. It consists of the P, SIRS, and T wave. Figure 2 illustrates the electrocardiogram of the frogs heart under various drug conditions. Table I is the simple beats per minute of a subject along with how fast it travels. These values are 88. 8 BPML and 4. 4 Ft/sec (3. 3 mil her) respectively. Table II represents blood pressure. It is shown that no trend exists throughout the various conditions. Table Ill exhibits a trend in the fact that upon exercising, pulse rate increased. Also, traveling from a seated to standing positions increased pulse rate. As seen in Table IV, various drugs exhibit various responses on the heart as compared to its normal state. DISCUSSION In this broad based study, cardiac physiology was affected by various elements. Altered stated were compared to " normal" states and vice versa. In the EGG reading, a P, SIRS, and T wave were visibly present.

The P wave was caused by the contraction and deportation of the atria. When the ventricles depopulated and contracted, this produced the SIRS wave. The final wave exhibited was the T wave. This was the result of the relaxation of ventricles and also of their revitalization. Even Hough the frog's EGG is different from the humans, drugs (for the most part) exhibit similar effects. Calcium and digitalis slowed the heart rate considerably. This was due to the increased uptake of calcium these two drugs provided. The calcium ions did this by decreasing the overall cardiac rate.

Digitalis inhibited the An/K pump that in turn increased the uptake of calcium. This also caused an efflux of potassium. Concurrently, when

potassium is added to the heart extracurricular its concentration is greatly increased thereby slowing the heart rate. As a result of calcium and digitalis exhibiting the same effect, their Egg's re very similar. Without proper measuring devices, one could easily mistake one for the other. Although potassium does slow the heart like calcium and digitalis, its EGG is clearly different. It produces no visible waves except for two hump-like waves.

Application and atropine caused a complete opposite effect compared to each other. They did this by the different utilization of acetylene's (Ach). Application facilitates the release of ACh while atropine blocks Ash's receptors. This explains why atropine increases heart rate and application decrease heart rate. Their EGG illustrates this in relation to their SIRS wave. Polonaise's SIRS wave is broader than that of atropine's. Caffeine and epinephrine both increase heart rate. Caffeine cause the concentration of camp to increase " which duplicates the action of the hormone epinephrine" (Mitchell).

The reason being that camp is utilized as a second messenger. These two drugs because of their severe similarity exhibit comparable EGG readings. Again, no noticeable difference is observed. Nicotine slows the heart rate down. The most likely is caused by nicotine binding to nicotine receptors. This activates the parasympathetic neuron that causes a slowing of the heart rate. It EGG is most comparable to that of calcium and digitalis due to the effect of slowing heart rate. Another way of studying the heart is through careful auscultation.

In this particular lab, the heart sounds were listened to. No difference was noted during the different breathing patterns. This could very well be the cause of an untrained ear and of low quality stethoscopes. These two are both necessary in order to correctly perform the experiment. Table II shows that there was not much of a fluctuation in blood pressure under the various conditions. This could have been caused by a lack of time given for each condition. Inadequate time does not allow the body to adjust to the given conditions thus skewing the results.

There is however, a slight decrease in the blood pressure after five minutes of motionlessness. This was due to a decrease in activity that lowered the blood pressure. Pulse pressure remained constant throughout each condition. As hardening of the arteries sets in, this would be expected to increase. Lastly, pulse per minute exhibits a trend that is quite common. Reclining (relaxed) shows a pulse of 80. As the subject stands, blood rushes down to the feet. This causes the pulse to keep up in order to evenly striated the blood. My results concur with that phenomenon.