on of the same amounts of total energy was also

rally, cataracts produced at threshold levels
s thread-like opacities in an otherwise clear
se "threshold" cataracts gave the same gross
for all time durations that were employed.
tion was continued past initial cataract forma-
cataract grew very rapidly and could eventually
entire lens thickness. These growth
stics were studied by slit-lamp photography
s of cataracts produced at a single intensity
ied for various time intervals.
hysical mechanisms involved in any ultrasonic
erations should be identified for the most
extrapolation of animal data to human
or therapeutic systems. Therefore, the
ve data on both toxic irradiation conditions
ponding measures of macroscopic and
c structural changes are being employed to
cidate mechanisms, such as thermal phenomena,
for ultrasonic cataract production. These
ons also employed other types of measurements,
vivo absorptivity determinations, to provide
data on relevant tissue properties.

THE EFFECT OF CONTINUOUS WAVE ULTRASONIC THERAPY ON MYOCARDIAL INFARCTION IN THE DOG

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Previous studies have indicated that ultrasonic therapy has some beneficial effects on wound healing specifically with increased vascularity and decreased fibrosis formation. To investigate potential benefits in myocardial healing after ischemic and infarcted events, 24 dogs were studied after coronary artery ligation. Mongrel dogs weighing from 20 to 30 kg. were anesthetized with sodium pentobarbital (30 mg/kg) and a left thoracotomy was performed at the fifth intercostal space. A portion of the fifth rib was removed and the pericardium incised. The heart was suspended by suturing the pericardium to the thoracic wall at five or six points to form a cradle. The pericardium so attached retained the lung from the anterior surface of the heart and thus provided a very good window for the post-operative ultrasonic treatment. The left anterior descending coronary artery or one or two of its anterior branches were ligated depending on the distribution pattern. The dogs were divided into three groups of eight animals each. Group A was studied for four weeks post-operatively, Group B for three weeks and Group C for two weeks. Each group contained four dogs that were treated with the ultrasound and four control dogs that received placebo massage with no ultrasound therapy. Treatment with ultrasound was commenced between six and eighteen hours after surgery using a continuous wave ultrasonic source. The frequency used was 1MHz, the average intensity was 1.5 watts/cm^2, and the treatments were performed for ten minutes three times a day on weekdays and twice a day on weekends. Control dogs were handled the same as treated ones, except that the ultrasonic generator was turned off. The transducer was coupled to the shaved chest wall with a water-soluble gel. The total power output of the ultrasound unit was checked weekly on a radiation

pressure measurement device to verify stability. Electrocardiograms were taken before coronary artery ligations and post-operatively on days 1, 2, 3, 4, 7, 14, 21 and 28. Blood samples for total LDH and LDH isoenzymes were obtained pre-operatively and then post-operatively at days 1, 2, 3, 7, 14, 21 and 28. At the termination of the treatment period, the animals were anesthetized and the heart was removed and perfused with an enzyme specific solution which stained the viable tissue a deep blue and left the infarcted area (dehydrogenase depleted) unstained. After formalin fixation the heart was sectioned transversely at 1 cm intervals from apex to base. Blocks for histological study were selected and stained with H and E and Masson's tetrachrome.

A rise in the myocardial fraction of the serum LDH isoenzymes gave indications of myocardial damage and verified the infarctions. The untreated controls peaked higher than the isoenzyme levels of the treated animals. On several animals with pronounced premature ventricular contractions, the ultrasound treatments seemed to elicit some anti-arrhythmic response and restored the sinus rhythm. A blind histological examination was performed and the infarcted areas treated with ultrasound demonstrated (1) a decrease in the dense collagenous scar tissue, (2) more vascularization and (3) more viable myocardial cells around the small arteries and arterioles (perivascular sparing). This preliminary study has indicated significant effects which are difficult to quantify from histological findings. Studies are underway to evaluate functional aspects more quantitatively.

EFFECTS OF EXPOSURE OF THE NINE-DAY RAT EMBR

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Review of the literature indicates that deleterious effects on development but that some indeterminate level above that used cli scribe our ongoing studies which are providi on the relationships between the intensity o embryo and the effects produced. These incl experiments using 3.2 and 0.71 continuous wa ultrasound to simulate doppler, therapeutic, ditions respectively.

In each case, individual embryos at 9 d exposed for 5 to 15 minutes to randomly assi ultrasound. The focused beams are coupled d nant uterus, which is exteriorized through a We have performed detailed calibrations to d and shape of the beams and so may express ex sity incident on the uterus. The effects of ated after 20 days of gestation by detailed

The studies with 3.2 MHz continuous wav completed, resulting in typical sigmoid curv to intensity. The curves for 5 and 15 minut significantly different, providing a pooled an "apparent threshold" of about 3 W/cm^2. N length of the surviving fetuses was affected malformations were observed; these were foun sonated at intensities of 10.5 W/cm^2 and gre

The studies at 0.71 MHz are not yet com sufficient data for preliminary analyses. T