

Investigating the cardiac effects of Sildenafil loaded nanoparticles on heart failure using the Zebrafish Embryo Model

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Background

Cardiovascular diseases (CVDs) are the first cause of death worldwide [1]. Vasodilator agents are used to relax cardiac muscle, but their extremely short half-lives limit their effectiveness. Sildenafil is such an agent used to relax the blood vessels muscles and increase the blood flow [2]. The conventional drug can lead to serious problems in patients due to the systematic drug delivery. Use of Nanomedicine potentially can enhance delivery of this agent while reducing the systematic effect of the drug [3].

Aim

The purpose of the research is to examine the effectiveness sildenafil loaded nanoparticles in rescuing heart failure using zebrafish embryo model.

Methodology

There will be five experimental groups. The zebrafish will be treated with Aristolochic Acid (AA) at 24 hour per fertilization (hpf) to create the heart injury group. The treatment groups will be heart injury followed by a dose of either Sildenafil or Sildenafil loaded nanoparticles at 36 hpf. Two control groups will be the negative control (exposed to egg water) and vehicle control (exposed to the Dimethylsulfoxide (DMSO)). To evaluate the drug effects on embryo, toxicity assessment (Survival rate, tail flicking and hatching rate), cardiotoxicity assessment and gene expression of heart injury marker via RT-PCR will be conducted.

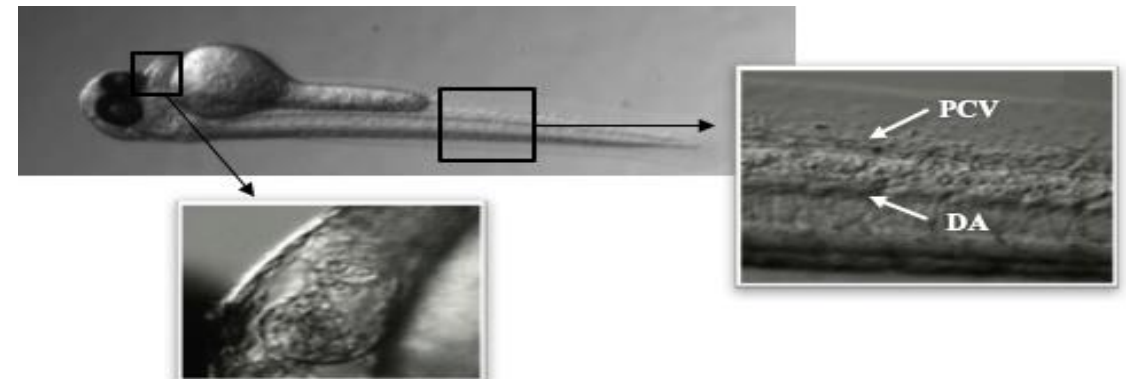
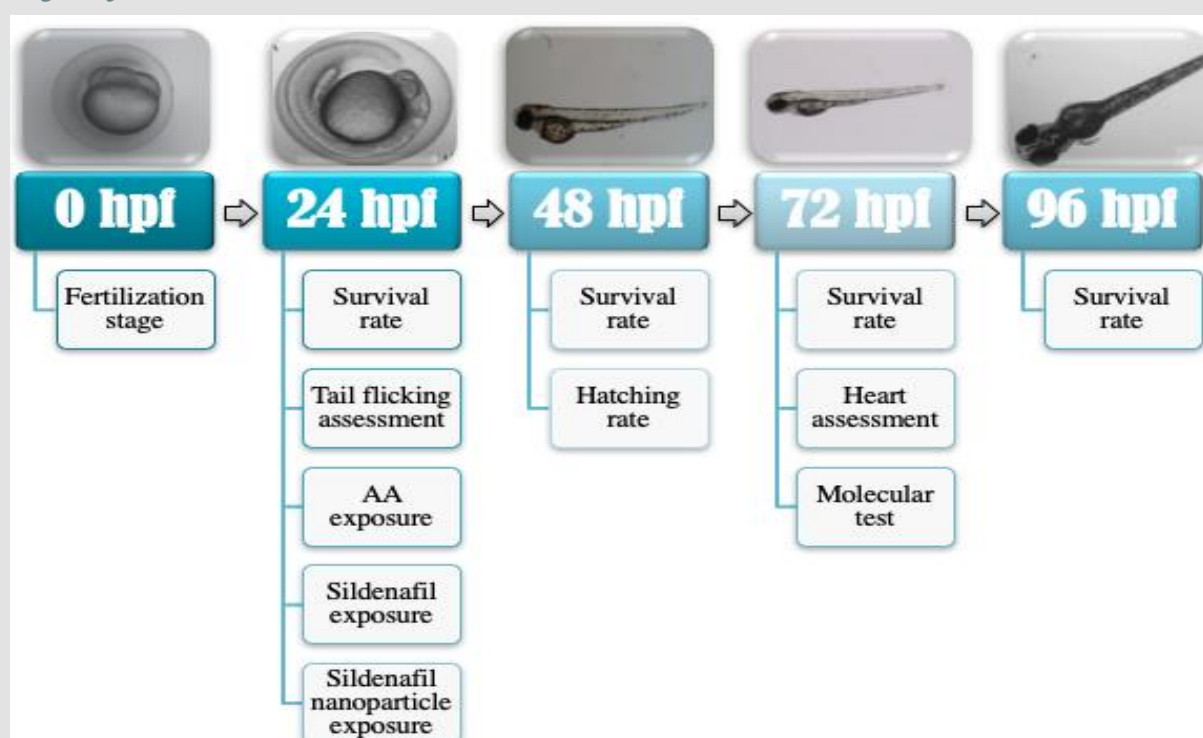


Figure 2: Image acquisition for Zebrafish embryo; posterior cardiac vein (PCV), distal aorta (DA).

Results

Preliminary findings demonstrate, loading Sildenafil to nanoparticles enhances its effectiveness dramatically. The experiments are ongoing to confirm the results.

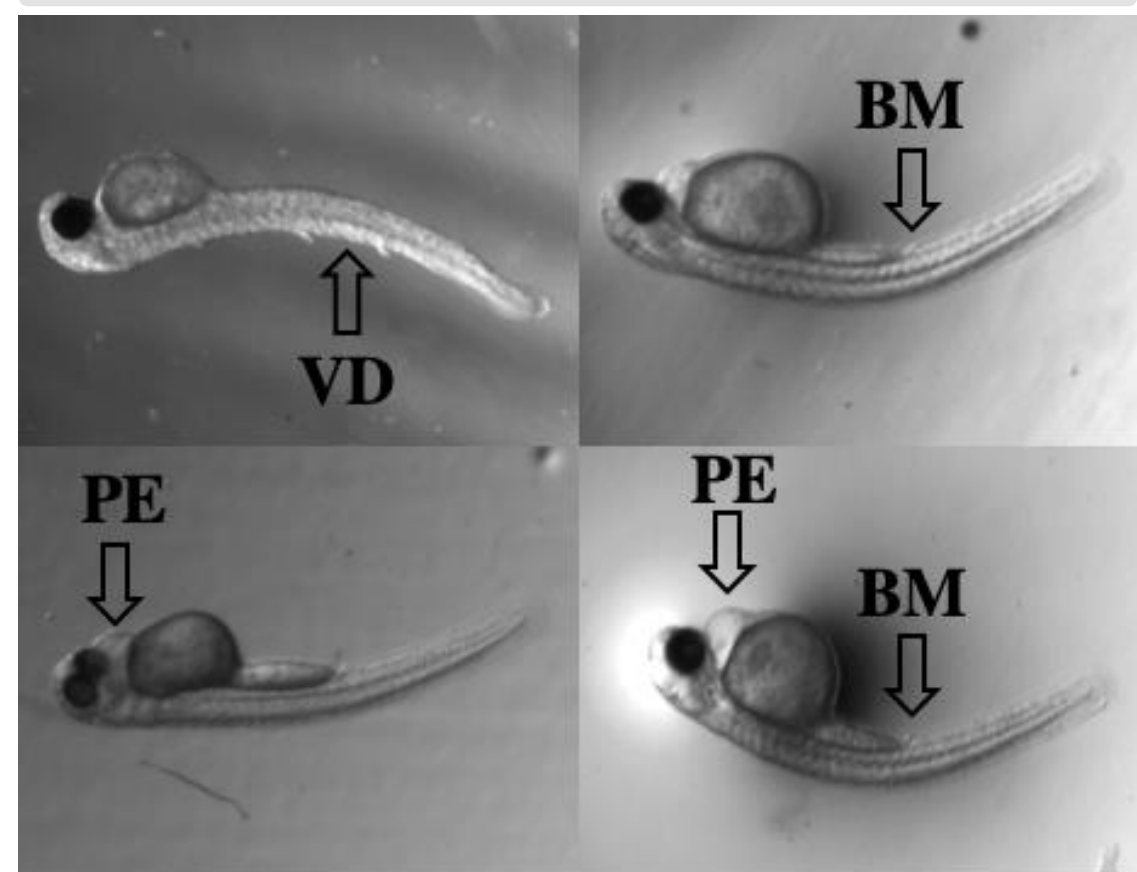


Figure 1: different types of malformation induced by Aristolochic acid (AA); vertebral deformation (VD), body malformation (BM), pericardial edema (PE).

Conclusion

Nanomedicine is a powerful approach to enhance cardiovascular therapy. Vasodilator drugs in particular will benefit from this improvement as demonstrated with our findings.

References

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