

**Movie 1:** Normal heart development from a left dorsal view at 30 hpf. Real-time recording shows the heart tube which is small and linear at this stage in development. The tube is only able to pump a few blood cells per contraction. The heart tube is visible dorsal and posterior to the left eye. Due to the fact that the tube is deep inside the embryo, it is hard to see if cardiac jogging has occurred.

**Movie 2:** Normal heart development from a left rostral view at 36 hpf. Real-time recording shows the heart tube which has become elongated and cardiac jogging is visible where the ventricle is bent towards the right side of the embryo. Circulation has increased from 30 hpf and more blood is being pumped through the tube with each contraction. Blood cells can be seen moving on the yolk sac before entering the heart tube. An initial large contraction occurs in the atrium region and is followed by a second, smaller contraction in the ventricle region.

**Movie 3:** Normal heart development from a frontal view at 55 hpf. Real-time recording shows the heart tube which has undergone heart looping where the ventricle loops back toward the left side of the embryo creating an S-shaped tube. The circulation has greatly increased at this stage with a steady stream of blood flowing through the heart with each contraction. There is a distinct contraction in the atrium region, followed by a second contraction in the ventricle region.

**Movie 4:** Normal heart development from a frontal view at 3 days post-fertilization. Real-time recording shows the chambers of the heart tube have continued to become enlarged with ballooning out of the chambers. The AV canal has narrowed, which helps to separate the atrium and the ventricle which have become significantly more defined. Also, the chambers are contracting faster and pumping more blood increasing the amount of circulating blood throughout the embryo.

**Movie 5:** Repositioning of the heart tube from the left side of the embryo. Time-lapse recording of an embryo starting at approximately 30 hpf, when the heart tube starts to beat and is positioned on the dorsal side of the embryo. The recording ends at 3 days post-fertilization when the heart tube has reached the ventral side of the embryo.

**Movie 6:** Less severe Wide Atrium at 36 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a frontal view. The heart tube does not demonstrate normal cardiac jogging and remains linear. The opening to the atrium region is expanded.

**Movie 7:** More severe Wide Atrium at 36 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from the right ventral view. The heart tube has an enlarged opening to the atrium region. The tube does not undergo normal heart jogging. Blood only flows from one side of the yolk sac which is abnormal compared to control embryos where blood flows in from both sides. In between the contractions of the heart tube, the blood flows backward which is referred to as retrograde blood flow.

**Movie 8:** Small Heart at 36 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a frontal view. Both the atrium and the ventricle are greatly reduced in size. There is no circulation and a large amount of fluid has collected around the tube. It is difficult to determine if there is an opening to the atrium for blood to flow through.

**Movie 9:** Wide Atrium with enlarged opening at 55 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a frontal view. The atrium has a very wide opening. The blood flows from only one direction on the yolk sac which is abnormal. In normal development, blood flows in from both directions. Also, the channel which the blood flows through is abnormally deep. The heart tube does not demonstrate normal heart looping but remains linear. The ventricle does not demonstrate normal ballooning out to form the chamber.

**Movie 10:** Wide Atrium at 55 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a frontal view of the embryo. The atrium is enlarged. The ventricle has remained narrow and has not undergone cardiac looping. This heart tube is not able to pump blood and blood cells can be seen moving back and forth in response to pressure changes.

**Movie 11:** Wide Atrium with normal heart looping at 55 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a frontal view of the embryo. The atrium region is enlarged and the ventricle has remained narrow, but still undergoes heart looping.

**Movie 12:** Linear Heart tube at 55 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows that the atrium is enlarged and ballooned out as seen in normal development. However, the ventricle remains narrow and heart looping has not taken place. The flow of the blood through the heart tube is greatly reduced.

**Movie 13:** Linear Heart tube at 55 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows that the heart tube remains straight and does not undergo heart looping. There is no ballooning out of the atrium and the ventricle. This heart tube is not able to pump blood as effectively, and less blood flows through the tube with each contraction.

**Movie 14:** Small Heart with reduced atrium and ventricle at 55 hpf in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows how both the atrium and the ventricle are truncated. In many of the embryos it is difficult to distinguish between the atrium and the ventricle cells and there is not a clear opening to the tube. This heart tube morphology is not able to pump blood cells.

**Movie 15:** Wide Atrium at 3 days post-fertilization in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows how the tube has still not undergone normal heart looping where the ventricle is shifted to the right side of the embryo. The heart tube is shown from a frontal view of the embryo.

**Movie 16:** Wide Atrium with heart looping at 3 days post-fertilization in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a frontal view of the embryo. The heart tube has undergone normal heart looping where the ventricle is shifted to the right side of the embryo. From this recording it is difficult to see blood cells moving through the heart tube due to the large amount of fluid which surrounds the tube.

**Movie 17:** Small Heart at 3 days post-fertilization in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows the heart tube from a ventral view of the embryo. Both the atrium and the ventricle are greatly reduced in size and as a result, the heart tube cannot pump blood. Also, there is not a clear opening to the atrium for blood to flow through.

**Movie 18:** Linear Heart at 3 days post-fertilization in an embryo treated with  $10^{-6}$  M retinoic acid. Real-time recording shows that the heart tube from a ventral view of the embryo. The heart tube does not undergo normal heart looping and chamber ballooning out. There seems to be decreased blood flow.

**Movie 19:** Wide Atrium at 55 hpf treated with  $10^{-6}$  M retinoic acid for 2 hours. Real-time recording shows that the atrium is greatly expanded and the ventricle is significantly reduced in size. The heart tube is contracting but no blood cells are being pumped through the heart tube. Blood cells surround the tube and move back and forth in response to pressure changes.

**Movie 20:** Wide Atrium with a truncated ventricle from the right side at 55 hpf treated with  $10^{-6}$  M retinoic acid for 2 hours. Real-time recording shows that the atrium is greatly expanded and the ventricle is truncated. The heart does not seem to be able to pump effectively due to the lack of circulation.