

A Step Forward in Treating Serious Genetic Disorders Before Birth

Evidence is mounting that clinicians can treat serious genetic disorders prenatally by injecting medicine into the amniotic fluid, thus preventing damage that begins in utero.



DISCOVERY

A UCSF-led study in mice and sheep found that delivering medicine via the amniotic fluid for spinal muscular atrophy (SMA) — a neurodegenerative disease that causes muscular weakness, atrophy, and death if untreated — was safe and helped prevent damage to nerve cells in the spinal cord, a part of the central nervous system that is responsible for movement.

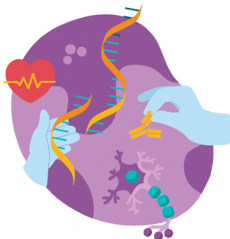
CHALLENGE

Children with severe forms of SMA can have irreversible damage by the time they are born. Current therapies are given to patients after birth, but research has shown that SMA can be diagnosed before birth and that the expression of the genes involved in the disorder can be manipulated prenatally.



DESIGN

In the first research on treatment for SMA via the amniotic fluid — a less invasive method than the other possible route via the umbilical vein — UCSF researchers tested a therapy using molecules called antisense oligonucleotides, or ASOs, which can alter the expression of genes through interactions with RNA, which creates proteins.



RESULTS

Our study team found that mice treated prenatally with ASOs fared better in terms of survival, motor function, and motor neuron numbers than mice that were treated only after birth or did not receive treatment. In sheep, the researchers confirmed the safety of the treatment and its ability to reach the spinal cord and other organs in therapeutic concentrations via the amniotic fluid.

IMPACT

"This suggests we may be able to use amniotic fluid to deliver therapeutic RNA molecules for other severe, early-onset diseases that affect different areas of the body," says Tippi MacKenzie, MD, a fetal and pediatric surgeon at UCSF Benioff Children's Hospitals and a senior author of the study. The research team believes that with further study and U.S. Food and Drug Administration approval, correcting SMA before birth could eventually be an outpatient procedure.

