## BioMarin and hemophilia timeline

### 1800s

- **Hemophilia—The royal disease**
- **Mendel’s theory of inheritance**
- **DNA isolated**

### 1900s

- **Whole-blood transfusion in hospital**
- **DNA double helix described**

### 1970s

- **At-home replacement therapy available, with plasma-derived factor concentrates**
- **Dr. Barrie Carter begins work on AAV-mediated gene transfer biotechnology at the National Institutes of Health**
- **Dr. Gordon Vehar begins work on factor VIII**

### 1980s

- **Genes for factor VIII and factor IX are cloned**
- **The Centers for Disease Control (CDC) reports first AIDS case in hemophilia**
- **Dr. Gordon Vehar publishes a paper describing the use of AAV as a vector**
- **Dr. Wing Yen Wong begins hematology fellowship**

### 1990s

- **First gene therapy trial in humans**
- **Recombinant clotting factors approved**
- **BioMarin**
- **BioMarin incorporates**
- **Lessons learned regarding risks related to potential severe immune response in early gene therapy trial with non-AAV vector**

### 2000s

- **Prophylaxis becomes standard of care**
- **Human Genome Project completed**
- **First gene therapy trial in hemophilia B using AAV vector technology**
- **BioMarin therapies for rare diseases approved**
- **Mucopolysaccharidosis IVA 2014**
- **Neuronal ceroid lipofuscinosis type 2 2017**

### 2010s

- **Dr. Barrie Carter joins BioMarin**
- **Extended half-life factors approved**
- **BioMarin therapies for rare diseases approved**

### References