The R&D Tax Credit Aspects of Orphan Drugs
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Drug development is a long process that is traditionally very expensive and time consuming due to research investments and maintaining regulatory and safety requirements. Given the perils of profitability that a drug candidate faces, many are unprofitable due to the rarity of the diseases and disorders they are to treat. The development of orphan drugs involves risks in research and development that may qualify for federal and state R&D tax credits.1

The Research & Development Tax Credit
Enacted in 1981, the Federal Research and Development (R&D) Tax Credit allows a credit of up to 13 percent of eligible spending for new and improved products and processes. Qualified research must meet the following four criteria:

- New or improved products, processes, or software
- Technological in nature
- Elimination of uncertainty
- Process of experimentation

Eligible costs include employee wages, cost of supplies, cost of testing, contract research expenses, and costs associated with developing a patent. On December 19, 2014, President Obama signed the bill extending the R&D Tax Credit for the 2014 tax year.

Orphan Drugs and the Valley of Death
Orphan drugs are products intended for diagnosis, prevention, or treatment of rare and sometimes deadly conditions. The term “orphan” is used to describe the pharmaceutical industry’s disinterest in developing and marketing drugs at too great a cost that will only be used by a select group of patients with these rare diseases. Unwanted by the market at large, orphan drugs present challenges in medicine, economics, and ethics. Orphan drugs are growing at an 11% rate which is larger than regular prescription drugs, and sales are expected to make up 19% of the total share of prescription drugs by 2020.ii

The Valley of Death refers to the time period during a drug development pipeline where the highest costs in time and capital may cause development to be terminated. The Valley of Death contributes to the issues that orphan drugs encounter in being efficiently developed and marketed to people that could use them. One of the challenges in solving the economic and procedural problems in drug development is alleviating the Valley of Death period.iii

Answers to Developing Orphan Drugs
There are several emerging innovation trends that address the challenges of efficiently and quickly discovering, developing, and bringing to market orphan drugs. The number of FDA product approvals for orphan drugs is increasing with 49 products approved in 2014.
These increases demonstrate a corresponding increase in research and development activity necessary to generate new orphan drugs. In addition, the regulatory climate has been adjusting to the demands required to enable faster and cheaper drug development pipelines.\textsuperscript{iv}

**Research and Development Partnerships**

One of the contributing factors to the increase in approvals and requests for designation and approval is the partnership between companies in research. Drug discovery companies that offer testing for potential candidates, testing in mouse models, and other partnerships that distribute or split research activities between specialized groups of researchers or companies has resulted in a division of labor that plays to the productive strengths of different companies. Companies distribute the risks and burdens involved with different parts of the process to take drugs through development and to market.\textsuperscript{v}

**Technological Innovations in Mouse Models**

Advances in genetics has lead to the increased technological use of mouse models for disease and drug candidate testing, easing the time and cost requirements of taking drugs through the development pipeline. Mouse models are 95% genetically similar to humans therefore testing platforms and regiments can greatly help the drug development process. Mouse models are also advancing with the advent of large cooperative genetic databases for comparison, selection, and testing.\textsuperscript{vi}

**Precision Medicine**

Precision medicine is another trend that is driving innovation in orphan drugs by way of driving technological and process innovation throughout medicine. Precision medicine aims to move from generalized, inefficient treatments for physical ailments to personalized, customized, and scientifically-driven precision treatments for ailments. As precision medicine methods and practices gain wider use throughout medicine, orphan drugs may more easily find targeted pathways to users by leveraging growing amounts of data and analysis.\textsuperscript{vii} \textsuperscript{viii}

**The Orphan Drug Act**

One key component in addressing the Valley of Death is the recognition of the effect that economics have on the development of drugs for rare use. The Orphan Drug Act of 1983 facilitates the development of orphan drugs and provides benefits to drug manufacturers that obtain an orphan drug designation. These benefits include:

- Seven year market exclusivity
- A tax credit totaling 50% of clinical testing expenses
- Waiver of PDUFA drug application filing fees
- Coordination and priority review with the FDA
- Federal grants and contract funding to perform clinical trials

The 2013 revision of the Orphan Drug Act widened the scope of applicable populations a drug designated as an orphan drug may apply to in the eyes of the Orphan Drug Act. While the nature of this change may be very specific, it has contributed to the increase of requests and approvals and has sped up the development of orphan drugs.\textsuperscript{ix}

**Conclusion**

Technological innovations across many fields of medicine are driving increased research and development, including research and development in the creation, development, and the bringing to market of orphan drugs. The activities involved in the drug development R&D process may qualify for federal and state R&D tax credits which can help shoulder the costs of bringing orphan drugs through the development pipeline.

\footnotesize{i} "About Orphan Drugs" http://www.eurordis.org/about-orphan-drugs
\footnotesize{ii} "Orphan Drugs & Rare Diseases Global Congress 2015 Europe" http://www.paradigmglobalevents.com/events/orphan-drugs-rare-diseases-global-congress-2015-europe/


