

Abstract/Introduction

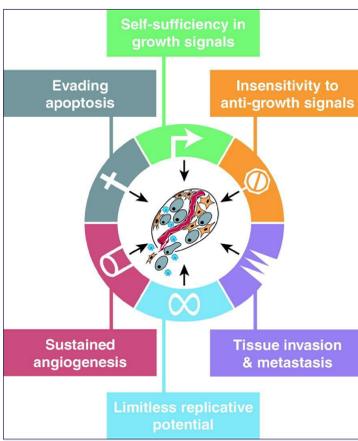
How much must be known about a disease, the human body, and the relationships between the two in order to treat that disease successfully? One of the major debates in the philosophy of biology is centered on the understanding of scientific processes and how those processes can be explained when they occur across different levels in the body. This poster will argue that the best way to provide a medical explanation that will lead to successful treatment is through the use of a mechanistic model. This will be presented through two examples, the first of which is an example that emphasizes the importance of mechanisms in developing new and successful treatments for cancer. The second example tells the of about how failing to understand the mechanism of biointeraction for the drug Thalidomide led to dangerous consequences. This poster will then present the most fitting mechanistic theory to provide an adequate medical explanation. This theory has been developed by Carl Craver, and though he did not intend it to be used as a medical explanation it provides the necessary scaffolding for a sufficient medical explanation that is likely to lead to more successful treatments.

Goal

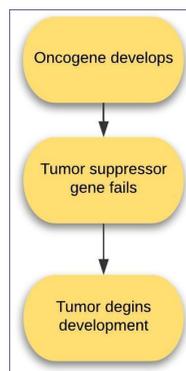
- Argue for the strength of a mechanistic model in explaining disease and maximizing treatment success

Cancer Basics

- Cancer is a family of diseases in which there is uncontrolled cell growth and proliferation
- 6 Hallmarks of Cancer:



- Cancer development is a stepwise process:



A Brief History of:

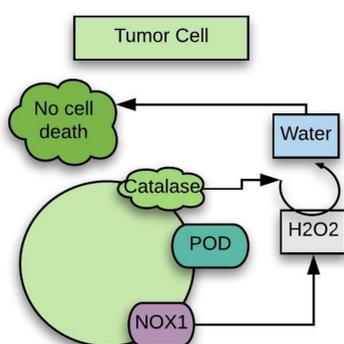
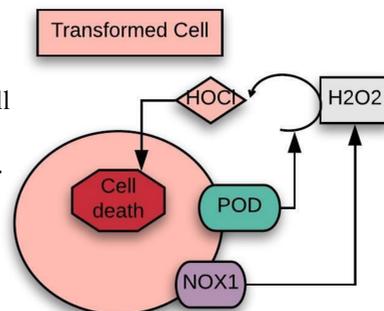
Our Understanding of Cancer Treatment and Cancer Mechanisms

- | | |
|---|--|
| 1. Rudolph Virchow, 1855 | 1. Learned that cancer cells are not a foreign agent, but of our own body |
| ○ Cancer cells are derived from our cells | |
| 2. William Halsted, 1882 | 2. Learned that cancer cells spread, and removing more tissues removes more cancer |
| ○ Pioneered radical mastectomy | |
| 3. Sidney Farber, 1940's | 3. Soft tumors can't be surgically removed, but can be poisoned |
| ○ First chemotherapy | |
| 4. Watson, Crick, Franklin, 1950's | 4. Cancer arises due to genetic failures |
| ○ Discovery of DNA, beginning of genetics | |

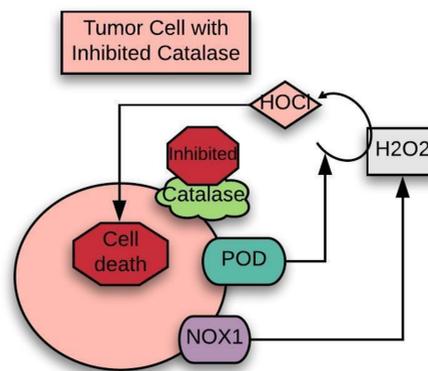
★ **The point: the better we understand the mechanism, the better we are able to treat disease**

Example One: Cancer

- The Bauer research group has developed a novel cancer treatment by identifying membrane proteins that are specific to tumor cells. These proteins are involved in the HOCl signaling pathway, which is initiated once cells become genetically altered
- Transformed cells can fall victim to HOCl pathway, which initiates cell death. When this happens, a tumor cannot form



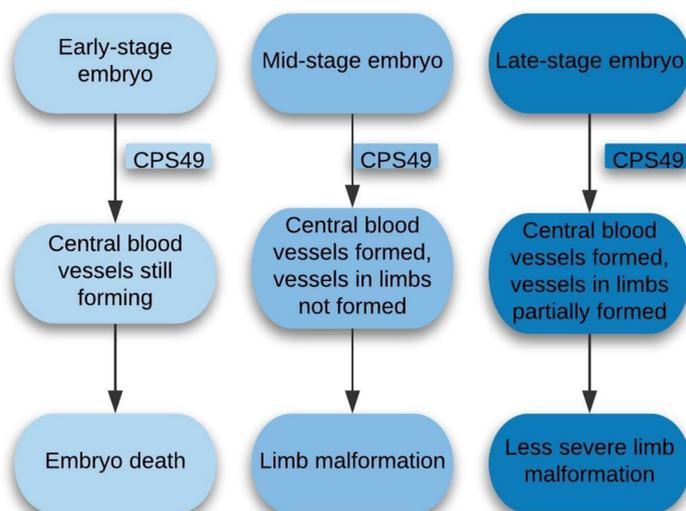
- Tumor cells can escape the HOCl pathway and subsequent death through expression of catalase enzyme



- Inhibiting catalase through drug treatment can reactivate the HOCl pathway to cause cancer cells to kill themselves

Example Two: Thalidomide

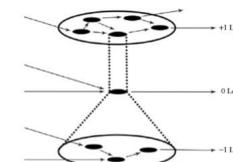
- Therapontos et al. run an experiment to understand why Thalidomide caused birth defects in the 1960's



- This experiment elucidated mechanisms associated with development of birth defects due to Thalidomide consumption
- It also allowed us to see what went wrong so that we do not make the same mistakes in the future

Craver's Theory of Mosaic Unity

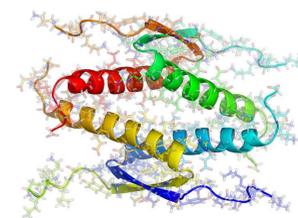
- Craver's theory can be characterized by two major focuses: mechanisms, and the organization of mechanisms
- Mechanisms: entities and activities that are organized so that they produce or underlie phenomena of interest



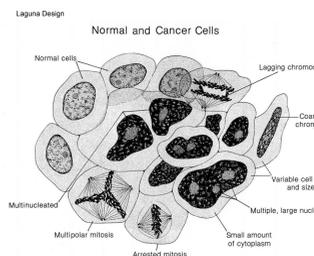
- Mechanisms are organized in hierarchies, meaning that some mechanisms are components of other levels, and a component in that same mechanism can include within it its own smaller mechanism

Why are mechanisms the best model for a disease explanation aimed at successful treatment?

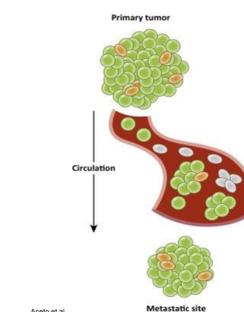
- They value information that comes from focusing on the molecules, cells, tissues, organs, and organism



- Behavior of tumor suppressor p53 determines whether or not a cell will become cancerous



- Multiple characteristics of a cell determine its grade, or how cancerous it is



- Whether or not a tumor metastasizes and where it goes determines how dangerous it is to a patient's life

Conclusions

Craver's theory of mosaic unity provides the best model for a disease explanation aimed at successful treatment because it is able to focus on the molecules, cells, tissues, organs, and organism, and because it can accommodate higher level causes. Doing these things allows Craver's model to provide information sufficient for successful medical treatment

Acknowledgements

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