Current research in the field of Literature Discovery is focused on hypothesis generation from biomedical literature. Most of these algorithms are dedicated to produce a data-specific type of hypothesis called Pairwise relations by interacting with biomedical and healthcare research libraries such as MEDLINE®. To fully implement the potential of Literature Discovery, BioCAID has developed the IMDI Profiler platform, a comprehensive research supporting application that delivers identification of hidden relationships with generation and conceptual integration of multiple types of biomedical hypotheses.

## Pairwise

The research activities in the domain of conceptual biology can be traced back to Swanson's work in 1986 that discovered the novel connection between Raynaud disease and fish oils by examining two disjointed biomedical literature sets [1]. The hypothesis of the beneficial effect of fish oils on Raynaud disease was proven by an independent clinical trial two years later, which demonstrated the value of literature as a potential source of new knowledge. Swanson's hypothesizing model can be simply described as "A relates to B, B relates to C, therefore A may relate to C", so called Swanson's ABC model [2, 3].

One of the types of hypothesis generated by the platform is called Pairwise, which is based on Swanson's ABC model. Nevertheless, our platform generates this type of hypotheses in a batch/mining mode rather than retrieval mode adopted by other works. In other words, our platform is able to generate all Pairwise hypotheses embedded in the underlying literature database, instead of generating one or several hypotheses at one time based on the users query. The advantage of using batch/mining mode is that it may generate hypotheses that are really novel and crossing fields, rather than being bounded by the user's initial thinking.
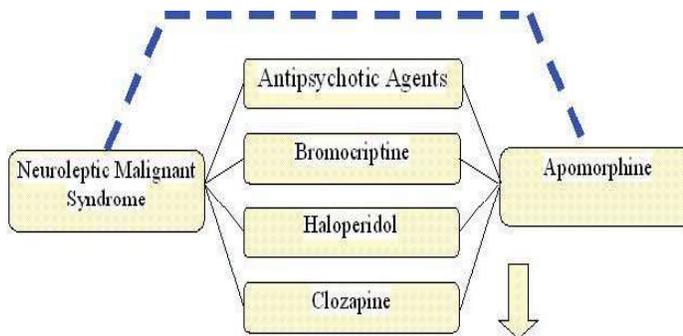


## Chaining

Our platform also automatically generates another new type of hypotheses that is called "chaining". The basic model for chaining is that "If concept A relates to B, B relates to C, and A relates to C, then A, B, and C may be related altogether". This type of hypothesis may help identify chaining relation among chemical compounds, predict biologic pathways, and analyze combinational effects of drugs.

### Example:

Vincristine and Carmustine are chemo-therapy drugs given as a treatment for some types of cancer. Articles also show that Carmustine and Vincristine are used in combination chemotherapy. Semustine is an investigational chemo-therapy drug and articles show its use in combination with Vincristine. However there has not been any evidence of all three drugs being used in combination and thus our algorithm suggests this as a hypothesis.
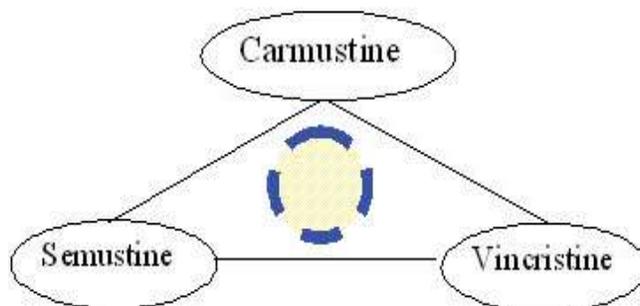
**Substitution**

Another new type of hypotheses generated by our platform is called "substitution". The basic model for substitution can be described as "If concept *A* is similar with *C*, and *A* is strongly related to *B*, then *C* may be also related to *B*".

**Example:**

"Vinblastine" and "Prednisone" have strong relations with quite a few common concepts including "Methotrexate", "Breast Neoplasms", "Hodgkin Disease", and many others. These two concepts are found to be similar to each other according to context similarity. "Asthma" is one of the concepts that is associated with "Prednisone," but not with "Vinblastine".
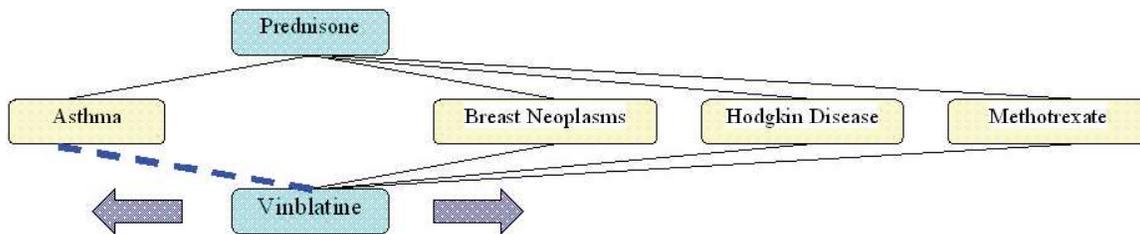


References for: **Hypothesis Generation Algorithms**

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**Find the Hidden Relationships in Biomedical Research**

To walk through a demonstration video of an Alpha prototype from our prior research, go to www.biocaid.com and click DEMO. In this self-guided demo, you will be able to see how the functionality of the IMDI Profiler organizes and presents relationships between publications and terms to support the visualization, navigation and integration of Concepts and researcher interests in the MEDLINE Library.

If you have questions about system features or our company, please contact BioCAID via e-mail: info@biocaid.com