

# Developing Graphical Abstract for Your Research Question

Pamela Walter, MFA  
GC730 Scientific Writing

# Purpose of this session

- Brainstorm a research question for your literature review.
- Create a pictorial or graphical expression of your research question.
- Review nouns and verbs.

## Benefits of reviewing the literature

- Discover current research in your field
- Learn about various research processes
- Begin to evaluate those processes
- Gain exposure to research writing
- Get ideas!!

# Research Questions Should

- Focus on a single problem or issue
- Be researchable using primary or secondary sources
- Be feasible to answer within our constraints
- Be specific enough to answer thoroughly
- Be complex enough to answer in a paper or thesis
- **Matter to your field of study or society**

# Why use a graphical abstract?

- Recognize the graphical abstract's purpose
- Analyze examples
- Describe elements you want in yours
- Use a tool to plan & sketch yours
- Get peer feedback for later revising

# The Walter Bedtime Story: The V8 engine



## According to Elsevier, graphical abstracts should:

- Capture the content at a single glance
- Allow readers to quickly get the take-home message
- Encourage browsing
- Promote interdisciplinary scholarship
- Help readers identify relevant research faster

# What to look for in a graphical abstract

- Is the story clear?
- Does it summarize the research?
- Is it simple and uncluttered?
- Is it enough?



# Without or With a graphical abstract (not whiz)

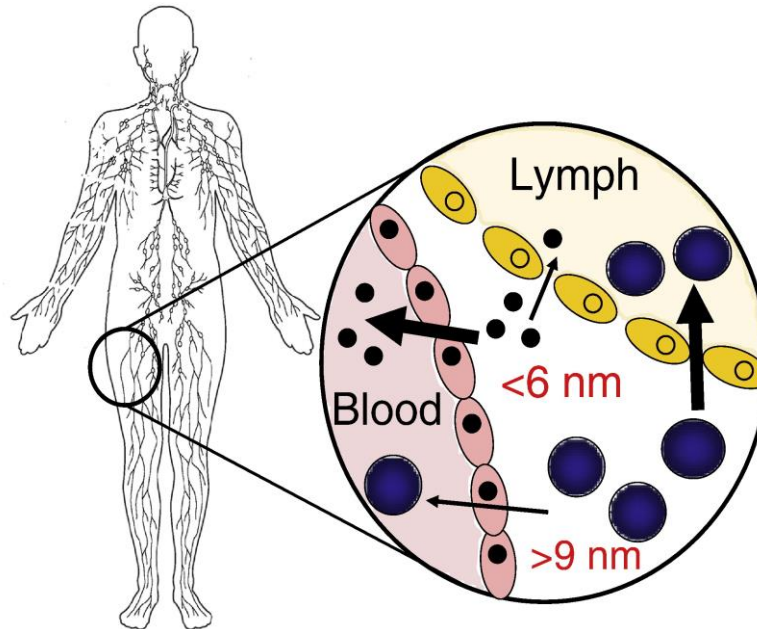
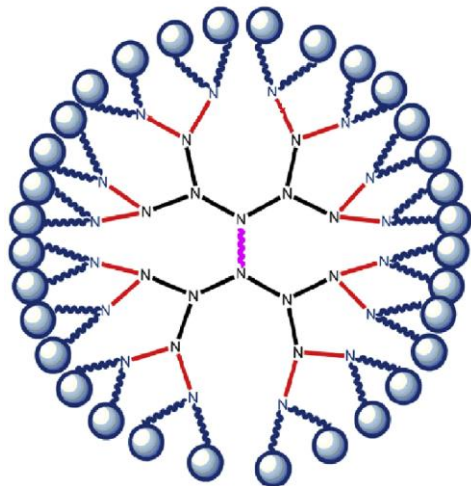
## Abstract

Dendrimers are unique biomaterials that are constructed by the stepwise addition of layers (generations) of polymer around a central core. They can be constructed with a range of molecular weights and have a polyfunctional surface that facilitates the attachment of drugs and pharmacokinetic modifiers such as PEG or targeting moieties. These properties have led to considerable interest in the development of dendrimers for a range of biomedical applications. After subcutaneous administration, larger dendrimers in particular ( $> 8$  nm), preferentially drain from the injection site into the peripheral lymphatic capillaries and therefore have potential as lymphatic imaging agents for magnetic resonance and optical fluorescence lymphangiography and as vectors for drug-targeting to lymphatic sites of disease progression. In general, lymphatic targeting of dendrimers is enhanced by increasing size although ultimately larger constructs may be incompletely absorbed from the injection site. Increasing hydrophilicity and reducing surface charge enhances drainage from subcutaneous injection sites, but the reverse is true of uptake into lymph nodes where charge and hydrophobicity promote retention. Larger hydrophilic dendrimers are also capable of extravasation from the systemic circulation, absorption into the lymphatic system and recirculation into the blood. Lymphatic recirculation may therefore be a characteristic of PEGylated dendrimers with long systemic circulation times.

## Abstract

Dendrimers are unique biomaterials that are constructed by the stepwise addition of layers (generations) of polymer around a central core. They can be constructed with a range of molecular weights and have a polyfunctional surface that facilitates the attachment of drugs and pharmacokinetic modifiers such as PEG or targeting moieties. These properties have led to considerable interest in the development of dendrimers for a range of biomedical applications. After subcutaneous administration, larger dendrimers in particular ( $> 8$  nm), preferentially drain from the injection site into the peripheral lymphatic capillaries and therefore have potential as lymphatic imaging agents for magnetic resonance and optical fluorescence lymphangiography and as vectors for drug-targeting to lymphatic sites of disease progression. In general, lymphatic targeting of dendrimers is enhanced by increasing size although ultimately larger constructs may be incompletely absorbed from the injection site. Increasing hydrophilicity and reducing surface charge enhances drainage from subcutaneous injection sites, but the reverse is true of uptake into lymph nodes where charge and hydrophobicity promote retention. Larger hydrophilic dendrimers are also capable of extravasation from the systemic circulation, absorption into the lymphatic system and recirculation into the blood. Lymphatic recirculation may therefore be a characteristic of PEGylated dendrimers with long systemic circulation times.

Targeting the lymphatics using dendritic polymers (dendrimers)



# Graphical Abstract in a grant

## Background and Hypothesis

Prostate cancer (PC) is the most frequently diagnosed non-cutaneous malignancy amongst American men, with over 170,000 new cases and a predicted number of deaths of over 30,000 in 2019. While for the local stages of the disease the overall survival rates are pretty encouraging, once PC has spread to distant organs it becomes incurable (American Cancer Society, 2019). Currently, the mechanisms of prostate tumor progression to a lethal resistant disease stage are not fully understood. Thus, elucidating novel, targetable key molecules and pathways that might contribute to PC lethality is a major task that needs to be endeavored for improving clinical outcome. Among the molecular determinants that regulate cell transitioning to a more aggressive phenotype are transcription factors (TFs).

In this context, by interrogating publicly available transcriptomic datasets and experimental models, we have unveiled new roles of key TFs that contribute to PC aggressiveness. In particular, we identified how the pioneer TF GATA2 regulates the expression of IGF-2 (Vidal et al., 2015) and more recently nucleoporin POM121, which in turn enhanced the transcriptional activity of MYC, E2F1 and AR (Rodriguez-Bravo, Pippa et al., 2018).

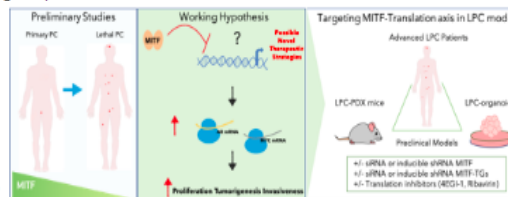
Most notably, in this proposal we have followed a similar experimental approach and have uncovered the potential role of another TF, namely Microphthalmia transcription factor (MITF), in regulating the aggressiveness of PC cells. MITF belongs to the "Mi" transcription factor family, which regulates gene expression by binding to E-box motifs with the consensus-binding sequence CA(C/T) GTG (Slade et al., 2017). MITF has been mainly linked to melanocyte development and differentiation (Chell et al., 2010), and it has been described to have major functions in melanoma, behaving as an oncogene when amplified and facilitating tumor invasiveness when its levels are low (Carreira et al., 2006). Its role in other tissues and types of cancer remains largely unexplored. Our preliminary studies have unveiled that MITF expression is significantly reduced in lethal PC (LPC) tumor samples and functionally impacts the proliferation, invasiveness, and tumorigenicity of PC cells. **Thus, this leads to the hypothesis that MITF counteracts PC aggressiveness by modulating a specific signaling network that yields to PC lethality.**

In this proposal, we seek to decipher the molecular contribution of MITF-controlled mechanisms to LPC focusing on its potential role on protein synthesis regulation *in vitro* and *in vivo* experimental LPC models. Upon completion, the proposed research has the potential to identify new molecular mechanisms that may be used to develop novel biomarkers and therapeutic approaches to improve the clinical outcome of this devastating disease (Figure 1).

## Research Strategy

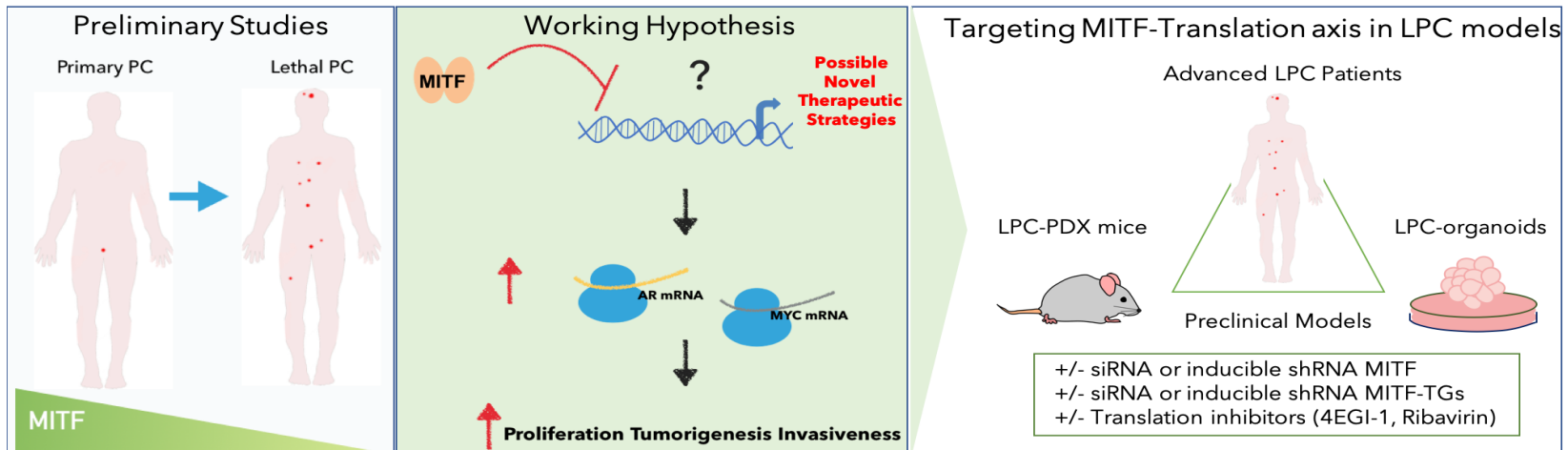
Our preliminary studies indicate that MITF is significantly reduced in metastatic LPC and that its reduction enhances cell proliferation, tumorigenesis, and invasiveness by regulating a subset of genes involved in protein synthesis. Dissecting the mechanisms by which MITF buffers PC aggressiveness will enable the finding of novel potential therapeutic targets and biomarkers for LPC.

To achieve these goals, we propose a three-year research strategy with two aims. In **Aim 1**, we will assess the impact of MITF on PC protein synthesis and will define which protein-synthesis-related MITF target genes (TGs) are key for PC progression and aggressiveness. In **Aim 2**, the MITF-translation regulated TGs-axis will be functionally validated and the efficacy of pharmacological inhibition of specific protein synthesis components will be tested in preclinical models (i.e. PDX models and organoids) and patient tumor samples.



**Figure 1. Hypothesis and research approach cartoon.** Preliminary data identified downregulation of MITF in publicly available datasets. Transcriptomic and computational analysis showed MITF controls a clinically significant signaling network that increases the translation of MYC and AR mRNAs, contributing to PC aggressiveness. The mechanistic study of MITF-translation axis promises to uncover novel therapeutic strategies for PC. Finally, the targeting of the MITF-translation axis will be validated in preclinical advanced LPC models.

# Graphical Abstract in a grant (expanded)



- **Figure 1. Hypothesis and research approach cartoon.** Preliminary data identified downregulation of MITF in publicly available datasets. Transcriptomic and computational analysis showed MITF controls a clinically significant signaling network that increases the translation of MYC and AR mRNAs, contributing to PC aggressiveness. The mechanistic study of MITF-protein synthesis axis promises to uncover novel therapeutic strategies for PC. Finally, the targeting of the MITF-translation axis will be validated in preclinical advanced LPC models.

# Describe elements you want in yours

# Plan and sketch a **draft** of a graphical abstract

<b>Who is my audience?</b>	
Research question: Hypothesis:	
What's unknown/the gap?	
How can I summarize my research graphically? <ul style="list-style-type: none"><li>• Photograph</li><li>• Flowchart</li><li>• Diagram</li><li>• Image</li><li>• Clip Art</li></ul> <b>Sketch it in this space -&gt;</b>	

## Get peer feedback on your sketch

- Exchange sketches with a partner
- Take turns
- Ask questions
- Tell them what works
- Suggest any improvement

# What to look for in a graphical abstract

- Is the story clear?
- Does it summarize the research?
- Is it simple and uncluttered?
- Is it enough?



# Adobe: free for Jeffersonians

- <https://www.jefferson.edu/adobe.html>

# Review Nouns and Verbs

Noun = person, place, thing, or idea

Verb = action

Cells (noun) mutate (verb).

## Zombie nouns are dead verbs

Find the actions:

We came to the realization that we could perform an investigation of the feasibility of the technique.

This system has applicability to development of catalysts.

## Zombie nouns are dead verbs

Find the actions:

We came to the **realization** that we could perform an **investigation** of the feasibility of the technique.

This system has **applicability** to **development** of catalysts.





**Jefferson**

Philadelphia University +  
Thomas Jefferson University

---

HOME OF SIDNEY KIMMEL MEDICAL COLLEGE