



## Tumor cells metastasis and Enzymes involved

**Chauhan JM<sup>1\*</sup>, Fefar DT<sup>1</sup>, Rathod PG<sup>2</sup> and Ramchandani DM<sup>3</sup>**

<sup>1\*</sup>Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh, Gujarat, India

<sup>2</sup>Department of Veterinary Physiology and Biochemistry, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Navsari, Gujarat, India

<sup>3</sup>Department of Veterinary Pharmacology and Toxicology, College of Veterinary Science and Animal Husbandry, Kamdhenu University, Junagadh, Gujarat, India

<https://doi.org/10.5281/zenodo.7414529>

### Metastasis

The spread of cancer cells from the place where they first formed to another part of the body. In metastasis, cancer cells break away from the original (primary) tumor, travel through the blood or lymph system, and form a new tumor in other organs or tissues of the body. The new, metastatic tumor is the same type of cancer as the primary tumor. For example, if breast cancer spreads to the lung, the cancer cells in the lung are breast cancer cells, not lung cancer cells.

### How metastases develop?

Metastases is the plural form of metastasis. Metastases most commonly develop when cancer cells break away from the main tumor and enter the bloodstream or lymphatic system. These systems carry fluids around the body. This means that the cancer cells can travel far from the original tumor and form new tumors when they settle and grow in a different part of the body. Metastases can also sometimes develop when cancer cells from the main tumor, typically in the belly, or abdominal cavity, break off and grow in nearby areas, such as in the liver, lungs, or bones. Any type of cancer can spread. Whether this happens depends on several factors, including:

- The type of cancer. Some cancers are more likely to spread than others
- How fast the cancer is growing

- Other factors about the behavior of the cancer that your doctor may find.

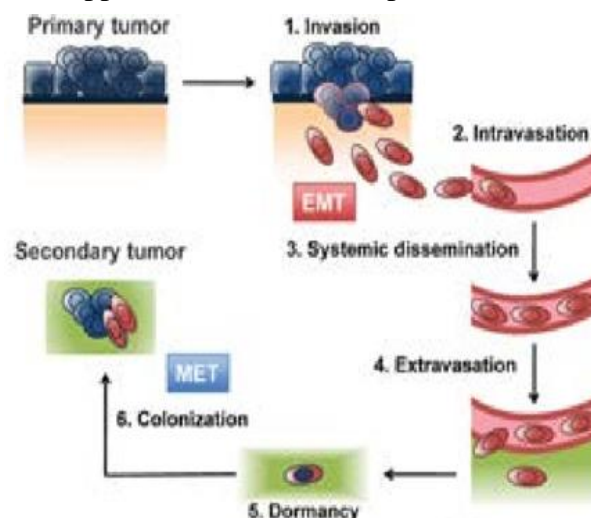
### Where in the body cancer can spread?

Cancer can spread to almost every part of the body. Some types of cancer tend to spread to certain parts of the body. For example;

- Breast cancer tends to spread to the bones, liver, lungs, chest wall, and brain
- Lung cancer tends to spread to the brain, bones, liver, and adrenal glands
- Prostate cancer tends to spread to the bones
- Colon and rectal cancers tend to spread to the liver and lungs
- Less frequently, cancer can spread to the skin, muscle, or other organs in the body. Cancer cells can also spread to the lining around the lungs called the pleural cavity. It can also spread to the space around the belly called the peritoneal cavity. When these cancer cells cause fluid to build up in these areas, it is called malignant pleural effusion and malignant ascites.

### Formation of Metastases

A metastatic tumor cell must successfully "set up shop" in a new organ to form a secondary tumor, this process is termed colony formation. The metastatic cell must create favorable surroundings within a hostile foreign environment that will allow for their growth and survival. This appears to be the make-or-break step in metastasis. In an experimental model of metastatic melanoma, more than 80% of injected cancer cells survived in the circulation and exited to the liver. Of these, only 1 cell out of 40 formed micro metastases within 3 days, and of those only 1 cell in 100 formed macro metastases within 10 days. Creating a friendly environment appears to be a difficult process that limits a metastatic cell's ability to form a secondary tumor.

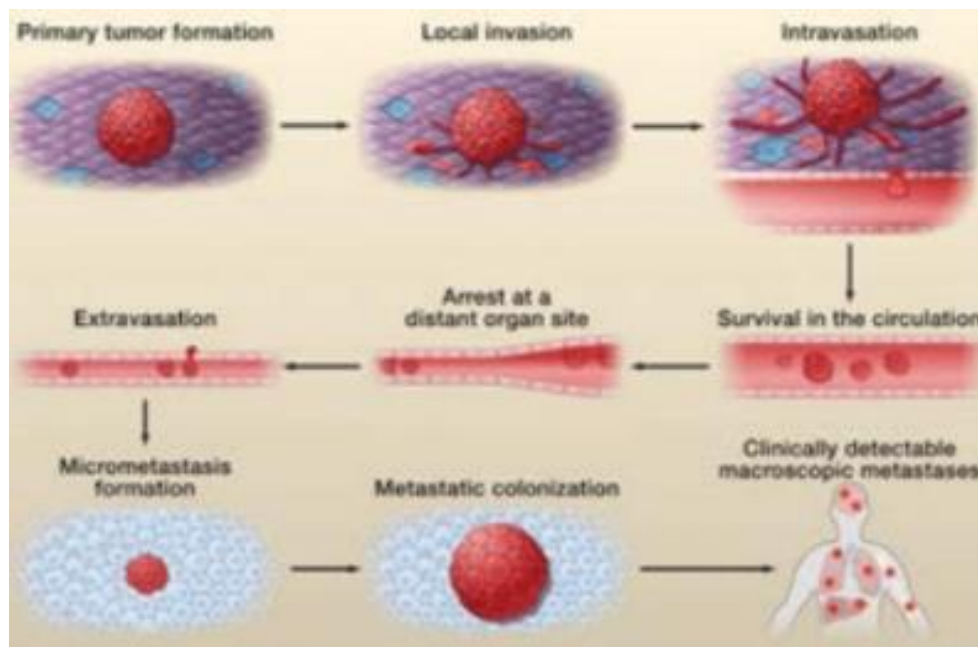


## Routes of Metastasis:

There are three primary ways tumors can spread to distant organs:

- Through the circulatory (blood) system (hematogenous)
- Through the lymphatic system
- Through the body wall into the abdominal and chest cavities (trans coelomic).

The circulatory system is the primary route of spread to distant organs, while lymphatic vessels provide a route to local lymph nodes, after which metastases often travel through the blood. While the circulatory system appears to be the most common route, the extent of lymphatic versus hematogenous spread appears to depend on the origin and location of the primary tumor. For example, bone and soft tissue tumors (sarcomas) spread primarily through the blood, while melanoma, breast, lung and gastrointestinal tumors spread through the lymphatic system. Trans coelomic spread is fairly uncommon, and appears to be restricted to mesotheliomas and ovarian carcinomas. In order for tumor cells to gain access to lymphatic or blood vessels, tumors need to promote the growth of these vessels into and around the tumor. Growth of blood vessels is called angiogenesis, and growth of lymphatic vessels is lymph angiogenesis.



## Enzymes in cancer metastasis

The production of metastasis appears to involve a number of different proteases including the urokinase form of plasminogen activator, cathepsin B, cathepsin D and various metalloproteases. Early data implicating these proteases in metastasis were mostly indirect and based on correlation studies in animal models. More recent work, using specific protease inhibitors and antibodies against proteases to block experimental metastasis, have provided more direct evidence that proteases play a role in cancer spread. In addition, transfection of genes encoding certain proteases increases the metastatic phenotype of the recipient cells. In human tumors, a number of different proteases also correlate with metastatic potential. It is concluded that certain proteases may be new prognostic markers in cancer as well as new targets for anti-metastatic therapy.

## References

<https://en.wikipedia.org/wiki/Metastasis>

Li Y, Wang Z, Ajani JA, Song S (February 2021). "[Drug resistance and Cancer stem cells](#)". *Cell Communication and Signaling*. **19** (1): 19.

Martin, T. A., Ye, L., Sanders, A. J., Lane, J., & Jiang, W. G. (2013). Cancer invasion and metastasis: molecular and cellular perspective. In *Madame Curie Bioscience Database [Internet]*. Landes Bioscience.

*Disclaimer:* The views and opinions expressed in this article are those of the authors and do not necessarily reflect the thoughts or beliefs of the editorial board of the magazine/journal published by the Science Rasala Publication. Similarly, the author is completely responsible for any examples and data used in the article or assumptions made within the analysis. In case of any dispute, the author will be responsible for the correction or resolution of the same.

