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| |  |  | | --- | --- | | |  | | --- | | [8 Types of Enzymes for Tumor Cell Dissociation](http://www.conversantbio.com/e1t/c/*W10p8KF6B0mmjW8Yll291ZL3pG0/*W6NdwSY2M68fvW35zrg75_DL0q0/5/f18dQhb0Sq5y8Y9YsWW6hckWq4T_wzgVdDZgg5wM2WFVsc_1K1SddPTW6kfX-L7s5Q5CW8Xldr855kqdcW2L7h194L-Vl5W60PYNq4zLdCvW7pzR2685_KwcW7NMlZj3mNG_QW6_qDsj1WP5r8W67hlkY64jl-rW8s4CTl5vLZfpW7ZkG8C7dT6Y3VQJJn63Lqnm_W8q5FTl68tQ2FW32p-C34cMd6zW2n4Wh88W1LYJW99LG6G7cvxVfN8q5qBxVQf4XW5vDhXC5F1sVtW63l7YW2yqy2KW4Vc02-3LyQY5W4pXmpm94vngYN9bhBYcZZdnwW6QYrP15ympLDN5Djb30hBbBdW3H4wfc3KdFRqN65sQyQZm5MNN3fp0p0bGCPFW4TtmwF4v-ddRVTqlMR2yp_BHW8yWHLQ5yncDLN3JrHfY-zVT_W4V3Y4T4MKXrfW3Swmg94QB6KhD6Y9ktTrJtW5xxgHl3snP2bW41H0d63gmCmRW642Nj_3WvwFvN2ZW3Cs84rVzW6PxM5W4gBwfSW4Hr-_B3kM77-W3NK1c28-kKJgW6zg5d15f0205N6bM_7Y15RsHf7wpZfg03) | | |

By Luke Doiron, Jul 15, 2015 12:00:09 PM



Cancer researchers understand that there is quite a bit of heterogeneity among the cells found in human tumor biospecimens. Such variations can result in cells that differ in growth properties, drug toxicity, immunological reactivity, and proliferative potential. For this reason, when tumor specimens are used for *in-vitro* studies, it's very important to properly isolate and dissociate all the cells from one another, so that researchers gain [better understanding](https://books.google.com/books?id=ajKoBQAAQBAJ&lpg=PA58&ots=AZRiDrwUCR&dq=Types%20of%20enzymes%20used%20for%20tumor%20cell%20dissociation&pg=PA58#v=onepage&q=Types%20of%20enzymes%20used%20for%20tumor%20cell%20dissociation&f=false) of tumor progression or regression properties, as well as predicting therapeutic responses to novel[treatment](http://www.conversantbio.com/blog/4-techniques-for-dissociation-of-human-cancer-cells) modalities, including potential new drug regimens.

Enzymatic dissociation is widely used for [studying tumor cells](http://www.conversantbio.com/disease-areas/) because, when properly performed, good cell yields and viability can be obtained. Most research protocols use multiple types of enzymes to obtain optimal samples for downstream applications.

Here are [eight enzyme types](http://www.worthington-biochem.com/CIT/CIT_Product%20Insert_2012.pdf) frequently used for tumor cell dissociation:

1. Collagenase

Collagenase is a proteolytic enzyme used to digest proteins found in the extracellular matrix. Unique to enzymatic proteases, collagenase can attack and degrade the triple-helical native collagen fibrils that are commonly found in connective tissue. Today, enzyme suppliers offer four basic collagenase types:

* **Type 1:** Recommended for epithelial, liver, lung, fat and adrenal tissue cell specimens; useful for obtaining lymphocytes
* **Type 2:** Higher proteolytic activity; good for heart, bone, muscle, thyroid and cartilage tumor originating tissues
* **Type 3:** Low proteolytic activity, so commonly used for mammary cells
* **Type 4:** Low tryptic activity and typically used for islets and other research protocols where receptor integrity is important; can be used to obtain myeloid cells.

2. Trypsin

This enzyme is described as a pancreatic serine (an amino acid) protease that has specificity for peptide bonds that involve the carboxyl group of arginine and lysine amino acids. It is considered one of the most highly specific proteases. Trypsin alone is not usually effective for tissue dissociation because it shows minimal selectivity to extracellular proteins. It is usually combined with other enzymes such as collagenase or elastase.

3. Elastase

Another pancreatic serine protease, it has specificity for peptide bonds that are next to neutral amino acids. It is unique among proteases in its ability to hydrolyze native elastin. Elastase can also be found in blood components and bacteria. Researchers find it to be the favored enzyme for isolation of Type II cells from lung tissue.

4. Hyaluronidase

A polysaccharidase, this enzyme is often used for dissociation of tissues, typically when combined with a more crude protease such as collagenase. It has affinity for bonds found in just about all connective tissues.

5. Papain

A sulfhydryl protease, it has wide specificity and so can degrade most protein substrates more thoroughly than pancreatic proteases, i.e. trypsin or elastase. Papain is frequently used to isolate neuronal materials from tissues. This [triple-negative breast cancer](http://www.ncbi.nlm.nih.gov/pubmed/25801992) study used papain to isolate Fab for prompt PET imaging to improve disease management.

6. DNase I

Deoxyribonuclease I (DNase I) is frequently included in enzymatic cell isolation procedures to digest nucleic acids that leak into the dissociation medium and can increased viscosity and recovery problems. DNaseI won't damage intact cells.

7. Neutral protease

Known commercially as [Dispase®](http://worthington-biochem.com/DISP/default.html), this is a bacterial enzyme with mild proteolytic activity, making it useful for isolating primary and secondary cell cultures because of its ability to maintain cell membrane integrity. It has been found to more efficiently dissociate fibroblast-like cells as compared to epithelial-like cells.  It is inhibited by EDTA.

8. [Trypsin inhibitor](http://www.sigmaaldrich.com/life-science/metabolomics/enzyme-explorer/analytical-enzymes/trypsin/trypsin-inhibitors.html)

Derived mainly from the soybean, it inactivates trypsin, and so is sometimes used for specific cell isolation protocols.