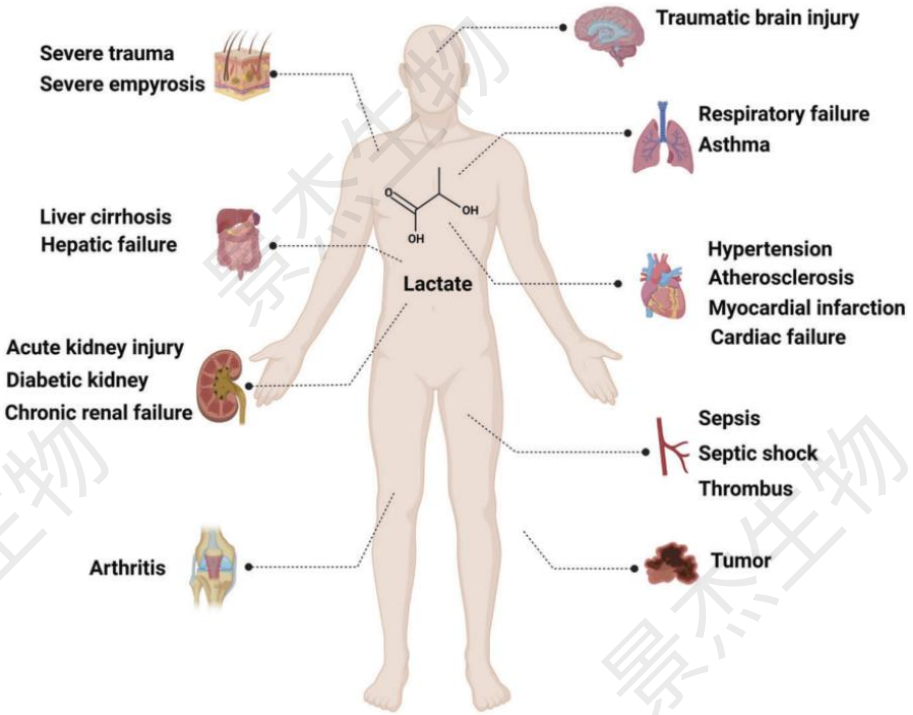
# Hot Research Topics

## Tumor Microenvironment

The significant amount of lactate produced by glycolysis in the tumor microenvironment was previously regarded solely as a metabolic waste. However, recent studies have revealed that lactic acid can actually promote tumor progression.




**Lactate metabolism in human health and disease**

Signal Transduct Target Ther. 2022

## Mechanism Study

Lactate serves as a critical regulatory factor for tumor immunity and antiviral response. It suppresses the activation of inflammatory macrophages and fosters cellular homeostasis through diverse mechanisms across multiple subcellular levels. The discovery of lactylation modification underscores its pivotal role in inhibiting macrophage activation in an epigenetic context. Investigating the mechanisms governing the activation of various signaling pathways under hypoxic conditions and their synergistic interactions with canonical inflammatory pathways will be a crucial research direction.

## Discovery of Drug Targets

Lactate in the blood is a byproduct of anaerobic respiration and indicates inadequate oxidative capacity. Clinical studies have revealed an association between lactate and hypertension, suggesting that insufficient oxidative capacity or mitochondrial dysfunction may contribute to hypertension. Furthermore, lactate levels can serve as diagnostic and prognostic tools for numerous diseases.

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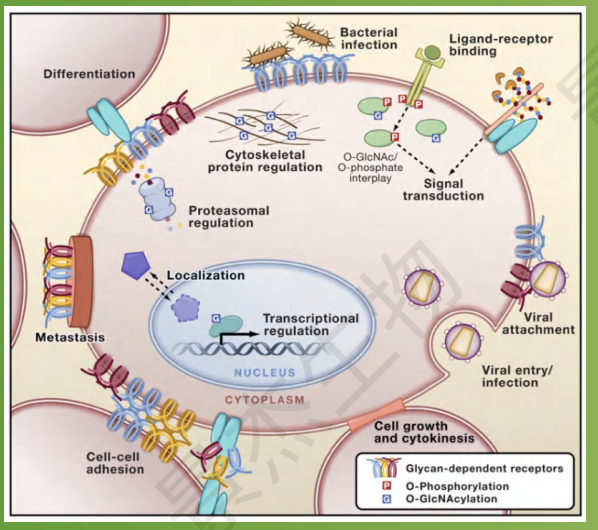
# Glycosylation

Glycosylation is a significant and prevalent post-translational modification of proteins. It plays a crucial role in maintaining the normal physiological functions of the human body. Over half of the proteins in organisms undergo glycosylation modification, including transcription factors, enzymes related to glucose metabolism, and more.

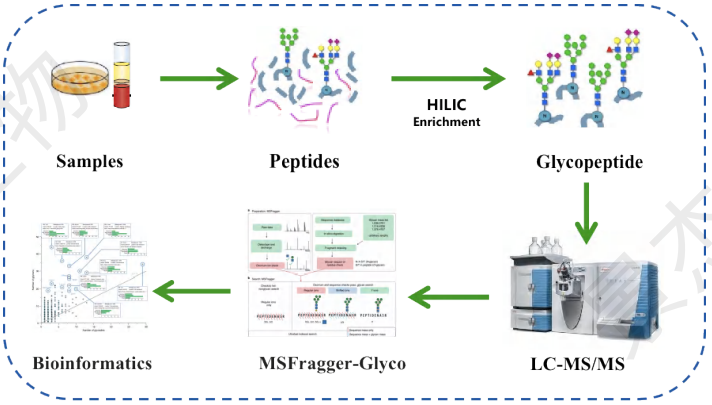



# Glycoproteomics Solution

**PTM BIO offers comprehensive glycoproteomics research solution, provides powerful research tools for biomarker discovery and investigates disease pathogenesis.**

N-glycoproteomics
O-glycoproteomics
intact N-glycopeptide
intact O-GalNac glycopeptide

# Analysis Protocol




# Applications

- Tumor occurrence and mechanism
- Cellular development and metabolism
- Immunological research
- Neurobiology
- Discovery of biomarkers
- Glycosylation modification function

# Advantages

### ① Complete information discovery |

Provide glycoproteins, glycosylation modification sites, and complete sugar chain information

### ② High sensitivity |

Using ultra-high sensitivity mass spectrometer

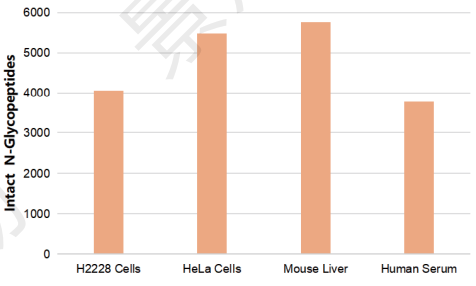
### ③ Stable and Reliable |

Experimental verification of clinical large queue organizational sample projects

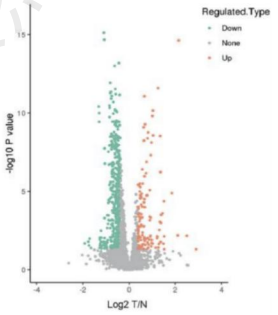
### ④ Deep bioinformatics analysis |

Innovative modification of multi omics, in-depth exploration of information

# Demo Data








Conventional cells/tissues:

Identified 5500+ intact N-glycopeptides

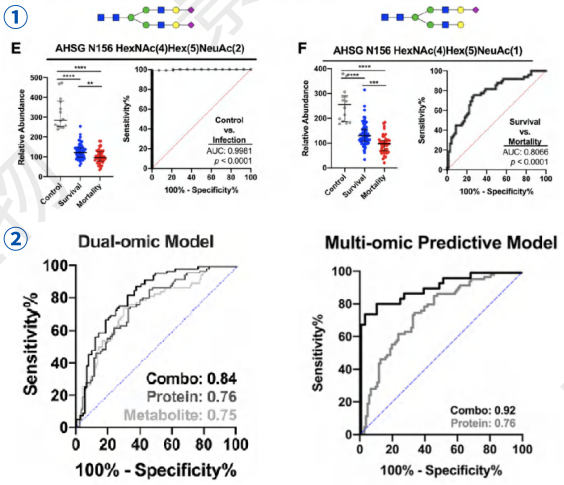
Clinical Large Queue Organizational Sample Project Testing:

1 | Identified over 3400 N-glycosylation sites
2 | Identified over 12000 intact N-glycopeptides
3 | Quantifiable proportion exceeding 80%

# Application Cases

Cell Resource

**Mortality Risk Profiling of *Staphylococcus aureus* Bacteremia by Multi-omic Serum Analysis Reveals Early Predictive and Pathogenic Signatures**




This study focuses on utilizing proteomics, metabolomics, and intact N-glycopeptides to discover highly accurate biomarkers that can be used to diagnose infections and predict infection-related mortality.

①Glycopeptides exhibit high accuracy in predicting both infection status and survival outcomes among infected individuals

②The multi-omic predictive model (combining protein, metabolite, and intact N-glycopeptide data) enhances the accuracy of predicting post-infection survival to an ROC-AUC of 0.92.

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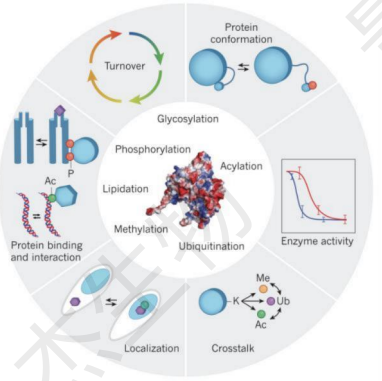
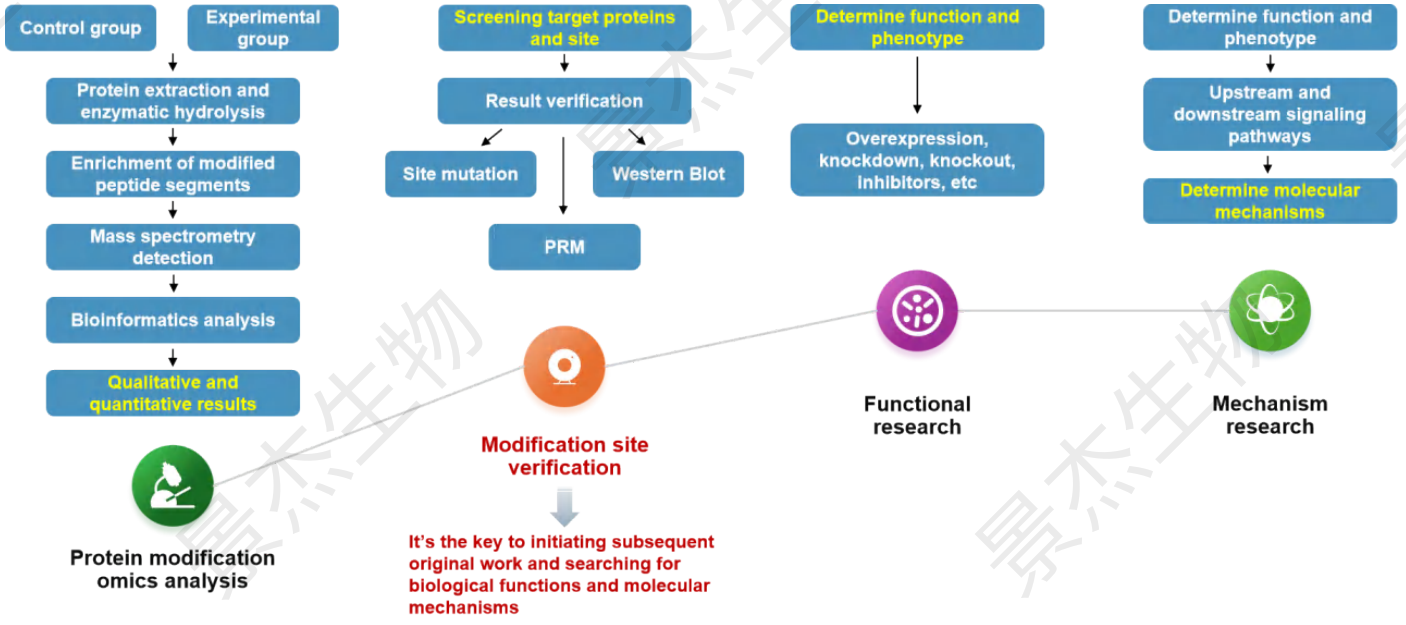
# Post-Translational Modifications Proteomics Service

Post-translational modifications (PTMs) play a central role in the complexity and diverse functional roles of the proteome. They are involved in various physiological activities and pathological processes beyond mere protein expression disorders. Therefore, PTMomics is crucial for exploring biological mechanisms, discovering clinical biomarkers, and identifying therapeutic targets.




# Solution for PTM research

As a leading and pioneering proteomic company, PTM BIO provides a comprehensive solution for PTM research with highly specific PTM antibodies and high-throughput PTM proteomics analysis service.




## Research Methods

| Methods | Applications |
|---|---|
| Identification of modification sites | Target protein function mining |
| Protein modification spectrum analysis | Draw modification spectrum |
| Quantitative analysis of PTM | In depth molecular mechanism research |
| Parallel Reaction Monitoring,PRM | Protein modification validation |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# PTM Product Catalog

| PTM | Biological Function | Applications |
|---|---|---|
| Phosphorylation | The most basic, common, and important mechanism for regulating and controlling protein viability and function | Widely applied in the research fields of signal transduction pathway, apoptosis, developmental differentiation, cancer Mechanism, etc |
| Acetylation | The most common type of acylation involved in epigenetic regulation, signal transduction, metabolic regulation, cell apoptosis, *etc* | Immune response, tumorigenesis, metabolic diseases, apoptosis, etc |
| Lactylation | First discovered on ***Nature*** in 2019.<br>Lactate, a metabolic byproduct, can serve as a precursor for lactylation modification | Inflammation, cancer, metabolic diseases, etc |
| Succinylation | Common in many metabolic enzymes of central metabolism and intermediate metabolism , especially in mitochondrial metabolism | Inflammation, metabolic diseases, tumors, etc |
| Crotonylation | First discovered on ***Cell*** in 2011.<br>involved in important biological processes such as gene expression regulation | Reproductive regulation, epigenetic regulation, tumor metabolism, DNA damage repair, etc |
| β-hydroxybutyrylation | First reported in 2016.<br>closely related to cellular core metabolism | Energy metabolism, tumor research, DNA damage repair, liver metabolism, liver cancer, etc |
| 2-Hydroxyisobutyrylation | Chromatin function regulation | Epigenetics and glycolytic metabolic pathways |
| Malonylation | Energy metabolism, antibiotic biosynthesis, metabolic regulation, and photosynthesis | Metabolic disorders, immune regulation |
| Benzoylation | First reported in 2018. Compared to acetylation, it regulates the metabolism of glycerophospholipids, synthesis of ovarian steroids, signaling pathways for phospholipase D hydrolysis, serotonin synapses, and insulin secretion processes | Epigenetics and metabolic regulation |
| N-glycosylation | A widely existing type of protein post-translational modification that mainly affects the correct folding, active state, intracellular transport of proteins, *etc*. | Intercellular recognition, cell adhesion, signal transduction, immune response, cell transformation, etc |
| O-glycosylation | Participate in the regulation of multiple signaling pathways, and participate in regulating processes such as growth, proliferation, and hormone response | Individual development, cellular stress, transcriptional regulation, signal transduction, metabolic diseases, tumor occurrence and development, etc |
| intact N-glycopeptide | Listed as one of the technologies of concern by ***Nature Methods***, it mainly affects the protein's spatial conformation, activity, transportation, and localization | Physiological mechanisms, disease pathology, discovery of disease biomarkers, interaction between pathogens and hosts, plant growth and development, etc |
| Ubiquitination | An important type of modification that downregulates protein expression, mediates protein degradation, alters protein cellular localization, activity, and affects substrate function and activity | Cell cycle, apoptosis, aging, neurodegenerative diseases, signal transduction |
| SUMOylation | A common ubiquitin like modification that participates in various important physiological and biochemical reactions in cells, such as the regulation of protein-protein, protein-DNA interactions, and plays an indispensable role | The occurrence and development of various diseases such as cardiovascular disease, cancer, neurodegenerative diseases, and immune diseases |
| Methylation | Participates in gene expression regulation, protein function regulation, and ribonucleic acid (RNA) processing | Epigenetics, cancer mechanisms, aging, neurodegenerative diseases |
| Redox modification | Can reversibly regulate protein activity, interactions, and localization, thereby achieving precise regulation of various life activities | Major disease occurrence, regulation of fat metabolism, plant stress, etc |

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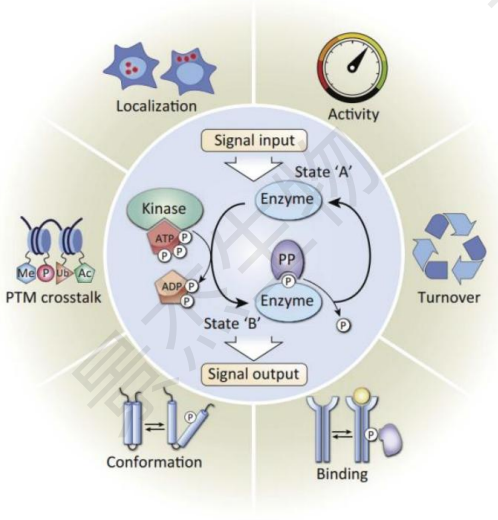
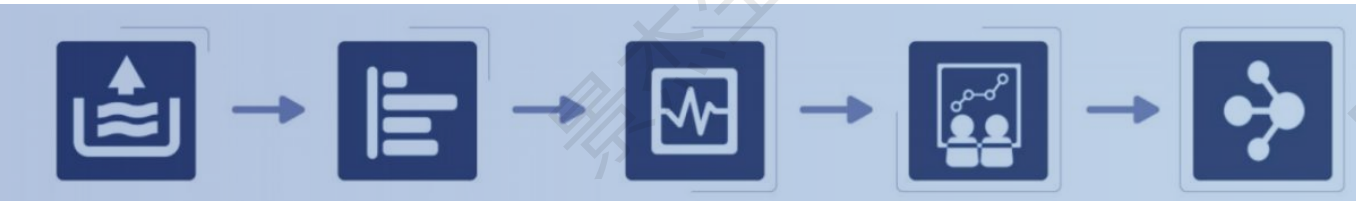
# Phosphorylation

Phosphorylation stands as the fundamental, ubiquitous, and essential mechanism for regulating and controlling protein function and viability.

PTM BIO has initiated an in-depth quantitative analysis of phosphorylation modifications, leveraging proprietary IMAC materials for the enrichment of phosphorylation-modified peptides, thereby effectively reducing sample complexity. This powerful combination, combined with rigorous double quality control and bioinformatics analysis, finds widespread application in studying phosphorylation mechanisms under both physiological and pathological conditions.




# Applications

- Signal transduction
- Cancer mechanism
- Immune inflammation
- Metabolic regulation
- Apoptosis
- Adversity stress
- Food science

***Science:*** In vivo brain gpcr signaling elucidated by phosphoproteomics.

***Nature:*** Proteomics identifies therapeutic targets of early-stage hepatocellular carcinoma.

***Immunity:*** Integrative proteomics and phosphoproteomics profiling reveals dynamic signaling networks and bioenergetics pathways underlying T cell activation.

***Cell Metab:*** Phosphoproteomics reveals the GSK3-PDX1 Axis as a key pathogenic signaling node in diabetic lslets.

***Autophagy:*** Phosphoproteome-based kinase activity profiling reveals the critical role of MAP2K2 and PLK1 in neuronal autophagy.

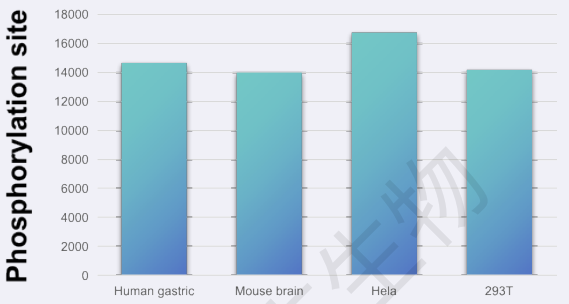
***Mol Cell:*** Reciprocal regulation of the TOR Kinase and ABA receptor balances plant growth and stress response.

***J Agric Food Chem:*** Comparative quantitative phosphoproteomic analysis of the Chicken Egg during Incubation based on tandem mass tag labeling.

# Advantages

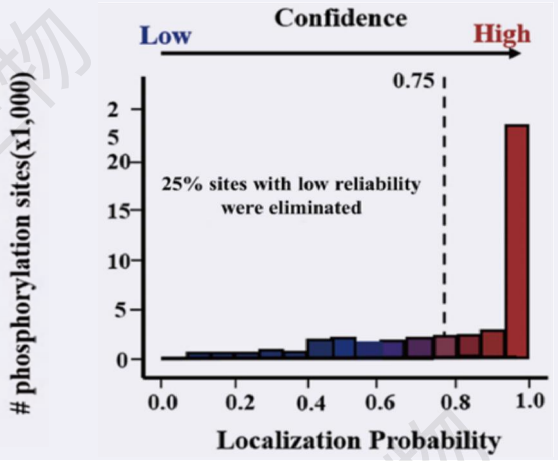
## Technology upgrade-Deeper Coverage

Utilizing the IMAC enrichment strategy in combination with 4D proteomics technology has greatly enhanced detection sensitivity and significantly increased the number of identified phosphorylation sites.



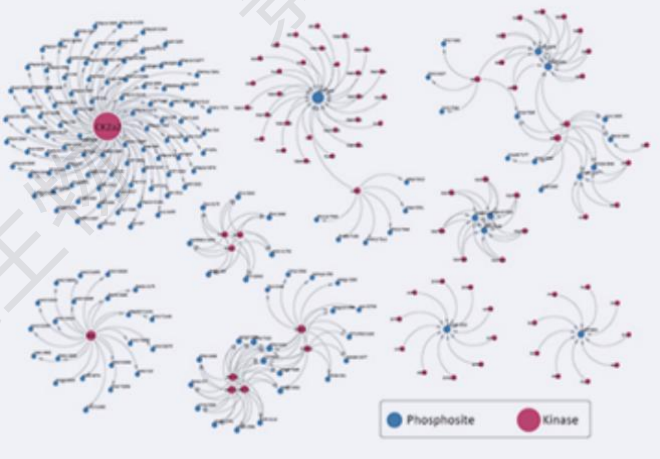

## QC upgrade-Higher Credibility

Double quality control standards, including both FDR (False Discovery Rate, set at 0.75) and FLR (False Localization Rate, set at 0.75), are applied to exclude modification sites with lower reliability.




## Bioinformatics upgrade-Deeper Mining

Kinase prediction, signal pathway analysis, and in-depth data mining are provided to explore the mechanisms under physiological and pathological conditions.



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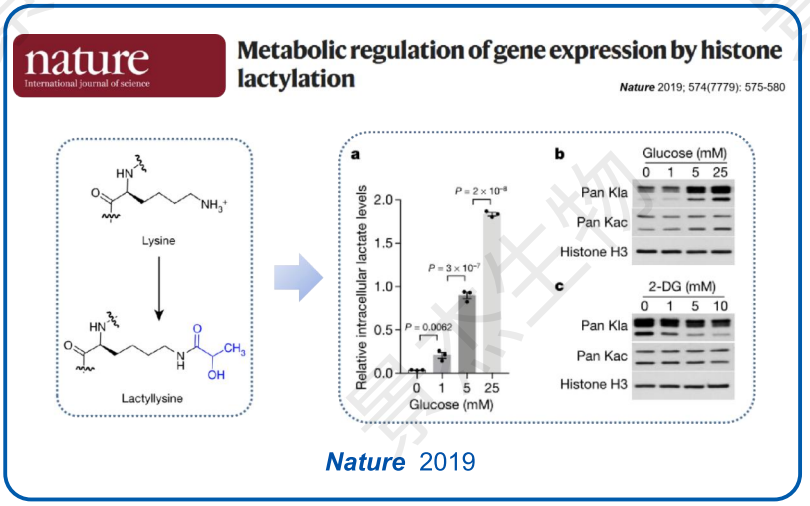
# Lactylation

Lactylation is a newly discovered post-translational modification, initially described by Professor Yingming Zhao of the University of Chicago in 2019. Research has revealed that lactic acid, a metabolic byproduct, can act as a precursor for the lactylation modification of histone lysine. This modification plays a role in regulating the steady-state of M1 macrophages infected by bacteria and is implicated in the regulation of inflammation, cancer, and other diseases.




*Nature* 2019

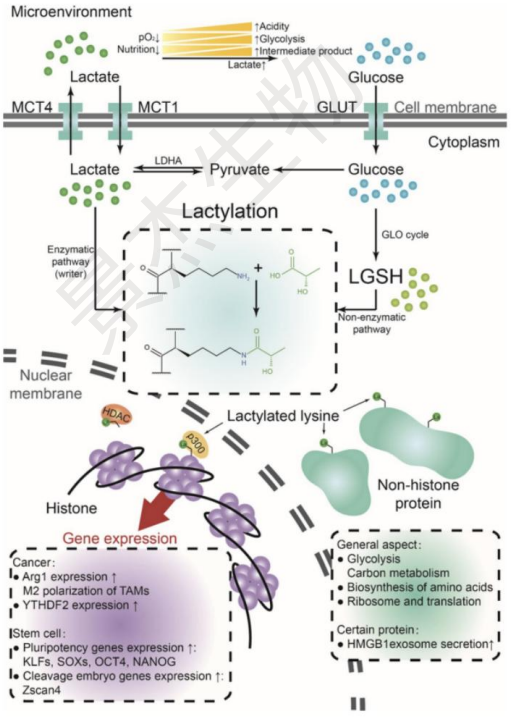
# Applications

### 1. Regulatory mechanism studies

Further research is needed on enzymes that catalyze the production of lactyl-CoA intermediates, the site-specific functions of histone lactylation modifications, and the 'writers,' 'erasers,' and 'readers' of histone lactylation modifications.

### 2. Physiological and pathological function studies

Lactic acid is a widely existing metabolic substance, and the new histone modification mediated by lactate will play an important role in biological processes such as DNA damage repair and muscle movement, as well as in pathological processes such as inflammation and cancer.




*Nat Methods* 2022