


Course 2851 Principles of Metabolism  
Metabolism and endocrinology programme, Karolinska Institutet

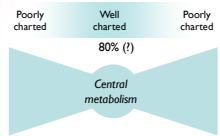
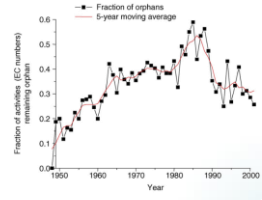
Lecture 19  
**Genomics**

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Center for Molecular Medicine  
Karolinska Institutet



### Metabolism is (comparatively) well charted


- About 1,500-2,000 genes encoding metabolic enzymes
- 3-500 transporters
- 100's of enzyme-like genes

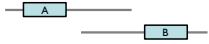
Dennis & Vitkup, Trends Biotech 25:343-348, 2007

### Isozymes

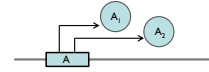
**Discovery 1959**  
Markert & Moller, PNAS 1959



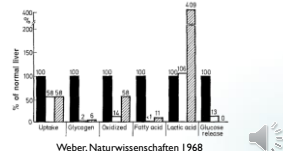
**Paralogous genes**



**Splice / translation variants**



**Glycolysis isozymes in embryonic / adult / cancer**



Weinhouse, Cancer Res. 1972

Weber, Naturwissenschaften 1968

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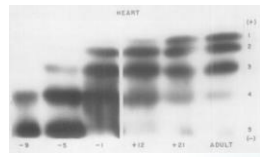
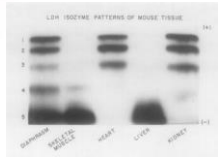
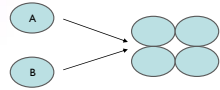
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Isozymes – complexes

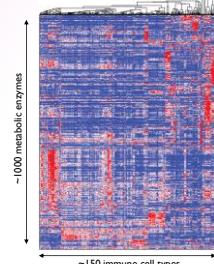
Lactate dehydrogenase



Markert, Dev Biol 1962

Metabolism is cell type-specific

Cell type-specific enzyme expression



~1000 metabolic enzymes  
~150 immune cell types  
Data from ImmGen Consortium

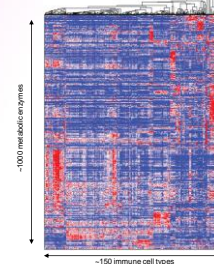
Aldolase genes



BioGPS portal

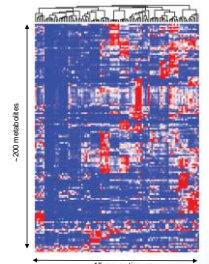
Metabolism is cell type-specific

Cell type-specific enzyme expression



~1000 metabolic enzymes  
~150 immune cell types  
Data from ImmGen Consortium

Diversity of tissue metabolite content



~200 metabolites  
15 mouse tissues  
Unpublished data

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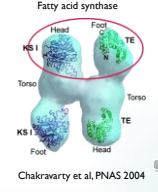
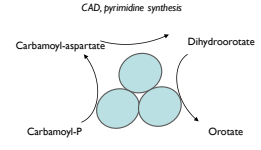
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### Operons & multidomain proteins

#### Nitrogen metabolism pathways



#### Multidomain proteins in higher eukaryotes



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