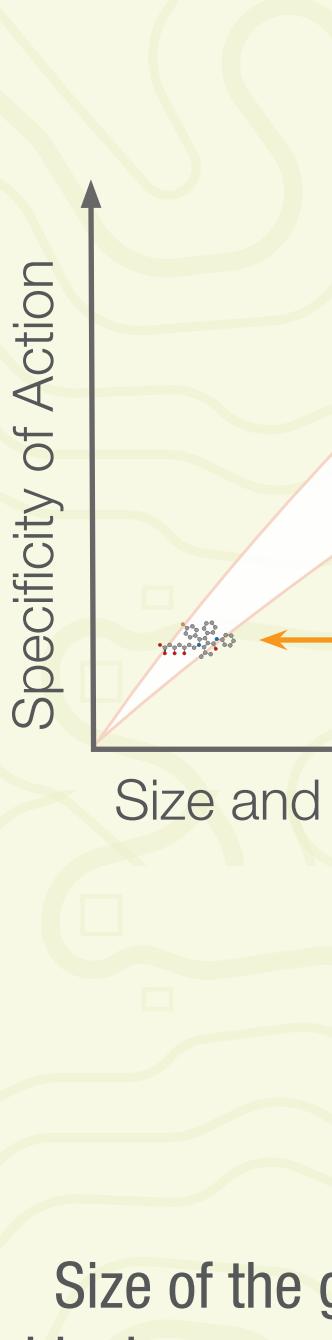


# NAVIGATING

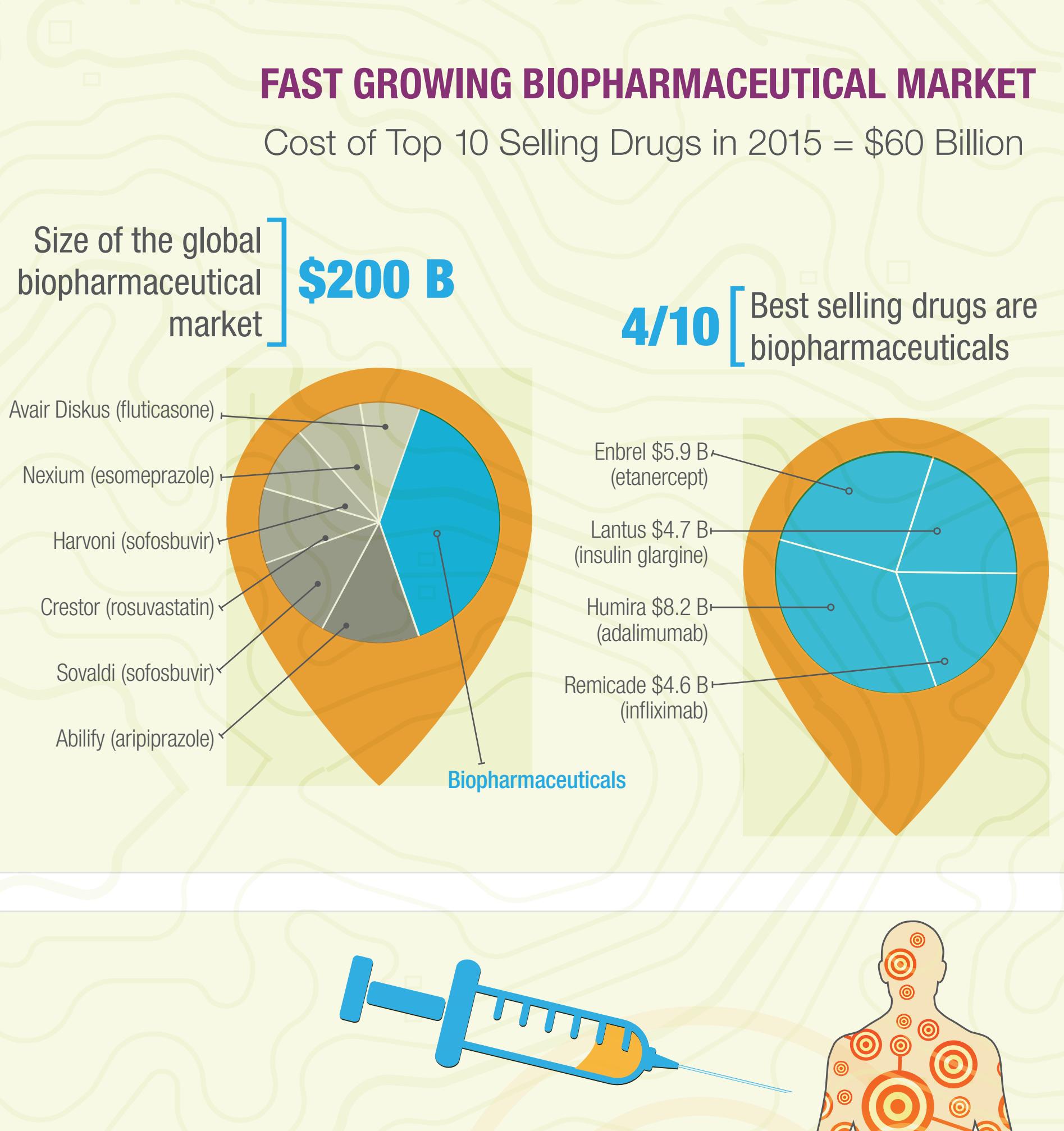
## BIOLOGIC

### MEDICINES



#### What are biopharmaceuticals?

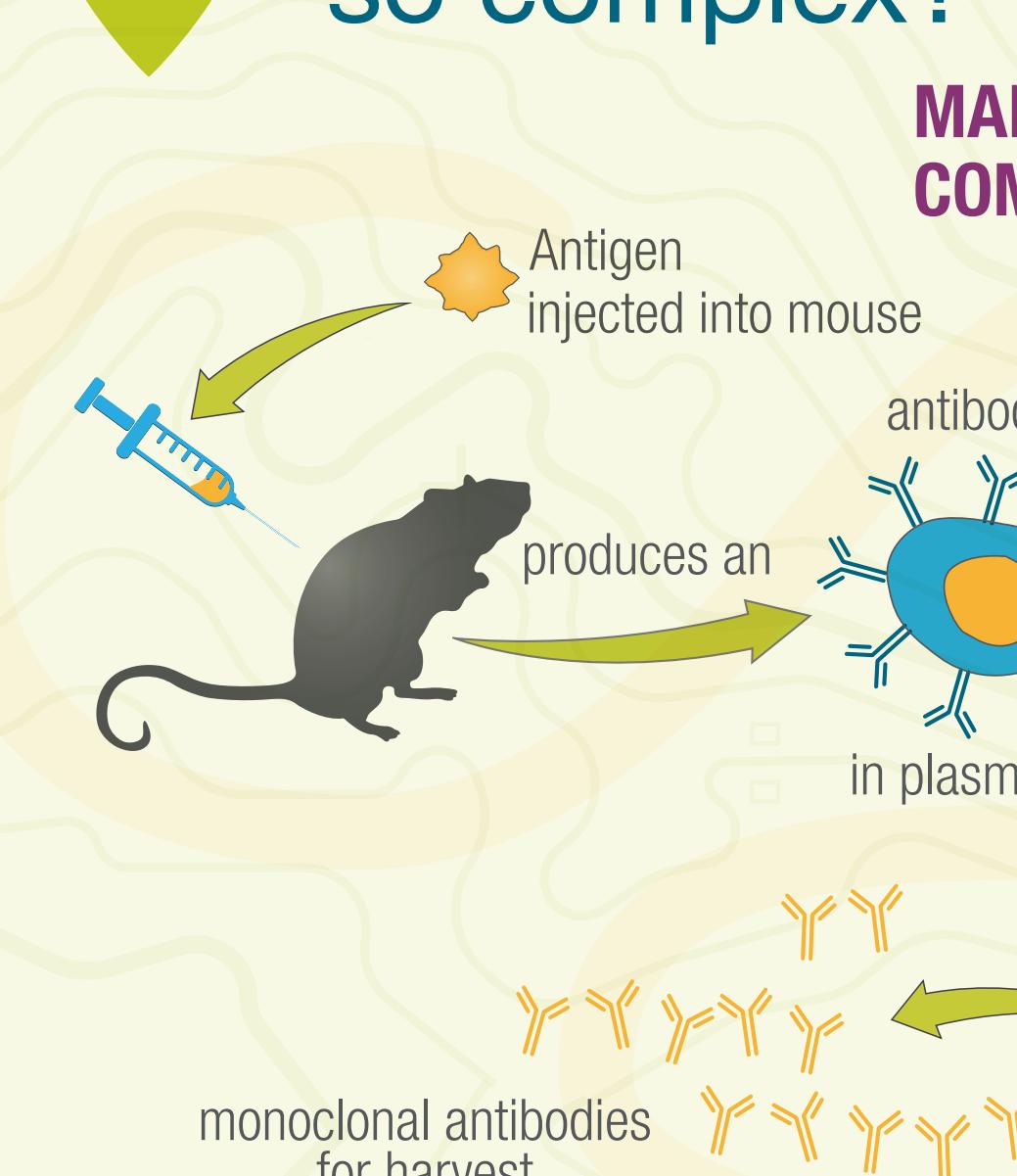
##### COMPLEX HIGHLY SPECIFIC THERAPEUTIC PROTEINS



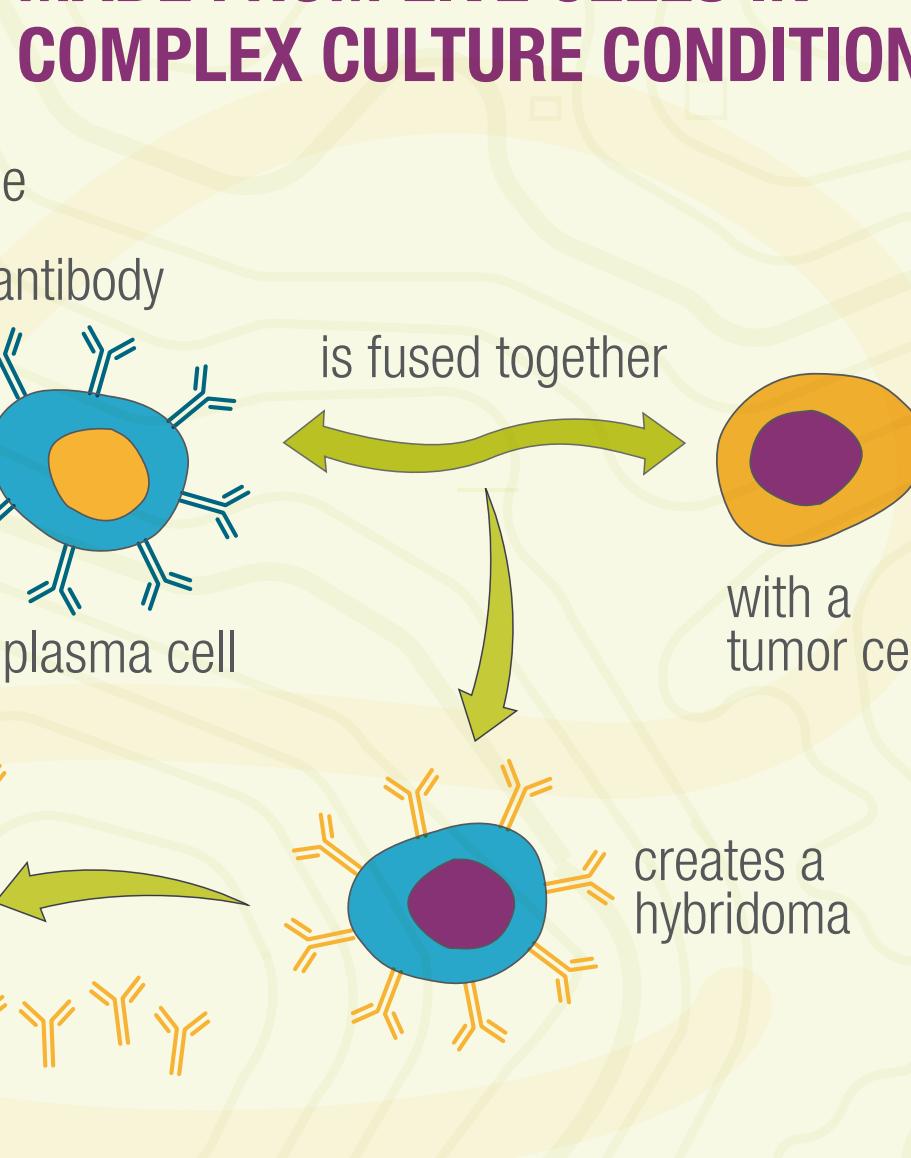
##### FAST GROWING BIOPHARMACEUTICAL MARKET

Cost of Top 10 Selling Drugs in 2015 = \$60 Billion

Size of the global biopharmaceutical market **\$200 B**



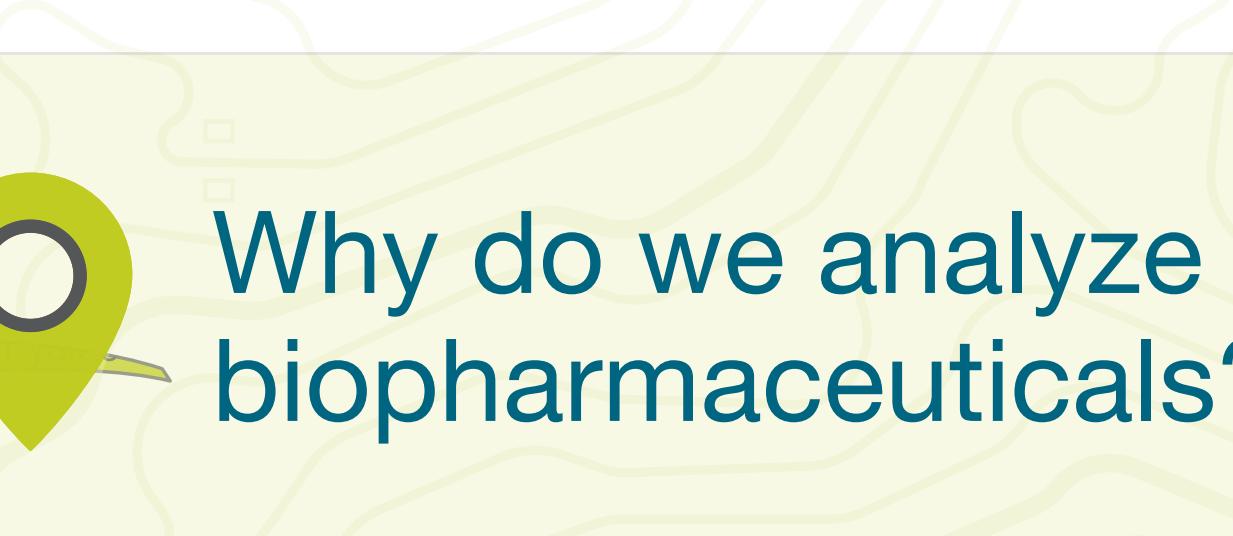
**4/10** Best selling drugs are biopharmaceuticals



#### Why biopharmaceuticals?

##### BIOPHARMACEUTICALS

- TARGETED
- SPECIFIC
- EFFICACIOUS
- PERSONALIZED



#### Why are biopharmaceuticals so complex?

##### MADE FROM LIVE CELLS IN COMPLEX CULTURE CONDITIONS



##### MADE FROM LIVE CELLS IN COMPLEX CULTURE CONDITIONS

Point Mutations



##### MADE FROM LIVE CELLS IN COMPLEX CULTURE CONDITIONS

Disulfide Bonds

Impurities

Amino-Acid Sequence

Mass

Quality

Glycosylation

Regulatory

FDA ICH Q6B Safety

Efficacy

Stability

Aggregation

Physico-Chemical Properties

Structure

Purity

Quantity

Size Weight

Quality Glycans

Regulatory

FDA ICH Q6B Safety

Efficacy Variation Stability

Quantity Amino-Acid Sequence Size

Stability Impurities Physico-Chemical Properties

Regulatory FDA ICH Q6B Safety

Aggregation Structure Quantity Amino-Acid Sequence Size

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Quality Glycans

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