

## Biopharmaceuticals: past – present – future

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Biopharmaceuticals or Biologics are medicines based on proteins, peptides or oligonucleotides. Over the past three decades they have become an integral part of medical intervention.

Whereas the first products were naturally occurring proteins isolated from various sources the invention of recombinant DNA technology and the advancement of biotechnological production allowed to produce these therapies in cells in bioreactors. This first wave of biologics is characterized by replacement therapies meaning a substitution of a lacking or reduced endogenous protein.

The second wave is characterized mostly by neutralizing biologics that attempt to balance unphysiological levels of various proteins causing disease. We see this trend continuing and predict that the future biologics will be like precision instruments interfering with disease in a highly selective and targeted manner.

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