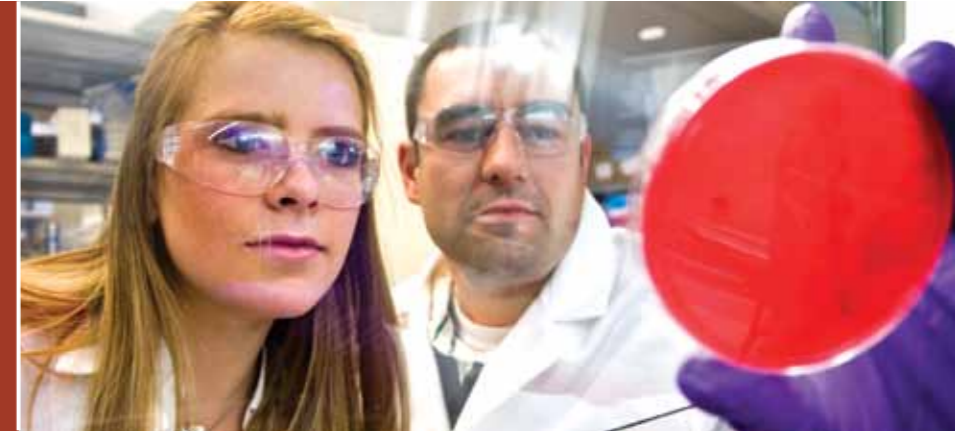
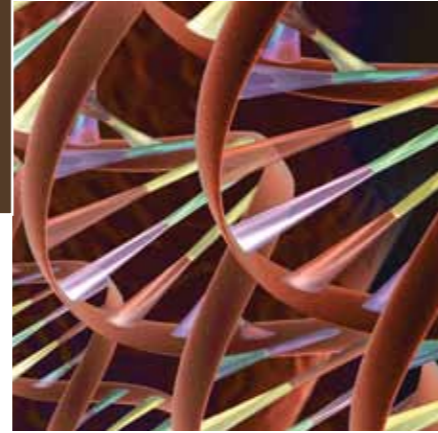


**At Novartis, everything we do
begins and ends with the patient.**



R&D at Novartis

Bringing Innovative Medicines to Patients



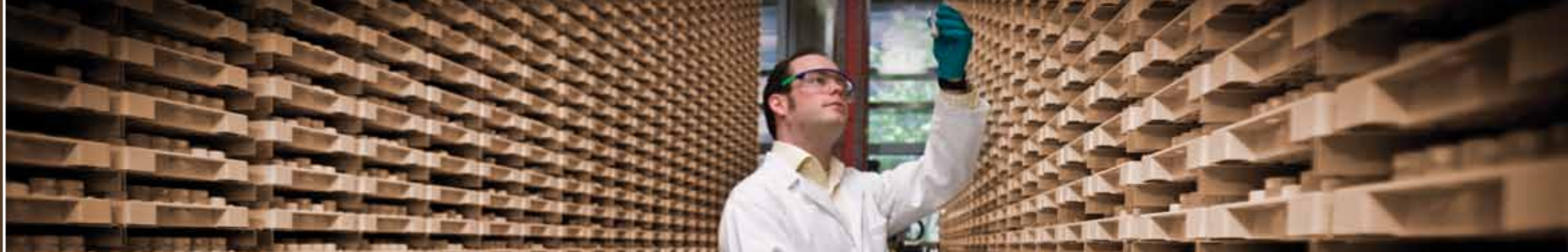
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Commitment to Patients

Research and Development at Novartis begins and ends with the patient. Our global R&D organization of scientists and physicians utilize novel technologies and approaches to discover and develop innovative medicines to address unmet medical need around the world.

The Novartis clinical pipeline, which has consistently been ranked as one of the strongest in the industry, holds a broad stream of more than 100 new medicines in all stages of development.



Drug Development Process

Target Discovery & Drug Design

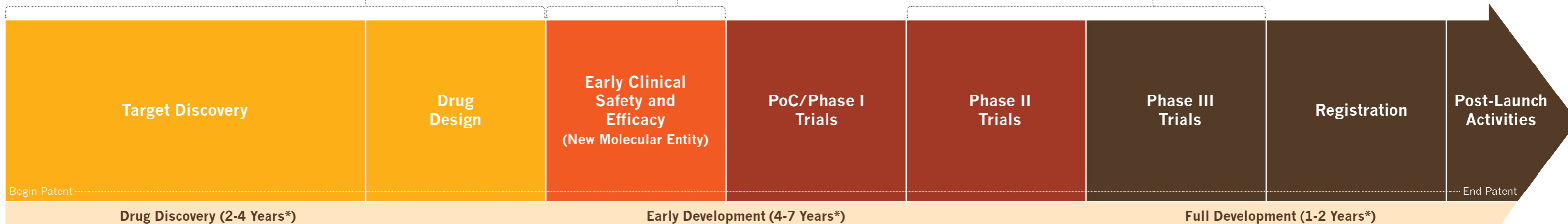
Making a drug typically begins with the identification of a protein associated with human disease. These proteins are known as “targets.” When it is confirmed that a target plays a role in a disease, an experiment known as high-throughput screening is conducted to find a chemical compound or antibody that binds or “hits” the target in a way that alters the disease. Once chemical compounds or antibodies are identified by their binding to a target, these “hits” are enhanced to improve their safety and effectiveness. The resulting chemical compound or antibody becomes a drug candidate.

Preclinical Safety and Efficacy

An initial profile of a drug candidate’s safety and effectiveness must be determined before it is tested in humans. In this phase, scientists use computer models and laboratory tests to assess the safety of a drug candidate. These tests determine how well a drug candidate is absorbed, where it goes within the body, how it is broken down or metabolized, and how quickly and in what manner it is eliminated from the system.

Clinical Development (Phases II and III)

In Phase II trials, the drug is given to a larger group of patients (100–300) to test its effectiveness, determine the appropriate dose, and to further evaluate its safety. In Phase III trials, the drug is given to large groups of patients (1,000–3,000) to confirm its effectiveness, monitor side effects, compare it to commonly used treatments, and collect information that will allow the medicine to be used safely.



Proof-of-Concept and Phase I

In Proof-of-Concept (PoC) trials, the drug candidate is given to a small group of patients (5-15) in order to understand how the target functions in the human body or its “mechanism of action” and to get an early readout of how the drug candidate alters human disease. After a successful PoC trial, a drug candidate may enter Phase I trials (20-80 patients or healthy volunteers) to evaluate its safety, determine the safe dose, and identify side effects. Sometimes drug candidates go directly from PoC to Phase II trials.

Registration/Post-Launch

To register a new drug, the results of all preclinical and clinical studies along with the description of the manufacturing process are compiled and submitted to regulatory authorities. If regulators agree that the data prove the quality, efficacy, and safety of the drug, a marketing authorization is granted. The new drug can then be made commercially available to patients. Once a drug is on the market, adverse effects need to be constantly monitored and reported to regulatory authorities. In addition, life-cycle programs – including Phase IV clinical trials – are often undertaken to add new indications or improve existing formulations of the drug.