Studies that are in vivo (Latin for “within the living”; often not italicized in English are those in which the effects of various biological entities are tested on whole, living organisms or cells, usually animals, including humans, and plants, as opposed to a tissue extract or dead organism. This is not to be confused with experiments done in vitro (“within the glass”), i.e., in a laboratory environment using test tubes, petri dishes, etc. Examples of investigations in vivo include: the pathogenesis of disease by comparing the effects of bacterial infection with the effects of purified bacterial toxins; the development of antibiotics, antiviral drugs, and new drugs generally; and new surgical procedures. Consequently, animal testing and clinical trials are major elements of in vivo research. In vivo testing is often employed over in vitro because it is better suited for observing the overall effects of an experiment on a living subject. In drug discovery, for example, verification of efficacy in vivo is crucial, because in vitro assays can sometimes yield misleading results with drug candidate molecules that are irrelevant in vivo (e.g., because such molecules cannot reach their site of in vivo action, for example as a result of rapid catabolism in the liver).