Antibody discovery has become increasingly important in almost all areas of modern medicine. Different antibody discovery approaches exist, but one that has gained increasing interest in the field of toxinoLOGY and antivenom research is phage display technology. In this review, the lifecycle of the M13 phage and the basics of phage display technology are presented together with important factors influencing the success rates of phage display experiments. Moreover, the pros and cons of different antigen display methods and the use of naïve versus immunized phage display antibody libraries is discussed, and selected examples from the field of antivenom research are highlighted. This review thus provides in-depth knowledge on the principles and use of phage display technology with a special focus on discovery of antibodies that target animal toxins.