



125 YEARS

Antibody Discovery and Development

From early explorations of vaccination to present-day clinical trials, antibody-based research and therapies have long demonstrated their enormous potential to benefit human health.

This year we celebrate the 125th anniversary of the use of antibodies to treat diphtheria and tetanus and the advancement of the humoral theory of immunity. We encourage you to explore the rich history of antibodies and to share our passion for research supporting the next wave of innovations in this field.

1971
ELISA assay developed independently by Eva Engvall and Peter Perlman (21)

1972
FACS instrument developed and patented by Len Herzenberg's lab at Stanford University (22)

1975
Georges Köhler and César Milstein develop hybridomas leading to the production of mAbs (23)

1976
Susumu Tonegawa describes somatic recombination of immunoglobulin genes to account for incredible diversity (24)

1978
Hybritech becomes the first mAb company (25)

1979
First patent on hybridoma technology awarded to Wistar Institute (26)

Western blotting, perhaps the most widely used immunoassay in research, is invented by Harry Towbin et al. (27)



1960
Radioimmunoassay developed by Rosalyn Yalow and Solomon Berson (18)

1965
Thomas Tomasi identifies secretory immunoglobulins (IgA) (19)

1966
Kimishige Ishizaka et al. and S.G.O. Johansson & Hans Benich independently identified IgE as the reaginic antibody (reviewed in 7)



1967
Kimishige Ishizaka identifies IgE as the reaginic antibody, binding the molecule that induced its synthesis (reviewed in 7)



1953
Wallace Coulter awarded a patent on Coulter principle, enabling flow cytometry (12)

1955
Niels Jerne proposes natural-selection theory of antibody formation (13)

1956
Kappa and lambda light chains, then known as Bence Jones proteins, are shown to be two separate proteins by Leonard Kogrod and Rose Lipari (reviewed in 7)

1957
Clonal selection theory proposed by Frank MacFarlane Burnet and David W. Talmage (14, 15)



1959 and 1962
Different regions of antibody structures independently elucidated by Gerald Edelman and Rodney Porter (16, 17)



1940
Karl Landsteiner and Alexander Weiner identify Rh antigens (8)

1942
Albert Coons labels antibodies with FITC originating the field of immunofluorescence (9)

1944
Jules Freund and Katherine McDermott demonstrate use of adjuvants to stimulate antibody production (10)

1944
IgM is described independently by Jan Waldenström with Kai Pedersen as well as Henry Kunkel (reviewed in 7)

1948
Astrid Fagraeus discovered antibody production in plasma B cells (11)

1930



1938
John Marrack proposes Antigen Antibody binding hypothesis (6)

1939
Arne Tiselius and Elvin Kabat discover the first antibody isotype, gamma-globulin (reviewed in 7)

1981
The lab of Herman Eisen develops the first anti-pTyr antibody (28)

Hybritech delivers first mAb product to measure IgE in blood to diagnose allergic reactions (29)

1982
Angus Nairn, et al. develop the first phospho-specific antibodies (30)

1984
hCG antibodies used to develop 5 minute pregnancy test (31)

1985
John Lis and David Gilmour develop Chromatin Immunoprecipitation (ChIP) assay (32)

1986
Sean P. O'Neill and Joseph Wu awarded patent for quantitative immunoprecipitation assay (33)

1980

1990
John McCafferty et al. report the use of phage display for antibody discovery (34)



1995
Katherine Knight and colleagues at Loyola University, Chicago, USA published first paper on rabbit mAb development (35)

1996
Prostascint[®], radio-labeled anti-PSMA (prostate specific membrane antigen) imaging antibody approved by the FDA (36)

1997
Idoc markets the world's first mAb treatment for lymphoma (Rituxan[®]) (37)

1998
Herceptin[®] approved for breast cancer treatment (38)

1999
CST established as an independent company and releases its first substrate motif antibody (#9611) (39)



1890
Antibodies are shown to be active against diphtheria and tetanus, giving rise to a humoral theory of immunity (Emil von Behring and Kitasato Shibasaburo) (1)



1891
Observed transferrable immunity (Emil von Behring and Kitasato Shibasaburo) (2)

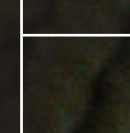
1896
Jules Bordet identifies complement as an antibacterial, heat-labile serum component (3)



1900
Paul Ehrlich develops antibody formation theory (4)



1909
Almroth Wright publishes, "Studies on Immunisation", a collection of papers describing opsonization in the context of therapeutic immunization (5)



2000
Abgenix develops Xenomouse[®] which produces fully human antibodies (40)

2004
Erbixub[®] approved by FDA for treatment of colorectal cancer (41)

2006
CST released its first XP[®] antibody developed using the proprietary XMT[®] method (42)



2000

2012
CST publishes NG-XMT[™] method, a proteomics approach to developing mAbs (43)



2013
Kadcyla[®] (ado-trastuzumab emtansine), an antibody-drug conjugate, receives FDA approval as late-stage breast cancer treatment (44)

2014
Yervoy[®] (ipilimumab), a monoclonal anti-CTLA4 antibody and the first immune checkpoint cancer therapy, receives FDA approval as a late-stage melanoma treatment (45)

2010

2015
CST releases The CST Guide: Pathways & Protocols, a comprehensive scientific and technical resource for cell biology researchers (46)



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