Overview of B-cell Development

This schematic is not intended to be comprehensive, and markers can be altered as a result of cellular environment, differentiation state, and other factors.

**Development of conventional B cells**
- Pre-Pro-B
- Pre-B
- Pro-B
- Immature B
- Transitional B
- Marginal Zone B
- Peripheral B

**Immunoglobulin**
- IgM
- IgD
- IgA
- IgE

**Mouse positive markers**
- CD11c, CD20, CD43, CD44, CD62L
- CD19, CD20, CD37, CD95

**Mouse negative markers**
- CD11c
- CD20
- CD43
- CD62L

**Human positive markers**
- CD10, CD19, CD20, CD34, CD38
- CD10, CD19, CD20, CD34

**Human negative markers**
- CD10
- CD19
- CD20

**Enzymes**
- RAG-1, RAG-2
- TdT
- EZH2

**Transcription factors**
- Pax5
- EBF1
- Oct2
- IRF4
- BCL6
- BLIMP1
- RUNX3
- SPI-B
- EZH2

**Expression of Cyclin D1**
- Memory B

**Migration to 2° lymphoid organs**
- Shuttling to bone marrow/2° lymphoid organs
- Antigen dependent activation
  - Clonal expansion
  - Somatic hypermutation
  - Ig class switch

**Antigen dependent activation**
- bone marrow generated survival signal
- Bone marrow generated survival signal

**Clonal expansion**
- Bone marrow generated survival signal

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