

# **Adaptive Immunity (Four Classifications)**

# How To Classify Adaptive or Acquired Immunity

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## Two Critical Questions to Ask

1<sup>st</sup> – Is the immunity acquired by either a **natural** or **artificial** process?

2<sup>nd</sup> – Is the immunity acquired by either an **active** or **passive** process?

*Based on the two questions, there are four possible outcomes for Acquired Immunity!*

- *Natural active adaptive immunity*
- *Natural passive adaptive immunity*
- *Artificial active adaptive immunity*
- *Artificial passive adaptive immunity*

# What is the meaning of natural and artificial?

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- **Natural**

- Stimulus activates immune response in an individual
- Acquired through normal human experience
- Production of one's own antibodies or T cells

- **Artificial**

- Produced as a result of a medical procedure or “not by a common natural process”
- Antibodies are not acquired or made by the host's own plasma cells
- Stimulus is not an active pathogen

# What is the meaning of active and passive?

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- **Active**

- Host will use their immune cells to make antibodies and/or Tc

- **Passive**

- Host receives antibodies from another source
- Antibodies received from donor across membrane // E.g. fetus acquires antibodies from mother through placenta or from mother's milk through breastfeeding
- Antibodies received from injection of serum

# What are the four types of acquired immunity?

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- **Natural active acquired immunity**
  - Pathogen enters host and stimulates B and T cells
  - Host produces their own antibodies and/or T cells
  - booster shots – may be needed periodically to stimulate immune memory to maintain a high level of protection
- **Natural passive acquired immunity**
  - Antibodies “naturally” produced by mother but then passively “transferred” to newborn
  - Mother’s IgG small enough to cross placenta and enter fetus
  - IgA may also cross from mother to new born during breast feeding

# What are the four types of acquired immunity?

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- **Artificial active acquired immunity**
  - Vaccinations
  - Inject host with attenuated virus, toxin, or weakened bacteria
  - Stimulates host immune system to make memory T and memory B cells
- **Artificial passive acquired immunity**
  - Harvest antibodies from another source
  - Inject antibodies into host to render pathogen harmless
  - e.g. antiserum for snake bites

### Table 13.10 The Four Types of Acquired Immunity

**Natural Immunity** is acquired through the normal life experiences of a human and is not induced through medical means.



#### Active

After recovering from infectious disease, a person will generally be actively resistant to reinfection for a period that varies according to the disease. In the case of childhood viral infections such as measles, mumps, and rubella, this natural active stimulus provides nearly lifelong immunity. Other diseases result in a less extended immunity of a few months to years (such as pneumococcal pneumonia and shigellosis), and reinfection is possible. Even a subclinical infection can stimulate natural active immunity. This probably accounts for the fact that some people are immune to an infectious agent without ever having been noticeably infected with or vaccinated for it.



#### Passive

Natural, passively acquired immunity occurs only as a result of the prenatal and postnatal mother-child relationship. During fetal life, IgG antibodies circulating in the maternal bloodstream are small enough to pass or be actively transported across the placenta. This natural mechanism provides an infant with a mixture of many maternal antibodies that can protect it for the first few critical months outside the womb, while its own immune system is gradually developing active immunity. Depending on the microbe, passive protection lasts anywhere from a few months to a year.

Another source of natural passive immunity comes to the baby by way of the mother's milk. Although the human infant acquires 99% of natural passive immunity in utero and only about 1% through nursing, the milk-borne antibodies provide a special type of intestinal protection that is not available from transplacental antibodies.

**Artificial Immunity** is that produced purposefully through medical procedures.



#### Active

Vaccination exposes a person to a specially prepared microbial (antigenic) stimulus, which then triggers the immune system to produce antibodies and lymphocytes to protect the person upon future exposure to that microbe. As with natural active immunity, the degree and length of protection vary.



#### Passive

Passive immunotherapy involves a preparation that contains specific antibodies against a particular infectious agent. Pooled human serum from donor blood (gamma globulin) and immune serum globulins containing high quantities of antibodies are frequently used.