Difference Between Hapten and Antigen

www.differencebetween.com

Key Difference - Hapten vs Antigen

Immunology is a broad field which teaches to identify and assess the manner in which an organism reacts upon exposure to a foreign body and protects it against the invasion. Immunological responses vary widely, and different defense mechanisms are discovered to explain the phenomenon. The immunological responses initiate when a host organism identifies a particular organism, cell or a particle as a foreign entity. This recognition results in a number of different reaction mechanisms to degrade or eliminate the foreign entity. An antigen is a foreign body or a molecule, which has the ability to trigger the host immune system to produce specific antibodies in order to destroy it. A hapten is another type of antigen and therefore, acts as a foreign recognition site that binds to the antibody. However, it does not have the ability to trigger the host immune system to produce an immune reaction. The **key difference** between the Antigen and the Hapten is the ability and the inability to generate an immune response. **Antigens are capable of being immunogenic whereas haptens are not capable of being immunogenic.**

What is a Hapten?

Haptens are small molecular weight compounds that are not immunogenic in nature but is antigenic in nature. This suggests that a hapten can only react with a specific antibody but cannot trigger an immune response. In order to make it immunogenic, the hapten should be conjugated with a suitable carrier. Therefore, a hapten is essentially an incomplete antigen. The carrier in which the hapten is attached or adhered to is typically a protein such as an albumin by a covalent bond. The carrier ideally does not elicit an immune response by itself, but both the hapten and the carrier can be antigenic.

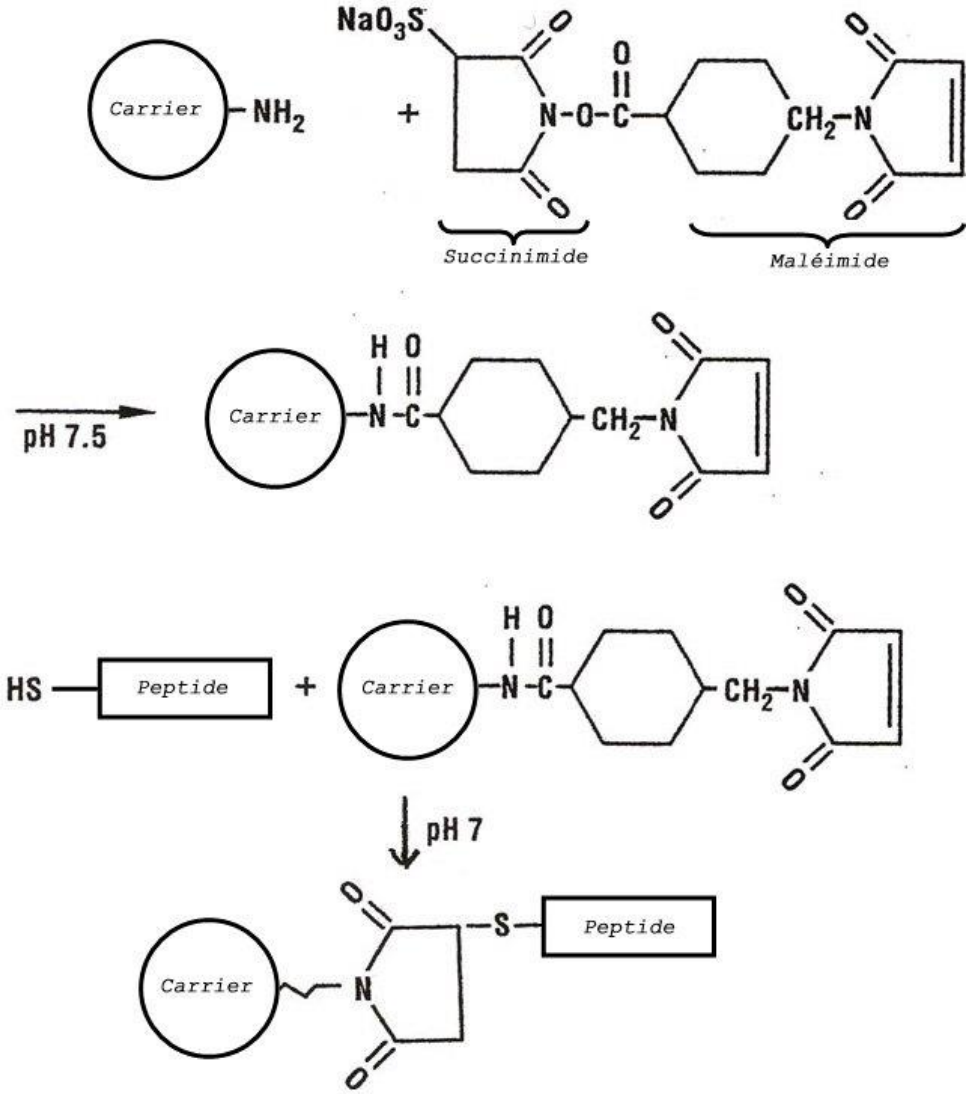

Figure 02: Hapten

The concept of haptens was introduced by Landsteiner. The concept of haptens is now widely used in drug designing and in assessing antibody responses under different conditions. Many antibiotics and anesthetics are developed as haptens, and the classic example is the development of penicillin. When designing penicillin, the major metabolites required for the action are linked with proteins to make the antibiotic immunogenic.

What is an Antigen?

Antigens are molecular recognition sites of many bacteria, fungi, viruses, dust particles and other cellular and non cellular particles which could be recognized by the host immune system. Most antigens are present on the cell surface. Chemically antigens can be proteins, amino acids, lipids,

glycolipids or glycoproteins or nucleic acid markers. These molecules possess the ability to bring about an immune response in the host. This immune response is brought about by triggering the production of antibodies as a corresponding result. Thus antigens possess both the properties of being antigenic and immunogenic.

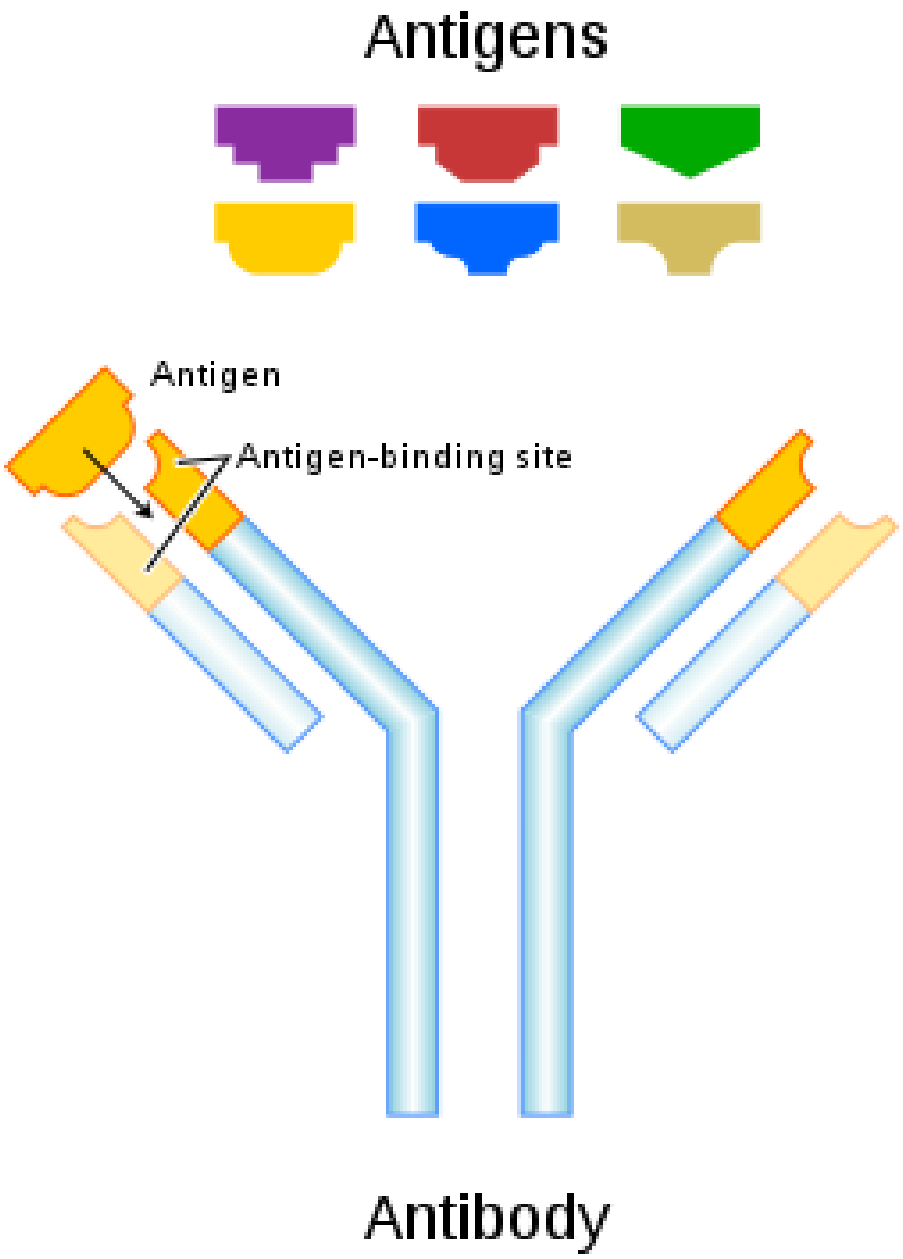

Figure 01: Antigens

Antigens are mainly involved in triggering the production of B lymphocytes which give rise to different classes of immunoglobulins depending on the requirement. Once the antibodies are present, they bind to the antigen on the foreign entity. Following the specific binding process, they form complexes, and the foreign particles are destroyed via different mechanisms such as agglutination,

precipitation or direct killing. Binding of antigen to antibody could also trigger T lymphocyte activity further boosting the immune response. This results in the activation of phagocytic mechanisms and thereby, complete degradation of the foreign particle.

Antigens at present synthesized under in vitro conditions and used in immunological testing procedures such as Enzyme Linked Immunosorbent Assays (ELISA). These tests are widely used in molecular diagnostics of special health manifestations which can occur due to communicable or noncommunicable diseases.

What are the Similarities Between Hapten and Antigen?

- Both are antigenic.
- Both are present on external cellular surfaces of microbial pathogens and other agents.
- Both form a part of the defense mechanism system between antigen and antibody.
- Both have the ability to bind to the antibody.
- Both bind to the antibody via weak linkages such as ionic interactions, H bonding and hydrophobic interactions.

What is the Difference Between Hapten and Antigen?

Hapten vs Antigen	
A hapten is a molecule or a foreign recognition site which binds to an antibody but does not have the ability to trigger the host immune system to produce an immune reaction.	An antigen is a foreign body or a molecule, which has the ability to trigger the host immune system to produce an immune reaction by binding to an antibody
Mechanism	
Hapten binds to an antibody but does not have the ability to trigger the host immune system to produce an immune reaction.	Antigen directly binds to the antibodies produced and initiate an immune reaction.
Reaction type	
Hapten reactions are only immunogenic.	Antigen reactions are antigenic and immunogenic.
Conjugation with carrier protiens	
Haptens conjugate with carrier molecules via covalent bond formation.	Antigens are not conjugating with a carrier molecule.
Uses	
Haptens are used in antibiotics and anesthetics	Antigens are used in *in vitro* techniques such as

designing.	ELISA and in pharmacological purposes.

Summary - Hapten vs Antigen

An antigen is a foreign body or a molecule, which has the ability to trigger the host immune system to produce specific antibodies in order to destroy it. A hapten is an incomplete antigen which is not originally immunogenic. Both antigens and haptens have the ability to bind to antibodies, but only antigens are capable of producing an immune response. In contrast, haptens should be made immunogenic by conjugating it with a carrier molecule such as a protein. Both these molecules have wide applications in both in vitro and in vivo conditions. These are the differences between hapten and antigen.

Reference:

1.“Hapten.” Hapten - an overview | ScienceDirect Topics, Accessed 3 Oct. 2017. Available here
2.“Immunogen, Antigen, Hapten, Epitope, and Adjuvant.” Creative Diagnostics Blog. Accessed 3 Oct. 2017. Available here

Image Courtesy:

1."Antibody" By Fvasconcellos 19:03, 6 May 2007 (UTC) - Color version of Image:Antibody.png, originally a Work of the United States Government (Public Domain) via Commons Wikimedia
2."Hapten" By MantOs - Own work (CC BY-SA 3.0) via Commons Wikimedia

How to Cite this Article?

APA: Difference Between Hapten and Antigen. (2017, October 3). Retrieved (date), from http://differencebetween.com/ difference-between-hapten-and-vs-antigen/

MLA: " Difference Between Hapten and Antigen" Difference Between.Com. 3 October 2017. Web.

Chicago: “Difference Between Hapten and Antigen.” Difference Between.Com. http://differencebetween.com/ difference-between-hapten-and-vs-antigen/ accessed (accessed [date]).