

Monoclonal Antibody

By
Pramod Kumar Mahish

What are monoclonal antibodies?

- ▶ Antibodies are proteins produced by the B lymphocytes of the immune system in response to foreign proteins, called antigens.
- ▶ Antibodies function as markers, binding to the antigen so that the antigen molecules can be recognized and destroyed by phagocytes.
- ▶ Population of antibody derived from a single kind of B cells are known as Monoclonal antibodies.
- ▶ Monoclonal antibodies have monovalent affinity, in that they bind to the same epitope.

History

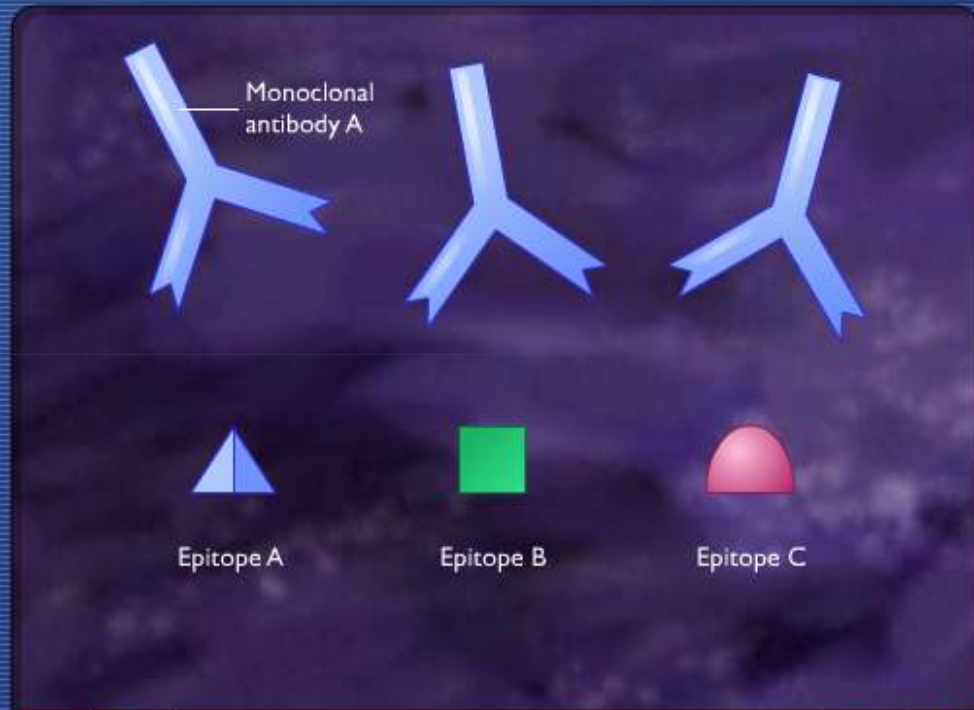
- ▶ The production of monoclonal antibodies was pioneered by Georges Kohler and Cesar Milstein in 1975.

Production of Monoclonal Antibody

- ▶ Production of B cell by immunization of any Organism with particular antigen protein.
- ▶ Extraction of B cell from Spleen of Organism.
- ▶ Production of hybridoma cell by growing B cell in culture of Myeloma cell (Having cancerous properties).
- ▶ Selection of hybridoma cell in HAT medium.
- ▶ Each hybridoma is screened.



Monoclonal Antibody Production



Monoclonal antibody preparations contain only one type of antibody, derived from a single cloned B cell.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Epitope A

Epitope B

Epitope C



Consequently they are highly specific for a single epitope and have applications, for example, in diagnostic microbiology and cancer therapy.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

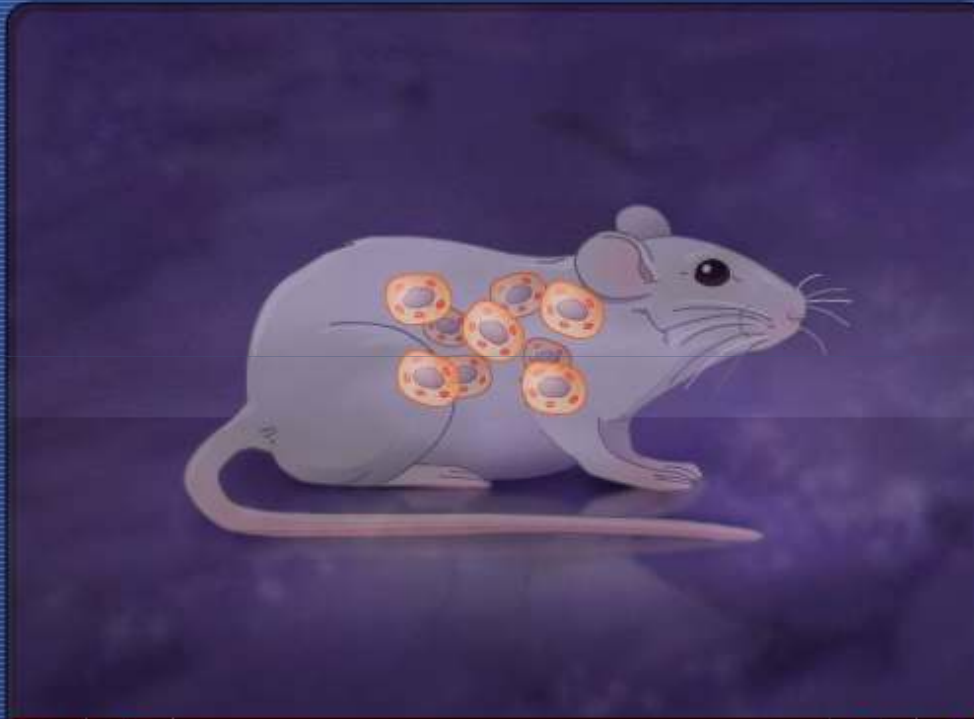


The first step in producing a monoclonal antibody is to inject an animal with an antigen containing the specific epitope of interest.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

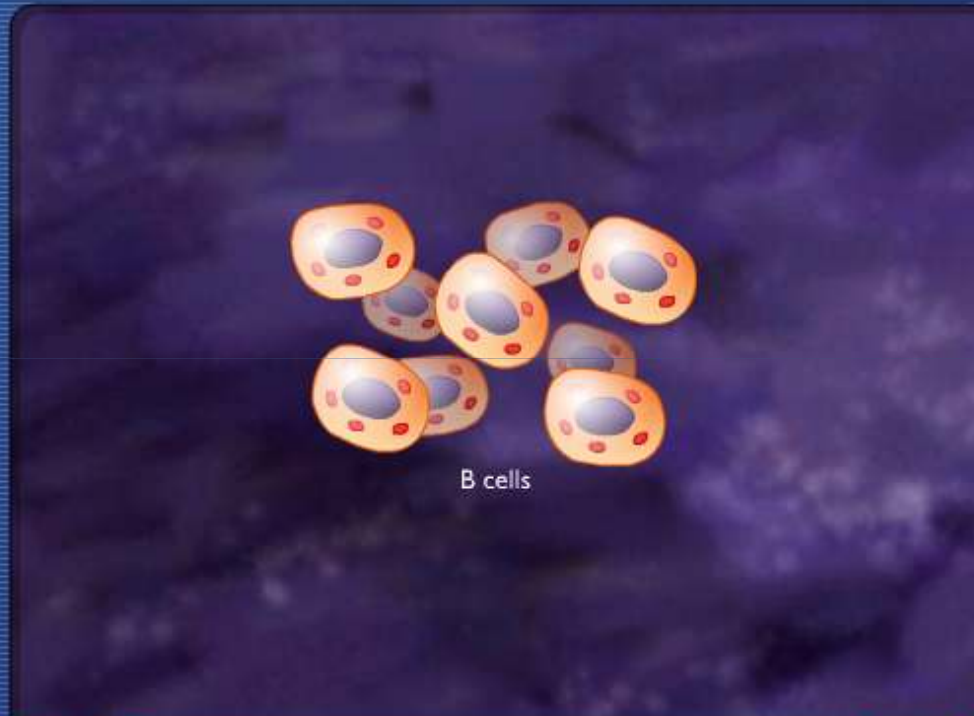


The first step in producing a monoclonal antibody is to inject an animal with an antigen containing the specific epitope of interest.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



B cells

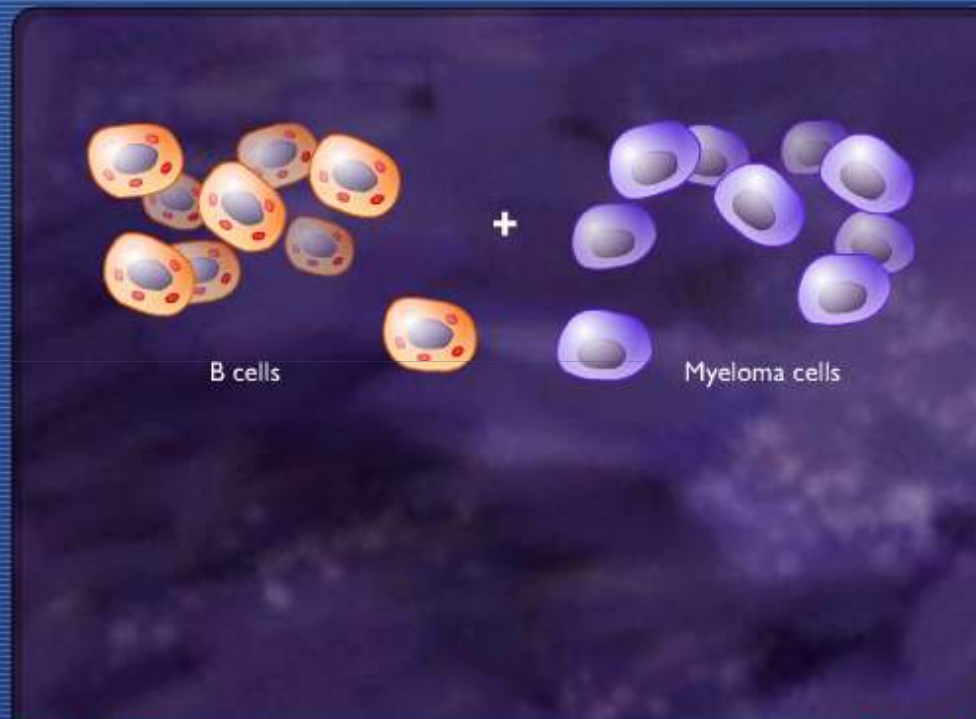


Each B cell produces a single type of antibody. B cells are isolated from the spleen and then mixed with myeloma cells, a type of cancer cell that grows continuously.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

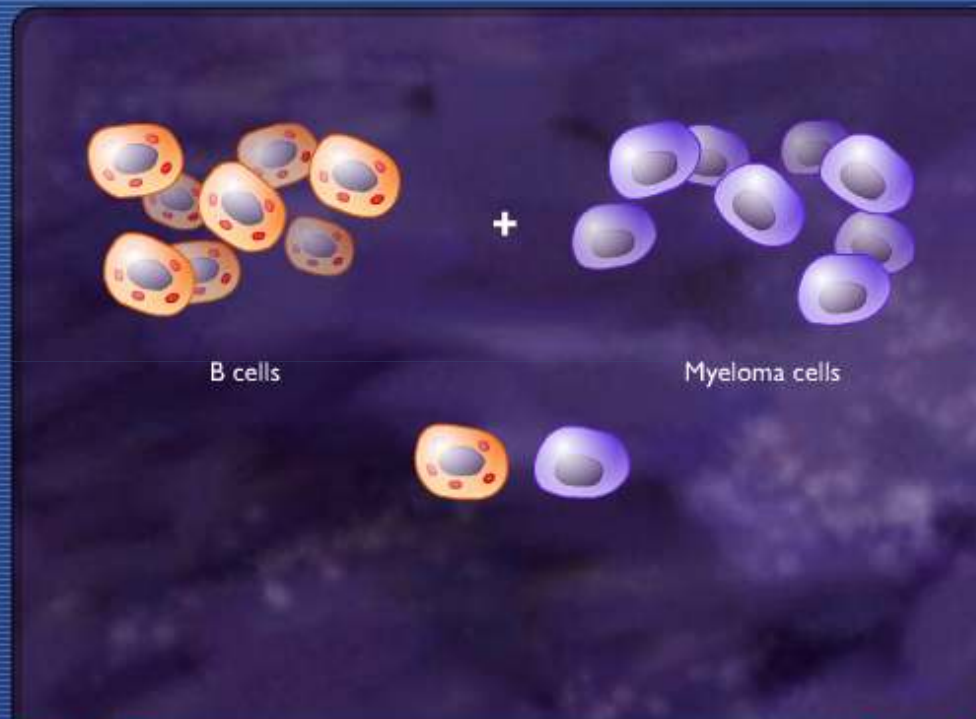


Each B cell produces a single type of antibody. B cells are isolated from the spleen and then mixed with myeloma cells, a type of cancer cell that grows continuously.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



B cells

Myeloma cells



Play



Pause



Audio



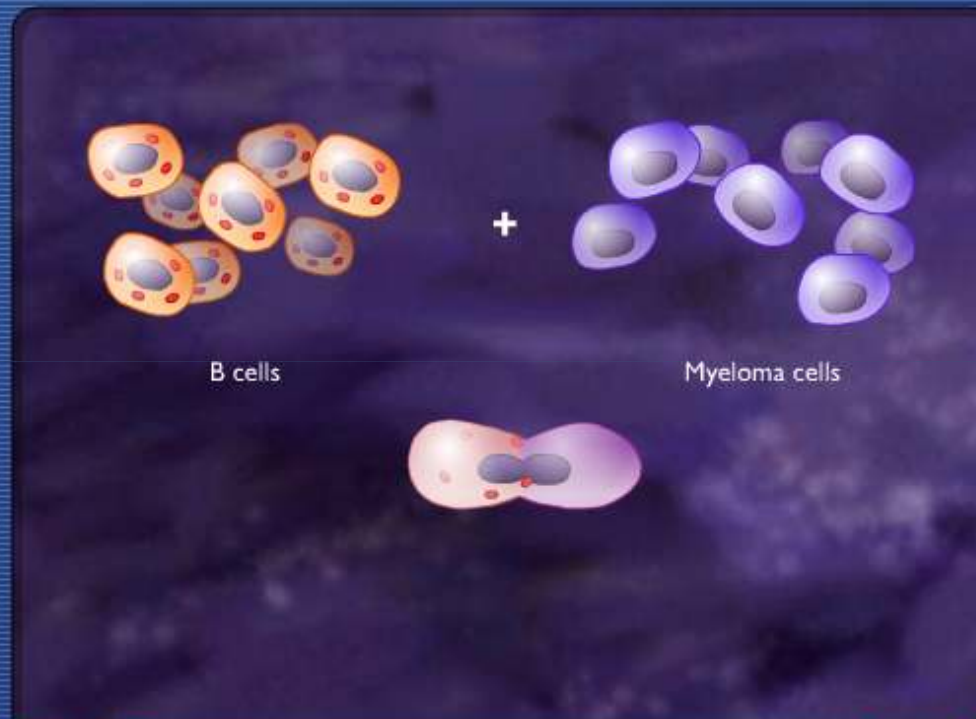
Text

Addition of polyethylene glycol causes the two types of cells to fuse together to form cells called hybridomas.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



B cells

Myeloma cells



Play



Pause



Audio



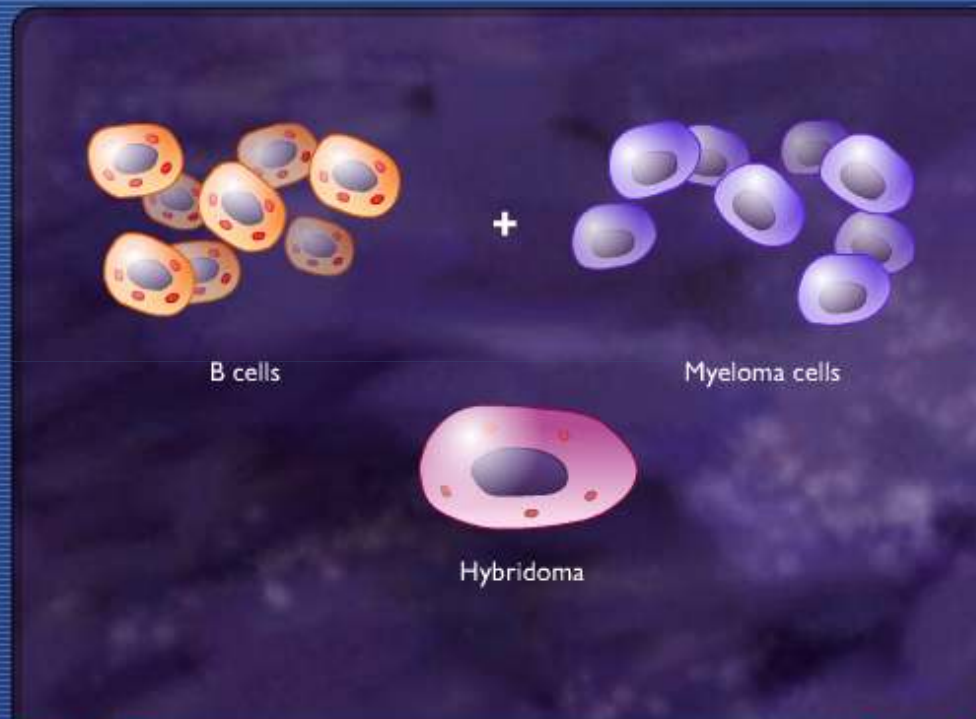
Text

Addition of polyethylene glycol causes the two types of cells to fuse together to form cells called hybridomas.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

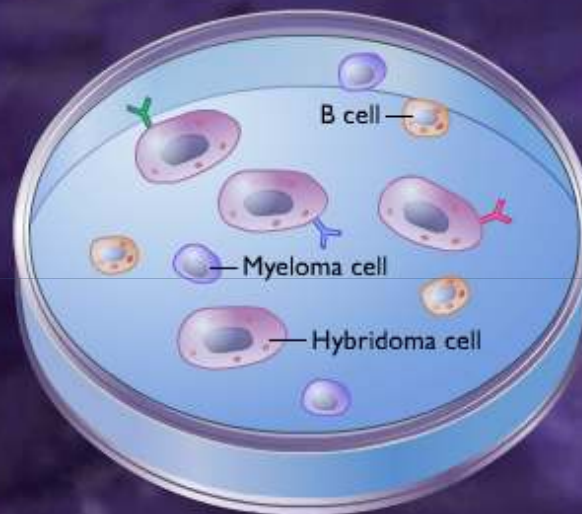


Addition of polyethylene glycol causes the two types of cells to fuse together to form cells called hybridomas.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

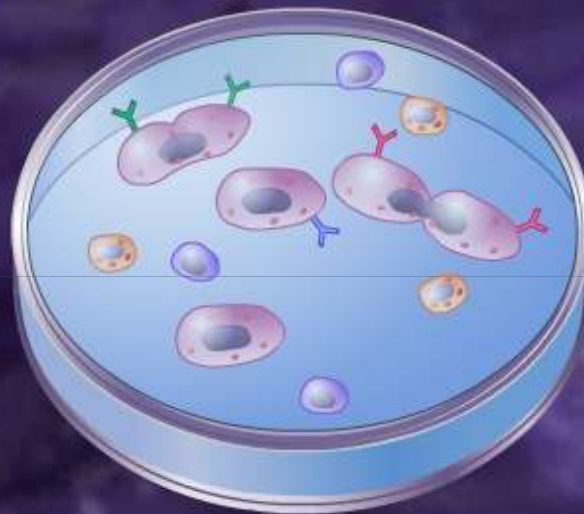


The mixture of B cells, myeloma cells and hybridomas are cultured under conditions which permit growth of only the hybridoma cells. Each hybridoma cell will produce a single type of antibody against a single epitope.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

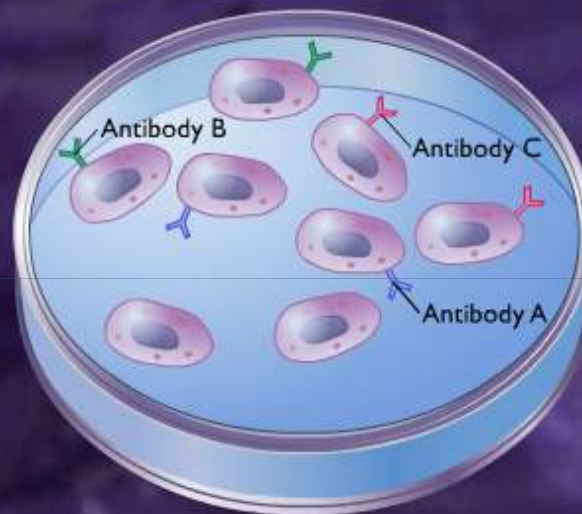


The mixture of B cells, myeloma cells and hybridomas are cultured under conditions which permit growth of only the hybridoma cells. Each hybridoma cell will produce a single type of antibody against a single epitope.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

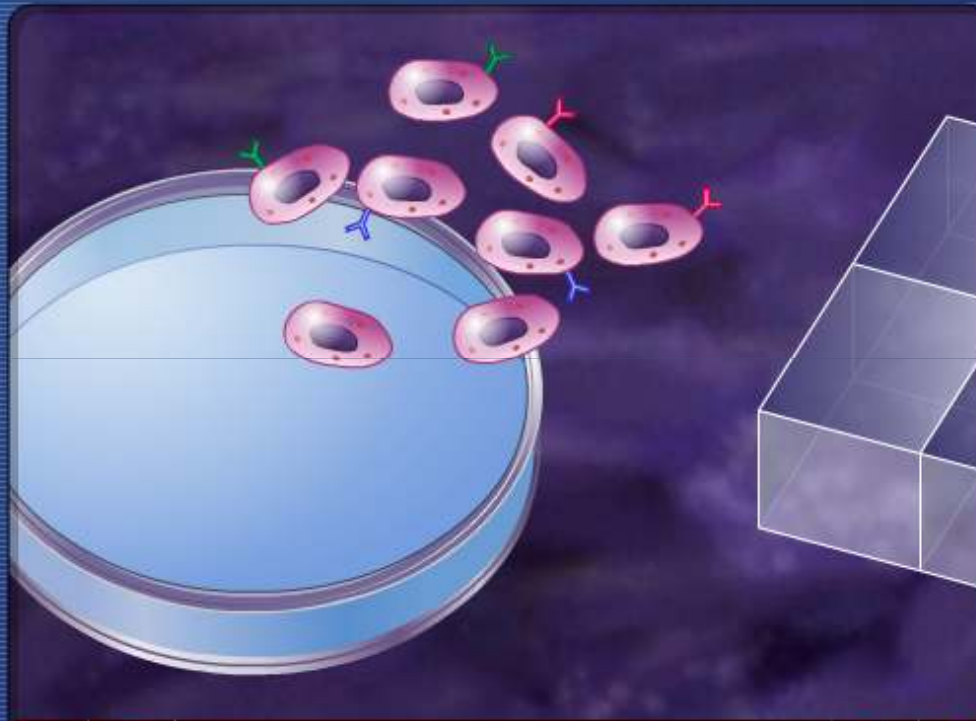


The mixture of B cells, myeloma cells and hybridomas are cultured under conditions which permit growth of only the hybridoma cells. Each hybridoma cell will produce a single type of antibody against a single epitope.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

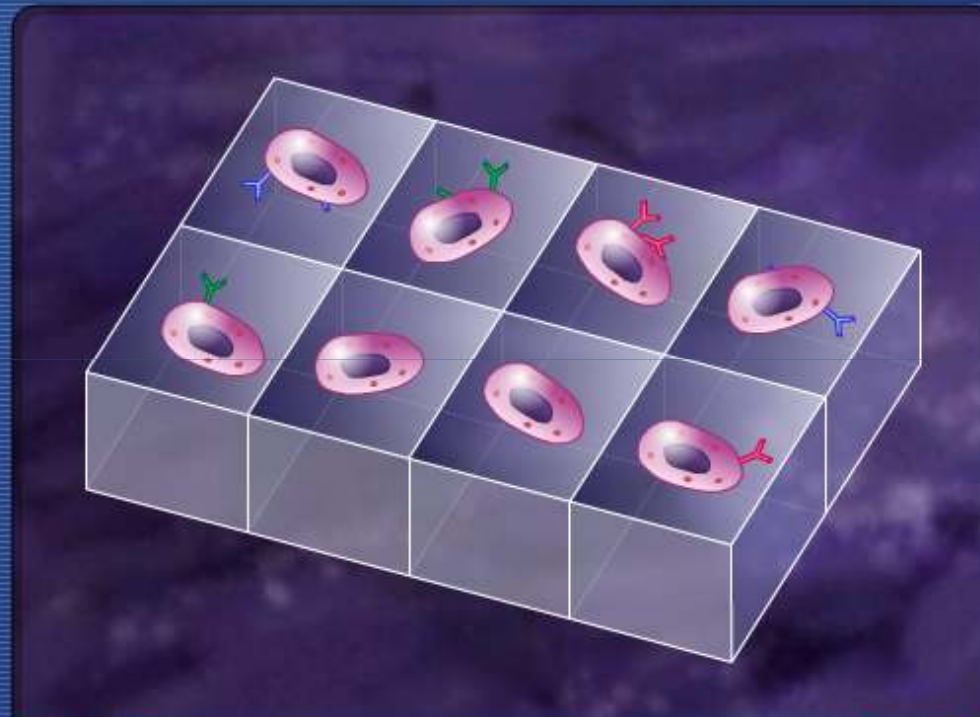


The single hybridoma cells are then separated into individual wells of a microtiter plate and tested for ability to produce the desired antibody.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

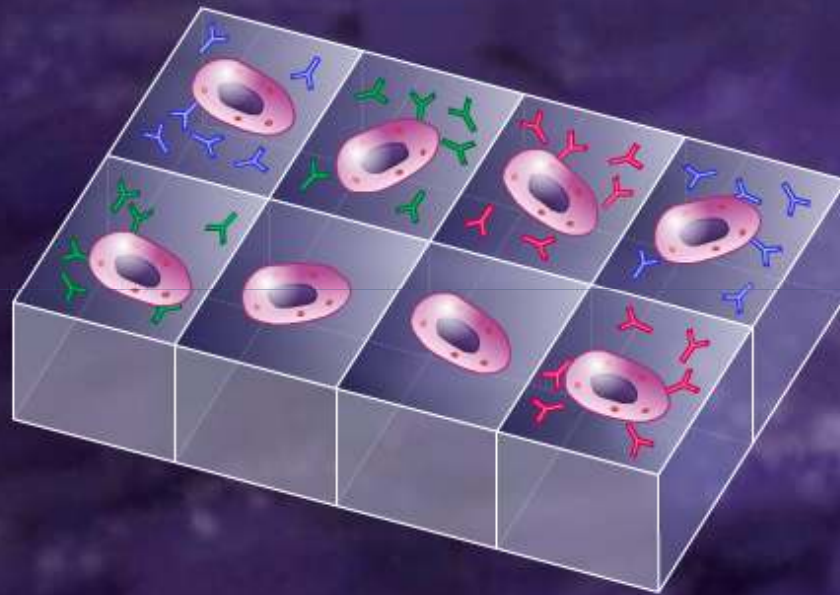


The single hybridoma cells are then separated into individual wells of a microtiter plate and tested for ability to produce the desired antibody.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

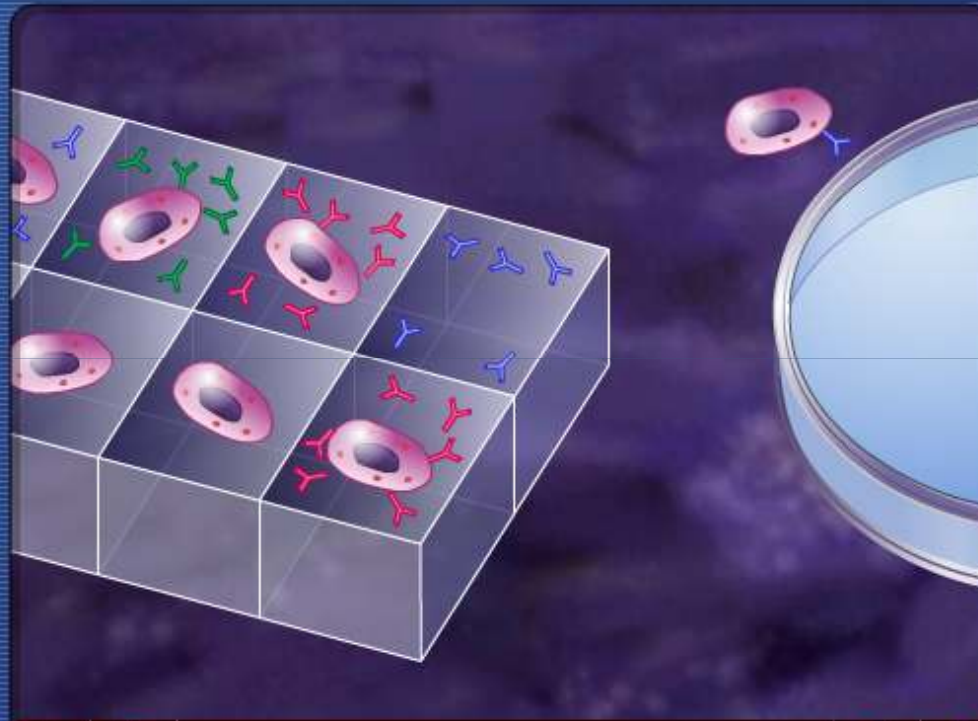


The single hybridoma cells are then separated into individual wells of a microtiter plate and tested for ability to produce the desired antibody.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

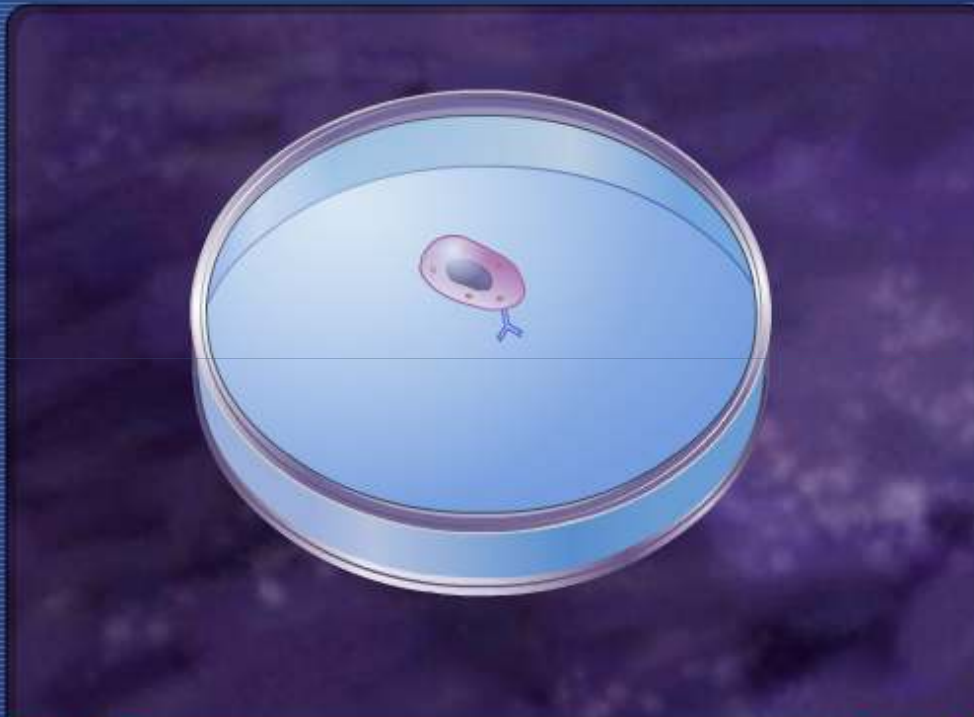


The hybridoma cells producing the desired monoclonal antibody are then cultured.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production

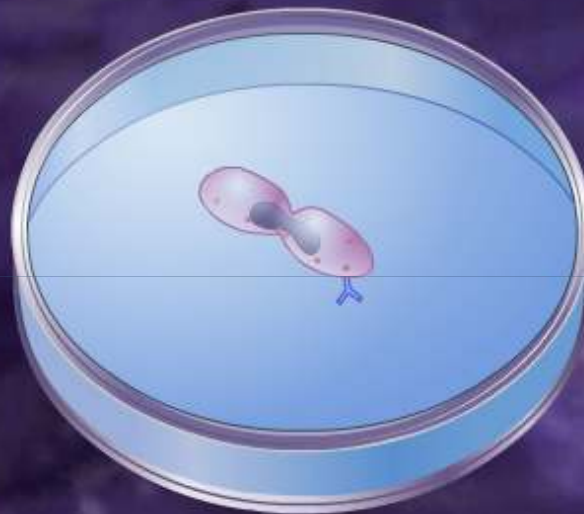


The hybridoma cells producing the desired monoclonal antibody are then cultured.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Play



Pause



Audio



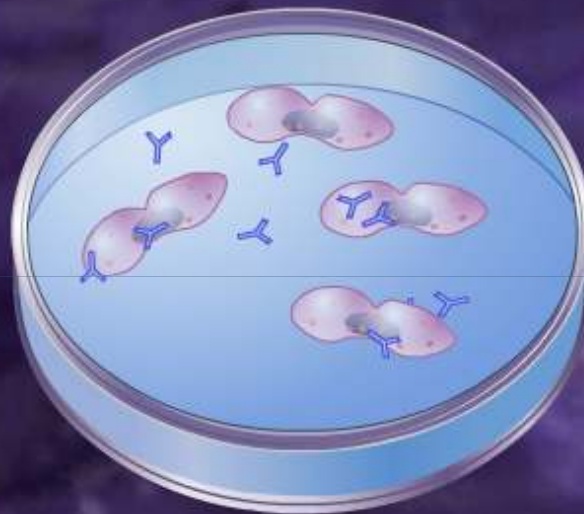
Text

The hybridoma cells producing the desired monoclonal antibody are then cultured.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Play



Pause



Audio



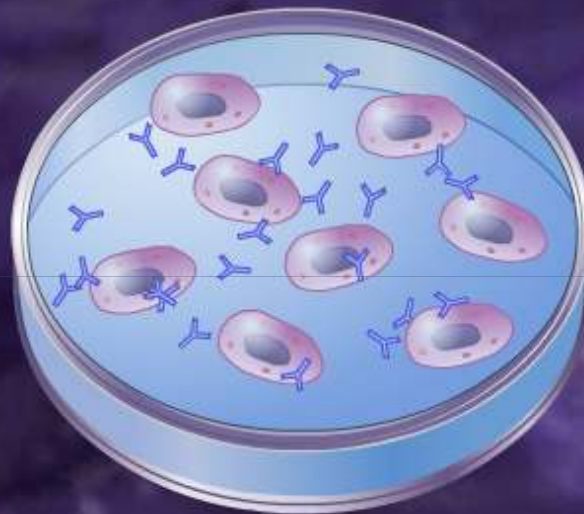
Text

The hybridoma cells producing the desired monoclonal antibody are then cultured.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Play



Pause



Audio



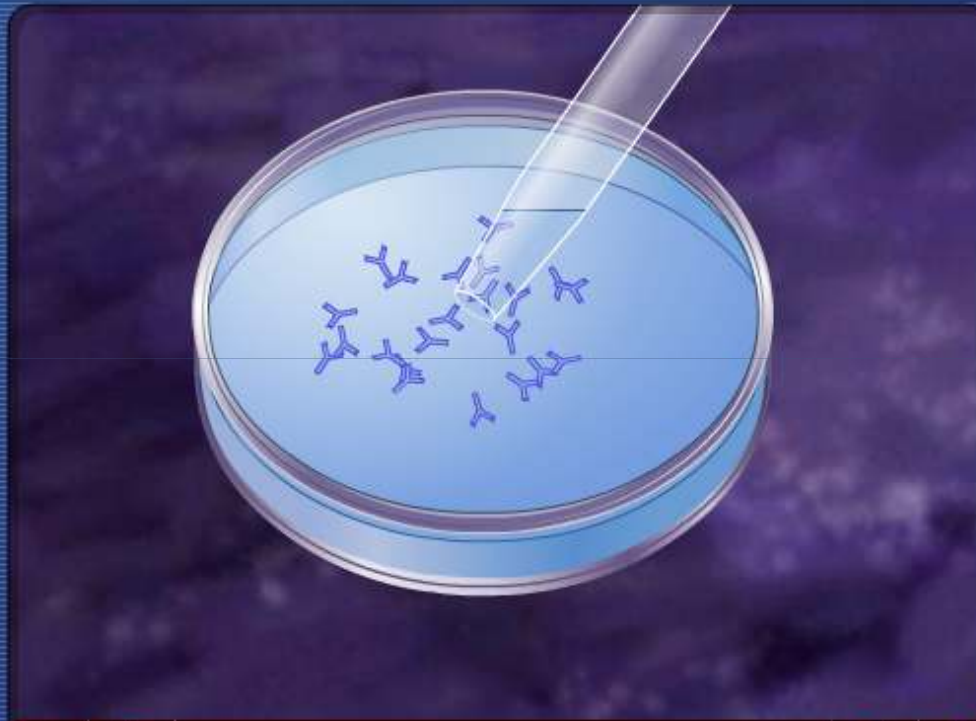
Text

The hybridoma cells producing the desired monoclonal antibody are then cultured.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Monoclonal antibodies are isolated and purified.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Monoclonal antibodies are isolated and purified.

Copyright © The McGraw-Hill Companies, Inc.



Monoclonal Antibody Production



Play



Pause



Audio



Text

Monoclonal antibodies are isolated and purified.

Copyright © The McGraw-Hill Companies, Inc.

Applications of MCAb

- ▶ **Diagnostic tests** – Uses in Western blot, immuno dot and other immunological diagnostic tools for detection of antigen, protein, toxins etc.
- ▶ **Cancer treatment** - One possible treatment for cancer involves monoclonal antibodies that bind only to cancer cell-specific antigens and induce an immunological response against the target cancer cell.
- ▶ MAbs approved by the FDA for cancer treatment include -
 - Bevacizumab
 - Cetuximab
 - Panitumumab
 - Trastuzumab



Thankyou