

Johns Hopkins Engineering

Immunoengineering

Immunoengineering Allergy and Autoimmunity
Introduction

Learning Objectives

- Describe the autoimmune and allergic disease market and drug landscape
- Utilize engineering design principles to design diagnostic devices for allergy and autoimmune disease
- Describe the importance and limitations of the microbiota's role in autoimmune and allergic disease as a biomarker and potential new therapy
- Compare and contrast mammalian and bacterial cells as sources for genetically engineered therapeutics
- Compare and contrast biologic with biomaterial approaches to treat allergy and autoimmunity
- Describe several examples of biologics and biomaterials being developed as therapeutics for autoimmune and allergic diseases
- Utilize biologic and biomaterial design principles to develop solutions to autoimmune and allergic diseases

Allergies

- 60 million people affected in the U.S.
- 6th leading cause of chronic illness in the U.S.
- Allergic Rhinitis – \$11.2 billion in U.S. (much on prescription medications)

NIH Designates \$42.7 Million for Food Allergy Research Consortium

Consortium Will Continue Seeking Food Allergy Treatment Strategies over Next Seven Years

March 29, 2017

The National Institutes of Health intends to award \$42.7 million over seven years to the [Consortium of Food Allergy Research \(CoFAR\)](#) so it may continue evaluating new approaches to treat food allergy. Established in 2005, the CoFAR has been continuously funded by the National Institute of Allergy and Infectious Diseases (NIAID), part of NIH. The first year of funding has been awarded, and awards will be made in subsequent years based on the availability of funds.

Autoimmunity

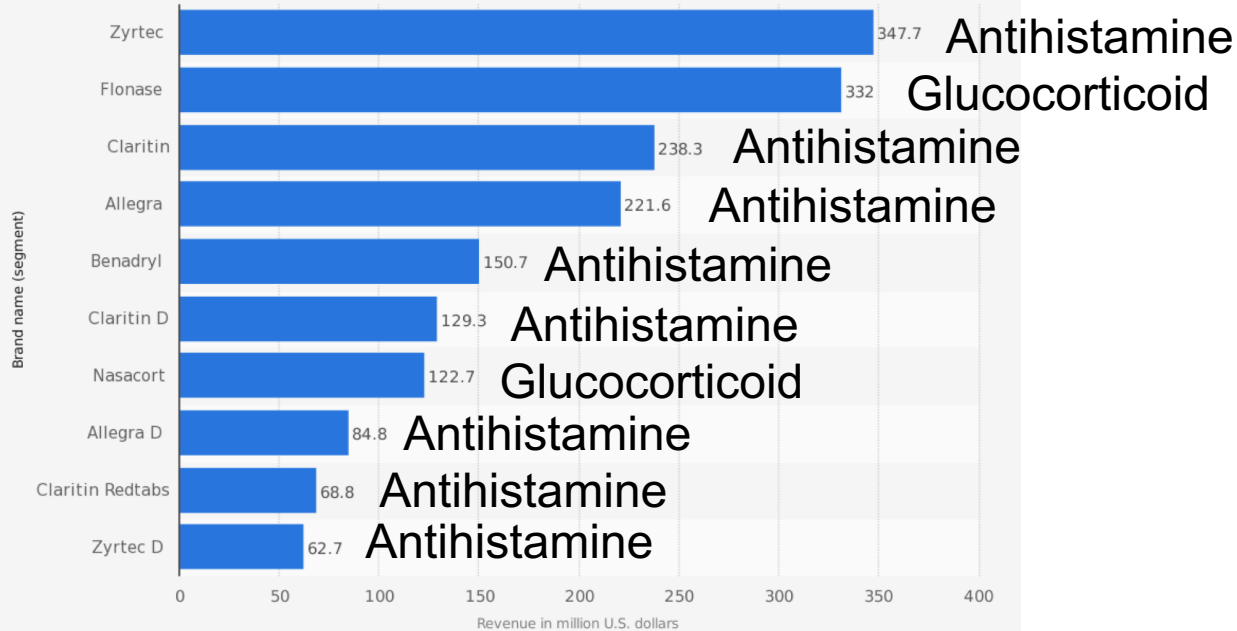
- 50 million people affected
- Costs up to \$50 billion in the U.S.

The Estimated Cost of Selected Autoimmune Diseases

Autoimmune Disease	Base Yr	Country	Indirect Costs	Direct Costs	Total Est'd Costs
Crohn's disease	2008	US			\$10.9-\$15.5 billion
Ulcerative colitis	2008	US	Est'd at 40 percent of direct costs	\$3.4-8.6 billion	\$8.1-\$14.9 billion
SLE	2008	US	\$8,659/pt/yr	\$12,643/pt/yr.	\$2.2-\$9.6 billion
MS	1994	US			\$6.8 billion
RA	2005	US	\$8.4 billion	\$10.9 billion	\$19.3 billion
Psoriasis	2010	US	\$4.5 billion	\$6.7 billion	\$11.2 billion
Scleroderma	1997	US			\$1.5 billion

Lots of room for improvement

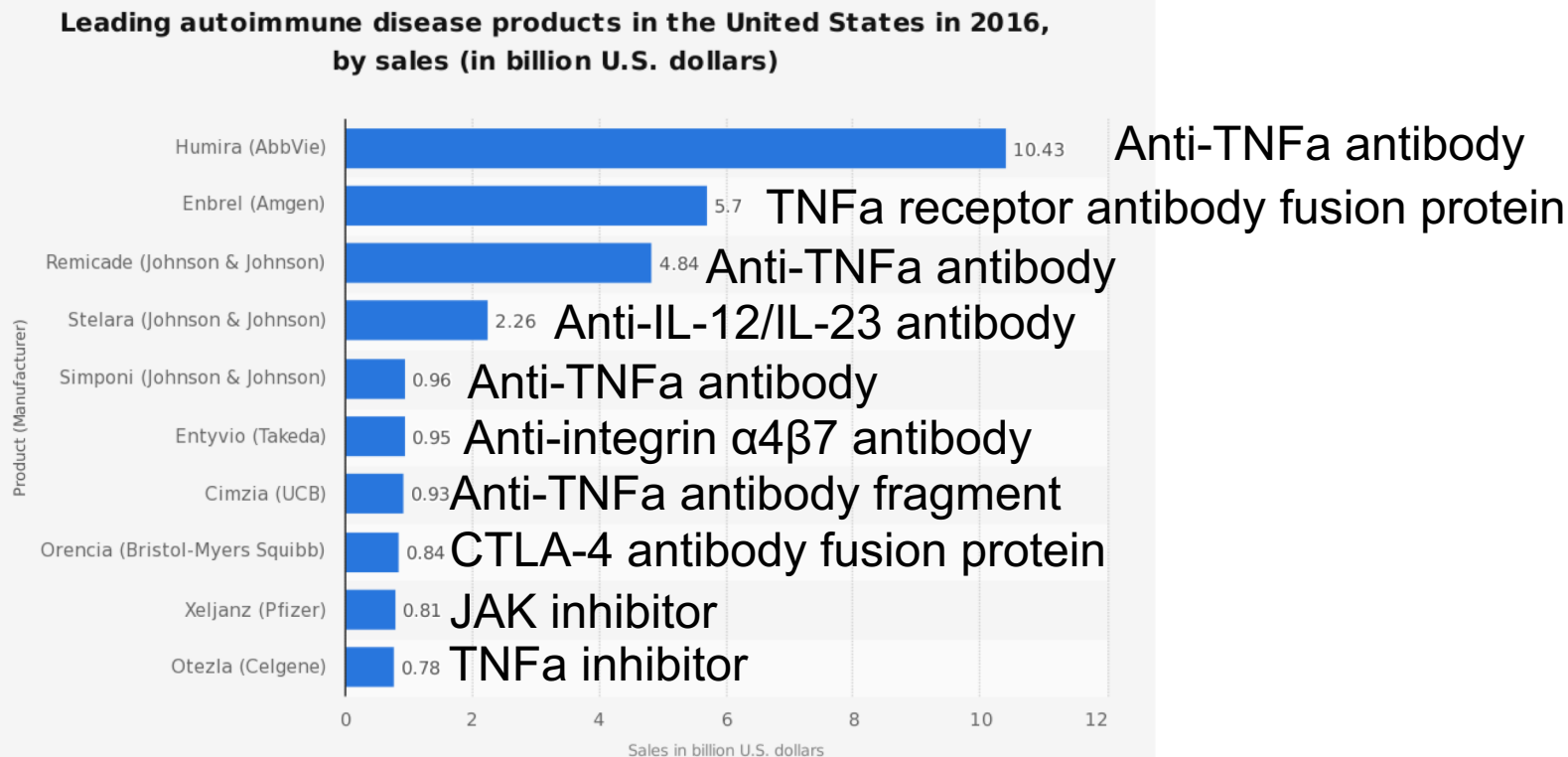
Top 10 OTC brands for allergies by revenue in the U.S. in 2016 (in million U.S. dollars)



Source
IRI; Drug Store News
© Statista 2017

Additional Information:
United States; IRI

Lots of room for improvement



Clinical Trials

Showing: 1-10 of 6,938 studies 10 studies per page

Show/Hide Columns

Row	Saved	Status	Study Title	Conditions	Interventions	Locations
1	<input type="checkbox"/>	Completed	Staff Management About Food Allergy Into Restaurants	• Food Allergy		
2	<input type="checkbox"/>	Unknown †	Randomized Double-Blind Placebo-Controlled Crab or Shrimp Allergy Reduction Study Using Nambudripad Allergy Elimination Techniques	• Food Allergies • Procedure: NAET		• National Taiwan University Hospital Taipei, Taiwan
3	<input type="checkbox"/>	Not yet recruiting	Baked Milk Oral Immunotherapy for Cow's Milk Allergy	• Cow's Milk • Drink: Baked non-fat cow's milk powder		• Johns Hopkins Hospital

NEW

Showing: 1-10 of 7,617 studies 10 studies per page

Show/Hide Columns

Row	Saved	Status	Study Title	Conditions	Interventions	Locations
4	<input type="checkbox"/>	Completed Has Results	Oral Immunotherapy for Whe...			
5	<input type="checkbox"/>	Completed	Immunotherapy for Peanut All...			
6	<input type="checkbox"/>	Enrolling by invitation	Intranasal Diagnostics in Foo...			
7	<input type="checkbox"/>	Terminated	Impact of Infant Formula on R...			
1	<input type="checkbox"/>	Completed Has Results	Gastrointestinal and Health-related Quality of Life Outcomes in Patients With Autoimmune Diseases Treated With Mycophenolate	• Autoimmune Disease	• Drug: Enteric-coated Mycophenolate Sodium	• Novartis Investigational Site Various cities, Germany
2	<input type="checkbox"/>	Recruiting	Molecular Reclassification to Find Clinically Useful Biomarkers for Systemic Autoimmune Diseases	• Systemic Autoimmune Diseases		• Medical University of Vienna Vienna, Austria • Université catholique de Louvain - Cliniques Universitaires Saint-Luc Brussels, Belgium • UZ Leuven - KU Leuven, Department of Rheumatology (KU LEUVEN) Leuven, Belgium • (and 15 more...)
3	<input type="checkbox"/>	Recruiting	Molecular Reclassification to Find Clinically Useful Biomarkers for Systemic Autoimmune Diseases: Inception Cohort	• Systemic Autoimmune Diseases		• Université catholique de Louvain - Cliniques Universitaires Saint-Luc (UCL) Brussels, Belgium • UZ Leuven - KU Leuven, Department of Rheumatology (KU LEUVEN) Leuven, Belgium • CHRU de Brest Brest, France • (and 7 more...)
4	<input type="checkbox"/>	Unknown †	Autologous Hematopoietic Stem Cell Transplantation for Refractory Autoimmune Diseases	• Autoimmune Diseases	• Procedure: Autologous hematopoietic stem cell transplantation	• Charité Universitätsmedizin Berlin Berlin, Germany

Corporate activity

BIOTECH

Celgene acquires autoimmune startup Delinia for \$775M

By JULIET PRESTON

Post a comment / Jan 26, 2017 at 1:05 PM



GOT NEWS? SEND US A TIP

On Thursday, Summit, New Jersey-based [Celgene Corporation](#) announced plans to acquire Delinia for an upfront \$300 million and an additional \$475 million in



Pandion raises \$58M for its autoimmune platform inspired by the tumor microenvironment

By JULIET PRESTON

Post a comment / Jan 18, 2018 at 7:01 AM



Sean Parker Grants \$10 Million To Aid Radical Autoimmune Research For Type 1 Diabetes

Sarah Buhr @sarahbuhr / Nov 17, 2015

Comment

Sean Parker has been very philanthropic lately, particularly with life sciences research. Parker announced he'd given \$600 million to a foundation with his name on it this summer and \$24 million last December to establish an allergy



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