

JOURNAL OF MICROBIOLOGY & BIOLOGY EDUCATION, May 2016, p. 300-301
DOI: <http://dx.doi.org/10.1128/jmbe.v17i2.1096>



Supplemental Materials

for

Modeling Influenza Antigenic Shift and Drift with LEGO Bricks

Boriana Marintcheva
*Department of Biological Sciences, Bridgewater State University,
Bridgewater, MA 02325*

Table of Contents

(Total pages 4)

Appendix 1: List of materials and instructor's notes

Corresponding author. Mailing address: 131 Summer Street, Department of Biological Sciences, Science Building – Room 309, Bridgewater State University, Bridgewater, MA 02325. Phone: 508-531-1729. Fax: 508-531-1745. E-mail: Boriana.Marintcheva@bridgew.edu.

©2016 Author(s). Published by the American Society for Microbiology. This is an Open Access article distributed under the terms of the Creative Commons Attribution-Noncommercial-NoDerivatives 4.0 International license (<https://creativecommons.org/licenses/by-nc-nd/4.0/> and <https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>), which grants the public the nonexclusive right to copy, distribute, or display the published work.

Appendix 1: List of materials and instructor's notes.

List of Materials

	Item	Number of pieces	Source
1	Celebrate it™ Gift box	1	Michaels arts and crafts store http://www.michaels.com/search?q=346385
2	1X2/red LEGO bricks	4	Online LEGO® shop http://shop.lego.com/en-US/Pick-A-Brick-ByTheme
3	1X4/red LEGO bricks	4	
4	1X6/red LEGO bricks	4	
5	1X2/blue LEGO bricks	1	
6	1X4/blue LEGO bricks	1	
7	1X6/blue LEGO bricks	1	

Modeling Antigenic Shift with Lego® Bricks

Instructor's notes

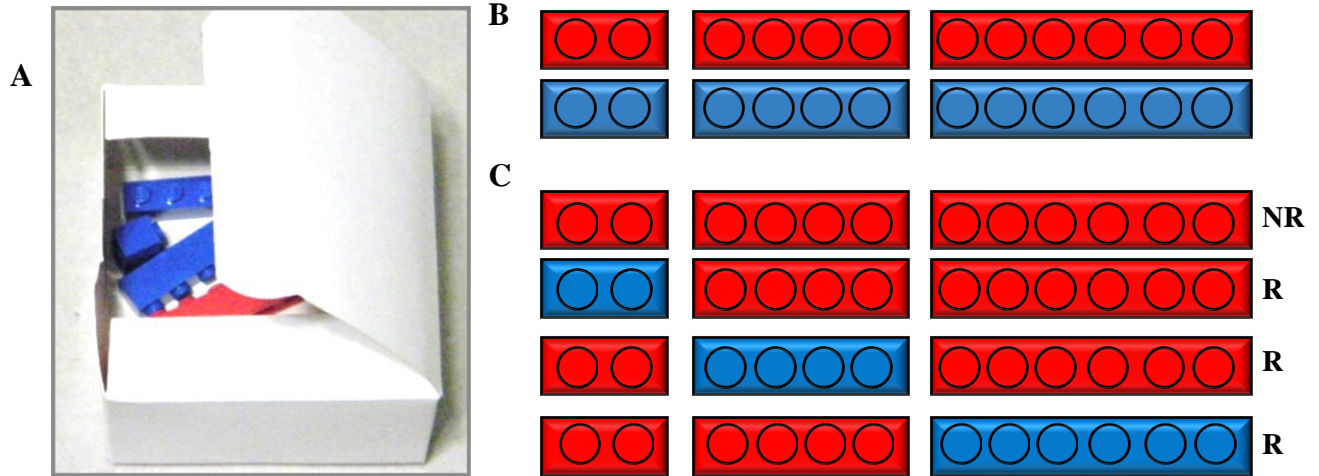


Figure 1. Antigenic Shift Exercise: Manipulatives and Outcomes.

Antigenic shift is modeled using i) a non-transparent box (panel A) as an infected host cell and ii) two sets of Lego® bricks with different color (panel B) representing the genomes of distinct Influenza strains replicating with the same rate. Single-row LEGO® bricks (to emphasize ssRNA genome) with two, four and six studs work the best. It is straightforward to purchase the needed pieces using the “Pick a Brick by Theme” option of the online LEGO® store. Total cost of 1 genome is under 1\$. The box shown in panel A was purchased from Michael’s crafts store, also for under one dollar. Students are asked to package 10 viruses by picking Lego® bricks based on their size without peeking in the box. The genetic makeup of each packaged virus is recorded as non-recombinant (NR) if all selected Lego® bricks are the same color or recombinant (R), if the colors are mixed (panel C). Lego® bricks are returned in the box before the next virus is assembled. Class results are tallied in a table and analyzed.

Modeling Antigenic Drift with Lego® Bricks

Instructor's notes

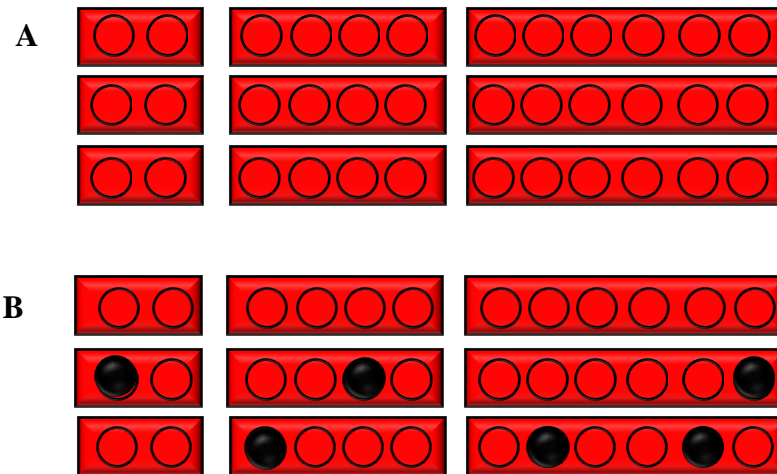


Figure 2. Antigenic Drift Exercise: Manipulatives and Outcomes.

Each pair of students is given three model Influenza genomes of the same color (panel A) and a marker (not shown). Students are asked to keep one genome as a reference for the genetic make-up of the virus that initially infected the cell (panel B-top) and to generate two genome copies taking into account the error prone nature of the RNA polymerase copying RNA. It is assumed that the enzyme introduces on average 3 mutations per every 10 nucleotides copied. Mutations are visualized by coloring studs of the Lego® bricks (panel B). Class results are displayed together to demonstrate the vast diversity of Influenza viruses that can arise.