Bio257 Immunology Practice Questions #4

1. Cytokines are crucial to immune system function. In class we discussed data from papers that support the importance of **interferon γ: IFNγ knockout** mice (**IFNγ$^{0/0}$**) were **killed** by **normally sublethal doses** of **mycobacteria** and **2) IFNγ receptor knockout** mice (**IFNγR$^{0/0}$**) were **unable to fend off** ***Listeria monocytogenes***, another **intracellular bacterium**.

The authors of these papers also designed experiments to address which aspects of immune system function were compromised in the different knockout mice. One of the **toxic molecules produced by activated macrophages**, **nitric oxide (NO),** can be **detected** by incubation with a reagent that converts **NO** into **nitrite (NO_2^-).** Results from experiments to **test levels of NO produced by macrophages** from **each type of mouse** are shown below.

IFNγ$^{0/0}$

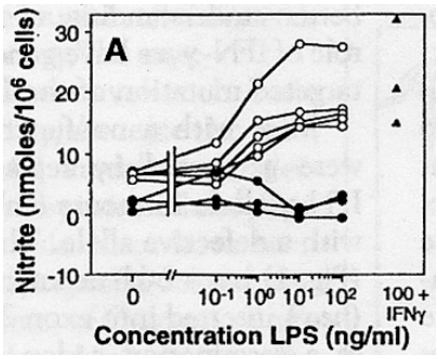
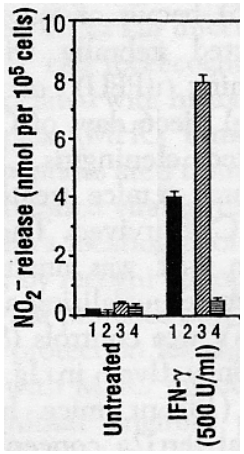


Fig. 1: Macrophage activation in IFNγ$^{0/0}$ mice. **Macrophages** from **mycobacterium-infected wildtype** or **mutant mice** were tested for **nitric oxide production** after 24 h treatment with different concentrations of lipopolysaccharide (LPS). Results represent two experiments with multiple mice (**each line=one mouse**). As a **control**, **macrophages** from **infected mutant mice** were incubated with **IFNγ** for 48 h.

IFNγR$^{0/0}$



1 2 3 4
strain: WT IFNγR$^{0/0}$ WT IFNγR$^{0/0}$

Fig. 2: Macrophage activation in IFNγR$^{0/0}$ mice. **Macrophages** from **wildtype** or **mutant mice** were tested for **nitric oxide production** after 24 h treatment with or without **IFNγ** and with or without 100 ng/ml lipopolysaccharide (LPS). Each **bar** represents the **average** of 3 samples.

a) Name **one type** of **immune cell** that **expresses IFNγ** and **two types** of **immune cell** that **express the IFNγ receptor**.

b) How does **each IFN receptor-bearing cell respond** to the presence of **IFNγ**?

c) Describe the **major result** shown in **Fig. 1**. Does this result **make sense**? **Why** or **why not?**

d) Describe the **major result** shown in **Fig. 2**. Does this result **make sense**? **Why** or **why not?**

e) Would you expect levels of **IL-10** and **IL-12** in the **IFNγ knockout mice** to be **lower, similar, or higher** than in **wildtype mice? Explain** your reasoning for each cytokine.

***f)** What **type** of **immune response(s)** are these **mutant** mice **missing**?

Q1 continued:

The **experiments** shown in **Figures 1** and **2** are quite **similar**, yet if you look at nitrite production at the **highest LPS** concentration (100 ng/ml) and in the **absence of added IFNγ**, macrophages from **wildtype** mice in **Fig. 1** show a **significant amount** of nitrite production (**highest points on curves**) while **macrophages** from **wildtype** mice in **Fig. 2** show **very little** nitrite production (**untreated #3**).

***g)** Assuming that the **same strain** of **wildtype** mice was used in the two experiments, **explain** this **difference** in nitrite production.

2. Viruses depend on the host cell for much of the macromolecular machinery required for viral replication (e.g. ribosomes). Although viruses usurp many host proteins, they also occasionally make their own, slightly different versions of host proteins. Epstein-Barr virus (EBV--a real virus, which causes mononucleosis) makes a protein that is a viral homolog of interleukin-10 (vIL-10).
Why would it be beneficial to EBV to produce vIL-10? Explain the benefit of vIL-10 to the virus in terms of the cells and molecules involved.

*Complete answers will involve info from lecture on Mon., Nov. 3.

Questions from the book

Chapter 12 #2, 5, 7, 9

Chapter 13 #2

Chapter 14 #2, 6, 8 (although we didn't discuss "CML" assays as such, they are the same as the assays we talked about when discussing MHC restriction (compare figs 14-17 and 8-15)
(also, #9 makes an important point, but is a rather silly/obnoxious question)