

**Supporting Information**

**SPHINGOLIPIDS AND GLYCOSPHINGOLIPIDS — THEIR SYNTHESSES AND  
BIOACTIVITIES**

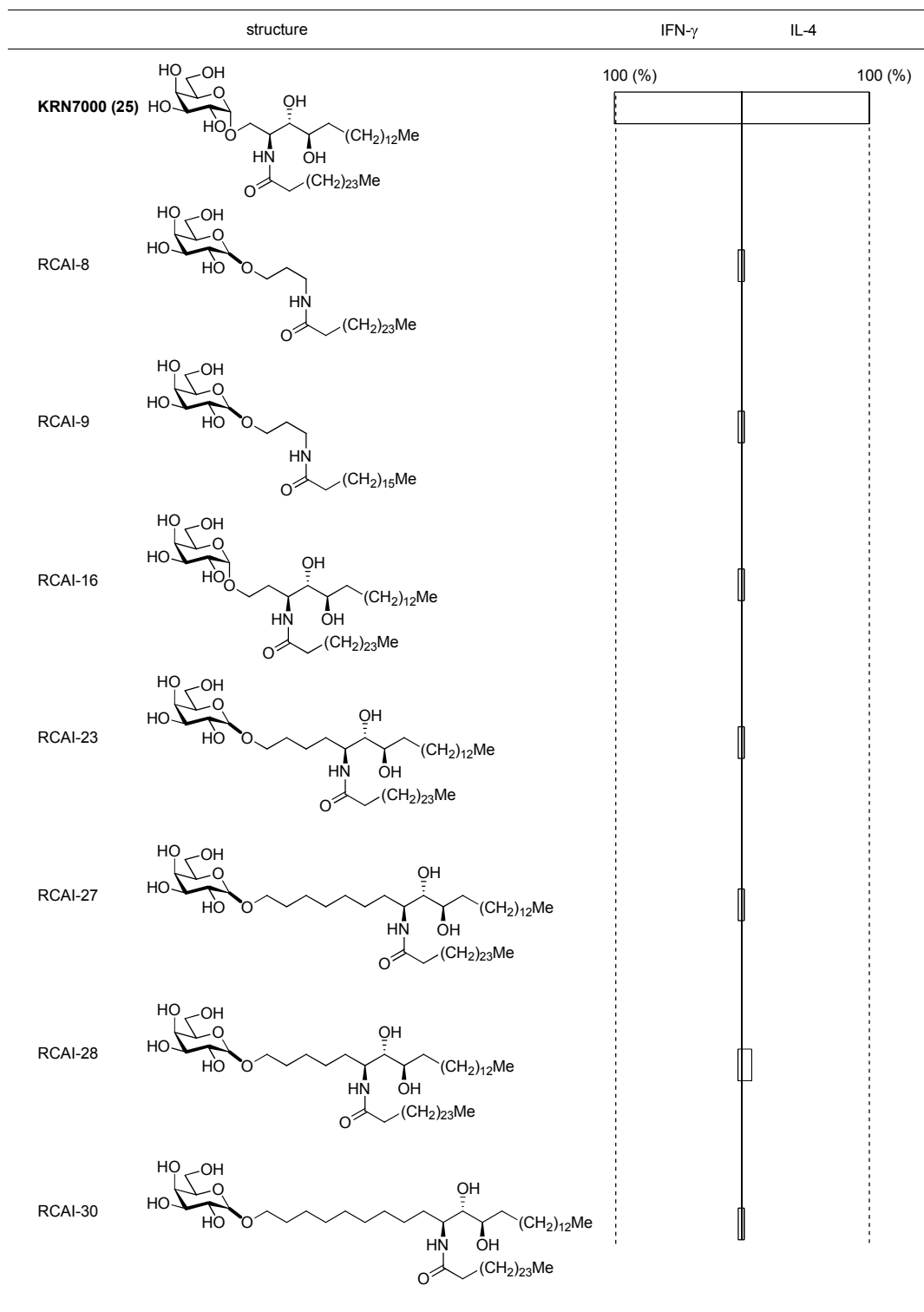
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# 1. Single-chain and spacer analogues

(mouse, *in vitro*)<sup>a</sup>



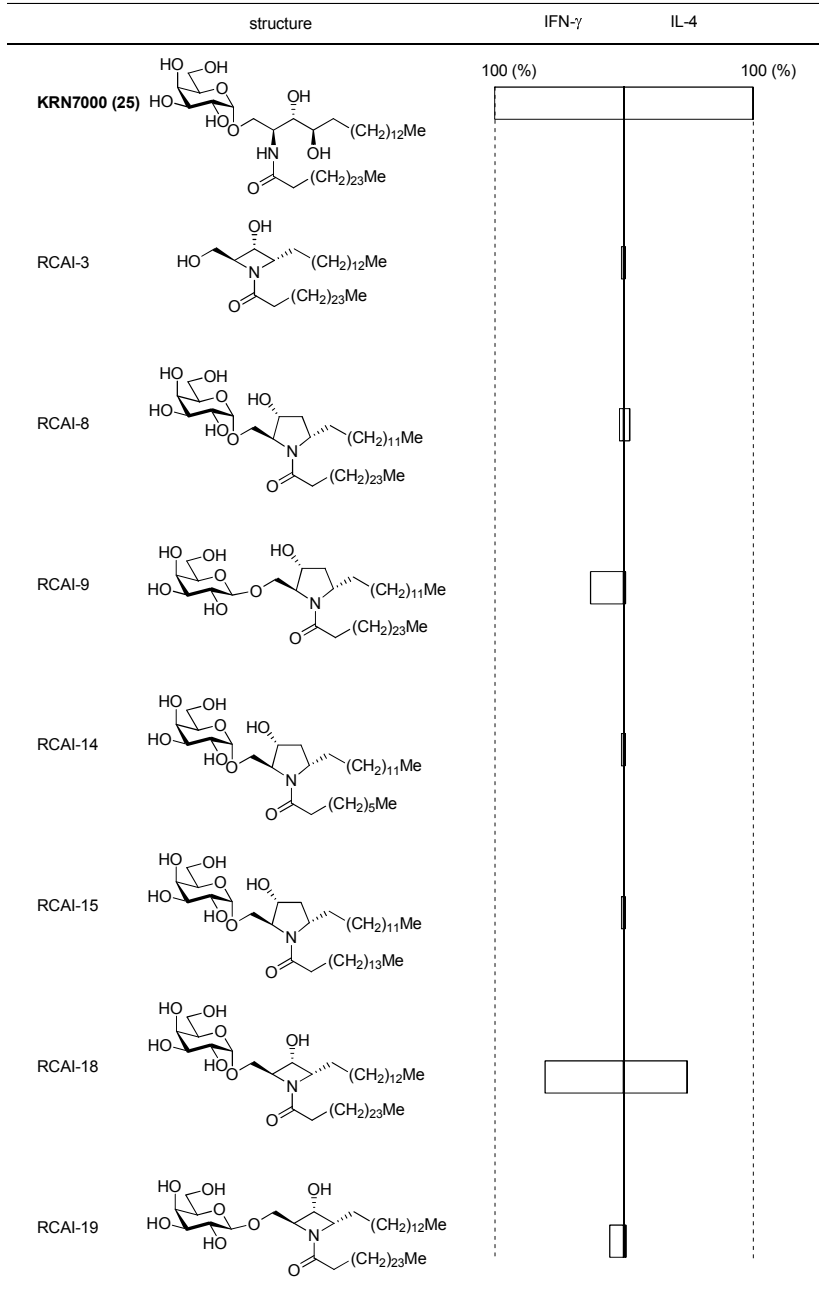
<sup>a</sup> Cytokine responses relative to KRN7000 (**25**)<sup>b</sup>

<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4, which were secreted from spleen cells (B6 mice) cultured with 40 ng/mL of glycolipids for 48 h, were measured by Cytometric Bead Array system

**Figure S-1.** Structures of analogues of KRN7000 (8), and their bioactivity

## 2. Azetidine and pyrrolidine analogues — 1<sup>1</sup>

(mouse, *in vitro*)<sup>a</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4, which were secreted from spleen cells (B6 mice) cultured with 20 ng/mL of glycolipids for 48 h, were measured by Cytometric Bead Array system<sup>2</sup>

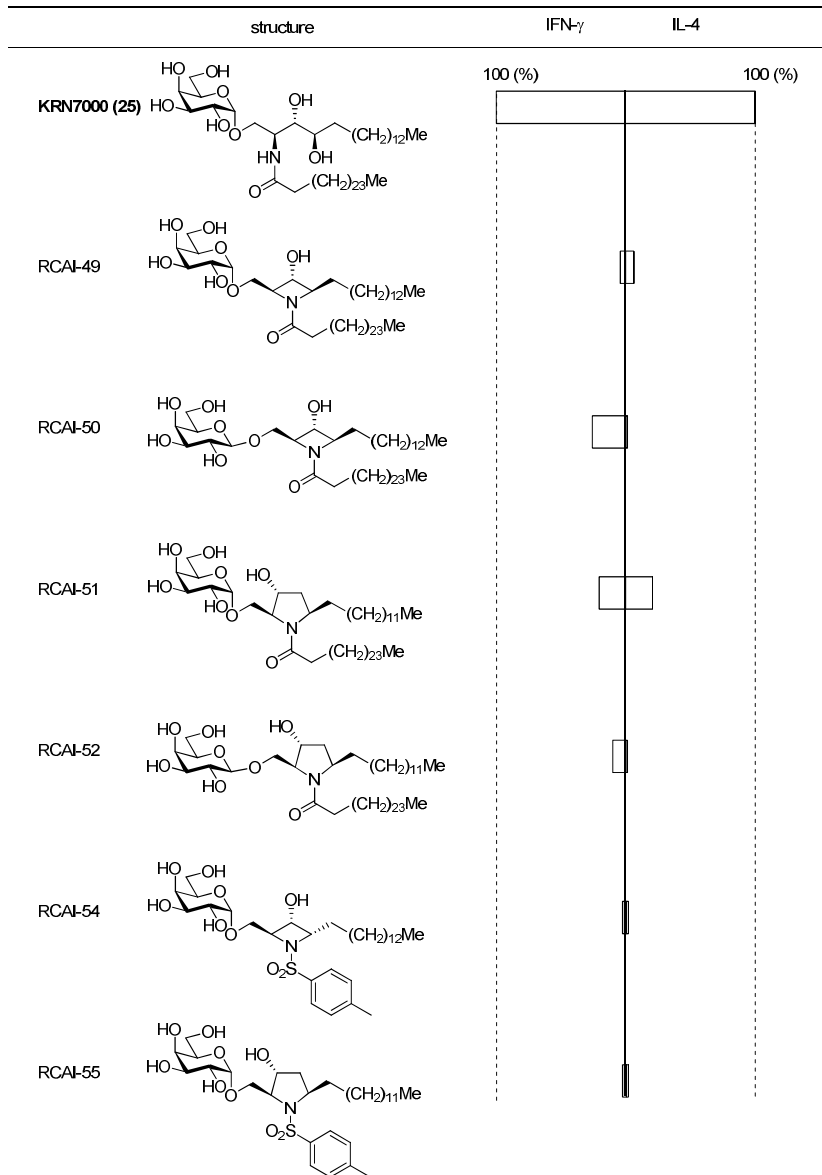
**Figure S-2.** Structures of analogues of KRN7000 (9), and their bioactivity

<sup>1</sup> K. Fuhshuku, N. Hongo, T. Tashiro, Y. Masuda, R. Nakagawa, K. Seino, M. Taniguchi, and K. Mori, *Bioorg. Med. Chem.* 2008, **16**, 950.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

## 2. Azetidine and pyrrolidine analogues — 2<sup>1</sup>

(mouse, *in vitro*)<sup>a</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

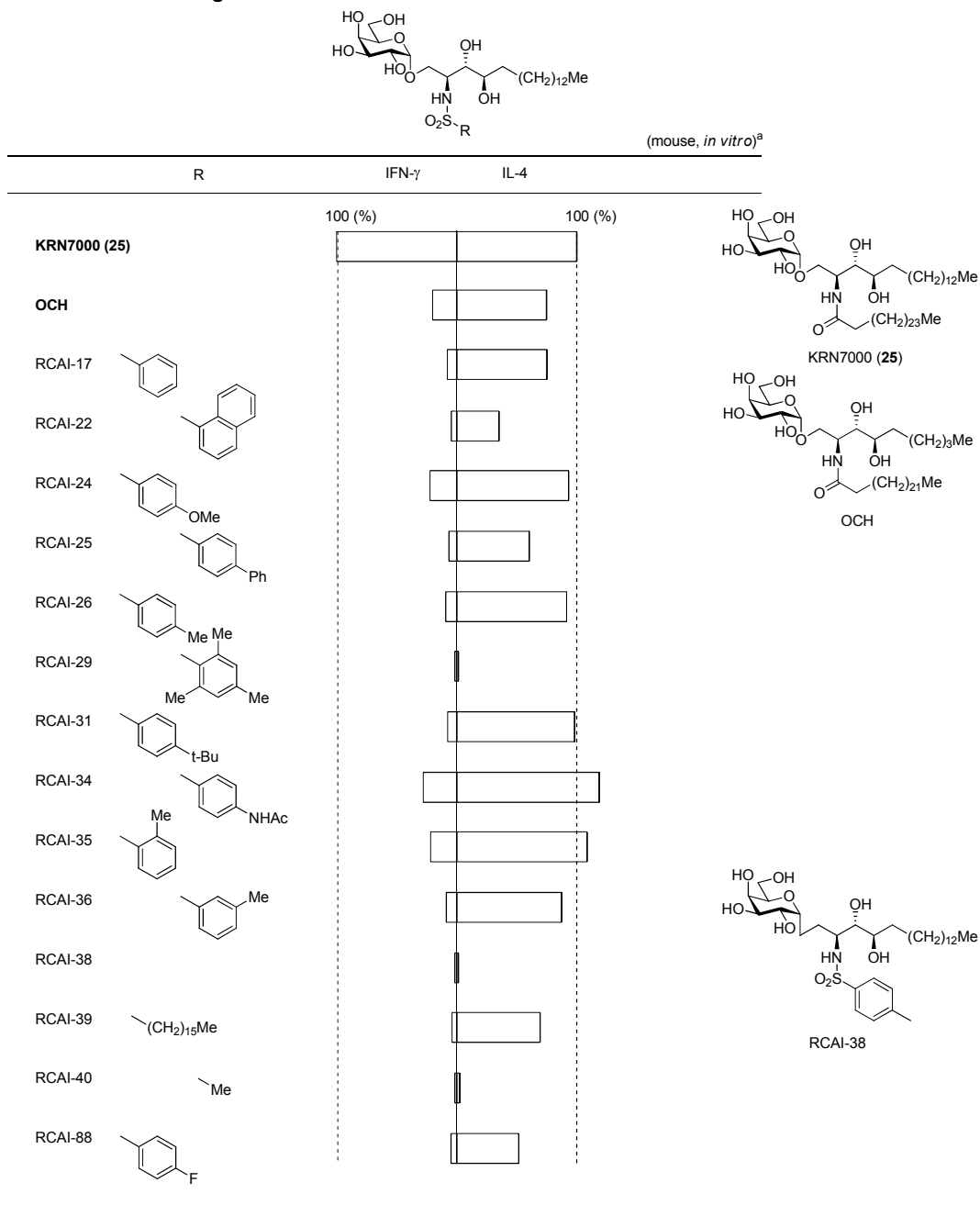
<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4, which were secreted from spleen cells (B6 mice) cultured with 20 ng/mL of glycolipids for 48 h, were measured by Cytometric Bead Array system<sup>2</sup>

**Figure S-3.** Structures of analogues of KRN7000 (10), and their bioactivity

<sup>1</sup> K. Fuhshuku, N. Hongo, T. Tashiro, Y. Masuda, R. Nakagawa, K. Seino, M. Taniguchi, and K. Mori, *Bioorg. Med. Chem.* 2008, **16**, 950.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

### 3. Sulfonamido analogues<sup>1</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

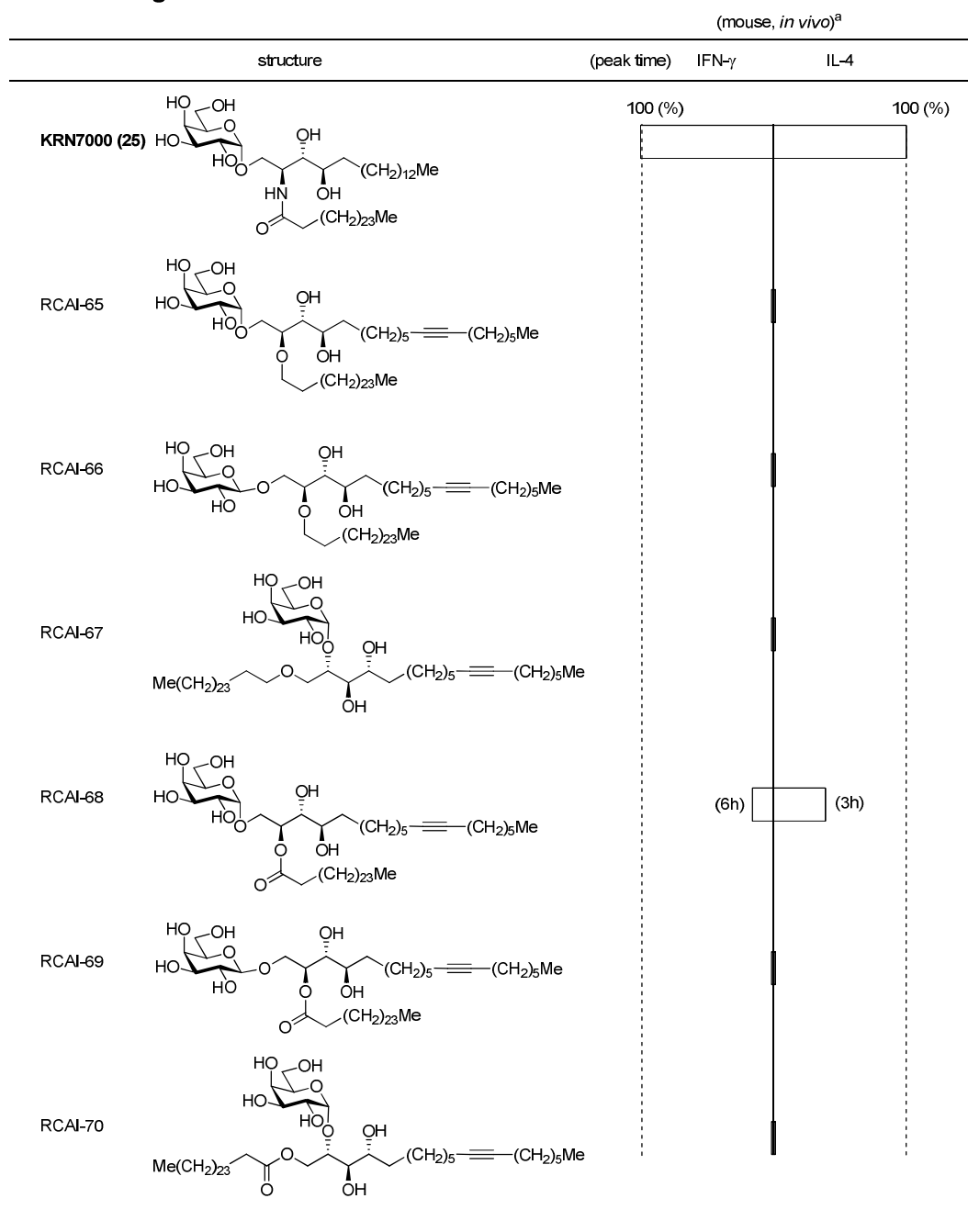
<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4, which were secreted from spleen cells (B6 mice) cultured with 20 ng/mL of glycolipids for 48 h, were measured by Cytometric Bead Array system<sup>2</sup>

Figure S-4. Structures of analogues of KRN7000 (11), and their bioactivity

<sup>1</sup> T. Tashiro, N. Hongo, R. Nakagawa, K. Seino, H. Watarai, Y. Ishii, M. Taniguchi, and K. Mori, *Bioorg. Med. Chem.* 2008, **16**, 8896.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

#### 4. Ester analogues — 1<sup>1</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

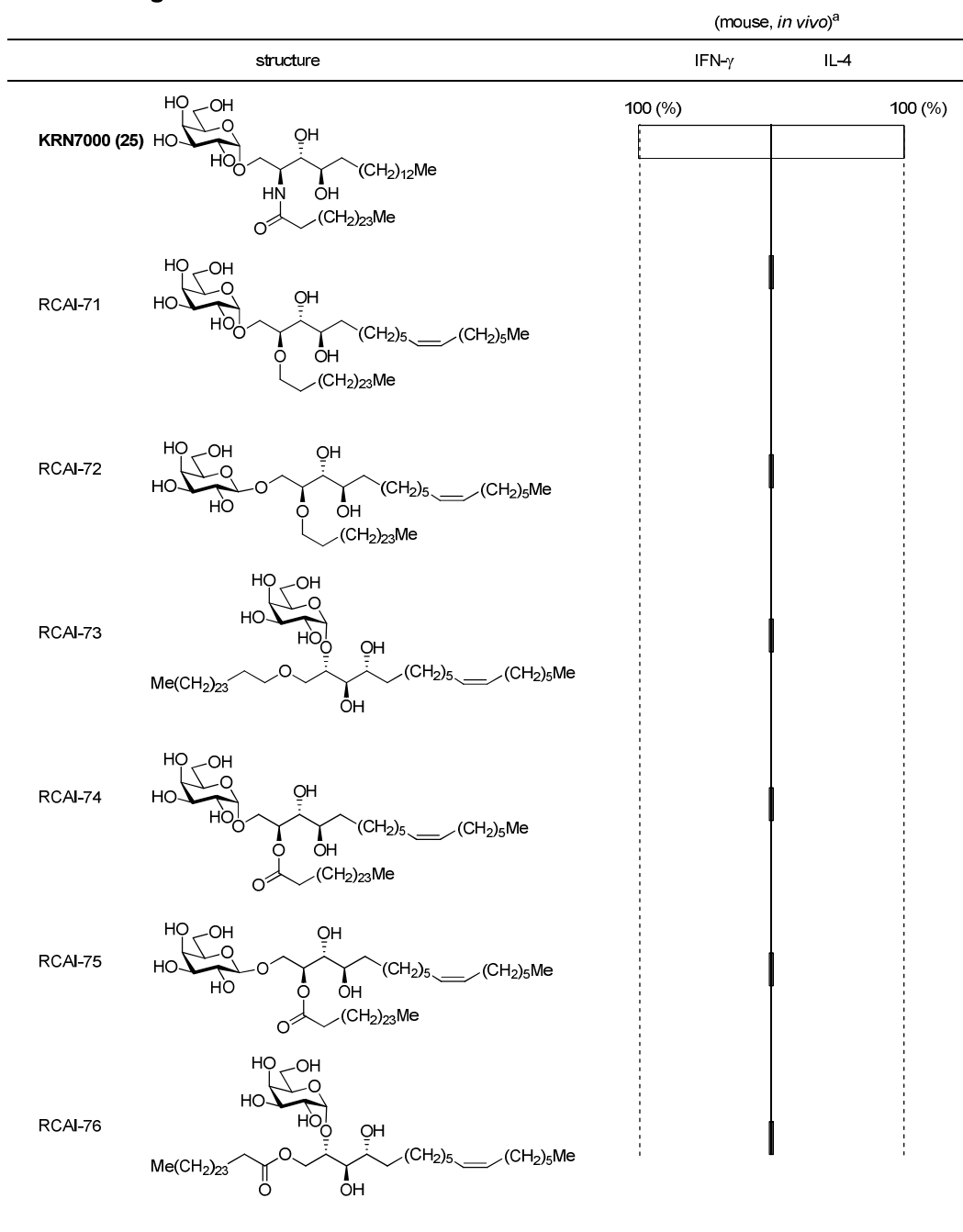
<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4 in sera in mice were measured by ELISA or Cytometric Bead Array system after their intravenous injection of glycolipids (2  $\mu$ g/mouse)<sup>2</sup>

**Figure S-5.** Structures of analogues of KRN7000 (12), and their bioactivity

<sup>1</sup> M. Shiozaki, T. Tashiro, H. Koshino, R. Nakagawa, S. Inoue, T. Shigeura, H. Watarai, M. Taniguchi, and K. Mori, *Carbohydr. Res.*, 2010, **345**, 1663.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

#### 4. Ester analogues — 2<sup>1</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

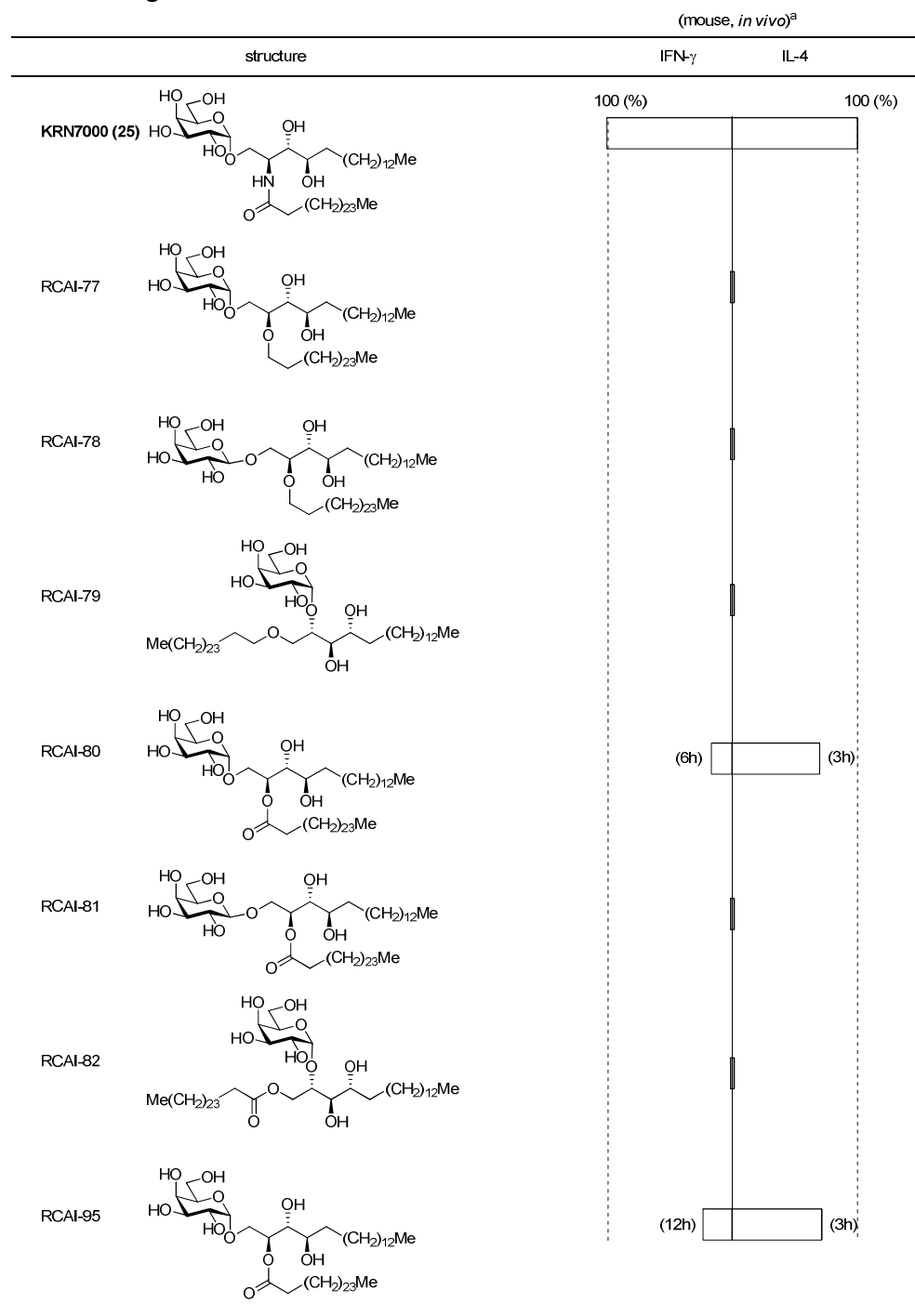
<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4 in sera in mice were measured by ELISA or Cytometric Bead Array system after their intravenous injection of glycolipids (2  $\mu$ g/mouse)<sup>2</sup>

**Figure S-6.** Structures of analogues of KRN7000 (13), and their bioactivity

<sup>1</sup> M. Shiozaki, T. Tashiro, H. Koshino, R. Nakagawa, S. Inoue, T. Shigeura, H. Watarai, M. Taniguchi, and K. Mori, *Carbohydr. Res.*, 2010, **345**, 1663.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

#### 4. Ester analogues — 3<sup>1</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4 in sera in mice were measured by ELISA or Cytometric Bead Array system after their intravenous injection of glycolipids (2  $\mu$ g/mouse)<sup>2</sup>

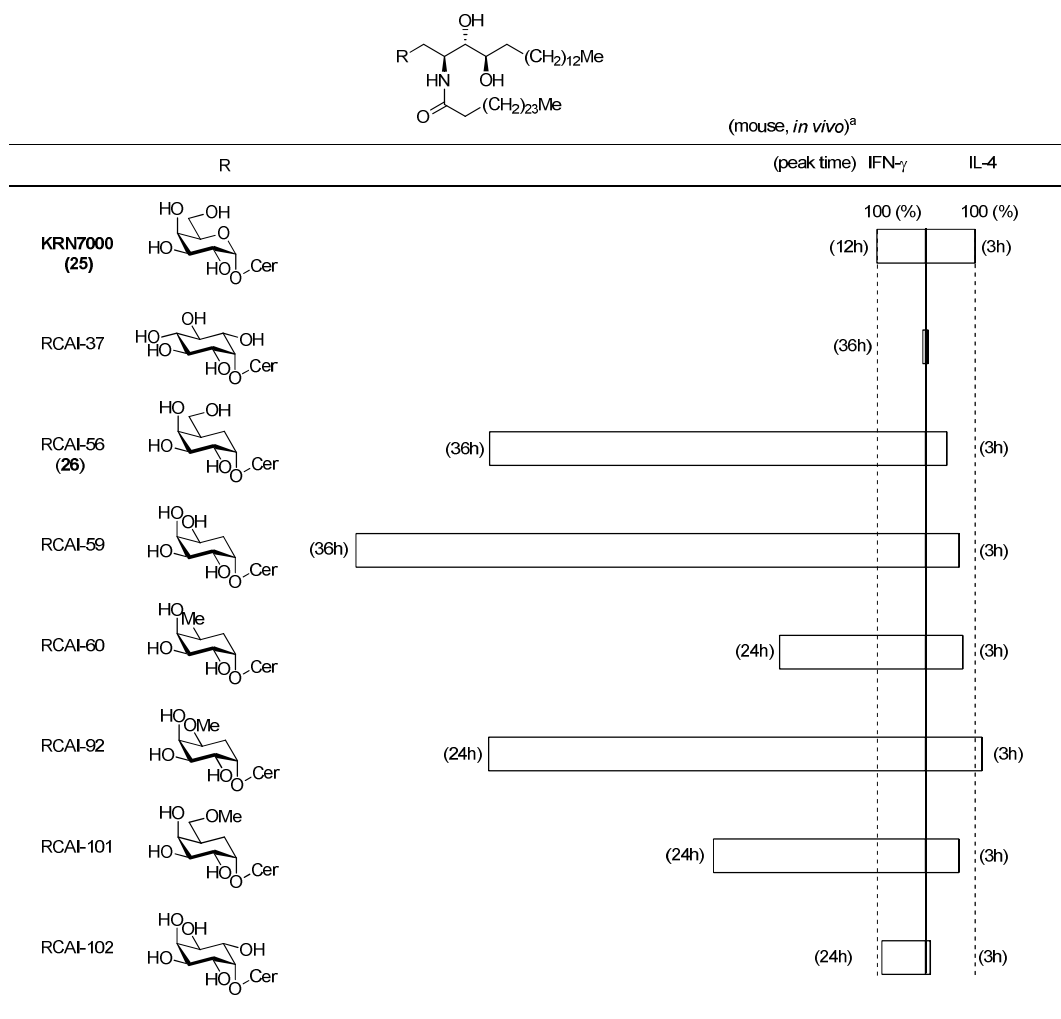
**Figure S-7.** Structures of analogues of KRN7000 (14), and their bioactivity

<sup>1</sup> M. Shiozaki, T. Tashiro, H. Koshino, R. Nakagawa, S. Inoue, T. Shigeura, H. Watarai, M. Taniguchi, and K. Mori, *Carbohydr. Res.*, 2010, **345**, 1663.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.



## 5. Cyclitol and carbasugar analogues<sup>1</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

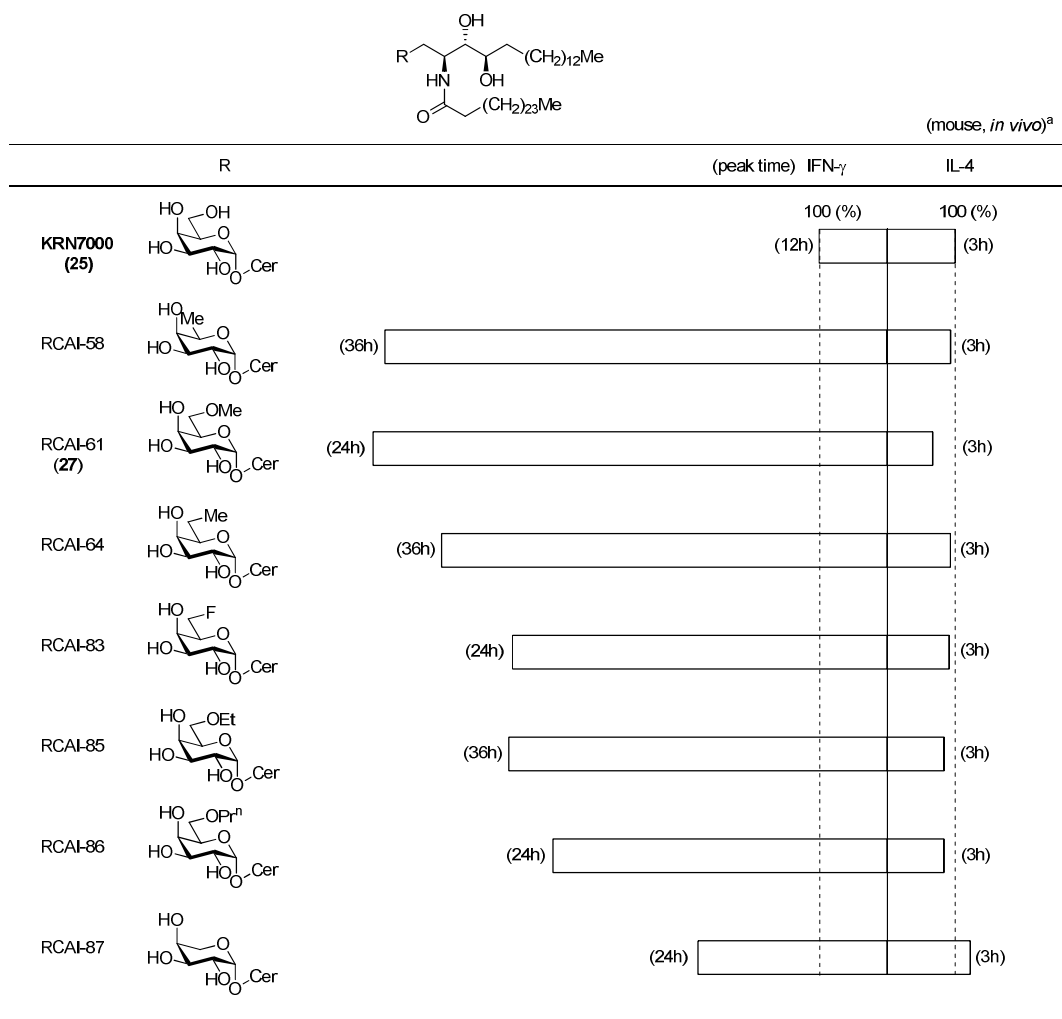
<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4 in sera in mice were measured by ELISA or Cytometric Bead Array system after their intravenous injection of glycolipids (2  $\mu$ g/mouse)<sup>2</sup>

**Figure S-8.** Structures of analogues of KRN7000 (15), and their bioactivity

<sup>1</sup> T. Tashiro, R. Nakagawa, T. Hirokawa, S. Inoue, H. Watarai, M. Taniguchi, and K. Mori, *Bioorg. Med. Chem.* 2009, **17**, 6360.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

## 6. 6'-modified galactose analogues<sup>1</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (25)<sup>b</sup>

<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4 in sera in mice were measured by ELISA or Cytometric Bead Array system after their intravenous injection of glycolipids (2  $\mu$ g/mouse)<sup>2</sup>

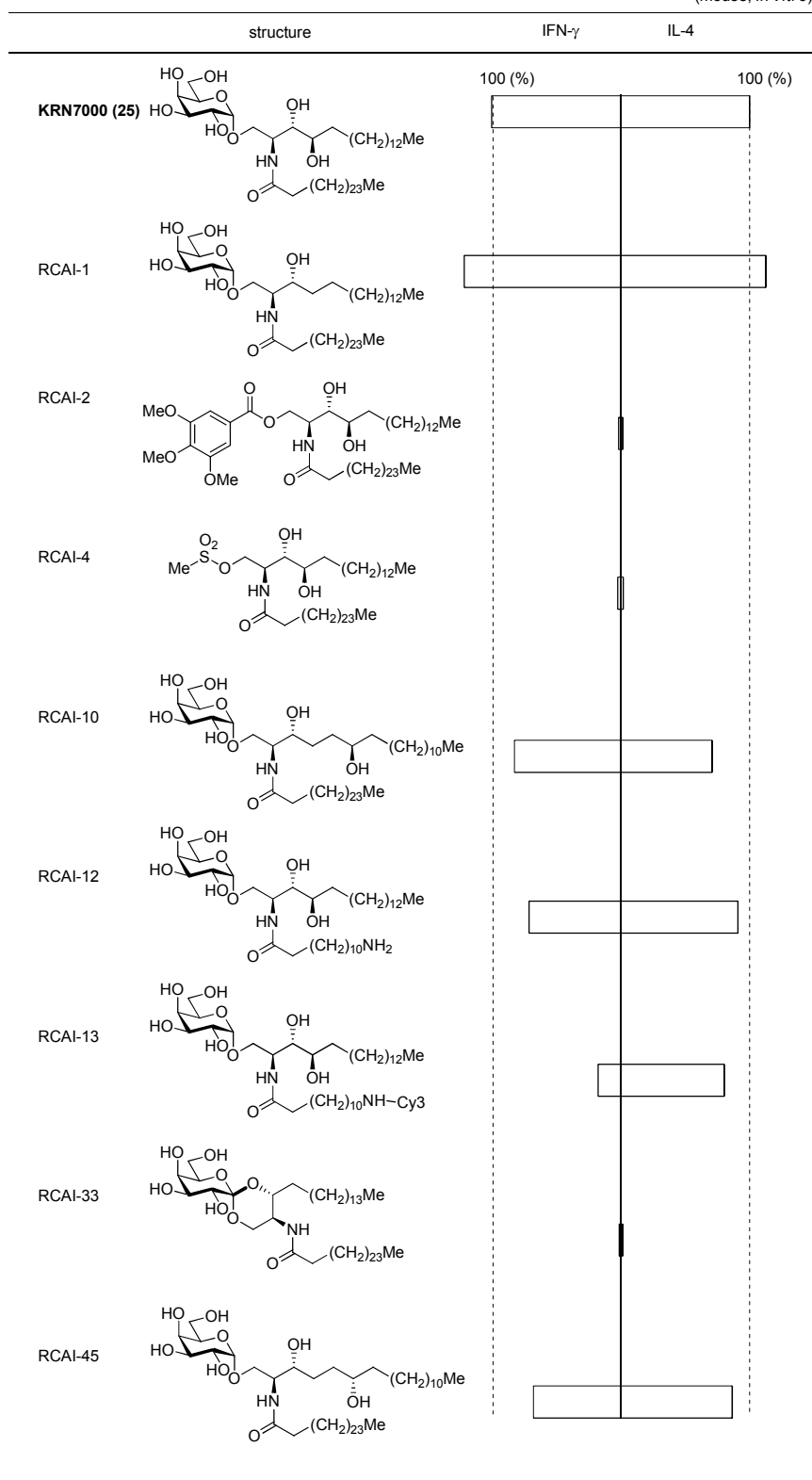
Figure S-9. Structures of analogues of KRN7000 (16), and their bioactivity

<sup>1</sup> T. Tashiro, R. Nakagawa, S. Inoue, M. Shiozaki, H. Watarai, M. Taniguchi, and K. Mori, *Tetrahedron Lett.* 2008, **49**, 6827.

<sup>2</sup> Bioassay was performed in our standard protocols. See: H. Watarai, R. Nakagawa, M. Omori-miyake, N. Dashtsoodol, and M. Taniguchi, *Nat. Protocols*, 2008, **3**, 70.

## 7. Other analogues

(mouse, *in vitro*)<sup>a</sup>



<sup>a</sup> Cytokine responses relative to KRN7000 (**25**)<sup>b</sup>

<sup>b</sup> Concentrations of IFN- $\gamma$  and IL-4, which were secreted from spleen cells (B6 mice) cultured with 40 ng/mL of glycolipids for 48 h, were measured by Cytometric Bead Array system

**Figure S-10.** Structures of analogues of KRN7000 (17), and their bioactivity