UNIVERSITY MEDICINE • EXERCISE SHEET

8.5 Host–pathogen interaction and transmission

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS chain of infection • attack rate

Objective

Compute transmission: the chain, attack rates and R_0.

1 Key knowledge and worked examples

■ The chain of infection

Reservoir → exit → route (contact, droplet, airborne, vector, vehicle) → entry → susceptible host ✓. Break any ONE link and transmission stops; carriers make reservoirs silent.

■ Worked example: the R_0 clock

$t_d \approx \mathrm{SI} \times \log 2 / \log R_0$: influenza ($R_0 \approx 1.3$, SI 2–3 d) doubles in ~5–7 d; measles ($R_0 \approx 15$, SI ~11 d) in ~2.5–3 d ✓. Wedding arithmetic: $54/120 = 45$ % attack rate.

2 Practice

2.1 List the five links of the chain, in order. [3]

2.2 36 of 90 picnic attendees fall ill – the attack rate? [3]

2.3 Why can a reservoir be a healthy person? [3]

3 Exam-style questions

3.1 A fictional banquet: 200 attendees, 92 develop gastroenteritis within 48 h; of the 100 who ate the seafood course, 78 fell ill; of the 100 who did not, 12 fell ill.

Calculate the overall attack rate (92/200 = 46 %) and the stratified rates (78 % vs 12 %). Name the likely vehicle and justify. Explain which link of the chain the kitchen's intervention breaks. [8]

3.2 A fictional ward: influenza with $R_0 \approx 1.3$, serial interval ~2.5 days.

Calculate the doubling time ($t_d \approx 2.5 \times \log 2 / \log 1.3 \approx 6.6$ days). Explain why isolation lowers the effective R, not R_0. Explain why a measles importation ($R_0 \approx 15$, SI ~11 d) into a susceptible ward would outrun the same measures. [7]