adults. Another example is Corynebacterium diphtheriae, which produces diphtheria only when it is carrying the bacteriophage that produces the toxin responsible for causing diphtheria.

- **Virulence**: the proportion of persons with clinical disease who become severely ill or die (severity). The virus that causes the common cold is not virulent; Ebola virus is.

- **Case fatality rate**: of all the persons who contract a disease, the proportion that die of it. The case fatality rate is related to virulence. The more virulent the disease, the higher the case-fatality rate is likely to be and the more urgent it becomes to control its spread. For this reason, physicians who diagnose virulent diseases, such as meningococcal illness, should notify the public health authorities as soon as possible by telephone, whereas the notification of less virulent diseases is not so urgent.

- **Herd immunity**: the resistance of a group or community to invasion and spread of an infectious agent. If enough people in the community are immune to an agent, the chain of transmission is very likely to be broken before the agent reaches non-immune people. So, the immunity of the "herd" protects non-immune members. This happens only with agents that are transmitted directly from person to person. If there is a vaccine against the agent, this will contribute to herd immunity and it may be possible to eradicate it.

see Nerd's Corner: Why "quarantine"?

11.3 Modes and Control of Transmission

There are six common modes of transmission of infection. (See Table 11.2) If the mode of transmission is known, precautions can be put in place to prevent outbreaks. Precautions will vary according to the microorganism involved and the context of the case. For instance a case of influenza in a normal household setting does not require strict precautions, where as one in a long term care home might. In hospitals, the infection control team can be a source of advice on which precautions to use. Outside hospitals, the local public health authority can be consulted.

Table 11.2: Modes of transmission of infections and corresponding ways of controlling spread. Note that the precautions to be taken vary with the microorganism and the context of the illness.

Contact	Direct	Direct physical contact (body surface to body surface) between infected individual and susceptible host. Examples: Influenza virus; Infectious mononucleosis; chlamydia. Precautions: Hand hygiene; masks; condoms.
	Indirect	Infectious agent deposited onto an object or surface (fomite) and survives long enough to transfer to another person who subsequently touches the object. Examples: RSV; Norwalk; rhinovirus; perhaps influenza. Precautions: Sterilizing instruments; disinfecting surfaces and toys in school.
	Droplet	Via coughing or sneezing, or (in health care) during suctioning. Droplets are relatively large (>5 μm) and can be projected up to about one metre. Examples: Meningococcus; influenza (though there is some debate); respiratory viruses. Precautions: Masks; cover mouth; stand clear.
Non-contact	Airborne	Transmission via aerosols (airborne particles <5μm) that contain organisms in droplet nuclei or in dusts. Can be spread via ventilation systems. Examples: TB; measles; chickenpox; smallpox (and maybe influenza: controversial, as more likely via droplets). Precautions: Masks; negative pressure rooms in hospitals.
	Vehicle	A single contaminated source spreads the infection (or poison). This can be a common source or a point source. Examples a) Point source: Food-borne outbreak from infected batch of food; cases typically cluster around the site (such as a restaurant) b) Common source: The Listeriosis outbreak in Canada in 2008 was linked to a meat production facility in Ontario. It caused 20 cases across five provinces. Cases may be widely dispersed due to transport and distribution of the vehicle. Precautions: Normal safety and disinfection standards. Deliberate contamination of Tylenol in 1982 led to the use of tamper-proof containers for medicines.
	Vector-borne	Transmission by insect or animal vectors. Example: Mosquitoes - malaria vector, ticks - Lyme disease vector. Precautions: Protective barriers (window screens, bed nets); insect sprays; culling animals.

see Links: Guidelines on hospital infection control

see Case Study: Once back in his office