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Since the existence of human beings in the world, they have been haunted by various infectious diseases. In fact, the history of mankind is also a history about the human fighting against infectious diseases. Infectious diseases are characterized by acute onset, rapid spread, and high mortality rate, which have killed billions of human lives and cause endless disasters to the fortunes and cultures of human beings. For instance, many brilliant cultures, such as the ancient Roman culture, the Maya culture, the Inca culture, and the Marine Polynesian culture, were ruined by plague in a direct or indirect manner. Therefore, people have been struggling to explore the possible causes, epidemic patterns, and pathogenic mechanisms of infectious diseases. In terms of their diagnosis and treatment, from the experience stage to the experiment stage till the present molecular biology stage, more and more knowledge about infectious diseases have been gained and keep on increasing.

According to the announcement by the Ministry of Health of the People's Republic of China on its official website (<http://wsb.moh.gov.cn/>) on March 15, 2013, in the year 2012 (from January 1, 2012, to December 31, 2012) in China (with no inclusion of data about Hong Kong, Macao, and Taiwan, the same hereinafter), a total of 6,951,478 cases of legal infectious diseases were reported, with 17,315 cases of death. The reported incidence rate is 5,159.4 per million and a mortality rate of 12.9 per million. Among these cases, 76 cases were defined as having Class A infectious diseases, with one case of death. The reported incidence rate of Class

A infectious diseases is then 0.056 per million and a mortality rate of 0.001 per million. Compared to the data in the year 2011, the incidence rate of Class A infectious diseases increased by 194.74 % in 2012, while the mortality rate of Class A infectious diseases remained the same as in 2012. Concerning Class B infectious diseases, no cases and death cases of SARS, poliomyelitis, and diphtheria were reported in 2012. A total of 3,216,856 cases of the other Class B infectious diseases were reported, with 16,720 cases of death. The reported incidence and mortality of Class B infectious diseases were 2,387.5 per million and 12.4 per million, respectively, which decreased by 1.66 % and increased by 9.02 %, respectively, compared to the data in the year 2011. The reported cases of HIV infection in the past years that developed into AIDS in the year 2012 were reported as the new cases of AIDS in 2012. The data of 2012 did not participate in the report of the incidence rate over the same period of past years. The top five infectious diseases with the most reported cases in 2012 were successively viral hepatitis, pulmonary tuberculosis, syphilis, bacillary and amebic dysentery, and gonorrhea, accounting for 94.55 % of the total reported cases of Class B infectious diseases. The top five infectious diseases with the most reported cases of death in 2012 were successively AIDS, pulmonary tuberculosis, rabies, viral hepatitis, and epidemic hemorrhagic fever, accounting for 98.38 % of the total reported cases of death of Class B infectious diseases. During the same period, the total number of reported cases of Class C infectious diseases was 3,734,546, with 594 reported cases of death. The reported incidence and mortality of Class C infectious diseases were 2771.8 per million and 0.4 per million, respectively. Compared to the data in the year 2011, the incidence increased by 20.57 % and mortality increased by 9.98 % in 2012. The top five with the most reported cases of Class C infectious diseases were successively hand-foot-mouth disease, other infectious diarrhea, epidemic parotitis, influenza, and rubella, accounting for 98.97 % of the total reported cases of Class C infectious diseases. More reported cases of death are found in the cases of hand-foot-mouth disease and

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other infectious diarrhea. Compared to the data about Class A and B infectious diseases in the year 2011, the reported incidences of digestive infectious diseases and respiratory infectious diseases decreased by 12.62 % and 3.5 %, respectively; the reported incidences of infectious diseases with natural epidemic foci and insect-borne infectious diseases as well as blood-borne and sexually transmitted infectious diseases increased by 3.78 % and 1.42 %, respectively. The reported cases of HIV infection in the past years that developed into AIDS in the year 2012 were reported as the new cases of AIDS in 2012. The data of 2012 did not participate in the report of the incidence rate over the same period of past years. Of the digestive infectious diseases, the reported incidences of cholera and typhoid/paratyphoid increased in 2012, while the reported incidences of poliomyelitis, hepatitis A, bacillary and amebic dysentery, hepatitis of undifferentiated type, and hepatitis E decreased. Of the respiratory infectious diseases, no cases and death cases of SARS and diphtheria were reported. The reported incidences of influenza A (H1N1), measles, scarlet fever, epidemic cerebrospinal meningitis, pertussis, and pulmonary tuberculosis decreased. Of the infectious diseases with natural epidemic foci and insect-borne infectious diseases, the reported incidences of dengue fever, epidemic hemorrhagic fever, leptospirosis, epidemic encephalitis B, schistosomiasis, and brucellosis increased with different degrees. The incidences of plague and human-infected highly pathogenic avian influenza (one reported case separately) remained the same as the year 2011. The reported incidences of malaria, rabies, and anthrax decreased. Of the blood-borne and sexually transmitted infectious diseases, the reported incidences of hepatitis C, AIDS, and syphilis increased. The reported incidences of gonorrhea and hepatitis B began to decrease. In the year 2012, only one case of plague was reported, with occurrence of death. The reported total cases and death cases were the same as in 2011. In 2012, 75 cases of cholera were reported, with no reported death cases, leading to a reported incidence of 0.06 per million and an increase by 211.11 % compared to data of 2011. In addition, one case of human-infected highly pathogenic avian influenza was reported, with one case of death, leading to the same reported cases and death cases as 2011 (see Table 4.1).

Due to the continual occurrence of new infectious diseases and the resurgence of some infectious diseases, the prevention and control of infectious diseases present great challenges. The outbreaks of infectious diseases caused by highly pathogenic viruses brought about panic to the public. For instances, Ebola hemorrhagic fever occurred in Africa in 1976 and 1995; hantavirus pulmonary syndrome (HPS) occurred in the southwest of the United States in 1993; avian influenza (H5N1) spread in Hong Kong, China, in 1997; Nipah virus encephalitis occurred in Malaysia in 1999; West Nile encephalitis broke out in New York in 1999. Concerning

these new infectious diseases, the mortality rate of West Nile encephalitis is 3–15 %, while the mortality rates of the other new infectious diseases remain to be 40–78 %. In these new infectious diseases, SARS deserves special attention. According to data from the Ministry of Health in China, a total of 5,327 cases of SARS were reported in mainland China during the period from mid-Nov 2002 to Aug 16, 2003, with 349 reported cases of death and a mortality rate of 6.55 %. It was prevalent in 32 countries and regions across the world, including China, European countries, and the United States. According to reports from the World Health Organization (WHO), by Aug 7, 2003, a total of 8,422 cases of SARS were reported, with 916 reported cases of death and a mortality rate of 10.9 %. At the time of SARS prevalence, the knowledge about its pathogen, spreading route, pathogenesis, and epidemic pattern was insufficient. Due to its strong infectivity, many cases in medical staffs, high mortality, and lack of effective control, the public was in panic. In 2003, SARS was listed into the legal infectious diseases in China, with its prevention and control guaranteed by laws.

In 1997, the outbreak of avian influenza caused by H5N1 occurred in Hong Kong, China. A total of 18 cases were reported, with six cases of death. Influenza A virus subtype H5N1 was then isolated from the patients. In Jun 19, 2008, the WHO announced that cases of avian influenza caused by H5N1 virus had been reported in 15 countries since the year 2003, with 385 reported cases, 243 reported cases of death, and a mortality rate of 63.1 %. In China, a total of 30 cases were reported, with 20 cases of death. According to the released data, definitive cases of avian influenza caused by H5N1 subtype virus were reported in 214 countries and regions, with at least 18,449 cases of death. The new mutant of influenza virus (H5N1) contains gene segments of three viruses, including swine influenza virus, bird influenza virus, and human influenza virus. Another new subtype of influenza virus, avian influenza H7N9 virus, was firstly isolated from patients in eastern China. According to the National Health and Family Planning Commission of China, by Aug 10, 2013, a total of 135 cases of avian influenza (H7N9) were reported in China, with 44 reported cases of death. Such an infectious disease with high mortality rate poses a great threat to human health. Due to the insufficient immunity to the new subtype virus like H7N9, pandemic of the infectious disease caused by such virus is likely to occur. Both avian influenza caused by H5N1 and H7N9 are zoonoses, which are the most common but most dangerous infectious diseases.

In recent years, great progresses have been achieved in the field of genome of pathogenic microorganisms. By May 2001, whole-genome sequencing of approximately 600 strains of viruses had been completed, among which about 76 strains are related to human being. In addition, the development of new vaccines has been progressing

Table 4.1 National data about reported cases and death cases of legal infectious diseases in the year 2012 in China

Disease	The year 2012		The year 2011		Over the same period in 2011 and 2012	
	Reported cases	Death cases	Reported cases	Death cases	Incidence fluctuation	Mortality fluctuation
Total of Class A, B, and C infectious diseases	6,951,478	17,315	6,320,099	15,802	9.18	9.05
Total of Class A and B infectious diseases	3,216,932	16,721	3,237,558	15,264	-1.66	9.02
Plague	1	1	1	1	0.00	0.00
Cholera	75	0	24	0	211.11	/
SARS	0	0	0	0	/	/
AIDS	41,929	11,575	20,450	9,224	16.71	24.89
AIDS (from HIV infection cases)	17,894	/	/	/	/	/
Viral hepatitis	1,380,800	747	1,372,344	830	0.14	-10.50
Hepatitis A	24,453	5	31,456	13	-22.64	-60.00
Hepatitis B	1,087,086	582	1,093,335	637	-1.05	-9.05
Hepatitis C	201,622	108	173,872	125	15.41	-13.98
Hepatitis E	27,271	28	29,202	39	-7.06	-27.59
Hepatitis of undifferentiated type	40,368	24	44,479	16	-9.68	50.00
Poliomyelitis	0	0	20	1	-100.00	-100.00
Human-infected highly pathogenic avian influenza	1	1	1	1	0.00	0.00
Influenza A (H1N1)	1,072	3	9,360	75	-88.60	-96.43
Measles	6,183	8	9,943	10	-38.11	-14.29
Epidemic hemorrhagic fever	13,308	104	10,779	119	22.86	-13.48
Rabies	1,425	1,361	1,917	1,879	-26.01	-27.91
Epidemic encephalitis B	1,763	59	1,625	63	7.92	-6.38
Dengue fever	575	0	120	/	379.78	/
Anthrax	237	1	309	3	-23.48	-50.00
Bacillary and amebic dysentery	207,429	13	237,930	24	-13.24	-44.44
Pulmonary tuberculosis	951,508	2,662	953,275	2,840	-0.66	-6.70
Typhoid and paratyphoid	11,998	3	11,798	1	1.20	100.00
Epidemic cerebrospinal meningitis	195	24	228	25	-14.71	-5.26
Pertussis	2,183	1	2,517	2	-13.69	0.00
Diphtheria	0	0	0	0	/	/
Neonatal tetanus	656	51	785	52	-1.71	16.13
Scarlet fever	46,459	2	63,878	1	-27.62	0.00
Brucellosis	39,515	1	38,151	0	3.08	/
Gonorrhea	91,853	1	97,954	1	-6.68	0.00
Syphilis	410,074	79	395,182	75	3.27	5.36
Leptospirosis	440	5	396	5	10.85	0.00
Schistosomiasis	4,802	4	4,483	2	6.61	200.00
Malaria	2,451	15	4,088	30	-40.34	-50.00
Class C infectious diseases	3,734,546	594	3,082,541	538	20.57	9.98
Influenza	122,140	4	66,133	4	83.81	0.00
Epidemic parotitis	479,518	0	454,385	1	5.03	-100.00
Rubella	40,156	1	65,549	0	-39.03	/
Acute hemorrhagic conjunctivitis	32,333	0	34,262	0	-6.08	/
Leprosy	430	3	352	0	21.29	/
Typhus	2,102	0	2,360	1	-11.36	-100.00
Kala-azar	218	1	293	0	-26.03	/
Echinococcosis	3,234	1	2,909	0	10.65	/

(continued)

Table 4.1 (continued)

Disease	The year 2012		The year 2011		Over the same period in 2011 and 2012	
	Reported cases	Death cases	Reported cases	Death cases	Incidence fluctuation	Mortality fluctuation
Filariasis	0	0	1	0	-100.00	/
Infectious diarrhea	885,678	17	836,591	23	5.36	-23.53
Hand-foot-mouth disease	2,168,737	567	1,619,706	509	33.26	10.79

Notes:

1. All data in the table is based on the nationally reported definitive cases in China in the year 2012 in sequence of occurrence time (with no inclusion of data about foreigners living in China and data about Hong Kong, Macao, and Taiwan)
2. The total number of reported cases and death cases of viral hepatitis comprises hepatitis A, hepatitis B, hepatitis C, hepatitis E, and hepatitis of undifferentiated type
3. “/” indicates the absence of data or denominator of zero that is unable to calculate
4. The demographic data is from those of permanent residents in China in 2011 provided by the National Bureau of Statistics of China in 2012
5. In 2012, the statistical rule for AIDS cases is adjusted. The data of reported cases of AIDS in 2012 includes both the new cases of AIDS in 2012 and those that progressed into AIDS from HIV infection reported in the past years. The adjustment has no effects on the data of the accumulative reported cases of HIV infection and reported cases of AIDS. The adjustment also has no effects on the prevention, treatment, control, and medical service for patients with HIV infection and patients with AIDS. Considering the adjusted statistical rule, the data of AIDS cases that are developed from HIV infection reported in the past years was not calculated in the total reported cases of Class A, B, and C infectious diseases, the total reported cases of Class A and B infectious diseases, and incidence and mortality fluctuations over the same period of 2011
<http://www.moh.gov.cn/mohjbyfkzj/s3578/201303/f02d91321f524a66a9df357a53bd0cf0.shtml>

rapidly. The traditional vaccines like bacteria killed vaccines and bacteria inactivated vaccines have been giving way to the new generation of vaccines, such as subunit vaccine, genetic engineering vaccine, and nucleic acid vaccine (DNA vaccine). As is known, the traditional vaccines cannot effectively induce cellular immune response in the human body, while nucleic acid vaccine can induce both humoral immune response and cellular immune response, serving as an effective way to the prevention and treatment of some infectious diseases like tuberculosis and AIDS. With the rapid development of medicine, the pathogenic mechanism can be analyzed and discovered from integral level, cellular level, and even molecular level. In addition, standardized procedures for diagnosis

and detection of pathogenic microorganisms have been established, including PCR, nucleic acid hybridization, and gene chip. An international surveillance network of the pathogens and their infections and drug resistance has been built to play a role in early warning. Based on these developments, we believe that the incidences of most infectious diseases can be controlled at a low level, and some infectious diseases can be completely eliminated. In the twenty-first century, the changes of human lifestyle have profound impact on the occurrence and development of infectious diseases. Therefore, the prevention and control of infectious diseases will face new challenges, and we have to put arduous efforts to eliminate or control infectious diseases.