

Introduction

Since October 1989, Taiwan has gradually opened its doors to foreign laborers. To prevent infectious diseases from being carried across the borders, all foreign laborers hired to work in the country must have passed the required health examinations before they can apply for a visa. Within three days of arriving in the country, foreign laborers also need to undergo an arrival health examination before the employment permit can be issued. Regular health screenings are conducted throughout the course of their employment, with the results reported to local health bureaus. Those who fail these health screenings are forwarded to the Council of Labor Affairs, Executive Yuan, and their employment permits are cancelled. Years of practice have helped to establish a management system to monitor the health of foreign laborers. Some of the regulations have also been modified slightly to reflect these changes. Literature discussing the results and regulations regarding the health examinations of foreign laborers include Yang, H. [1], Hsu, H. [2], Hsu, C. [3], and Wu L. et al., [4,5]. To get a more current picture of the health conditions of foreign laborers, this report has focused on the changes in regulations related to the health examinations of foreign laborers and the results of these examinations between 2008 and 2012.

Number of foreign laborers in Taiwan

Data released by the Council of Labor Affairs shows that by the end of 2008 there were 365,060 foreign laborers in Taiwan, and 445,579 in 2012; an increase of over 90,000 laborers in four years. Of the foreign laborers in 2012, 191,127 (43%) came from Indonesia, 100,050 (22%) from Vietnam, 86,786 (19%) from the Philippines, 67,611 (15%) from Thailand, four from Malaysia and one from Mongolia. By profession, in the year of 2012, 242,885 (55%) of the foreign laborers worked in manual industrial work; while 202,694 (45%) worked in areas of health and social care (caregivers or domestic laborers).

Regulations of the Health Examinations for Foreign Laborers

1. Progression of the regulations

Between 2008 and 2012 some changes had been made to the “Regulations Governing Management of the Health Examination of Employed Aliens”.

(1) Changes made on 26 February 2009:

- i. As those tested positive for Hepatitis B surface antigen (HBsAg) are not contagious under normal working conditions, testing for Hepatitis B surface antigen (HBsAg) is no longer required for the pre-entry and arrival health examinations.
- ii. As *Blastocystis hominis* does not cause serious illnesses, foreign laborers whose stool samples have tested positive for *Blastocystis hominis* would be considered as qualified with no further treatment required.
- iii. To prevent measles and rubella from entering the country, starting from 1 September 2009, foreign laborers must be checked for measles and rubella in pre-entry health examinations. Laboratory reports of positive antibody titers or certificates of immunization must be submitted.

- (2) Changes made on 25 January 2011:
- i. To accommodate the rights of both employers and employees, foreign laborers who are tested positive for *Entamoeba histolytica* in their 6th, 18th, or 30th -month regular health screenings can be re-tested. If re-tested negative three times within 75 days, the worker can be considered as having passed the examination.
 - ii. Rules regarding the re-testing of chest X-rays, previously an item listed in Annex Three, has now been officially added to the regulation in Clause Seven. Foreigners who are suspected of tuberculosis during the health examinations could be re-tested at delegated institutions within 15 days of the issuing date of the health examination certificate.
- (3) In response to the typhoid fever outbreaks in 2009 caused by Indonesian laborers, the Department of Health (reform the Ministry of Health and Welfare) announced annually the requirement of screening Indonesian laborers for typhoid fever. From 15 October 2009, Indonesian laborers must be screened for typhoid fever, paratyphoid fever and shigellosis (via stool culture) within three days of their arrival.

2. Items screened in the health examinations for foreign laborers

The following summary explains the general requirements of health examinations for foreign laborers between 2008 and 2012:

- (1) Schedule of health examinations: Pre-entry examination before entering the country, arrival examination within three days after entering Taiwan, and regular examinations within 30 days before or after the 6th, 18th, and 30th months of employment in Taiwan.
- (2) Items checked in the health examinations:
 - a. Chest X-ray for tuberculosis
 - b. Serological Test for HIV antibody (HIV)
 - c. Serological Test for syphilis
 - d. Stool examination for intestinal parasites
 - e. Skin examination for Hansen's disease
 - f. General physical assessment (including mental status assessment)
 - g. Pregnancy test (only for pre-entry examination)
 - h. Hepatitis B surface antigen (HBsAg) (originally required for the arrival examination, but has been waived since 28 February 2009)
 - i. Measles and Rubella – laboratory report of positive antibody titers or certification of immunization must be submitted (only required in the pre-entry examination, starting from 1 September 2009)
 - j. Typhoid fever, paratyphoid fever and shigellosis (by stool culture) – only required for Indonesian laborers at their arrival medical examinations, starting from 15 October 2009.

(3) Determination of disqualification, treatment and re-testing:

- a. Those tested positive on the preliminary HIV antibody test will be followed by a Western blot test. A positive confirmation by the Western blot test will result in the cancellation of the employment permit. If tested indeterminate by the Western blot, the case will be tested again after three months. If both tests return indeterminate results the case is considered as having passed the examination.
- b. Those whose chest X-ray results are suspected but cannot be confirmed of tuberculosis (TB) should visit a designated institution for further evaluation. Confirmation of TB will result in the cancellation of work permit.
- c. Those tested positive for syphilis, upon obtaining a proof of completion of the treatment within 30 days, will be considered as qualified.
- d. Those whose stool samples tested with parasites (excluding *Entameba histolytica*) should be treated and re-tested within 45 days. *Entameba histolytica* carriers are not allowed to work in Taiwan. However, from 28 February 2009, if *Entameba histolytica* is found during the 6th, 18th, or 30th -month regular health examinations, the carrier can complete treatment and be re-tested within 75 days.

Management of the hospitals designated for health examinations

To ensure the quality of the examinations, health examinations of foreign laborers must be conducted by accredited hospitals. The Department of Health, Executive Yuan, under the authorization of the Employment Services Act, has set the “Regulations Governing the Management of Hospitals for the Health Examination of Employed Aliens”. According to the regulations, a hospital can apply to become a designated hospital if it has been accredited or qualified as a teaching hospital under the hospital accreditation system, and submit a current laboratory accreditation certificate, a valid proficiency testing certificate for HIV antibody test, and a three-year valid qualifying certificate for training for intestinal protozoa examinations. Each designation is valid for three years. Hospitals located on offshore islands however, are not restricted by the requirement of a current laboratory accreditation. In 2008 there were 62 designated hospitals for the health examinations of foreign laborers. Other than four hospitals that were located on offshore islands, 58 of them had obtained laboratory accreditation. To facilitate the needs of foreign laborers residing in Nantou County, Yunlin County and Hualien County’s Yuli area, local health bureaus in these areas were asked to recommend a hospital to trial the examination tasks in 2009 and 2010, until a local hospital applied to become a designated hospital. In 2012 there were a total of 70 designated hospitals. Excluding four hospitals on offshore islands and three trial hospitals, 63 of the designated hospitals have obtained laboratory accreditation.

Failure rates of health examinations

This report has used the public health statistics record from the Department of Health, Executive Yuan. Results between 2008 and 2012 of the arrival (within three days) and the following regular health examinations of foreign laborers have been collected and summarized as listed in Table 1 and Table 2. The results of the arrival health examinations (conducted within three days upon the laborer's arrival), came from the Council of Labor Affairs, Executive Yuan. The number of fails in intestinal parasites screenings referred only to those who failed again at the re-testing despite of anti-parasite treatment. The results of the regular health screenings (conducted after the commencement of the employment), came from local health bureaus. Their number of fails in intestinal parasites screenings included both the number of laborers who failed the screenings for the first time, and the number of laborers who failed again despite anti-parasite treatment. As each set of statistics used different method to count the failure rates in parasites screenings, this report has adopted the method used by the regular health screenings conducted after the commencement of employment of foreign laborers.

Table 1. Reasons for foreign laborers to fail the arrival health examinations, conducted within three days of arrival between 2008 and 2012

Year	Number of laborers screened	Total failed (Failure rate %)	Intestinal parasites (+) (%)	TB (+) (%)	HIV (+) (%)	Syphilis (+) (%)	Hepatitis B (+) (%)
2008	133,378	406	307	39	13	11	36
		0.30	0.23	0.03	0.010	0.008	0.027
2009	95,051	207	174	25	1	4	3
		0.22	0.18	0.03	0.001	0.004	-
2010	115,828	158	114	36	4	4	-
		0.14	0.10	0.03	0.003	0.003	-
2011	149,317	233	150	60	18	5	-
		0.16	0.10	0.04	0.012	0.003	-
2012	132,614	282	202	71	4	5	-
		0.21	0.15	0.05	0.003	0.004	-
Total	626,188	1,286	947	231	40	29	39
		0.21	0.15	0.04	0.006	0.005	-

Notes:

- (1) A fail in intestinal parasites refers to a person who failed the re-testing in spite of anti-parasite treatment.
- (2) Hepatitis B (+) refers to those who were tested positive for Hepatitis B surface antigen (HBsAg) which is no longer required in the examinations after 28 February 2009.

Table 2. Reasons for foreign laborers to fail their regular health screenings between 2008 and 2012

Year	Number of laborers screened	Total failed (Failure rate %)	Intestinal parasites (+) (%)	TB (+) (%)	HIV (+) (%)	Syphilis (+) (%)	Hepatitis B (+) (%)
2008	373,105	31,858 8.54	31,196 8.36	613 0.16	27 0.007	22 0.006	-
2009	312,899	6,915 2.21	6,418 2.05	456 0.15	16 0.005	24 0.008	1 0.0003
2010	324,524	2,801 0.86	2,246 0.69	503 0.15	36 0.011	16 0.005	-
2011	355,768	3,013 0.85	2,331 0.66	572 0.16	85 0.024	25 0.007	-
2012	384,391	4,148 1.08	3,243 0.84	810 0.21	67 0.017	28 0.007	-
Total	1,750,687	48,735 2.78	45,434 2.60	2,954 0.17	231 0.013	115 0.007	1 0.0001

Notes:

- (1) Regular health screenings refer to the health examinations conducted at the 6th, 18th, and 30th months after the commencement of a foreign laborer's employment.
- (2) Parasites (+) in this table refers to the number of different parasites found. If one person was found to have two kinds of parasites at the same time, then the number counted is two. The total number of failures in the parasites screenings includes those who failed the first test (but might have had a successful treatment and passed the re-test) and those who failed the re-testing. From 28 February 2009 *Blastocystis hominis* detected would not be counted towards the disqualifications.
- (3) TB (+) refers to the total number of failures which include those who failed the first X-ray test (but might have passed the re-testing or have withdrawn from the re-testing), and those who failed the re-testing.
- (4) HIV (+) refers to the total number of HIV positive results. It includes the number of cases which were confirmed as positive by Western blot tests, as well as the number of cases which were indeterminate by the first Western blot test.

1. Results of intestinal parasite examinations

The number of fails in the parasite examinations was determined by the total kinds of parasites identified in stool samples. If a person had two kinds of parasites at the same time, it would be counted as two fails. The failure rates for foreign laborers in their regular health screenings from 2008 to 2012 were 8.54%, 2.21%, 0.86%, 0.85% and 1.08%, respectively (Table 2). Failure rates in stool examinations were 8.36%, 2.05%, 0.69%, 0.66% and 0.84%, respectively from 2008 to 2012 (Table 3). Parasites most frequently detected were hookworms (0.21%), *Giardia lamblia* (0.19%), whipworm (0.13%), and *Strongyloides stercoralis* (0.07%). *Blastocystis hominis*, a parasite commonly found among foreign laborers, was grouped in the "others" category and has been considered as non-pathogenic from 28 February 2009. In the regular health screenings of foreign laborers, the failure rate of the "others" category had declined greatly from 7.75% in 2008, to 1.30% in 2009, 0.02% in 2010, 0.01% in 2011, and 0.02% in 2012. By comparing the results of "others" category in 2008 with the figure in 2012, the detection rate of *Blastocystis hominis* among foreign laborers could be estimated as being around 7%. Statistics obtained from other studies on parasite prevalence among foreigners from Southeast Asian countries [6-10] showed that five designated hospitals had very different detection rates of *Blastocystis hominis* (2.5%, 13.4%, 13.9%, 15.3% and 19.5%).

Table 3. Detection rate of intestinal parasites among foreign laborers in Taiwan between 2008 and 2012 through regular health screenings

Year	Total number of laborers screened	Total number @ Detection Rate (%)	R.	T.	G.L.	H.	L.F.	S.S	T.O.	W.	E.H.	Others
2008	373,105	31,196	150	24	524	669	97	238	5	507	56	28,926
		8.36	0.04	0.01	0.14	0.18	0.03	0.06	0.001	0.14	0.02	7.75
2009	312,899	6,418	133	22	590	715	101	224	14	531	34	4,054
		2.05	0.04	0.01	0.19	0.23	0.03	0.07	0.004	0.17	0.01	1.30
2010	324,524	2,246	116	28	629	615	86	231	7	367	102	65
		0.69	0.04	0.01	0.19	0.19	0.03	0.07	0.002	0.11	0.03	0.02
2011	355,768	2,331	123	38	716	642	64	252	4	364	76	52
		0.66	0.03	0.01	0.20	0.18	0.02	0.07	0.001	0.10	0.02	0.01
2012	384,391	3,243	223	40	944	980	62	337	6	485	101	65
		0.84	0.06	0.01	0.25	0.25	0.02	0.09	0.002	0.13	0.03	0.02
Total	1,750,687	45,434	745	152	3,403	3,621	410	1,282	36	2,254	369	33,162
		2.60	0.04	0.01	0.19	0.21	0.02	0.07	0.002	0.13	0.02	1.89

Note 1: @-Number of total failure in parasite screening R: roundworm; T: tapeworm; G.L.: *Giardia lamblia*; H: hookworm; L.F.: liver fluke; S.S.: *Strongyloides stercoralis*; T.O.: *Trichostrongylus orientalis*; W: whipworm; E.H.: *Entamoeba histolytica*.

Note 2: "Others" refers to those parasites which have not been listed separately, such as *Blastocystis hominis*. However, as from 28 February 2009 *Blastocystis hominis* has been considered as non-pathogenic and would be excluded from the "others" category.

By nationality, in 2012, laborers from Vietnam had the highest infection rate (1.36%) of intestinal parasites, followed by those from the Philippines (0.77%), Indonesia (0.73%), and Thailand (0.62%) – as listed in Table 4. Chi-squared test showed no statistical difference ($p < 0.05$) of the parasite prevalence rates between different countries. Intestinal parasites most commonly found in foreign laborers are *Giardia lamblia*, hookworm, whipworm, *Trichuris trichiura*, and *Strongyloides stercoralis*. Vietnamese laborers had a higher prevalence rate of hookworm (0.60%) and whipworm (0.32%), Thai laborers had a higher rate of *Strongyloides stercoralis* (0.31%), while Indonesian laborers had a higher rate of *Entamoeba histolytica* (0.054%). All of the above rates were of statistical significance as identified by chi-squared test ($p < 0.05$).

Table 4. Distribution by nationality of foreign laborers found with parasitic infection in 2012 during regular health screenings

Nationality	Total number of health screenings	Total number @ Detection Rate (%)	R.	T.	G.L.	H.	L.F.	S.S	T.O.	W.	E.H.	Others
			Vietnam	75,868	1,031 1.36	72 0.09	1 0.001	203 0.27	452 0.60	20 0.03	21 0.03	1 0.001
Phillippines	79,174	610 0.77	98 0.12	6 0.008	172 0.22	147 0.19	4 0.01	34 0.04	1 0.001	121 0.15	12 0.015	15 0.02
Indonesia	160,530	1,173 0.73	42 0.03	27 0.017	462 0.29	338 0.21	14 0.01	66 0.04	3 0.002	113 0.07	86 0.054	22 0.01
Thailand	68,818	429 0.62	11 0.02	6 0.009	107 0.16	43 0.06	24 0.03	216 0.31	1 0.001	6 0.01	2 0.003	13 0.02
Total	384,391	3,243 0.84	223 0.06	40 0.010	944 0.25	980 0.25	62 0.02	337 0.09	6 0.002	485 0.13	101 0.026	65 0.02

Note 1 : @-Number of total failure in parasite screening; R: roundworm; T: tapeworm; G.L.: *Giardia lamblia*; H: hookworm; L.F.: liver fluke; S.S.: *Strongyloides stercoralis*; T.O.: *Trichostrongylus orientalis*; W: whipworm; E.H.: *Entamoeba histolytica*

Note 2 : “Others” refers to those parasites which have not been listed separately, such as *Blastocystis hominis*. However, *Blastocystis hominis* has been considered as non-pathogenic after 28 February 2009 and would be excluded from the “others” category.

Foreign workers would all have gone through medical examinations before and within three days upon entering the country. Has the detection rate of intestinal parasites among foreign laborers reduced at the following regular health screenings? In 2012, the parasite detection rate among Vietnamese laborers was 1.77% at the sixth-month screening, 1.20% at the 18th-month screening, and 0.70% at the 30th month screening. For the laborers from the Philippines, the rates for the 6th-month, 18th-month and 30th-month screenings were 1.13%, 0.61% and 0.34%, respectively. Among Indonesian laborers, the rates were 0.90%, 0.71% and 0.41%, while Thai laborers scored 0.60%, 0.72% and 0.51% for each period. Generally, parasite detection rates among laborers from Vietnam, the Philippines and Indonesia reduced over time. However, the rate among Thai laborers, whose infection rate was always lower, showed little change.

Some factors may affect and limit the analysis of above results. Using the total number of kinds of parasites was detected, instead of just counting the number of laborers with parasites, could have slightly over-estimated the infection rate. Parasite detection rates and the number of foreign laborers screened vary greatly between different hospitals. The parasite detection rates mentioned above could be reflecting the rate of the hospital which had screened most of the laborers.

2. Chest X-ray and TB Detection Rates

The TB detection rates listed in Table 2 show that between 2008 and 2012 about 0.15% - 0.21% of foreign laborers failed their regular chest X-ray tests. The number of X-ray disqualifications in the table was the total number of those who failed their first chest X-ray screenings (regardless whether they had passed the re-testing or withdrawn from further tests), and those who failed their re-testing. These numbers were obtained from the statistics recorded by local health bureaus. TB detection rates listed in the Table 5 were calculated based on the results from the arrival (within three days upon arrival) medical examinations and the following regular screenings, using the total number of those who failed their X-ray re-testing, and the number of those who failed the first X-ray test, but have withdrawn from further X-ray tests. Between 2008 and 2012, roughly 193- 342 foreign laborers each year were found to be infected, or suspected to be infected, with TB. The TB detection rates among foreign laborers ranged between 45 and 66 people per 100,000 population, or averaged 52 per 100,000 population, as listed in Table 5. By nationality, the TB detection rates between 2008 and 2012 per 100,000 population were 66 for Filipino laborers, 53 for Indonesian laborers, 47 for Thai laborers, and 39 for Vietnamese laborers. Chi-squared test determined that the detection rate of TB was significantly different between laborers from different countries ($p < 0.05$).

Table 5. Foreign laborers found with TB and HIV antibody positive through health screenings between 2008 and 2012

Year	Total number screened	Chest X-ray examinations		HIV antibody tests	
		Number of disqualified cases	Detection Rate (per 100,000)	Number of positive cases	Rate of positive cases(%)
2008	506,474	239	47	11	0.002
2009	407,944	193	47	9	0.002
2010	440,348	196	45	10	0.002
2011	505,082	257	51	27	0.005
2012	515,896	342	66	12	0.002
Total	2,375,744	1,227	52	69	0.003

Notes :

- (1) The total number of disqualification includes those cases who failed their second X-ray tests, and those who failed the first X-ray but didn't attend the second X-ray.
- (2) The number of HIV positive cases includes those who were tested positive by Western blot test, and those whose results of the first Western blot test was indeterminate but didn't attend the re-test, but excludes those whose second Western blot tests returned indeterminate results and as a consequence passed the tests.

3. HIV positive rates

The numbers of foreign laborers who were found to be HIV positive during regular health screenings between 2008 and 2012 are listed in Table 2. These numbers were obtained from the local health bureaus, and were the total number of the cases who were tested positive and those tested indeterminate by the first Western blot test. Based on the results of the arrival examinations and those of the following regular health screenings, the prevalence of HIV positive among foreign laborers was calculated using the number of positive and indeterminate cases by the first Western blot tests, after excluding the number of indeterminate cases at the second Western blot tests and re-listed as passing the examinations. Between 2008 and 2012, about 9 to 27 foreign laborers a year were found to be HIV positive during health screenings, making the prevalence rate between 0.002% and 0.005%, or an average rate of 0.003%, as listed in Table 5. By nationality, HIV positive rates among foreign laborers between 2008 and 2012 were 0.004% for Indonesia, 0.003% for Thailand, 0.002% for Vietnam, and 0.002% for the Philippines. Chi-squared test didn't detect significant differences between laborers from different countries.

Discussion

Between 2008 and 2012, about 193 to 342 foreign laborers every year were confirmed or suspected to be TB positive, an average rate of 52 per 100,000 population. A hospital in Taiwan reported a rate of 91 per 100,000 population based on the X-ray screenings conducted on foreign laborers between 2001 and 2002 [11]. An international travelers' healthcare center in China reported a TB positive rate of 32 per 100,000 population from the X-ray screenings between 2005 and 2011 on Chinese travelers and foreign citizens who had applied for residency [12]. Data released by the World Health Organization (WHO) showed that in 2011, the Philippines had the highest TB prevalence rate (270 per 100,000 population), followed by Vietnam (199), Indonesia (187) and Thailand (124) [13]. Foreign laborers who are found to have TB in the pre-entry or the arrival health screenings will not be allowed to work in Taiwan. As a result, the TB prevalence rate among foreign laborers in Taiwan is lower than the rates in their home countries.

Data released by the WHO showed in 2011 the HIV prevalence rates among the 15-49 years age group of the top foreign laborers source countries were 1.2% in Thailand, 0.5% in Vietnam, 0.3% in Indonesia, and less than 0.1% in the Philippines [14]. Foreign laborers found to be HIV positive during the pre-entry, the arrival or the following regular health examinations are not allowed to work in Taiwan. This is why the HIV positive prevalence rate among foreign laborers in Taiwan is very low (0.003%), much lower than the rates in their home countries.

Conclusion

Foreign laborers have been working in Taiwan for over 23 years since they were first introduced in October 1989. Over the years some regulations have been relaxed in order to balance the needs of disease prevention with the rights of foreign laborers. The government has removed the requirement of pregnancy tests in the arrival health examinations. Blood smear test for malaria is no longer required. Regular health screenings at the 12th and 24th months of employment have been cancelled, as have tests for Hepatitis B surface antigen. Syphilis or parasite positive cases are now allowed to get treatment in Taiwan before re-testing. Some items have also been added to the requirements of health examinations in order to prevent infectious diseases from being carried across the border. Foreign laborers are now required to provide proof of positive measles and rubella antibody titers or vaccination certificates. Indonesian laborers must be tested within three days of their arrival for typhoid fever, paratyphoid fever and shigellosis (by stool culture). Health screenings of foreign laborers help to identify cases of infectious diseases as early as possible and to prevent them from spreading further.

Foreign labor is necessary for a country's economic development. Managing the health of foreign laborers must achieve a balance between the rights of foreign laborers and the protection of public health. In the near future it is hoped with the allowable capacity of our infectious disease control system, the chance of foreign laborers having their work permits cancelled due to infectious diseases can be reduced to a minimum.

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Outbreak Investigation Express

Imported Acute Viral Hepatitis A Outbreak from Cambodia in 2013

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Abstract

Two cases of acute viral hepatitis A were confirmed on August 5-6, 2013 in Keelung City and Hsinchu County respectively. The case 1 and case 2 dating each other are colleagues working at the same company. They joined a Cambodia tour organized by their company during June 29th - July 5th, 2013. When an epidemic investigation and diagnostic activity were carried out, two additional tour members with suspected symptoms were identified accordingly. They were confirmed as the case 3 and case 4 of acute viral hepatitis A on August 8-9, 2013. As a result, the cluster was identified as an imported acute viral hepatitis A outbreak from Cambodia. Furthermore, another tour member (brother of case 1) developed suspected symptoms on August 29, 2013. He was confirmed as the case 5 on September 6, 2013. In order to reduce the spread of infection in Taiwan, the health authority was actively implementing several measures to control the disease, including tour members' contact tracing, household contacts' health care and epidemic surveillance. The experience could be shared with other health organizations when deal with a similar epidemic.

Keyword : Acute hepatitis A, imported, cluster

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