Surveillance of Antimicrobial Resistance among *Escherichia coli* from House Flies in a Hospital Area

Atchariya Yosboonruang[*] *Anong Kiddee*[*] *Chatsuda Boonduang*[*]

ABSTRACT

House flies are one of the crucial mechanical vectors spreading resistant bacteria including *Escherichia coli*. This study aimed to investigate the frequency and resistance patterns of *E. coli* as well as multidrug resistant (MDR) *E. coli* isolated from house flies in Phayao Hospital, Thailand. We found 68 of 70 *E. coli* isolates (97.1%) showed antimicrobial resistance and 49 isolates (70.0%) were MDR). Forty-three patterns of antimicrobial resistance occurred and the number of antimicrobials in co-resistance varied from 1 to 14 of 15 tested antimicrobials. The highest frequency resistance was cephalothin (86.8%), followed by ampicillin and amoxicillin (85.3%) and tetracycline (67.6%). Interestingly, we found resistance to cefotaxime (47.1%), ciprofloxacin (16.2%), norfloxacin (11.8%), imipenem (7.4%) and meropenem (5.9%), which are the antimicrobial classes to treat bacterial infections resistant to empirical agents. Our results indicated the dissemination of resistant *E. coli* in a hospital environment. Therefore, resistance surveillance and control should be increased.

Keywords: antimicrobial resistance, hospital area, fly, MDR *E. coli*

J Public Health 2018; 48(2): 185-197

Correspondence: Atchariya Yosboonruang, Department of Microbiology and Parasitology, School of Medical Sciences, University of Phayao, Phayao 56000 THAILAND. E-mail: f.atchariya@hotmail.com, atchariya.yo@up.ac.th

[*] Department of Microbiology and Parasitology, School of Medical Sciences, University of Phayao

Introduction

House flies (*Musca domestica*) are well known as pathogen carrying insects and common in Thailand.[1] They can travel to find food and reproductive sites up to 8 km within 24 hr. They are a mechanical vector of various pathogenic bacteria. They can transmit various pathogens such as *Escherichia coli, Pseudomaonas aeruginosa, Proteus mirabilisa, Bacillus cereus,* and *Staphylococcus aureu*.[2-3] House flies act as a potential vector for pathogenic bacteria found in the environment particularly in hospital areas.

Hospitals serve as a reservoir of many types of microorganisms causing nosocomial infections. Microorganisms frequently infect hospitalized patients included *E. coli*, *P. aeruginosa*, *Klebsiella* sp. *S. aureus* and *Mycobacterium tuberculosis*.[4] However, *E. coli* was reported as the most common strain found in clinical samples of many hospitals.[5-6] Although *E. coli* is the normal flora in the intestines of humans and animals, it causes human infections, e.g., diarrhea and entero-colitis, urinary tract infection, meningitis, peritonitis and septicemia.[5-7] In some hospitals, *E. coli* was the most common cause of nosocomial infections.[4] The incidence of antimicrobial resistant bacteria, particularly *E. coli*, is now a critical concern. *E. coli* can transmit resistant genes to other gram negative bacteria through horizontal gene transfer mechanisms. Because *E. coli* is commonly found in the human gut and environment, when antimicrobial resistant, it can transfer resistant genes to both normal flora and bacteria in the environment. Therefore, preventing and controlling resistant *E. coli* is important, particularly within the hospital setting.

Antimicrobial resistance is a worldwide problem in both developing and developed countries. The resistance of bacteria occurs in both nosocomial and community infections. Particularly, nosocomial infections caused by antimicrobial resistant pathogens impact morbidity and mortality rates. In addition, patients need to stay in the hospital longer incurring increasing cost. One related report on antimicrobial resistance among pathogenic bacteria in Southeast Asia found that resistance from clinical samples has increased in Thailand.[8] The prevalence of antimicrobial resistance in Thailand was found in both gram positive bacteria, e.g., *Streptococcus pneumoniae*, *Staphylococcus aureus*, coagulase-negative staphylococci etc. and gram negative bacteria, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Samonella* spp. etc.[9-11] Surveillance for antimicrobial resistance of nosocomial pathogens according to the Center for Disease Control and Prevention (CDC) recommendations[12] is conducted in most hospitals. The prevention of transmission is one of four strategies to prevent antimicrobial

resistance. Accordingly, screening for resistant *E. coli* from house flies produces important data to control the distribution of resistance genes among gram negative bacteria in the hospital.

Antimicrobial resistance has been reported in Southeast Asian hospitals as well as in Thailand, but is insufficient to reach the overall data throughout the country. Particularly, data of transmission vectors of antimicrobial resistant bacteria in the hospital are limited. Therefore, our study aimed to investigate the frequency and patterns of antimicrobial resistant *E. coli* and multidrug resistant (MDR) *E. coli* isolated from house flies in Phayao Hospital area.

Materials and Methods

Media and antimicrobial discs

All bacterial culture medium were purchased from Difco (Difco Laboratories, Inc. New Jersey, USA), and antimicrobial discs were purchased from Oxoid (Oxoid Limited, Basingstoke, UK).

House flies collection

House flies were randomly collected from various sites of Phayao Hospital, such as garbage, canteen, and hospital areas by trapping from June to August, 2015. The sampling was conducted twice monthly and a total of 60 house flies were collected over the three months. Then flies were identified using morphological characteristics..

Bacterial isolation

After shocking with refrigeration, each fly was placed in 0.85% sterile saline solution and vortex for 2 min. The solution was cross-streaked on Eosin methyleneblue (EMB) agar and incubated at 37°C for 18-24 h. The identical colonies were selected from each plate for identification. Isolated black-colored colonies with metallic sheen were picked up and then identified by Gram's stain and biochemical test.

Identification and confirmation of *Escherichia coli* isolates

The isolates of *E. coli* were screened under microscopic examination and biochemical characterization to confirm their identity. The biochemical tests including motility, indole, oxidase, lysine decarboxylase, lysine deaminase and urease production, citrate utilization and methyl red-Voges-Proskauer test. The reactions on triple sugar iron agar were followed using standard methods.[13] *E. coli* ATCC 25922 was used as the reference-typed strain for all tests.

Antimicrobial susceptibility test

The antimicrobial susceptibility test was conducted using the disc diffusion technique. The isolates were tested against 15 anti-microbial agents including ampicillin (AMP) 10 μg, amoxycillin (AML) 10 μg, cephalothin (KF) 30 μg, cefotaxime (CTX) 30 μg, chloramphenical (C) 30 μg, trimethoprim-sulfamethoxazole (SXT) 25 μg, meropenem (MEM) 10 μg, imipenem

(IMP) 10 μg, amikacin (AK) 30 μg, gentamicin (CN) 10 μg, ciprofloxacin (CIP) 5 μg, norfloxacin (NOR) 10 μg, amoxicillin/clavulanic acid (AMC) 20/10 μg, ampicillin/sulbactam (SAM) 10/10 μg, and tetracycline (TE) 30 μg. The isolated *E. coli* was prepared by inoculating a colony in Muller-Hinton broth and incubating at 37°C for 18 h. Turbidity was then adjusted to 0.5 McFarland standard. The standardized inoculum was swabbed onto Muller-Hinton agar and left to dry for 15 min. The antimicrobial discs were placed on the surface of the inoculated plate. The plates were then incubated at 37°C for 18 h. The inhibition zone diameter was measured and interpreted to be resistant or susceptible according to Clinical and Laboratory Standards Institute guidelines.[14] *E. coli* 25922 was used as a control organism for antimicrobial sensitivity. MDR isolates were defined as resistant to at least one agent in three or more antimicrobial classes.[15]

Statistical analysis

Data were presented in number and percentage. Data was analyzed using SPSS Software for Windows, Version 22.0.

Results

Identification of antimicrobial resistant *E. coli* isolates

A total of 70 isolates recovered on EMB agar were confirmed as *E. coli* isolated from 60 house flies (116.7%) over three months. All isolates were tested for antimicrobial susceptibility using 15 antimicrobial agents. The result showed that 68 isolates (97.1%) were resistant to at least 1 antimicrobial agent and only 2 isolates (2.9%) were susceptible to all antimicrobial agents. The 49 isolates (70.0%) were classified as MDR *E. coli* (Table 1). The number of antimicrobial agents in co-resistance was up to 14 from 15 agents. The number of resistant isolates in each co-resistant types is shown in Figure 1. The co-resistance of 8 antimicrobial agents found in 10 isolates was the highest frequency of resistant patterns.

Table 1 Antimicrobial Susceptibility to 15 Antimicrobial Agents of the Isolated *E. coli* From House Flies in The Hospital Area.

Isolated *E. coli*	No. of isolates	Percentage (%)
Susceptible isolates	2	2.9
Resistant isolates	68	97.1
MDR *E. coli*	49	70.0
NonMDR *E. coli*	19	30.0
Total isolates	**70**	**100.0**

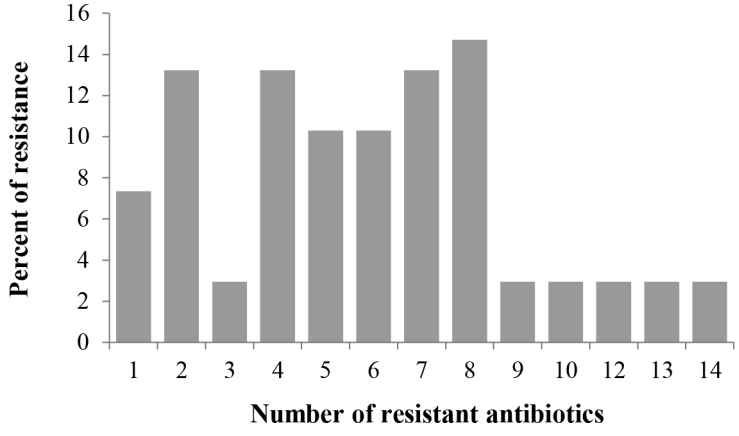

Figure 1 Percent of Co-resistant Type Resistant to 15 Antimicrobial Agents of Isolated *E. coli* Samples. (n=68)

Antimicrobial resistant patterns of *E. coli* isolates

The 43 resistant patterns of isolated *E. coli* toward the 15 antimicrobials are shown in Table 2. The most resistant patterns of isolated *E. coli* was co-resistance to ampicillin and amoxicillin (pattern 2.1) exhibiting 7.4% resistance. This was followed by co-resistance to ampicillin, amoxicillin, cephalothin, ampicillin/ sulbactam, and tetracycline (pattern 5.1) exhibiting 5.9% resistance. Another pattern was co-resistance to ampicillin, amoxicillin, cephalothin, cefotaxime, chloramphenicol, trimetroprim-sulfamethoxazole, gentamycin and tetracycline (pattern 8.1) also exhibiting 5.9% of resistance.

Regarding resistance frequency for each antibiotic (Figure 2), most *E. coli* isolates were resistant to cephalothin (86.8%) and followed by ampicillin and amoxicillin (85.3%) indicating a high frequency of resistance. Moreover, we found carbapenem-resistance including imipenem (7.4%) and meropenem (5.9%) of *E. coli* isolated from house flies. It implied that carbapenem-resistant *E. coli* were present in the environment.

Table 2 Antimicrobial Resistant Patterns Toward 15 Antimicrobial Agents of Isolated *E. coli*.

No. of agents in co-resistance	Antimicrobial resistance	No. (%) of resistant isolates (n=68)
1	C	1 (1.47)
	KF	3 (4.41)
	TE	1 (1.47)
2	AMP, AML	5 (7.35)
	SAM, TE	1 (1.47)
	KF, TE	2 (2.94)
	KF, CTX	1 (1.47)
3	AMP, AML, KF	1 (1.47)
	AMP, AML,TE	1 (1.47)
4	AMP, AML, KF, CTX	3 (4.41)
	AMP, AML, KF, TE	2 (2.94)
	AMP, AML, KF, SAM	2 (2.94)
	AMP, AML, SAM, TE	1 (1.47)
	KF, SXT, SAM, TE	1 (1.47)
5	AMP, AML, KF, SAM, TE	4 (5.88)
	AMP, AML, KF, AK, TE	1 (1.47)
	AMP, AML, KF, CTX, SXT	1 (1.47)
	AMP, AML, KF, STX, SAM	1 (1.47)
6	AMP, AML, KF, CTX, CIP, NOR	1 (1.47)
	AMP, AML, KF, CTX, SXT, SAM	2 (2.94)
	AMP, AML, KF, SXT, SAM, TE	2 (2.94)
	AMP, AML, KF, CTX, SAM, TE	1 (1.47)
	AMP, AML, KF, CN, SAM, TE	1 (1.47)
7	AMP, AML, C, CIP, AMC, SAM, TE	1 (1.47)
	AMP, AML, KF, CTX, C, AK, TE	1 (1.47)
	AMP, AML, KF, CTX, C, CN, TE	1 (1.47)
	AMP, AML, KF, CTX, C, SXT, TE	1 (1.47)
	AMP, AML, KF, CTX, C, SAM, TE	2 (2.94)
	AMP, AML, KF, C, SXT, CIP, TE	1 (1.47)
	AMP, AML, KF, SXT, AK, SAM, TE	1 (1.47)
	AMP, AML, KF, C, SXT, SAM, TE	1 (1.47)
8	AMP, AML, KF, CTX, C, SXT, CN, TE	4 (5.88)
	AMP, AML, KF, C, SXT, CN, SAM, TE	1 (1.47)
	AMP, AML, KF, CTX, C, CN, SAM, TE	3 (4.41)
	AMP, AML, KF, CTX, IPM, AK, SAM, TE	1 (1.47)
	AMP, AML, KF, SXT, AK, CN, SAM, TE	1 (1.47)
9	AMP, AML, KF, CTX, C, SXT, CN, SAM, TE	1 (1.47)
	AMP, AML, KF, CTX, C, CN, AMC, SAM, TE	1 (1.47)
10	AMP, AML, KF, CTX, C, CIP, NOR, AMC, SAM, TE	1 (1.47)
	AMP, AML, KF, CTX, C, SXT, CN, CIP, SAM, TE	1 (1.47)
11	AMP, AML, KF, CTX, C, SXT, CN, CIP, NOR, AMC, SAM, TE	2 (2.94)
	AMP, AML, KF, CTX, SXT, MEM, IPM, CN, CIP, NOR, AMC, SAM, TE	2 (2.94)
12	AMP, AML, KF, CTX, SXT, MEM, IPM, AK, CN, CIP, NOR, AMC, SAM, TE	2 (2.94)

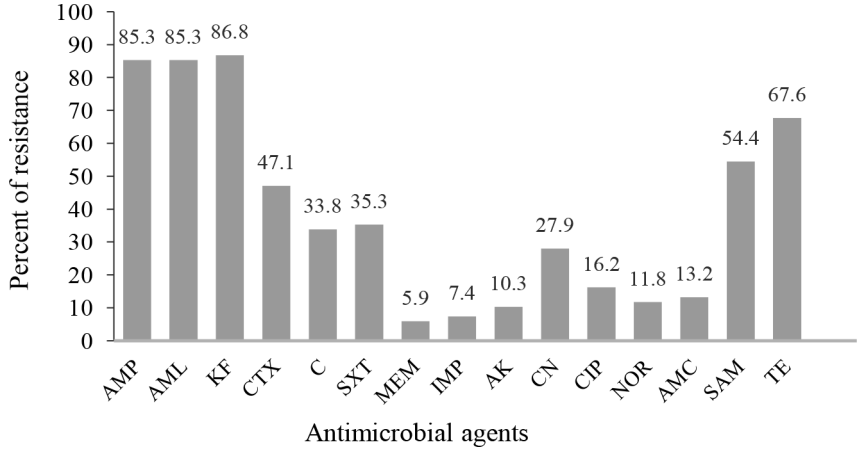

Figure 2 Percent Resistance of Isolated *E. coli* Toward Each Antimicrobial Agent. (n=68)

Discussion

E. coli was reported as the most common cause of infection in hospitals and communities for many countries and is usually found in hospital areas, such as wards, drainages, garbage as well as insects specifically flies, the predominant mechanical vector of pathogens.[3, 5, 6] Table 1, reveals the high frequency of resistant *E. coli* isolates (97.1%) as well as MDR *E. coli* (70%). Illustration of 43 resistant patterns of *E. coli* isolates among the 15 antimicrobial tests showed that each pattern contained different antimicrobial agents. The number of antimicrobial agents involved in co-resistance found in each resistant pattern varied from 1-10, 12, 13, and 14 agents. The *E. coli* isolates were resistant to at least one agent in three or more classes of antimicrobial agents and was defined as MDR *E. coli*. Resistance to penicillins (ampicillin and amoxicillin) and/or cephalosporins (cephalothin and cefotaxime) was found in most MDR *E. coli* isolates. In addition, Figure 2 illustrates that all antimicrobial agents were resisted by isolated *E. coli*. It indicated the reduced number of antimicrobial agents to treat *E. coli* infections effectively. The result indicated that most *E. coli* isolates were resistant to penicillins (ampicillin and amoxycillin) as well as 1st generation cephalosporin (cephalothin), the primary antibiotics to treat bacterial infection. Moreover, tetracycline and antimicrobial agents in folate pathway inhibitors including ampicillin/sulbactam, alternative antimicrobial agents to treat epidemic strains resistant to primary antimicrobial agents exhibited a high proportion of resistance. Notably, fluoroquinolones (ciprofloxacin and norfloxacin), 3rd generation cephalosporin (cefotaxime) and carbapenems (meropenem and imipenem) were also found

resistant. WHO has reported a high proportion of resistance to 3rd generation cephalosporin in many global regions.[16] It means that treating severe infections caused by *E. coli* must rely on carbapenems, the last resort to treat severe community and hospital acquired infections.[16]

Although *E. coli* are normal flora in the intestines of humans and animals, *E. coli* frequently cause hospital acquired and community urinary tract, blood stream, skin and soft tissue infections. In addition, they constitute causative agents of foodborne diseases. The resistance of *E. coli* leads to increasing treatment costs for infections. Recently, many reports concern the high prevalence of fluoroquinolones meaning available oral treatment of infection such as urinary tract infection remains limited. The mechanism of resistance to fluoroquinolones in *E. coli* is through mutation of genes encoding efflux pumps.[16-17] For broad-spectrum penicillins, e.g., ampicillin or amoxycillin and cephalosporins, resistance is achieved by acquiring a mobile genetic element.[6, 18-19] A great concern in our findings was resistance to 3rd generation cephalosporins (cefotaxime) and carbapemens (meropenem and imipenem) in *E. coli* isolated from house flies in Phayao Hospital. Resistance to 3rd generation cephalosporins is related to extended spectrum beta-lactamases (ESBLs), which destroy many beta-lactam antimicrobials. ESBL genes can be dispersed to other human pathogens or nonpathogens that are susceptible to antimicrobials through the mechanism of horizontal gene transfer.[6, 18-20]

Antimicrobial resistant *E. coli* isolated from house flies in the hospital of the Northern Thailand remains unreported. The ominous finding of this study was carbapenem resistant *E. coli* isolated from house flies in the hospital. A recent report from the National Antimicrobial Resistance Surveillance Center Thailand showed that resistance to imipenem among *E. coli* isolated from clinical samples ranged from 0.3-0.9% from 2000-2015.[21] Another related report indicated few carbapenem resistant *E. coli* in clinical samples. Flamm R.K. *et al.* (2011) reported that the resistance to meropenem of *E. coli* isolated from patients from Asia-Pacific and South African medical centers was 1.3%.[22] The study of Mantadakis E. *et al.* (2015) reported that resistance to imipenem and meropenem of *E. coli* isolated from hospitalized children with urinary tract infections was 0.7% and 1.2%, respectively.[23] Ansari et al. (2015) reported that *E. coli* resistance to imipenem isolated from clinical isolates[6] was not found. Regarding carbapenem-resistant *E. coli* in the environment, none were found in samples from Australian food-producing animals,[17] flies[20] and recreational waters in the Netherlands.[24]

House flies are highly mobile with opportunity to carry resistant *E. coli* within

and nearby hospital areas. In addition, *E. coli* strains that have ESBLs or other genetic elements on gene cassettes are usually resistant to several antimicrobial agents and these genes are also commonly transferred among Enterobacteriaceae and other gram negative bacteria. Indeed, carbapenems are usually available to treat several infections. Cabapenem-resistant *E. coli* could confer their resistance affecting all available beta-lactam antibiotics.[13] The mechanism of resistance in *E. coli* to cabapenem is achieved by acquiring a mobile genetic element mediated by metallo-beta-lactamases, which can be transmitted among bacteria. Moreover, the result indicated that MDR *E. coli* were resistant up to 14 antimicrobial agents from all of the 15.

Conclusion

This study determined antimicrobial resistance in *E. coli* for hospital surveillance. Our results demonstrated a high prevalence of antimicrobial resistance and multidrug resistance with various patterns of *E. coli* isolated from house flies in a hospital setting. In addition, carbapenem-resistance of *E. coli* was observed, which is less prevalent in the environment. This emphasized the potential of hospital waste to serve as a reservoir of resistant bacteria spread by house flies throughout the environment. For further study, MDR-*E.coli* isolates should be investigated for integron genes to determine the probability of genetic transfer to other gram negative bacteria within the hospital.

Acknowledgements

The authors would like to thank the University of Phayao and School of Medical Sciences, University of Phayao for the supporting research grant. We also would like to acknowledge Phayao Hospital for supporting the collecting of house flies. Finally, we thank you Prof. Dr. Nison Sattayasai for his kindness to improve and to proof our manuscript.

References

1. Suntaravitun P. Flies: The Important Role in Medicine. Songkla Med J 2012; 30(3): 167-178.
2. Davari B, Kalantar E, Zahirnia A, Moosa-Kazemi SH. Frequency of resistance and susceptible bacteria isolated from house flies. Iran J Arthropod-Borne Dis 2010; 4(2): 50-5.
3. Butler JF, Maruniak AG, Meek F, Maruniak JE. Wild Florida house flies (*Musca domestica*) as carriers of pathogenic bacteria. Fla Entomol 2010; 93(2): 218-23.
4. George DF, Gbedema SY, Agyare C, Adu F, Boamah VE, Tawiah AA, et al. Antibiotic resistant patterns of *Escherichia coli* isolates from hospitals in Kumasi, Ghana. ISRN Microbiology 2012; doi: 10.5402/2012/658470.
5. Sotto A, Boever CM, Peray PF, Gouby A, Sirot D, Jourdan J. Risk factors for antibiotic-resistant *Escherichia coli* isolated from hospitalized patients with urinary tract infections: a prospective study. J Clin Microbiol 2001; 39(2): 438-44.
6. Ansari S, Nepal HP, Gautam R, Shrestha S, Neopane P, Gurung G, et al. Community acquired multidrug resistant clinical isolates of *Escherichia coli* in a tertiary care center of Nepal. Antimicrob Resist Infect Control 2015; 4(15): 1-8.
7. Bopp CA, Brenner FW, Fields PI, Wells JG, Strockbine NA. *Escherichia, Shigella* and *Salmonella*. In: Murray PR, Barron EJ, Jorgensen JH, Pfaller MA, Yolken RH (eds). Manual of Clinical Microbiology. (8^{th} ed., pp.654-671). Washington, D.C.: American Society for Microbiology, 2003.
8. Lestari ES, Severin JA, Verbrugh H. Antibacterial resistance among pathogenic bacteria in Southeast Asia. Southeast Asian J Trop Med Public Health 2012; 43(2): 385-422.
9. Pitikultang S, Munsawaengsub Ch, Chanyasanha Ch. Factors associated with pharyngeal carriage of Streptococcus pneumoniae and Antimicrobial resistance in healthy children attending day-care center of a health promotional hospital. J Public Health 2010; 40(2): 123-35.
10. Pattarach P, Pitikultang S, Chanyasanha Ch, Sujirarat D. Staphylococcus aureus and methicillin-resistant Staphylococcus aureus among outpatients with skin and soft tissue infections at Prachuaphhirikhan General, Hua Hin and Pranburi Hospital. J Public Health 2011; 40(2): 173-82.

11. Yosboonruang A, Jitsatthra C, Tharawet L. Incidence of resistant bacteria isolated from medical devices in intensive care unit of the hospital. J Public Health 2016; 47(2): 222-4.
12. Centers for Disease Control and Prevention. National strategy for combating antibiotic-resistant bacteria. Antibiotic Resistance Treats in the United States. 2013.
13. Forbes BA, Sahm DF, Weissfeld AS. Bailey and Scott's Diagnostic Microbiology. 12th edition. Mosby Company, St. Louis, Mo, USA, 2007.
14. Clinical and Laboratory Standards Institute. Performance standards for antimicrobial susceptibility testing; twenty-fourth informational supplement. Document M100-S24. Wayne, PA: CLSI; 2014.
15. Magiorakos AP, Srinivasan A, Carey RB, Carmeli Y, Falagas ME, Giske CG et al. Mutidrug-resistant, extensively drug-resistant and pandrug-resistant bacteria: an international expert proposal for interim standard definitions for acquired resistance. Clin Microbiol Infect 2012; 18(3): 268-81.
16. World Health Organization. Antimicrobial resistance: global report on surveillance 2014. Geneva, Switzerland: World Health Organization; 2014.
17. Abraham S, Jordan D, Wong HS, Johnson JR, Toleman MA, Wakeham DL, et al. First detection of extended-spectrum cephalosporin- and fluoroquinolone-resistant *Eschericia coli* in Australian food-producing animal. J Glob Antimicrob Resist 2015; 3: 273-77.
18. Maheshwari M, Yaser NH, Naz S, Mansha F, Ahmad I. Emergence of ciprofloxacin-resistant extended-spectrum β-lactamase-producing enteric bacteria in hospital wastewater and clinical sources. J Glob Antimicrob Resist 2016; 5: 22-5.
19. Hawser SP, Bouchillon SK, Hoban DJ, Badal RE, Hsueh PR, Paterson DL. Emergence of high levels of extended-spectrum-β-lactamase-producing Gram-negative bacilli in the Asia-Pacific region: data from the Study for Monitoring Antimicrobial Resistance Trends (SMART) Program. Antimicrob Agents Chemother 2009; 53: 3280-4.
20. Liu Y, Yang Y, Zhao F, Fan X, Zhong W, Qiao D, et al. Mutidrug resistant Gram-negative enteric bacteria isolated from flies at Chengdu airport, China. Southeast Asian J Trop Med Public Health 2013; 46(6): 988-96.
21. Department of Medical Sciences, Ministry of Public Health. National Antimicrobial Resistance Surveillance Center Thailand (NSTDA): Antimicrobial resistance 2000-2015 report. 2015 [cited 2016 August 30]. http://narst.dmsc.moph.go.th/data/ MR2000__2015.pdf.

22. Flamm RK, Jones RN, Sader HS. In vitro activity of ceftaroline tested against isolates from the Asia-Pacific region and South Africa (2011). J Glob Antimicrob Resist 2014; 2:183-9.
23. Mantadakis E, Vouloumanou EK, Panopoulou M, Tsouvala E, Tslkidis A, Chatzimichael, et al. Susceptibility patterns of uropathogens identified in hospitalised children with community-acquired urinary tract infections in Thrace, Greece. J Glob Antimicrob Resist 2015; 3: 85-90.
24. Blaak H, Kruijf P, Hamididjaja RA, Hoek AHAM, Husmann AMR, Schets FM. Prevalence and characteristics of ESBL-producing E. coli in Duth recreational waters influenced by wastewater treatment plants. Vet Microbiol 2014; 171: 448-59.

การเฝ้าระวังการดื้อยาต้านจุลชีพของเชื้อ *Escherichia coli* จากแมลงวันบ้านในบริเวณโรงพยาบาล

อัจฉริยา ยศบุญเรือง[*] อนงค์ คิดดี[*] ฉัตรสุดา บุญดวง[*]

บทคัดย่อ

แมลงวันบ้านเป็นพาหะเชิงกลที่สำคัญในการแพร่กระจายเชื้อแบคทีเรียดื้อยาซึ่งรวมถึงเชื้อ *Escherichia coli* ด้วย การศึกษานี้มีวัตถุประสงค์เพื่อตรวจสอบการดื้อยาและรูปแบบการดื้อยาของเชื้อ *E. coli* ที่แยกได้จากแมลงวันบ้านภายในบริเวณโรงพยาบาลพะเยา ประเทศไทย พบเชื้อ *E. coli* ที่แยกได้ทั้งหมด 70 ไอโซเลต พบการดื้อยา 68 ไอโซเลต (ร้อยละ 97.1) และพบการดื้อยาแบบหลายชนิด 49 ไอโซเลต (ร้อยละ 70.0) พบรูปแบบการดื้อยาทั้งหมด 43 รูปแบบ โดยจำนวนยาต้านจุลชีพในแต่ละรูปแบบนั้นมีตั้งแต่ 1 ถึง 14 ชนิด จากยาต้านจุลชีพที่ใช้ทดสอบ 15 ชนิด ซึ่งชนิดที่มีการดื้อมากที่สุด คือ ยาเซฟาโลทิน (ร้อยละ 86.8) รองลงมาคือ แอมพิซิลินและอะม็อกซีซิลิน (ร้อยละ 85.3) เตตราซัยคลิน (ร้อยละ 67.6) ตามลำดับ สิ่งที่น่าสนใจคือ พบการดื้อยาเซโฟแท็กซิม (ร้อยละ 47.1) ซิปโปฟล็อกซาซิน (ร้อยละ 16.2) นอร์ฟล็อกซาซิน (ร้อยละ 11.8) อิมิพิเนม (ร้อยละ 7.4) และเมโรพิเนม (ร้อยละ 5.9) ซึ่งปกติยาเหล่านี้จะใช้สำหรับการรักษาโรคติดเชื้อเนื่องจากแบคทีเรียที่ดื้อยาพื้นฐาน ผลการศึกษานี้ชี้ให้เห็นว่า มีการแพร่กระจายของเชื้อ *E. coli* ดื้อยาในสิ่งแวดล้อมของโรงพยาบาล จึงควรเฝ้าระวังและควบคุมให้มากยิ่งขึ้น

คำสำคัญ: การดื้อยาต้านจุลชีพ, บริเวณโรงพยาบาล, แมลงวัน, *E. coli* ดื้อยาหลายชนิด

วารสารสาธารณสุขศาสตร์ 2561; 48(2): 185-197

[*] สาขาจุลชีววิทยาและปรสิตวิทยา คณะวิทยาศาสตร์การแพทย์ มหาวิทยาลัยพะเยา