rious K1/K2 K. pneumoniae infections in diabetic patients, by documenting that poor glycemic control reversely impaired phagocytosis of K1/K2 isolates (but not other strains), which was significantly lower in patients with diabetes mellitus than in healthy control subjects.

Although the phagocytosis rate of non–K1/K2 isolates was insignificantly lower in diabetic patients than in healthy control subjects [3], we observed a high prevalence (86%) of diabetic mellitus in our patients with non–K1/K2 isolates, which rarely invaded nondiabetic persons. Thus, we posit that strict metabolic control might be helpful in reducing infections of non–K1/K2 K. pneumoniae, which accounted for 12 (39%) of 31 cases of primary liver abscess in diabetic patients.

Antiphagocytosis and serum resistance are 2 major mechanisms of virulence for pathogenesis of K. pneumoniae infection [4, 5]. The significant impact of human glycemic change on neutrophil phagocytosis of K. pneumoniae does not reflect the seroepidemiology of K. pneumoniae between diabetic and healthy persons. The impact of glycemic change on serum resistance of K. pneumoniae is unclear. It seems that serum resistance assay rather than phagocytosis testing can well correlate the virulence of K. pneumoniae with serious infections.

In conclusion, nondiabetic or healthy persons with primary K. pneumoniae liver abscesses are largely infected with virulent K1 strains, whereas non–K1/K2 strains with relative lower virulence can still cause liver abscesses, mostly in diabetic patients. Strict glycemic control might reduce non–K1/K2, rather than K1/K2, liver abscess in diabetic patients.

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Virulence of Klebsiella pneumoniae Serotype K2 Should Not Be Underestimated in K. pneumoniae Liver Abscess

TO THE EDITOR—Fang et al.[1] have observed that serotype K2 Klebsiella pneumoniae isolates are not a significant risk factor for septic ocular or CNS complications. According to our previous study [2] and studies from outside Taiwan [3, 4], serotype K2 is the second largest serotype (after K1) to cause pyogenic liver abscess (PLA) and complications. Actually, the study by Fang et al. [1] made the same observation. One of the problems that has always been confusing to us is the number of cases in the series of studies by Fang et al. [1, 5] and Chuang et al. [6], which we tried to understand previously [7]. In their series of studies in the same hospital, 53 cases of PLA occurred during 1996–2001 [5] in which only 1 case was not caused by K1, then 42 PLA cases occurred consecutively in 1997–2003, of which 35 cases were caused by serotype K1 [6]. Although Fang and colleagues have explained that the errors occurred in sampling between 2 studies, the latter study was more accurately collected [7]. In the recent study [1], strains were collected in 1997–2005, and numbers of cases were increasing remarkably in 2004–2005, with 135 cases of PLA within 2 years, ~11.25 times the average increase per year after 2003. We believe that the increasing number of PLA cases was possibly due to selection criteria for PLA. Previous studies of K. pneumoniae liver abscess focused on the cryptogenic PLA, whereas there were 3 different categories of PLA in the study by Fang et al. [1]. We actually do not understand how to combine the so-called secondary PLA and undefined (noncryptogenic and nonsecondary) PLA to compare with other studies. According to Fang et al. [1, 5] and Chuang et al. [6], K2 isolates first occurred after 2002, and the proportion then increased dramatically, to 20% in total, for PLA in 1997–2005. Thus, there was a sharp increase in K2 PLA. In fact, K2 should be considered a significant factor that we should not separate from K1 liver abscess. Whether the cases with complications in the study of Fang et al. [1] were all from cryptogenic PLA and without cases from secondary or undefined PLA, another question will be raised as to whether the cases of complication in the study of were totally from cryptogenic PLA.

With the assumption that the compli-
cations in the study by Fang et al. [1] were all from cryptogenic PLA, 43 (81%) of 53 and 6 (11%) of 53 isolates had K1 and K2 serotype, respectively. Among them, 19 and 2 of the K1 and K2 isolates, respectively, had endophthalmitis and meningitis. Thus, 19 (43%) of 43 and 2 (33%) of 6 patients with K1 and K2 liver abscess, respectively, had further complications. Therefore, K2 strains play an important role and not a minor or nonsignificant role. The authors should clarify the origin of those complicated cases. If not, the analysis will become inconclusive and uncertain. However, for either of the situations above, K2 is still an important factor for complications or liver abscess.

Finally, if serotyping for the K antigen is used only to differentiate K1 from non-K1 K. pneumoniae, detection could be done within 10 min by a simple antiserum Quellung test. PCR detection should not be the rapid test used to differentiate serotype K1 and non-K1 K. pneumoniae. Antiserum could also be purchased easily, as described in the previous study by Chuang et al. [6].

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References


The Distant Metastasis of Pyogenic Liver Abscess Caused by Klebsiella pneumoniae Serotype K2 and the Underlying Disease of Diabetes Mellitus Should Be Carefully Interpreted

To the Editor—A recent article by Fang et al. [1] mentioned that diabetes mellitus (DM) is not a significant risk factor for septic ocular or CNS complications in Klebsiella pneumoniae liver abscess (KP-LA). In the study by Fang and colleagues, 13 (57%) of 23 patients with distant metastasis to eye or CNS were affected with DM. Previous studies showed that 67%–95.5% of the KP-LA–affected patients with distant metastasis were affected with DM [2–5]. In 2 studies, with overall enrollment of 354 patients with KP-LA, DM was verified as a significant factor for developing severe extrahepatic complications [4, 5] and poor visual outcome of endophthalmitis [5]. We suggest that subjects with DM should not be ignored in the future study of KP-LA and that the definition of severe metastatic complications of KP-LA should not be confined to eye and CNS only. Although the introduction in the article by Fang et al. [1] provided references to support the low prevalence of DM among subjects with liver abscess, all references have at least 64% of patients with KP-LA had DM (see the references [6–9], which Fang et al. [1] cited). The only reference from Korea [10], with ~40% of patients affected with DM, actually mentioned that DM was at highest prevalence among all underlying diseases. Taken together, the work of Fang and colleagues seems to completely misrepresent the significance of DM in KP-LA.

Fang et al. [1] disagree with our conclusions that K1/K2 is a major virulence factor, conclusions that are based on our findings from an in vitro neutrophil phagocytosis model and an animal lethality study [11, 12]; we used isolates from 2 geographical regions. Instead, Fang and colleagues concluded that K1 only (and not K2) was the major virulence factor, conclusions that were based on their results from a serum-resistance assay of K1 and K2 isolates from their single hospital [1]. Might the results of their in vitro assay of serum resistance be less pertinent than the findings of virulence from the animal model? In the study by Mizuta et al. [13], K1 strains had lower virulence than did K2 strains. Although 2 strains of K2 isolates from the study by Mizuta et al. [13] were avirulent, 7 of 9 K2 isolates did cause lethality with <10 colony-forming units. It is also interesting that 1 patient infected with a serum-sensitive K1 strain in the study by Fang et al. [1] developed endophthalmitis that led to loss of vision.

Although we highlight the fact that serotypes K1 and K2 play an important role in KP-LA, as well as the extrahepatic complications [2, 11], the significance of interactions between the virulence of K. pneumoniae and DM should not be ignored [12]. We should not exclude the associated factors other than serotypes that were involved in the KP-LA, because non-K1/K2 KP-LA still has an unknown etiology that magA or serotypes cannot explain.