GLYCOLIPID RECEPTORS OF F1C FIMBRIAL ADHESIN OF UROPATHOGENIC ESCHERICHIA COLI

A. Salam Khan and Jörg Hacker
Institut für Molekulare Infektionsbiologie der Universität Würzburg, Röntgenring 11, D-97070 Würzburg, Germany

1. INTRODUCTION

One of the indispensable steps in several infections caused by *Escherichia coli* and other gram-negative bacteria is their specific adherence to host cell surface carbohydrates linked to glycoproteins or to glycolipids

Urinary tract infections (UTI) in humans are strongly associated with *E.coli* producing P-, type 1, S- and F1C- fimbriae. P fimbriae are defined by the ability to mediate binding to the Galα1-4 Gal saccharide in glycolipids of the globoseries. Type-1 fimbriae bind specifically to mannose residues. *Escherichia coli* strains harboring S-fimbriae are primarily responsible for UTI and newborn meningitis (NBM). The bacterial ligands and their corresponding eukaryotic receptor structures have only been identified and characterized for two (SfaI and SfaII) of the four members of the S-fimbrial family. The adhesin proteins and their cognate receptors of two other members of the S super family, F1C- and Sfr-fimbriae, which are also involved in UTI, are not yet identified. Despite the significant sequence similarities among the major and minor subunits of S-, F1C- and Sfr-fimbrial complexes, F1C- and Sfr-fimbriated bacteria do not bind to the receptor (2-3 sialyl lactose residues) of the S-fimbrial adhesin nor do they show a hemagglutinating property.

In the present study we investigated the binding ability of F1C fimbriated recombinant *E. coli* strain (HB101-110-54) to several different cell lines.
Additionally, a glycolipid receptor for F1C fimbriated bacteria was also identified.

2. ELISA BASED ADHERENCE STUDIES

In order to identify the binding specificity of F1C fimbriated recombinant bacteria, binding assays were carried out with different cell lines as shown in Table 1. F1C fimbriated bacteria bound to the monolayers grown in microtiter plates in a dose dependent manner (Table 1). The bacteria of the nonfimbriated phenotype failed to bind. Interestingly, F1C fimbriated \textit{E. coli} do not show binding to all of the cell lines to which the two other members of this family (SfaI and SfaII) bind (Table 1). These results suggest that the difference in binding of F1C- and SfaI- or SfaII-fimbriated bacteria could be due to the presence or absence of certain binding epitopes on the surface of those cell lines (Table 1). These finding also confirmed the previous

\begin{table}
\centering
\begin{tabular}{|l|l|l|c|c|c|}
\hline
\textbf{Cell Lines} & \textbf{Origin} & \textbf{Control} & \textbf{F1C} & \textbf{SfaI} & \textbf{SfaII} \\
\hline
\textit{Epithelium} & & & & & \\
HKEPC & Human Kidney & - & ++ & ++ & ++ \\
LLCPK1 & Pig Kidney & - & - & ++ & ++ \\
MDCK & Canine Kidney & - & - & ++ & ++ \\
VERO & Monkey Kidney & - & - & - & - \\
A6-112 & Pigeon Kidney & - & - & - & + \\
T24 & Human Urinary Bladder & - & - & + & + \\
RT112 & Human Urinary Bladder & - & ++ & ++ & ++ \\
CaCo2 & Human Intestine & - & + & ND & ND \\
\hline
\textit{Endothelium} & & & & & \\
HUVEC* & Human Umbilical. Cord & - & - & ++ & ++ \\
EA-hy926 & Human Umbilical Cord & - & - & + & + \\
HGMEM & Human Glomerulus & - & ++ & ++ & ++ \\
RGMEM & Rat Glomerulus & - & ++ & ++ & ++ \\
HBMEC & Human Brain & - & - & ++ & ++ \\
\hline
\end{tabular}
\caption{Binding efficiencies of serially diluted nonfimbriated recombinant \textit{E. coli} HB101 (control), F1C-, SfaI- and SfaII-fimbriated recombinant strains to the monolayers of several different cell lines grown on microtiter plates. Bacterial binding was determined by an ELISA based assay. (*) Primary cells, (-) No binding, (+) Weak binding, (++) Strong binding, (ND) Not determined}
\end{table}