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Monitoring the Heterogeneous Structural Deposition of Sand Gravel Pressure on Bordetella in Coastal Environment, Applying Predict Model

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ABSTRACT

This paper monitors bordetella transport in structured sand gravel deposited formation, these type of mathematical application were subjected to thorough derivation in other to apply it for the prediction of bordetella transport in structured sand gravel deposition, the system monitor the rate of migration through the influential deposited porosity observed to pressure the increase of the contaminant in soil and water environment, other influential parameters considered were observed to improved on the concentration rate of the system, these parameters were integrated in the derived solution, the derived model if applied for simulation will definitely generated different concentration base on the rate of influences in heterogeneous structured strata in coastal environment.

Keywords: *heterogeneous sand gravel bordetella and coastal environment*

INTRODUCTION

Correct acquaintance of the transport and fate of bacteria in subsurface Surroundings is needed for many practical Scenarios. An understanding of bacteria Movement, for example, is applied to evaluate the risk that pathogenic microorganisms pose to water resources (Ginnet al., 2002 Gargiulo, et al 2008), to develop efficient water treatment methods (Tufenkji et al., 2002; Ray et al., 2002; Weiss et al., 2005 Eluozo 2011, Eluozo and orji 2011), and to design bioremediation strategies for hazardous waste sites (Mishra et al., 2001; Vidali, 2001; Eluozo 2011a, Eluozo 2011b Eluozo et al 2011a; Eluozo et a 201lb; Eluozo et al 2011c). Column transport experiments conducted under carefully controlled conditions of solid and/or aqueous phase chemistry have indicated that enhanced retention of colloids in unsaturated systems is unlikely to be due to attachment at the air–water interface (Chuet al., 2001; Chen and Flury, 2005 Bradford et al 2003, 2005 2006a; 2006c; 2006c Bradford and Leji 1997 Tan et al 1994; Tong and Johnson 2004a; 2005b; Tufenji et al 2002; 2004a). Models of attachment to the solid – water and air–water interfaces have traditionally assumed a constant first order deposition term, which predicts an exponential spatial distribution of retained colloids with distance (e.g., Yao et al., 1971; Logan et al., 1995; Tufenkji and Elimelech, 2004a, Albinger et al., 1994; Baygents et al., 1998; Simoni et al.,1998; Bolster et al., 2000; DeFlaun et al., 1997;Zhang et al., 2001; Redman et al., 2001; Bradford et al., 2002, 2006b; Li et al., 2004; Bradford and Bettahar, 2005; Tong et al.2005a,b Ukpaka et ala;2011b Ukpaka et al 2011a).

THEORETICAL BACKGROUND

Several experts has monitored the transport of microbes on stratum between fine and coarse soil deposition, but never care to monitor the migration rate of this contaminant in sequences litho structure to phreatic beds, the knowledge gap of other influences on the transport process at different litho structure including formation characteristic are not observed in these transport process, lots of pollution influences has been observed in my previous studies, these conditions has express the pressure from there structural depositions, the study tend to monitor bordetella deposition in coastal environment, base on other pressures from predominant formation characteristics in the coastal deposition.

There are predominant variations that has define the rate of transport of bordetella in soil and water environment, the derived solution in phases approach the influences in various concentration that were observed, such condition in detailed express various parameters that affect the system on the derived solution in these phase. The deltaic formations were observed to develop predominance from porosity, these condition calls for serious attention to experts due to fast transport to phreatic bed. The rates of concentration are subjected to thorough evaluation from the structured strata level of porosity in every deposition. Other pressure that should cause some decrease and increase in concentrations are express on the process of generating the derived model for the study, these defined several functions of these variables in various stage of the derived solution, the system are structure to predict the behaviour of these contaminant base on the their geological deposition that has lots of role to play on the migration process of the contaminant (Eluozo et al 2011a; Eluozo et al2011b)

GOVERNING EQUATION

$$K\frac{d^2c}{dx^2} - V_o\frac{dc}{dx} + \Phi\frac{dc}{dx} = 0 \quad (1)$$

Nomenclature

C = Concentration

ϕ = Porosity

K = Permeability

V_o = Void Ratio

Z = Depth

Equitation [1] is the generated governing equation, the expression were generated from the system these were applied to developed governing equation for the study.

$$K\frac{d^2c}{dx^2} - (V_0 - \Phi)\frac{dc}{dx} = 0 \quad (2)$$

Let $C = \sum_{n=0}^{\infty} a_n x^n$

$$C^1 = \sum_{n=1}^{\infty} n a_n x^{n-1}$$

$$C^{11} = \sum_{n=2}^{\infty} n(n-1) a_n x^{n-2}$$

$$K\sum_{n=2}^{\infty} n(n-1) a_n x^{n-2} - (V_0 - \Phi)\sum_{n=1}^{\infty} n a_n x^{n-1} = 0 \quad (3)$$

Replace n in the 1st term by $n+2$ and in the 2nd term by $n+1$, so that we have;

$$K\sum_{n=0}^{\infty} (n+2)(n+1) a_{n+2} x^n - (V_o - \Phi)\sum_{n=0}^{\infty} (n+1) a_{n+1} x^n = 0 \quad (4)$$

i.e. $K(n+2)(n+1)a_{n+2} = (V_0 - \Phi)(n+1)a_{n+1}$ (5)

$$a_{n+2} = \frac{(V_0 - \Phi)(n+1)a_{n+1}}{K(n+2)(n+1)} \quad (6)$$

$$a_{n+2} = \frac{(V_0 - \Phi)a_{n+1}}{K(n+2)} \quad (7)$$

for $n = 0,\ a_2 = \frac{(V_0 - \Phi)a_1}{2K}$ (8)

$$C(x) = a_0 + a_1 \ell^{\frac{(V_0 - \Phi)}{K}x} \quad (9)$$

The derived model at this phase were considered without the boundary conditions, the expression will monitored the progressive condition of bordetella in coastal deposition, the contaminant are assessed base on the rate of strata permeation, these also reflect the pressure predominant of porosity in the coastal environment. The behaviuor of the derived solution if applied for simulation will express their rate of increase or decrease base on the deposited strata from geochemistry that may reflect decrease or increase depending on the rates of the it depositions.

Subject equation (16) to the following boundary condition

$$C(o) = 0 \ and \ C^1(o) = H$$

$$C(x) = a_0 + a_1 \ell^{\frac{(V_0 - \Phi)}{\frac{\lambda}{\beta}}x}$$

$$C(o) = a_0 + a_1 = 0$$

i.e. $a_0 + a_1 = 0$ (10)

$$C^1(x) = \frac{(V_0 - \Phi)}{2!K} a_1 \ell^{\frac{(V_0 - \Phi)}{K}x}$$

$$C^1(o) = \frac{(V_0 - \Phi)}{2!K} a_1 = H$$

$$a_1 = \frac{HK}{V_0 - \Phi} \quad (11)$$

Substitute (10) into equation (11)

$$a_1 = -a_0$$

$$\Rightarrow a_0 = \frac{-HK}{V_0 - \Phi} \quad (12)$$

Hence, the particular solution of equation (16) is of the form:

$$C(x) = -\frac{HK}{V_0 - \Phi} + \frac{HK}{V_0 - \Phi}\ell^{\frac{(V_0-\Phi)}{K}x}$$

$$\Rightarrow C(x) = \frac{HK}{V_0 - \Phi}\left[\ell^{\frac{(V_0-\Phi)}{K}x} - 1\right] \qquad (13)$$

This is derived solution is the final phase of the developed model, there is no doubt that several conditions are observed or put into consideration, base on the parameters established in the study location, the behaviour of the contaminant are influenced by these variables in the system base on the transport process has been thorough expressed. The parameters were subjected to thorough derivations applying power series; this developing model will predict the transport of bordetella in soil and water environment. The derived solution can also be applied to monitor the system at every phase of the transport system.

CONCLUSION

The study has streamlined the behaviour of bordetella in heterogeneous structured sand gravel in coastal location. the system try to monitor the behaviour of the deposited contaminant in terms of their effect from structural condition thus the rate of accumulation, these were observed depending on the rate of porosity degree in the structure sand grave deposition in coastal environment, the derived solution were able to consider the behaviour of the system base on its rate of reflection of predominant soil porosity in the study environment, this research paper has express the rate at which the system can monitor the migration of bordetella in such coastal depositions, the geological setting were observed to express different rate of transport to phreatic aquifers. The study has streamlined the possibility of bordetella variations on their various strata base on the reflection of all these parameters considered in the coastal location.

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