

# The social amoeba *Dictyostelium discoideum* is a simple model for medical research

Nicholl Pakes, Steve Robery, and Robin SB Williams

Centre for Biomedical Sciences, School of Biological Sciences, Royal Holloway-University of London, Egham, TW20 0EX

**1. Abstract:** Medical research using animal cells is often difficult, since it is expensive and slow. The social amoeba, *Dictyostelium*, provides a very simple system for medical research. We use *Dictyostelium* to understand how medical drugs function on a molecular level, and to examine the cellular role of specific proteins (with homologues in humans).



Figure 1: The social amoeba, *Dictyostelium*, in the wild.

**3. Our research:** We use *Dictyostelium* in a range of biomedical research projects, including understanding the pharmacology and of Valproic acid (Epilim) function. VPA is a commonly used treatment for epilepsy and a range of other conditions (Fig 4). This work includes identifying genes responsible for the action of VPA and other compounds, and in the molecular tagging of genes (using, e.g. GFP, Fig 3).

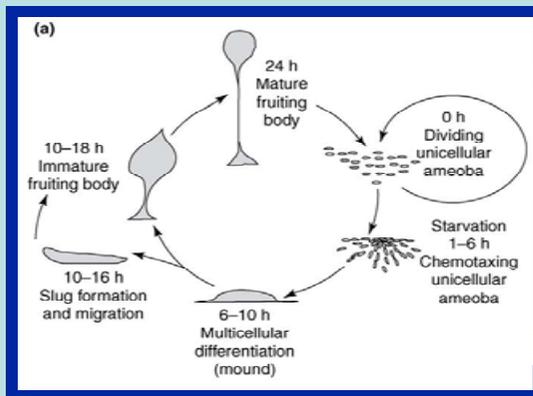


Figure 2: *Dictyostelium* life cycle as single cell and as a multi-cellular fruiting body (above). We can grow the amoeba in the laboratory on a bacterial lawn as a food source (right).



**2. The social amoeba:** *Dictyostelium* occurs naturally in the forest litter of temperate regions, as both single cells and as mature fruiting bodies of approximately 1mm in height (Fig 1). As a single cell, the amoeba eats bacteria and divides by splitting into two daughter cells (Fig 2). When cells start to starve, they move to one place to form a fruiting body consisting of around 50 000 cells. We can grow *Dictyostelium* in the laboratory, using bacterial (Fig 2) or as single cells (Fig 3) in nutrient-rich liquid media as a food source. This enables us to manipulate the amoeba in medical research.

Figure 3: We can grow *Dictyostelium* as single cells, in culture (right).

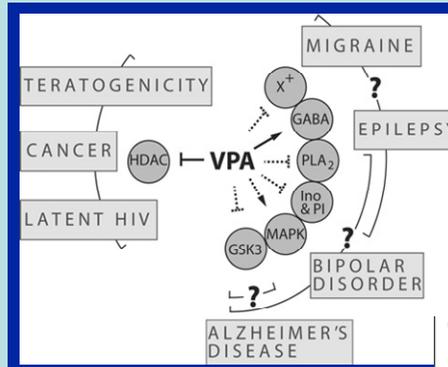
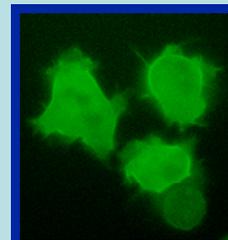
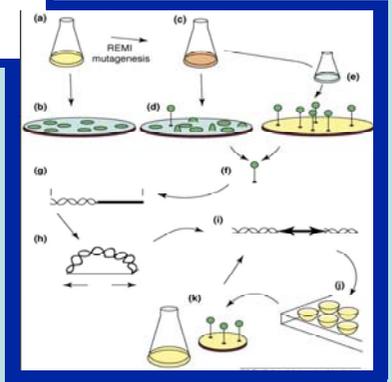


Figure 4: Valproic acid (VPA) has multiple medical roles, without a clear grasp of molecular mechanisms.

Figure 5: *Dictyostelium* can be used to identify genes controlling the action of medical treatments such as VPA or other compounds caspacasin (chilli).



**4. Summary:** We can use the simple amoeba, *Dictyostelium*, as a non-animal model for biomedical research.