

Transgenic anopheline mosquitoes impaired in transmission of a malaria parasite

J. Ito, A. Ghosh, L. A. Moreira, E. A. Wimmer and M. Jacobs-Lorena
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Mosquitoes are obligatory vectors for the malarial parasite, *Plasmodium*. This paper utilizes a strategy of generating transgenic vectors that are incapable of harbouring the parasite. Such transgenics of *Anopheles stephensi* were constructed by inserting a synthetic gene (termed *AgCP[SMI]4*) that retained the strong induction patterns in midgut epithelium after a blood-meal. The gene product, when expressed, strongly inhibited parasite development and transmission. Accordingly, the transgenic technology shows strong promise for the development of a novel strategy in efforts to eradicate malaria.

The destruction of N₂O in a pulsed corona discharge reactor

X. Hu, J. Nicholas, J. Zhang, T. M. Linjewile, P. de Filippis and P. K. Agarwal
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Oxides of nitrogen and sulphur are among the major pollutants from coal-fired power plants. N₂O is a potent greenhouse gas responsible for depletion of stratospheric ozone layer. In this paper the authors describe a pulsed corona reactor (PCR) to decompose N₂O, converting it to harmless nitrogen and oxygen gases. PCR consists of a high voltage power supply and control unit, and the pulser/reactor assembly. The reactor consists of ten parallel stainless tubes (22.9 mm Id, 91.5 cm long). The pulse voltage rises within 10 ns, with a peak of 15 kV and pulse length of 70 ns. Pulse current was maintained within a peak of 800 amperes. Removal of N₂O in a PCR was examined at various levels of energy input, different background gases, flow rates and initial pollutant concentrations. Reactor performance was studied with test gas mixtures containing 200 ppm N₂O and the end-products analysed for the presence of oxides of nitrogen by means of a Spectrum 2000 Perkin-Elmer FTIR spectrometer. Conversion was better in the background of Ar gas in place of nitrogen. A model was constructed assuming plug flow of gas and spatially uniform distribution of electrons, and analytical reactor performance equations were derived. Reaction mechanisms were proposed for this conversion to nitrogen and

oxygen. Results demonstrate the use of corona discharge reactors in removal of gaseous pollutants from the combustion exhausts.

Convection induced by composition gradients in miscible systems

V. A. Volpert, J. A. Pojman and R. Texier-Picard
C. R. Mech., 2002, **330**, 353–358.

Non-uniform distribution of temperature or concentration leads to ‘Korteweg-stress’ in fluids, which could be relieved through diffusion. This paradigm is useful in visualizing how mixing of miscible fluids compares with that of the immiscible fluids. The authors studied two miscible fluids, glycerol and water, and numerically simulated the formation of miscible drops and plane interfaces under the assumption of low, thermal-diffusive fluxes and incompressibility. Preliminary experiments under microgravity conditions were also performed on a NASA’s KC-135 airplane to observe the convection patterns when a drop of water was injected into glycerol or a stream of glycerol was injected into water.

Blood substitute and erythropoietin therapy in a severely injured Jehova’s witness

C. Cothren, E. E. Moore, P. J. Offner, J. B. Haenel and J. L. Johnson
New Engl. J. Med., 2002, **346**, 1097–1098.

Jehova’s witnesses, members of a denomination of Christian churches, refuse to accept blood transfusions due to religious reasons. Alternative therapeutics are required in such cases during a life-threatening emergency. The doctors from Denver Medical Health Center (Colorado, USA) describe the use of erythropoietin and PolyHeme, a haemoglobin-based polymer, as blood substitute in the case of a 44-year old Jehova’s witness injured seriously in a motor accident (during surgery). Recovery of the patient suggested that combination therapy with erythropoietin and PolyHeme could replace blood transfusion.

Dissecting streptavidin–biotin interaction with a laminar flow chamber

A. Pierres, D. Touchard, A. Benoliel and P. Bongrand
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Streptavidin–biotin interaction has been used in non-radioactive labelling and in

purification protocols. The authors investigated ligand-binding interactions using this as a model system. Streptavidin-coated (3460 mol/μm²) spherical beads of 2.8 μm diameter were passed over a biotinylated surface under a hydrodynamic drag lower than a pico-newton in a laminar flow chamber fabricated with pexiglass block and mica sheets containing a cavity of 0.1 × 6 × 20 mm³. The bead suspension was driven through the chamber with a 5 ml syringe, and the adhesion and flow were monitored and analysed using videotapes. This experimental system could track single-molecule interactions with 20 ms and 40 nm resolution. It was concluded that such a laminar flow chamber under low shear rate can yield useful information on molecular bond formation during ligand–receptor interactions as a complement to atomic force microscopy.

Synthesis of metal nanoparticles using polyoxometalates as photocatalysts and stabilizers

A. Troupis, A. Hiskia and E. Papaconstantinou
Angew. Chem. Int. Ed. Engl., 2002, **41**, 1911–1914.

Polyoxometalates (POMs) are well-characterized metal–oxygen clusters that can participate in redox-catalytic reactions as electron relays. This paper reports that several metal ions (Ag, Pd, Au, Pt) can form nanoparticles in the presence of POMs when photochemically reduced in a low salt aqueous solution. The nanoparticles were characterized with absorption spectra and transmission electron micrograph were used.

Short interfering RNA confers intracellular antiviral immunity in human cells

L. Gitlin, S. Karelsky and R. Andino
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The authors demonstrate that infection by cytolytic polio viruses could be significantly reduced by pretreatment with double-stranded, short interfering RNAs. This intracellular anti-viral activity is due to sequence-specific and direct targeting of the viral genome, that may open up a new strategy for anti-viral therapeutics.