Editorial

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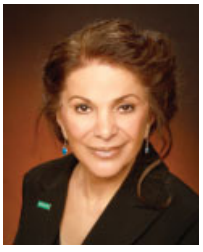
The biofuels agenda shall not wait for miracles!



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Alexander Fleming's discovery of penicillin – the most important medicine in the history of human kind – from the mold which grew on the *Staphylococcus* aureus bacterium was completely by chance. It was then isolated by Howard Felory and Ernst Chain (1945 Nobel prize) resulting in the saving of hundreds of thousands of wounded soldiers in World War II and the slowing of an epidemic of several infectious diseases. While penicillin was an accidental discovery, poliomyelitis had been, and was, causing over 20 000 epidemic paralytic cases in the US alone. It took over a decade of intensive, cutting-edge research (1947–1961) – initiated by Jonas Salk of the University of Pittsburg who first introduced an inactivated version of the polio vaccine – to control the epidemics of a combination of three, polio-related RNA viruses. This was not accidental; it was due to the cutting-edge immunotechnology of that century.

Innovative science and good policy to make a global change in the history of humankind

Today, the extreme petroleum energy shortages are – at least partially – being blamed for the world's political instability, the bankruptcies of banks and the start of a serious trend of economic depression; we cannot, and shall not wait for unexpected miracles such as the discovery of penicillin. Great science and innovations, along with good policies and cautious, but reasonably practical regulations are expected to once again make a global change in the history of human kind within the next decade; this time resolving the western world's bioenergy shortages and hopefully restoring world peace.

Over the last decade, tremendous innovations have been made in biofuels, bioproducts and biorefining technologies. The US Government and the petro industries have allocated billions of research dollars to these technologies, and many thousands of scientists have switched gears in an attempt to solve bioenergy problems. As a result, today's industries, governments and academia have collaboratively redirected their emphasis toward the cutting-edge technologies associated with old and new bioenergy crops, and the creation of genetically

designed bioenergy crops, which are soon expected to result in affordable alternatives to petroleum fuel.

This Special Issue of *Biofuels, Bioproducts and Biorefining (Biofpr)* features a set of peer-reviewed articles explaining some of these cutting-edge technologies, which are expected to create short-cuts in the production of more affordable biofuels and bioproducts. These technologies are still at some risk and certainly not yet mature; however, they have great potential to become mature within a decade or so, resulting in their large-scale commercialization.

Although the US Department of Energy has recognized the 'lower plant' – microalgae – as a major source of lipid biofuel for the last 30 years, it is due to recent necessity, that this technology has only been considered seriously in the last few years. For example, dozens of international conferences and symposia have been organized within the last three years to discuss microalgae research. The article by Pienkos and Darzins addresses the potential of microalgae for lipid biofuel and the major technical and economic challenges which are still associated with this very promising technology.[1]

The article authored by myself was invited by the *Biofpr* Managing Editor.[2] The major emphasis of this contribution is on the use of cutting-edge genetic-engineering technologies for the creation of designer crops that could be used for cheap production of biofuels. The use of the petroleum industry as a model industry for coproduction of higher-value, lower-volume coproducts, such as recombinant pharmaceuticals and industrial products is suggested.

The article by Snell and Peoples is an excellent example of relatively high-value recombinant coproduct, such as a heterologous biodegradable plastic, in a major bioenergy crop. Today, over 20% of US landfills are occupied by non-biodegradable plastics.[3] Coproduction of recombinant biodegradable plastics in new bioenergy crops can add value to the crop; the use of non-biodegradable plastic could be replaced by environmentally benign biodegradable plastics.

Good policy is a pre-requisite for the correct implementation of any good science. Gutterson and Zhang address the simple theory of reduction in greenhouse gas emissions via production of low-carbon-dedicated bioenergy crops; they also emphasize the major challenges that can prevent such reduction, and the possible harm that otherwise might occur.[4] This article further acknowledges governments and their role in supporting of R&D, alongside their industry partners, to reduce risk of loss of industry investments, such as the introduction of the US Energy Independence and Security Act of 2007

Finally, the article by Lee, Chen and Nair addresses the relatively unnecessary regulatory hurdles that are presently associated with the production of genetically engineered crops.[5] This contribution summarizes the US regulatory processes associated with transgenic bioenergy crops and recommends modifications of the regulations to match the level of risk that is associated with production of such crops.

I wish to sincerely thank the authors of this Special Issue for accepting my invitation to write, and for the efforts and great contributions they have made

toward the improvement of cutting-edge biofuels and bioproducts technologies, policy and regulations.

References

1. Pienkos PT and Darzins A, The promise and challenges of microalgal-derived biofuels. *Biofuels, Bioprod. Bioref.* **3:**431–440 (2009).
2. Sticklen M, Expediting the biofuels agenda via genetic manipulations of cellulosic bioenergy crops. Biofuels, *Bioprod. Bioref.* **3:**448–455 (2009).
3. Snell KD and Peoples OP, PHA bioplastic: A value-added co-product for biomass biorefineries. *Biofuels, Bioprod. Bioref.* **3:**456–467 (2009).
4. Gutterson N and Zhang J, Important issues and current status of bioenergy crop policy for advanced biofuels. *Biofuels, Bioprod. Bioref.* **3:**441–447 (2009).
5. Lee D, Chen A, and Nair R, Regulatory hurdles for transgenic biofuel crops. *Biofuels, Bioprod. Bioref.* **3:**468–480 (2009).

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