

Microalgae Production using Human Urine

*A new era of sustainable food and
energy production*



Microalgae and cyanobacteria production are revolutionary developments in fulfilling growing demands of food, energy, sanitation and carbon emission reduction. Furthermore microalgae production does not imply land and food competition (unlike terrestrial plants). Using wastewater for producing microalgae is considered as one of the most sustainable and environmentally friendly solutions for food and energy production.

Human urine (HU) makes up the main portion of nutrients in municipal wastewater. Urine contains up to 85% of the nitrogen and half of the phosphorus and potassium excreted from the human body but its volume is less than 1% of total domestic wastewater volume.

According to our experimental researches at Kristianstad University (HKR), producing microalgae in diluted human urine can beat the biomass production using chemical solutions. The algal biomass can be used for biodiesel production and cosmetics, pharmaceutical products and fertilizers as the side products. Using urine has many advantages over crude wastewater including:

- Relatively low level of pathogenic infection. Urine has a self-purification capacity due to the high ammonia concentration.
- Urine is cheap and widely available thanks to the collection projects using urine diversion toilets (UDT) and dry urinals worldwide.
- Human urine does not cause severe contamination in culture. The level of pathogens, heavy metals, organic matter and dissolved solids are low in human urine. Moreover, the risk of contamination with other microorganism as predators does not exist using HU.

The Royal Norwegian Society for Development (Norges Vel) and Sustainable Sanitation Design (SuSan Design) are implementing and establishing respectively algae projects and urine collection initiatives in Southeastern Africa. Our recent research (funded by Norges Vel as upstart for further field implementation) about the possibility of producing *Spirulina platensis* in human urine revealed the fact that human urine can be used for mass production of this microorganism. *Spirulina platensis* is a blue-green algae which contain up to 65% protein and is rich in vitamins and minerals. The produced biomass can be

used for livestock consumption. Aquaculture using *Spirulina* improves the growth, fertility, immune system and survival of many commercial fish species. There is a remarkable potential to produce *Spirulina* in Madagascar according to our research. Norges Vel is currently active in Madagascar, conducting seaweed cultivation projects, and SuSan Design is establishing a urine collection initiative.

If you are interested in biomass production using human urine, please do not hesitate to contact us. We will gladly like to share our ideas and plans with you for any possible contributions. The microalgae biomass production using human urine is a sustainable beneficial green solution which will play a significant role in future energy and food markets.

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