**Extraction of DNA and RNA and other small molecules from various biological samples using bare magnetic nanoparticles**

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Magnetic nanoparticles have great potential as tools for both research and industrial applications and they can be successfully utilized to make processes more efficient, faster, convenient, and environment friendly. Isolation of genomic DNA is an important criterion for molecular biology practice and serves as the starting material for various downstream applications like PCR, sequencing, etc. As an alternate to the conventional and spin-column based methods, magnetic nanoparticles are widely being used owing to its various advantages like limited centrifugation, cost effectiveness and scalable options. While most of the commercially available beads are carboxyl coated magnetic beads,we make use of uncoated magnetic nanoparticles. The use of uncoated beads enables in exploiting the property to reversibly bind to the DNA and due to the absence of coating, the particle size remains small thereby having higher surface to volume ratio. Magnetite (Fe3O4) prepared by co-precipitation method is amphoteric in nature and can thereby gain positive or negative charge depending on the pH of the solution. DNA precipitation onto the magnetic bead occurs in the presence of monovalent salt (most commonly Na+) along with a condensing agent. The condensing agent decreases the repulsive force between the DNA segments, thereby causing a change in its structural form (coil- to- globule) which promotes binding and eventually the extraction of DNA.

Our current research is based on the development of methods wherein magnetic nanoparticles are used for a rapid, efficient and contamination-free extraction of biomolecules like DNA and RNA. These technologies will be helpful to various research labs and genomics based industry. Our technology based on the aforementioned principle is already been introduced in the market for rapid DNA isolation from various biological samples. We are currently working on automating these technologies for catering the need of high throughput labs and genomics based diagnostic companies.

Dr Aniruddha Bhati is currently working as a Scientist at MagGenome Technologies Pvt. Ltd. Chennai. He completed his PhD in Bio-nanotechnology from Charotar University of Science and Technology, Gujarat. He is associated with MagGenome Technologies since its inception in 2015 and looks after Techno-commercial activities and also supports the R&D team in the development of new technologies. He has delivered talks on applications of Magnetic nanoparticles at various Universities and institutes like Slovak Academy of Sciences, Christian Medical College, Vellore, VIT University, Vellore, University of Madras, Chennai.