

G M Technology

- ❑ **BASIS**
- ❑ **ADVANTAGES** - Due to gene
- ❑ **DISADVANTAGES** - Due to gene
 - Unintended effects (problem with technology)
 - Vector problem
 - Social problems (e.g. weeds)
 - Social need? (e.g. Bt brinjal)
 - Confined effectiveness (e.g. Bt cotton)

STUDY MATERIAL & SUBJECTS

- **CROPS** : Corn, Soya, Potato, Rice, Tomato, Brinjal, Cotton
- **GENES** : Bt, Round-up-Ready (Weedicide), +
- **ANIMALS** : Mice, Rats, Rabbits, Hamsters, Chicken, Cattle, Humans

EFFECTS ON ANIMAL HEALTH

- **STRUCTURAL AND FUNCTIONAL CHANGES IN ORGANS**
[e.g. thymus, spleen, GI tract, liver, pancreas (drop in amylase production), testicles (drop in Sertoli cells and spermatocytes)]
- **CHANGES IN CONCENTRATION OF METABOLITES AND NUTRIENTS**
[e.g. creatinine, blood sugar]

Contd....

- **CHANGE IN KEY ENZYME CONCENTRATIONS**
(e.g. LDH-2)
- **DISTORTION IN LIPID AND CARBOHYDRATE METABOLISM**
- **DISRUPTION OF NORMAL GROWTH** (e.g. liver, kidney, erythropoiesis)
- **ACCELERATED AGING**
- **FORMATION OF PRECANCEROUS LEGIONS AND DEVELOPMENT OF TUMOURS**
- **ALLERGENIC AND IMMUNE RESPONSE**

Contd....

- **ANIMAL DEATHS FOLLOWING GRAZING ON Bt-COTTON PLANTS OR CONSUMPTION OF Bt-CORN**
- **REPRODUCTIVE INTERFERENCE – 1st TO 3rd GENERATION (low size and birth weight of litter, its decreased survival and loss of fertility)**

EFFECT ON HUMAN HEALTH

■ ALLERGY

Philippines (Mindano – 4 villages): Bt- corn pollen IgA, IgG, IgM antibodies in 39/100, with dizziness stomach pain, vomiting, fever.

Punjab

USA : 1997-1999, 2/3rd processed food had GM material. Food allergy in children up 18% from 1997 to 2007.

USA : Anaphylaxis cases from food increased from 21,000 to 51,000, 1999-2008.

Contd...

■ ALLERGY

USA : Food allergy related hospital admission increased from 2,600/year (1998-2000) to 9,500/year (2004-2006).

USA : Before 1999 – 10% allergic to soya; after 1999 when GM soya came → 50%

Contd...

- **CANCER**

- Punjab
- La Leonasa (Argentina) – childhood cancer rate tripled between 2000–2009

- **BIRTH DEFECTS**

- La Leonasa : 4-fold increase

- **GI TRACT**

- USA : Obesity? (check for leptin)

EFFECT ON PLANTS

**PRADEEP BURMAS PAPER IN J. BIOSCIENCES
(2011)**

Effect of Bt gene on growth and development

EFFECT ON AGRICULTURE (INDIA)

- **Bt-COTTON STORY (10 YEARS)**

 - **Success and failure, region-wise/year-wise**
 - **Contribution of Bt gene**

- **RESISTANCE (refuge problem?)**

- **MINOR PESTS, e.g. MEALY BUG**

- **BENEFICIAL PESTS?**

- **SOIL ECOLOGY (MICROBES, TRACE ELEMENTS, MOISTURE)**

- **CONTAMINATION OF SMALL FARMS (LIABILITY LAWS?)**

EFFECT ON ENVIRONMENT / BIODIVERSITY

- **NO NON-Bt COTTON SEEDS IN INDIA :
EFFECT OF MONOCULTURE**
- **CONTAMINATION OF CENTRES OF ORIGIN:
INTEFERENCE WITH NATURAL EVOLUTION**

RELATED EFFECTS ?

- **ANTIBIOTIC RESISTANCE (e.g. Bt Brinjal – aad gene)**
- **GENE TRANSFERRED TO GI TRACT BACTERIA**
- **GM DNA APPEARING IN BLOOD**
- **LATERAL GENE TRANSFER (Pollen can travel a 100 miles in 48 hr)**

INDIAN SITUATIONS

- **Initial entry and use of Bt cotton – illegal**
- **Conflict of interest in RCGM/GEAC**
- **Supreme Court ruling to make Bt data public – assessment of data**
- **Bt Brinjal story**
- **Decision of States**
- **Parliamentary Committee**
- **TEC appointed by Supreme Court**

IMPLICATIONS

- **Country's sovereignty**

INTERNATIONAL SITUATION

- **IAASTD report. (HANS HERREN)**
- **Report of scientists (JACK HEINEMANN,
DAVID SCHUBERT, MICHAEL ATTOINEAU)**
- **Proposition 37 in California**

CONCLUSION

- **RECOGNISE THE POWER OF GM TECHNOLOGY (e.g. to make cheap drugs)**
- **ASSESS SOCIO-ECONOMIC NEED**
- **CHECK ALTERNATIVES**
- **VENDING AGENCIES CANNOT BE REGULATORS**
- **NO CONFLICT OF INTEREST IN ANY REGULATOR**
- **INDEPENDENT TESTING MECHANISM TO ASSESS RISKS (problem with Monsanto)**
- **PRECAUTIONARY PRINCIPLE: ENSURE NO HARM**