CSE findings on antibiotic use in the Indian dairy sector

As dairy farmers inject antibiotics in their livestock, chances are high that these are passed on to humans through milk, finds Delhi-based non-profit Centre for Science and Environment.

Rajeshwari Sinha, Deeya Khatter and Amit Khurana

Online meeting on antibiotic use in the Indian dairy sector
July 28, 2020

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Food Safety and Toxins, CSE
Antimicrobial resistance (AMR) and its linkages with food and environment

Three AMR determinants that travel across the systems, sectors
• Antibiotic resistant bacteria
• Antibiotic resistance genes
• Antibiotic residues

Animals
• Poultry for eggs and meat, fisheries, dairy
• Intensive production systems leading to antibiotic overuse and misuse

Human health
• Self medication
• Over-the-counter (OTC) sale

Plants
• Routine use of antibiotics in crops

Waste and Environment
• Hotspots: Waste from farms, factories, healthcare settings, sewage/water treatment plants
• AMR determinants when excreted can pass in to environment through waste
CSE’s work to help contain antibiotic misuse and AMR: examples of studies on food systems

- 2010 (Honey)
- 2014 (Poultry)
- 2016 (Fish)
- 2017 (Poultry farms)
- 2017 (Fast food)
- 2019 (Crops)
- 2020 (Feed)
- 2020 (Fast food)
- 2020 (Zambia-AMR surveillance)
- 2020 (Zambia-Roadmap to eliminate antibiotic misuse)
Why dairy sector?
Less understood and talked about w.r.t AMR

- **Antibiotic resistance growing** in several bacteria against different antibiotics
- Antibiotic misuse so far largely talked about in poultry and aquaculture; **dairy sector less understood and less talked about**
- Antibiotic use high in livestock; possibly quite high in **dairy** because of **scale** of the sector and **weight** of the animals
- **Milk** is an important **component of Indian diet**, particularly children; Residues in milk could pose a huge risk to AMR
- Antibiotic residues in milk have been found in several studies in India (e.g., tetracycline, β-lactams, enrofloxacin)
  - The Food Safety and Standards Authority of India (FSSAI), in its National Milk Quality Survey (NMQS) 2018 also found antibiotic residues in milk (both raw and processed)
Scope of the CSE assessment: key milk producing states; both organized and unorganized sector

- **Stakeholders**
  - Farmers
  - Food regulators: FSSAI and state administrations
  - Animal husbandry: Centre and state
  - NDDB, state milk federations, private dairies
  - Research and academic institutions: NDRI, IVRI, veterinarians
  - Organic milk producers

- **Collectively, stakeholders belonged to 10 key milk producing states**
  - Andhra Pradesh, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh

- **Duration**: March-May 2020

**Milk handling in the Indian dairy sector**

- **Total milk produced** (187.7 million tonnes in 2018-19)
- **Total milch animals (in-milk and dry) in cows and buffaloes**: 125.34 million (2019)

- **Consumed/sold in rural areas** (48%)
- **Sale in urban areas** (52%)

- **Unorganized sector (60%)**
  - Local milkman, dudhias, contractors

- **Organized sector (40%)**
  - Dairy cooperatives (20%; serve 80% consumers)
  - Private dairies (20%; serve 20% consumers)
Key findings: indiscriminate use of antibiotics in the dairy sector

- Antibiotics used for several diseases in dairy cattle
  - Bacterial: Mastitis, Brucellosis, Haemorrhagic Septicemia (HS), Black Quarter (BQ)
  - Including viral: Foot and Mouth Disease (FMD)

- Antibiotics also used for mass prevention by big farmers (dry cow therapy): intramammary antibiotic infusions during the dry period

- Self administration of antibiotics by farmers
  - Antibiotic injections given as soon as disease is suspected (swelling of teats, smelling of milk, milk curdy, blood in milk)
  - Farmers themselves inject antibiotics in different combinations or doses; often does not wait for veterinarian
  - Stock medicines to avoid delay

- High doses of antibiotics given (because of the weight)
  - Mastitis (infection/inflammation of mammary gland) is most common bacterial disease
  - Multiple causative organisms, primarily bacteria such as *S. aureus*, *Streptococcus* sp., coliforms
  - Known to be caused by poor farm and milking hygiene
**RAMPANT MISUSE**
Dairy farmers indiscriminately inject into cattle antibiotics that are critical for humans

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Antibiotic class</th>
<th>Use in human beings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceftizoxime</td>
<td></td>
<td>In infections caused by aerobic and anaerobic gram-positive and gram-negative organisms</td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td></td>
<td>In bacterial dysentery, enteric fever, biliary tract infections, acute bacterial meningitis, cellulitis and community-acquired pneumonia</td>
</tr>
<tr>
<td>Ceftriaxone-tazobactam, ceftriaxone-sulbactam</td>
<td>Third generation cephalosporins is highest priority critically important antimicrobial (HPCIA)</td>
<td>Tazobactam and sulbactam are used in combination with other antibiotics for infections of the abdomen, gastrointestinal tract, skin and soft tissue, ear, bone and joint infections, respiratory tract, urinary tract etc</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td></td>
<td>Ear infections, central nervous system infections, pediatric infections, neonatal infections</td>
</tr>
<tr>
<td>Cefiotofur^</td>
<td></td>
<td>Antibiotics of the same class are critical for humans to treat infections</td>
</tr>
<tr>
<td>Enrofloxacin**^</td>
<td>Fluoroquinolones (HPCIA)</td>
<td>Antibiotics of the same class are critical for humans to treat infections</td>
</tr>
<tr>
<td>Gentamicin*</td>
<td>Aminoglycosides is critically important antimicrobial (CIA)</td>
<td>Sepsis during pregnancy and childbirth, pneumonia, pediatric infection, bone and joint infection, heart infection</td>
</tr>
<tr>
<td>Streptomycin*</td>
<td></td>
<td>Tuberculosis, heart infection</td>
</tr>
<tr>
<td>Penicillin*</td>
<td>Penicillins (CIA)</td>
<td>Cardiovascular infections, respiratory tract infections, gynaecological infections, ear infections, acute rheumatic fever</td>
</tr>
<tr>
<td>Ampicillin</td>
<td></td>
<td>Lower respiratory tract infection, abdominal infection, heart infection</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td></td>
<td>Skin and soft tissue infection, ear infection, urinary tract infection, sinusitis, sepsis during pregnancy and childbirth</td>
</tr>
<tr>
<td>Amoxicillin-clavulanic acid</td>
<td></td>
<td>Infections of the abdomen, gastrointestinal tract, skin and soft tissue, ear, respiratory tract, urinary tract, genital tract and gynaecological infections</td>
</tr>
</tbody>
</table>
Problem worsens when most farmers sell milk while animal is on treatment

- Farmers sell milk while animal is on treatment.
- They are mostly unaware about withdrawal period; few preferred to not sell milk for 1-3 days.
- Farmers cited that they cannot let go of their earnings for so many days (treatment + withdrawal period).
- This milk was sold to state dairy cooperatives as well as directly to consumers.

High possibility that antibiotic residues and resistant bacteria may appear in milk.
Reasons cited for indiscriminate use by stakeholders

• **OTC availability of antibiotics**
  – Antibiotics can be easily procured without prescription

• **Qualified veterinary support lacking**
  – Government doctors not always available when needed
  – Little knowledge or training of compounders/junior doctors
  – Local quacks/jholachaaps treat without proper diagnosis
  – Private doctors available at high fees

• **Outreach of vaccination programme inadequate**
  – No vaccines for mastitis
  – Farmers sometimes unwilling or do not rely on govt. vaccines
What about antibiotic residues in processed milk?
CSE reached out dairy co-operatives, unions and private dairies

<table>
<thead>
<tr>
<th>Milk Federations/Unions/ Private dairies</th>
<th>Milk brand</th>
<th>Response status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh Dairy Development Co-operative Federation Ltd.</td>
<td>Vijaya</td>
<td>✗</td>
</tr>
<tr>
<td>Gujarat Co-operative Milk Marketing Federation Ltd.</td>
<td>Amul</td>
<td>✓</td>
</tr>
<tr>
<td>Milk Union Ambala (under Haryana Dairy Development Co-operative Federation Ltd.)</td>
<td>Vita</td>
<td>✓</td>
</tr>
<tr>
<td>Karnataka Co-operative Milk Producers Federation Ltd.</td>
<td>Nandini</td>
<td>✓</td>
</tr>
<tr>
<td>Malabar Regional Co-operative Milk Producers’ Union (under Kerala Co-operative Milk Marketing Federation Ltd.)</td>
<td>Milma</td>
<td>✓</td>
</tr>
<tr>
<td>Gwalior Sahakari Dugdha Sangh (under Madhya Pradesh State Co-operative Dairy Federation Ltd.)</td>
<td>Sanchi</td>
<td>✓</td>
</tr>
<tr>
<td>Mother Dairy Fruit &amp; Vegetable Pvt. Ltd (subsidiary of NDDB)</td>
<td>Mother Dairy</td>
<td>✗</td>
</tr>
<tr>
<td>Ropar District Cooperative Milk Producer’s Union Limited (under Punjab State Co-operative Milk Producers’ Federation Ltd.)</td>
<td>Verka</td>
<td>✓</td>
</tr>
<tr>
<td>Pradeshik Co-operative Dairy Federation Ltd. (Uttar Pradesh)</td>
<td>Parag</td>
<td>✓</td>
</tr>
<tr>
<td>Rajasthan Co-operative Dairy Federation Ltd.</td>
<td>Saras</td>
<td>✓</td>
</tr>
<tr>
<td>Nestlé India Ltd.</td>
<td>Nestle</td>
<td>✓</td>
</tr>
<tr>
<td>Gopaljee Dairy Food Pvt. Ltd.</td>
<td>Gopaljee</td>
<td>✗</td>
</tr>
</tbody>
</table>

Note: CSE wrote to Managing Director/Director/CEO/Chairman of the federations; in the event of no response contacted milk unions. Few federations/unions responded through emails. Rest were interviewed on phone. Kerala shared test reports.
Key findings: inadequate antibiotic testing in milk

DAIRY FEDERATIONS/ MILK UNIONS—Except in case of Gujarat and Kerala, others indicated:

- Limited focus on antibiotics
  - Major focus is on testing adulterants (e.g., detergent, starch, maltodextrin, urea etc.)
  - Frequency of testing for antibiotics in milk is too less
    - Occasionally tested only from tankers (once in 3 or 6 months)
    - Gujarat, Kerala claimed daily testing from tankers

Reasons cited

- Pooling of milk dilutes antibiotic residues in milk
  - Milk is pooled from different DCS into tankers, antibiotics concentration very low
  - No reports of antibiotic residues found in milk so far (However report shared by Kerala MRCPU had residual antibiotics)

- Routine testing of antibiotics not possible
  - Time consuming and expensive, lack of necessary testing kits or equipment

PRIVATE PLAYERS—Nestlé India claimed that milk is tested for antibiotics by qualitative and quantitative methods at NABL accredited external labs. Did not share lab reports
**Objective 1:** Limit misuse of antibiotics, particularly CIAs and no use of highest priority CIAs

**Objective 2:** Antibiotic laden milk should not reach the consumer

**Objective 3:** Effective management of waste from dairy farms

- **Department of Animal Husbandry and Dairying**
  - Develop STG to reduce antibiotic misuse
  - Create awareness campaigns for farmers to not sell milk while animal is on treatment
  - Promote good farm management and hygiene to prevent mastitis
  - Strengthen veterinary extension system
  - Expand the vaccine coverage for diseases through its programmes

- **Food Safety and Standards Authority of India**
  - Set tolerance limits for antibiotics used commonly in dairy sector (e.g., amoxicillin, ceftriaxone, gentamicin); those with no limits should not be allowed for use
  - Help state FDAs strengthen routine antibiotic monitoring in milk and make data public
  - Increase frequency of testing milk as per STI and support dairy processors on its implementation
CSE Recommendations

• **Central Drugs Standard Control Organization**
  – Work with state drug officials to ensure that no antibiotic is sold without prescription

• **Central Pollution Control Board**
  – Work with state pollution control boards to ensure implementation of Guidelines for Environmental Management of Dairy Farms and Gaushalas (released July 2020)

• **Indian Council of Agricultural Research**
  – Develop low-cost diagnostics for early disease diagnosis and antibiotic residue monitoring
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Dairy co-operative structure and milk supply chain

Three-tier structure

- Dairy Federation (State Level; apex body)
- Milk Unions (District level)
- Dairy Co-operative Societies (DCS) (Village level)

Milk supply chain

1. Farm
2. Dairy Co-operative Society (via Tankers)
3. Chilling centre (via Tankers)
4. Processing Plant
5. Wholesaler
6. Retailer
7. Consumer

Note: Private dairies have their own supply chain; Milk from unorganized sector directly reaches customer
Perspectives on antibiotic use

Farmer from Haryana:
“If mastitis goes out of control, I give M Ceft. If the disease is acute, Intacef-tazo, Vetaceph-tazo are given”

Farmer from Karnataka:
“Mastitis happens in about 40% of cows in my farm. Either I or my staff administer gentamicin to treat them”

Farmer from Uttar Pradesh:
“Since it takes long to send a sick animal to hospital and I cannot wait to call anyone home, I have learnt treatment process myself. It is important to save the animal first”

Veterinary officer, NDRI:
“Farmers give injections without knowing which antibiotic should be given and in what dose. As a result, they end up underdosing or overdosing the animal”

Veterinary surgeon from AHD, Haryana:
“Veterinarians give antibiotics for mastitis based on their experience - it is a hit and trial. If not effective, antibiotic is changed”
Perspective on testing of milk

**Uttar Pradesh milk federation:**
“We have upgraded our major dairy laboratories. These laboratories have been provided with antibiotic testing kits. Testing is done route-wise for incoming milk. Once in six months we get our milk and milk products checked for nutritional values, pathogens, antibiotic residues and veterinary drug residues. Qualitative testing is used for antibiotics testing”

**Karnataka milk federation:**
“Milk is tested for antibiotics once in six months. Testing is done at NABL-accredited lab as per ISO standards”
(Note: Similar frequency was cited by federations/unions in Rajasthan, Punjab, Haryana)

**Madhya Pradesh milk union:**
“Testing of antibiotics in milk which gets pooled cannot be done with the lab infrastructure that we have. It requires high-end equipment from certified labs”

**Gujarat milk federation:**
“Milk from all tankers is tested for antibiotic residues on a daily basis though FSSAI recommends less frequent testing. A kit-based quantitative method is used to test about 700 samples each day at a rate Rs 1,000 per sample”
Farmers sell milk while animal is on treatment

They are mostly unaware about withdrawal period; few preferred to not sell milk for 1-3 days

Farmers cited that they cannot let go of their earnings for so many days (treatment + withdrawal period)

This milk was sold to state dairy cooperatives as well as directly to consumers

Farmer from Haryana:
“Animal is milked even when sick although the milk quantity may reduce. I sell this milk to customers”

Another farmer from Haryana:
“Milk from uninfected teats can always be used. In case of other infections, where milk quality is not compromised, I sell milk to customers irrespective of ongoing antibiotic treatment”

Farmer from Uttar Pradesh:
“Farmers cannot afford to not earn for as many days as the animal is sick”

High possibility that antibiotic residues and resistant bacteria may appear in milk
Reasons cited for indiscriminate use by stakeholders

- **OTC availability of antibiotics**
  - Antibiotics can be easily procured without prescription

- **Qualified veterinary support lacking**
  - Government doctors not always available when needed
  - Little knowledge or training of compounders/junior doctors
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  - Private doctors available at high fees

- **Outreach of vaccination programme inadequate**
  - No vaccines for mastitis
  - Farmers sometimes unwilling or do not rely on govt. vaccines

Farmer from Haryana:
“Medicines are easily available and there is no hassle of having a doctor’s prescription every time”

Farmer from Karnataka:
“Government doctors are mostly not available. There are compounders who come with little knowledge. Therefore, I discuss problems and their solutions with my friends on WhatsApp”

Farmer from Uttar Pradesh:
“I rely more on privately procured vaccine than govt. ones as I am not sure of their cold chain. Each vaccine dose is about 30 Rs which is affordable also”
FSSAI NMQS 2018 results confirms the problem of residues, but does not reflect the actual scale of it

- Residue found in both raw and processed milk samples
  - 37 raw samples from 10 states; 40 processed samples from 13-14 states
  - 20/37 raw samples are from Madhya Pradesh reflecting problem is not as widespread in case of processed samples

- Presence of antibiotic residue in processed samples indicate it can be present even after pooling or processing

- Limited number of antibiotics tested; many antibiotics used in practice not tested

- Antibiotics with residue levels > permissible limits counted; there could be many samples with levels < permissible limits. Tests were however qualitative (?)

- Since names of brands and residue levels were not disclosed, it is unclear whether problem was with few or most brands
Gaps in policy/programmes/implementation

• Department of Animal Husbandry and Dairying
  – No standard treatment guideline (STG) for antibiotic use in animals
  – Existing schemes/programmes/guidance do not focus on controlling antibiotic use
  – Complete vaccination coverage and outreach is an issue

• Food Safety and Standards Authority of India
  – Tolerance limits for antibiotics does not include some commonly used ones
  – State FDA focus not on antibiotic residues
  – Scheme of Testing and Inspection (STI) for dairy processing plants recommends antibiotics residue testing at two inspection points; frequency of quarterly testing is too less
    • Oct’ 19 notification: weekly testing
    • Jan’ 20 notification: quarterly testing (low frequency)

• Central Drugs Standard Control Organization
  – Despite Schedule H, antibiotics are still available without prescription