PACA | Partnership for Aflatoxin Control in Africa | Partenariat pour lutter contre l'aflatoxine en Afrique | Parceria para o Controle da Aflatoxina em África | الشراكة من أجل مكافحة الافلاتوكسين في أفريقيا

# Aflatoxins: Impact on Livestock and Livestock Trade

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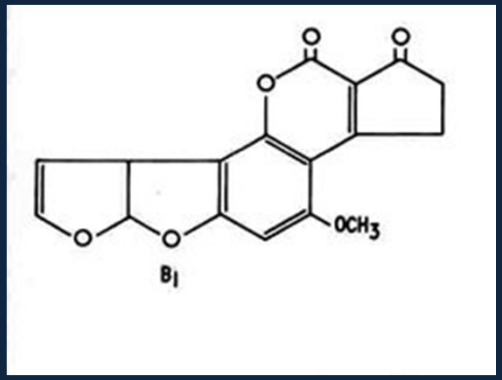
# What are aflatoxins?

- Fungal metabolites (naturally occurring)
- Produced by strains of *Aspergillus flavus* and *A. parasiticus*
- Toxic to humans and animals
- Highly stable compounds, withstand normal food/feed processing procedures

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# Aflatoxin contamination

- Occurs preharvest, harvest, storage
- Maize, groundnut, cottonseed and byproducts are highly susceptible but occurs in wide ranging food and feed
- Grass, silage and hay do not contain appreciable levels
- Influenced by drought stress and high temperature, insect damage, and improper harvesting, drying and storage

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# The Aflatoxin Challenge in Africa

1. **Agriculture and Food security:** aflatoxin affects several African staple crops, contaminated food is likely to be consumed by smallholder farmers and their families

www.ipm.iastate.edu

25% of the world food supply is contaminated with aflatoxins (FAO, 2000)

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# The Aflatoxin Challenge in Africa

2. **Health:** aflatoxin is linked to cancer, immune-system suppression, growth retardation, liver disease, and death in both humans and domestic animals.

4.5 billion people chronically exposed (WHO, 2004)

3. **Trade:** aflatoxin undermines efforts to streamline SPS issues continent-wide

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64% reduction in food quality in Africa (WHO, 2001)

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# Factors in the Aflatoxin Challenge in Africa:

- Conducive climatic conditions
- Traditional crop production practices
- Inadequate harvesting, drying and storage practices
- Policy and institutional capacity
- Lack of awareness

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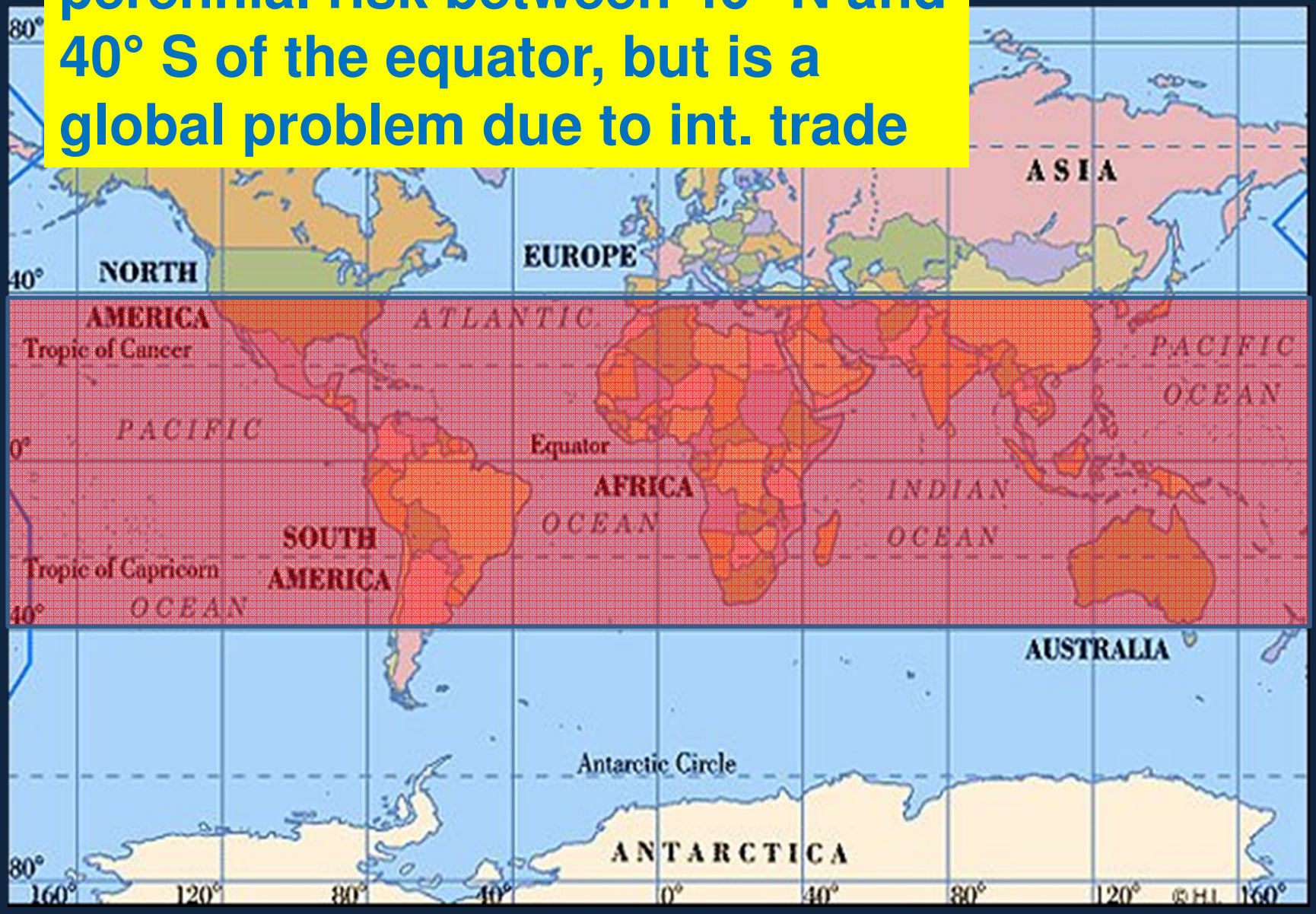
**Aflatoxin contamination is a perennial risk between 40° N and 40° S of the equator, but is a global problem due to int. trade**



# Effects of aflatoxins on animals

- Exposure to moderate to high levels of aflatoxins in feed leads to mortality and morbidity (Acute toxicity) – the major organ affected is the liver
- No animal is immune to the acute effects of aflatoxins

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# Effects of aflatoxins on animals

- Low dietary concentrations lead to (chronic effects):
  - Decreased milk and egg production
  - Poor weight gain
  - Recurrent infection due to immunity suppression
  - Reduced fertility, abortion, and lowered birth weights

# Effect of aflatoxins on livestock sector

- Productivity of the livestock industry is seriously affected by aflatoxins
- E.g. Production losses to the U.S. poultry and swine industries exceed $100 million per year
- Aflatoxin regulations restrict flow of animal feed
- Export of dairy, meat and fish products is increasingly subject to aflatoxin testing

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# Levels of AFT occurrence in feed in Africa

| Commodity | Country | Incidence | Range (µg/kg) |
|---|---|---|---|
| Animal feeds | Kenya | 703/830 | 0.9-595 |
| Animal feeds | Sudan | 36/56 | 4.1-579.9 |
| Animal feeds | South Africa | 99/108 | 3.2-950 |
| Cottonseed meal | South Africa | 60/60 | 13.4-75.7 |
| Poultry feed | Morocco | 14/21 | 0.05-5.38 |
| Poultry/livestock feeds | Nigeria | 1/2 | 0.0-67.9 |

Source: Adapted from Anthony et al. (2012)

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# Levels of AFT occurrence in high aflatoxin-risk crops in Africa

| Commodity | Country | Type of Aflatoxin | Incidence | Range (µg/kg) |
|---|---|---|---|---|
| Groundnut | DR Congo | AFB1 | 43/60 | 1.5-937 |
| | Kenya | AF | 170/769 | 0-7525 |
| Maize | Nigeria | AFB1 | 55/55 | 0-1874 |
| | Uganda | AF | 22/49 | 1.00-1000 |
| Cottonseed | Nigeria | AFB1 | 3/8 | 0.0-271 |

# Occurrence of aflatoxins in livestock products in Africa

| Commodity | Country | Type of Aflatoxin | Incidence | Range (µg/kg) |
|---|---|---|---|---|
| Cheese | Libya | AFM1 | 15/20 | 0.11-0.52 |
| Cow Milk | Sudan | AFM1 | 42/44 | 0.22 – 6.90 |
| | Kenya | AFM1 | 474/613 | 0.005-0.78 |
| | Cameroon | AFM1 | 10/63 | 0.006-0.527 |
| | South Africa | AFM1 | 98/114 | Max: 2.07 |
| | South Africa | AFM1 | 85/85 | Max: 2.48 |
| Egg | Cameroon | AF | 28/62 | 0.002-7.68 |
| Smoke dried fish | Nigeria | AFB1 | 11-Nov | 1.505-8.11 |

Source: Adapted from Anthony et al. (2012)

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# Aflatoxins and Trade: Regulations in the world

Adapted from Dohlman (2003)

| Category | Aflatoxin level (ppb) | | Nr of countries |
|---|---|---|---|
| | Median | Range | |
| B1 in foodstuffs | 4 | 0-30 | 33 |
| B1+B2+G1+G2 in foodstuffs | 8 | 0-50 | 48 |
| B1 in foodstuffs for children | 0.3 | 0-5 | 5 |
| M1 in milk | 0.05 | 0-1 | 17 |
| B1 in feedstuffs | 20 | 5-1,000 | 19 |
| B1+B2+G1+G2 in feedstuffs | 50 | 0-1,000 | 21 |

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# Aflatoxin regulations and impact on trade

- Codex standards are advisory
- National standards vary widely depending largely on the level of economic development and the susceptibility of a nation's crops to contamination (stringent based on the "precautionary" principle)
- Regulations have significant economic consequences (lost trade, enforcement costs) mainly to developing countries

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# Framework in aflatoxin control

- Aflatoxin contamination is a complex problem:
  - Hard to solve by a single actor/discipline
  - Requires multi-stakeholder actions
  - Need to focus on the cause rather than the symptoms
  - No single answer (bag of tricks)
- Integrated and coordinated actions needed

# Abatement of aflatoxin problem: Prevention

- Resistant varieties
- Native beneficials (non-toxin producer strains)
- Improved agronomic practices
- Postharvest: drying to safe moisture levels (in starchy cereals <15% SMC), clean, dry storage

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# Abatement of aflatoxin problem: Decontamination

- Removal: cleaning, physical sorting (e.g. sifting broken kernels), chemical binders
- Detoxification: Ammoniation

# Abatement of aflatoxin problem: Regulation

- Setting of regulatory limits (legislation)
- Enforcement:
  - Monitoring to ensure compliance with limits
  - Taking appropriate enforcement action
- Providing guidance

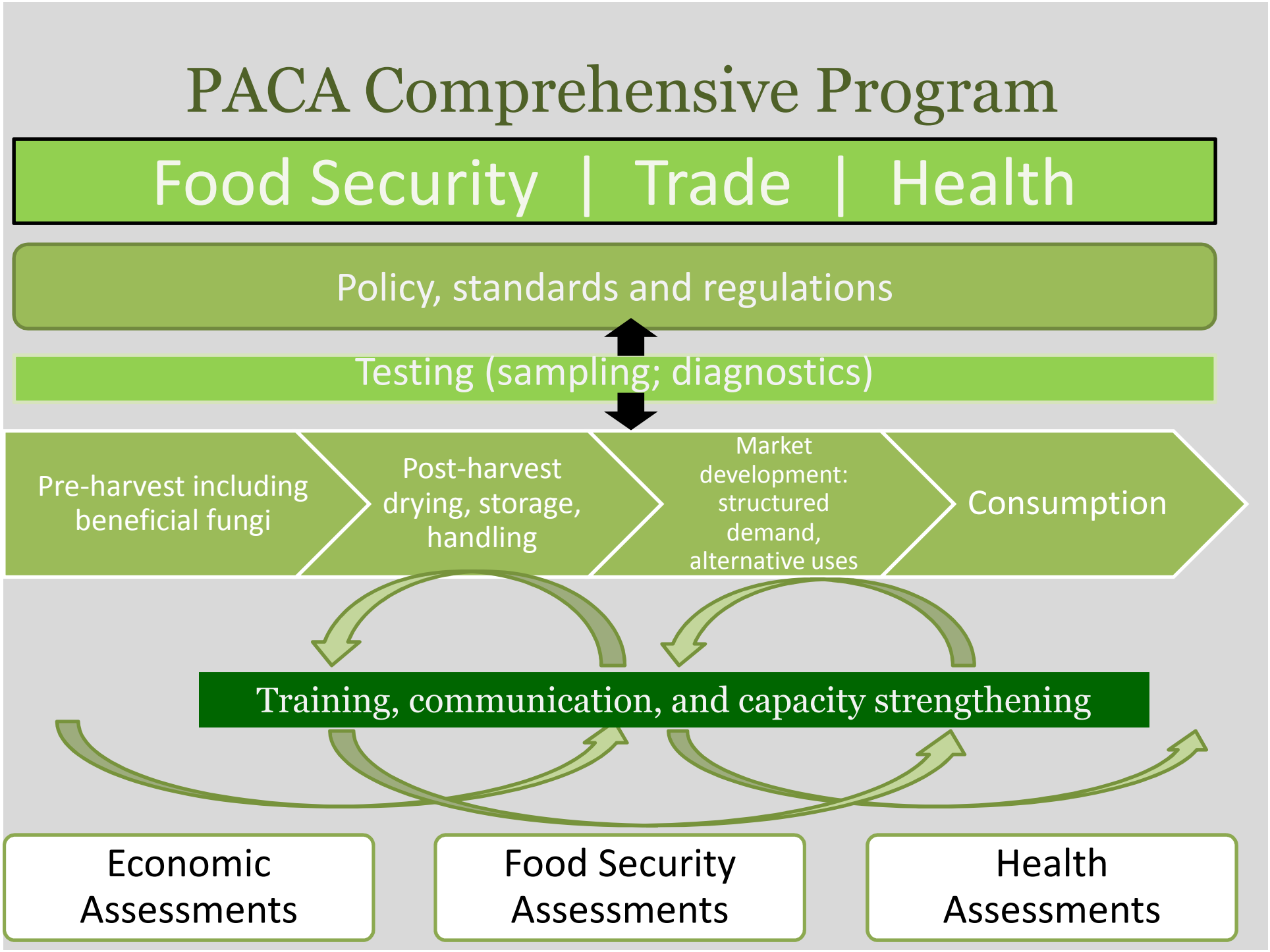
# Summary of GAPs and GMPs for aflatoxin control (Codex, 2002)

| Stage | Commodity | Hazard | Control measure |
|---|---|---|---|
| Preharvest | Cereal grains, oil seeds, nuts | Mold infestation with subsequent aflatoxin formation | - Use resistant crop varieties<br>- Use native beneficials<br>- Insect control<br>- Adequate irrigation<br>- Proper agronomic practices |
| Harvesting | Cereal grains, oil seeds, nuts | Increase in aflatoxin formation | - Harvest at appropriate time<br>- Rapidly dry to safe moisture level |
| Postharvest storage | Cereal grains, oil seeds, nuts | Increase and/or occurrence of mycotoxin | -Protect stored product from moisture, insects |
| | | | -Store product on dry, clean surface. |
| Postharvest, processing and manufacturing | Cereal grains, oil seeds, nuts | Aflatoxin carryover or contamination | -Test all ingredients added<br>-monitor processing/manufacturing<br>-Follow good manufacturing practices |
| Animal feeding | Dairy, meat and poultry products | Transfer of mycotoxin to livestock products | - Use good quality feed ingredients<br>-Test products for aflatoxin |

# What is PACA?

- PACA is an innovative consortium aiming at coordinating aflatoxin mitigation and management across health, agriculture and trade sectors in Africa.
- PACA aims to adapt proven solutions, and identify new ones, that will work for African situation.

# PACA Comprehensive Program



# Genesis of PACA

- BMGF recognized need for aflatoxin control beginning in 2010 with WFP
- Opportunity to integrate action across Agriculture, Trade and Health
- Create Africa-based, Africa-led approach to aflatoxin control
- Bring to scale aflatoxin control technologies while building system of coordination

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# PACA Timeline

| Date and Location | Event |
|---|---|
| 23 March 2011, Yaoundé, Cameroon | CAADP PP, asked AUC to explore establishment of PACA |
| 3-4 October 2011, Nairobi, Kenya | PACA organizational planning meeting under the auspices of AUC |
| 1-2 March 2012, Maputo | PACA Interim Steering Committee Meeting |
| 25-27 June 2012, Ibadan, Nigeria | PACA Interim Steering Committee Meeting |
| 30 October – 1 November 2o12, Addis Ababa, Ethiopia | PACA Launch and Steering Committee Inauguration |
| 10-12 April 2013, Dar Es Salam | PACA Strategy Development Stakeholders' Consultation Workshop |
| June 2013 | Review of PACA Strategy document by Secretariat and strategy participants |

# PACA Strategic Thematic Areas

1. Research and technology for control of aflatoxins
2. Legislation, policies, and standards in the management of aflatoxins
3. Growing commerce and trade while protecting lives from aflatoxins
4. Enhancing capacity for effective aflatoxin prevention and control
5. Public awareness, advocacy and communication

# Conclusion

- Aflatoxin is an unavoidable as natural toxicant but options are available to manage it successfully
- Aflatoxin is a complex problem that can be addressed through integrated measures and coordinated actions
- The competitiveness of the African livestock industry is at stake unless the aflatoxin problem is addressed proactively

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