



四川省疾病预防控制中心  
SICHUAN CENTER FOR DISEASE CONTROL AND PREVENTION

# **Elimination of Schistosomiasis in Sichuan Mountainous Regions & Emerging Challenges**

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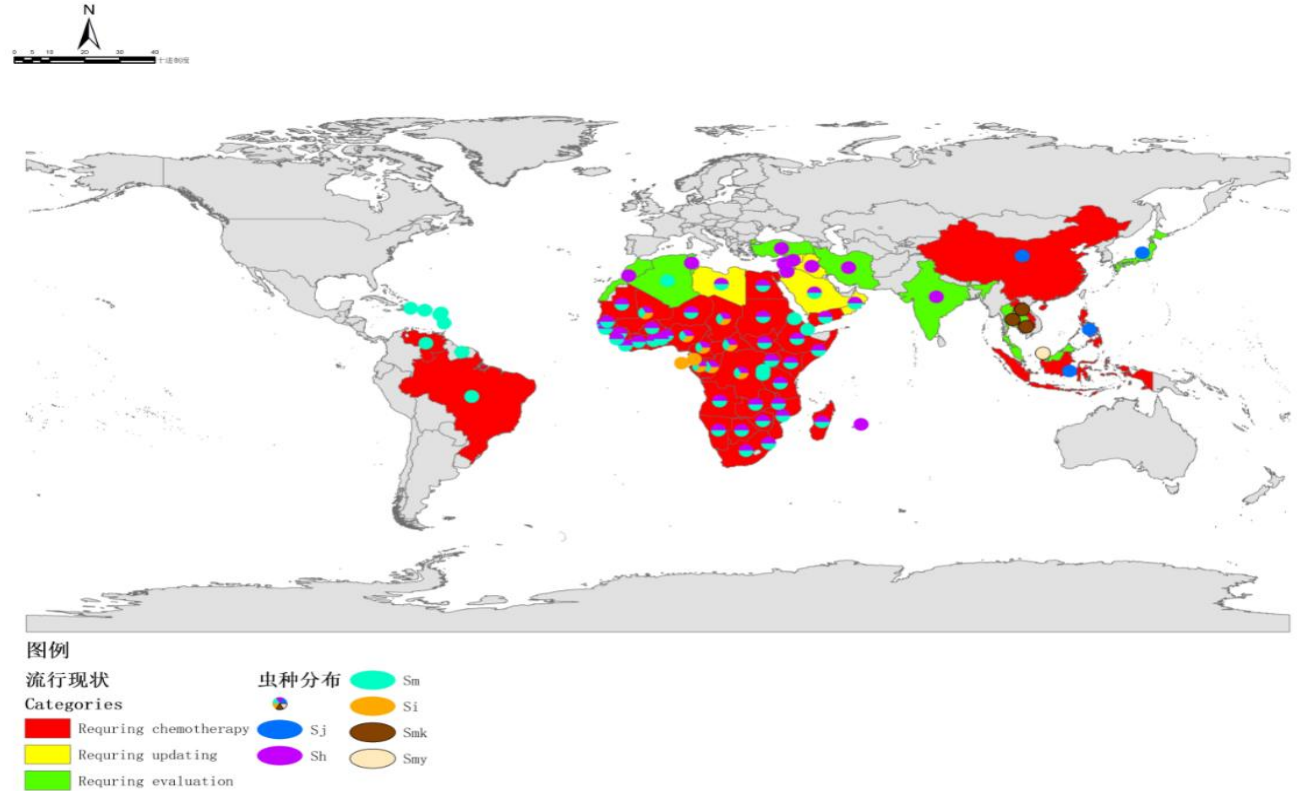
**Shanghai, 18<sup>th</sup> June, 2024**

# Outline

- **Background**
- **History of Schistosomiasis Control in Sichuan Province**
- **Strategies from a One Health Perspective**
- **Challenges**

# Background

- Estimates show that at least 251.4 million people required preventive treatment in 2021.
- Schistosomiasis transmission has been reported from 78 countries.
- Chemotherapy for schistosomiasis, where people and communities are targeted for large-scale treatment, is only required in 51 endemic countries with moderate-to-high transmission.



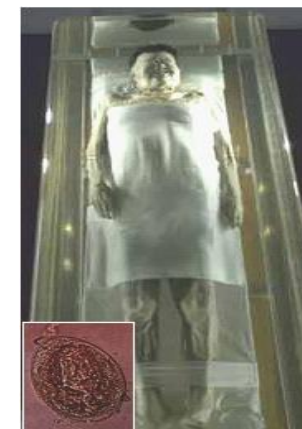
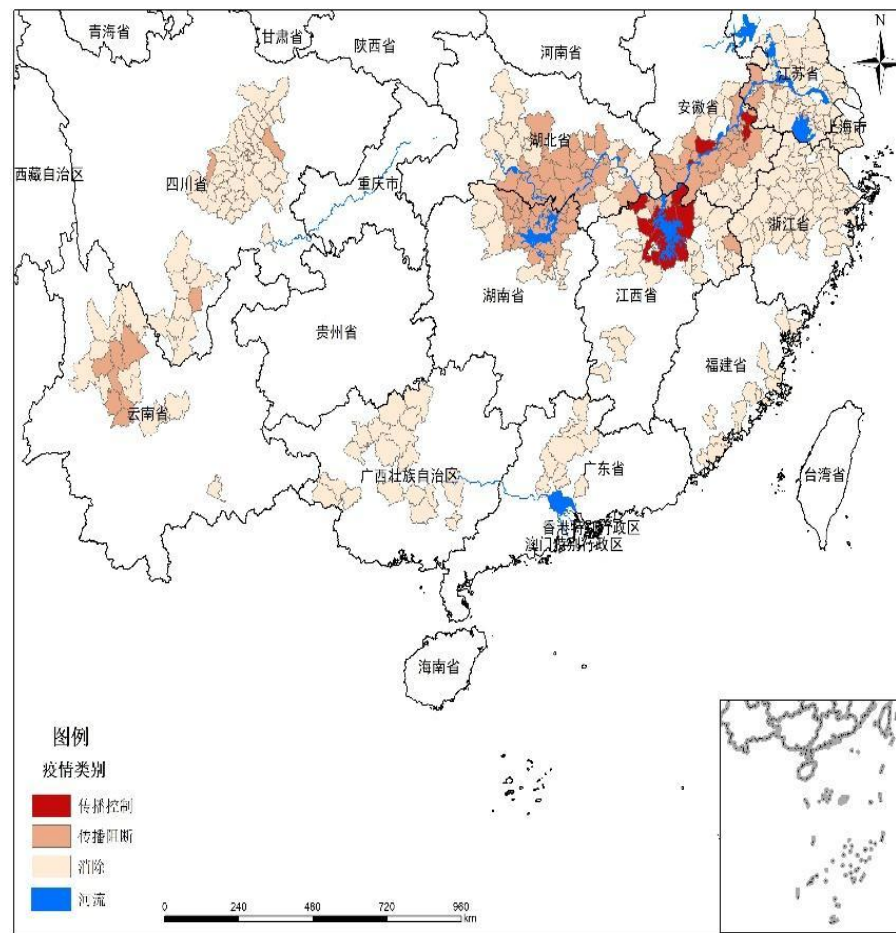
Vision	A world free of schistosomiasis
Goals	<p>To control morbidity due to schistosomiasis by 2020</p> <p>To eliminate schistosomiasis as a public-health problem by 2025</p> <p>To interrupt transmission of schistosomiasis in the Region of the Americas, the Eastern Mediterranean Region, the European Region, the South-East Asia Region and the Western Pacific Region, and in selected countries of the African Region by 2025</p>
Objectives	<p>To scale up control and elimination activities in all endemic countries;</p> <p>To ensure an adequate supply of praziquantel and resources to meet the demand</p>



# Background

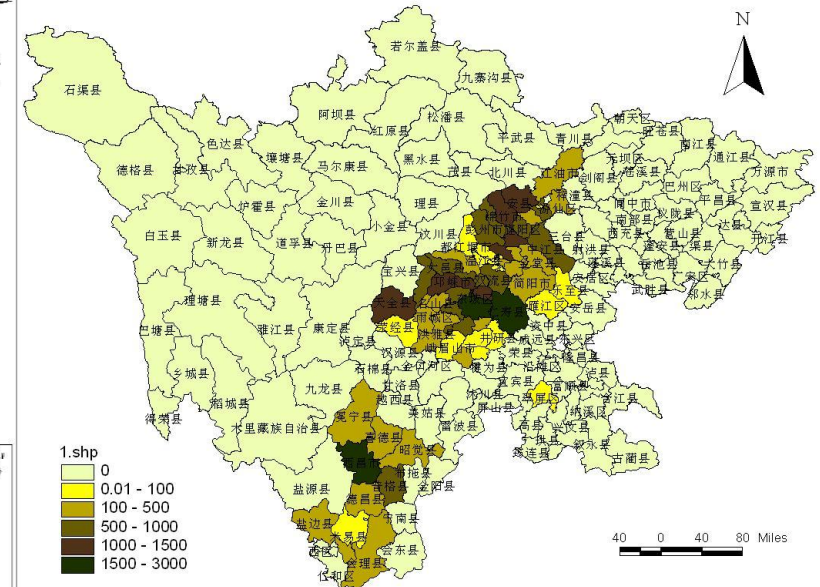
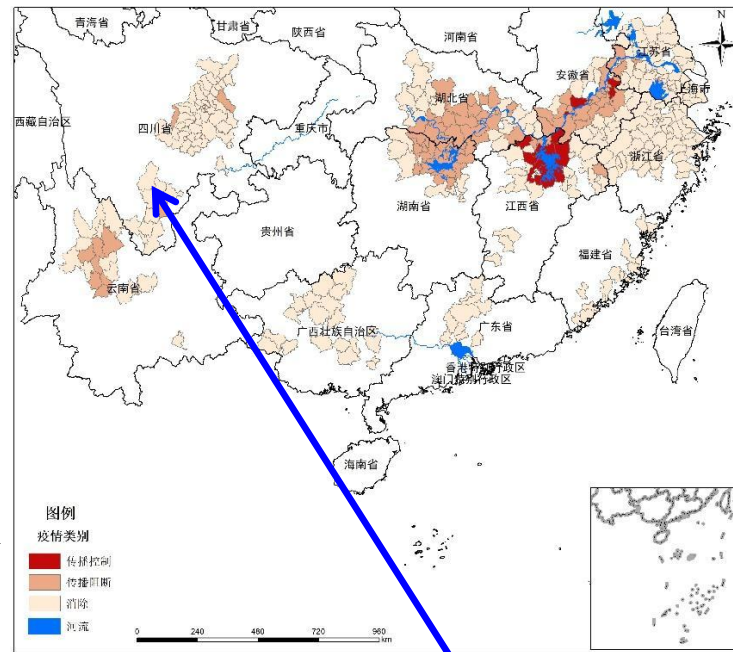
**表1 2023年全国血吸虫病流行概况**  
**Table 1 Endemic status of schistosomiasis in China in 2023**

省(直辖市、自治区) Province (municipality, autonomous region)	流行县 (市、区)数 No. endemic counties (cities, districts)		达到消除标准 Elimination		达到传播阻断标准 Transmission interruption		新达标县(市、区)数 No. counties (cities, districts) achieving the criteria of elimination or transmission interruption in 2023		
	流行 乡(镇)数 No. endemic townships	县(市、区)数 No. counties (cities, districts)	乡(镇)数 No. townships	县(市、区)数 No. counties (cities, districts)	乡(镇)数 No. townships	达到 消除标准 Elimination	达到传播 阻断标准 Transmission interruption	新达标县(市、区)数 No. counties (cities, districts) achieving the criteria of elimination or transmission interruption in 2023	
								达到 消除标准 Elimination	达到传播 阻断标准 Transmission interruption
上海 Shanghai	8	79	8	79	0	0	0	0	
江苏 Jiangsu	65	471	60	440	5	31	2	0	
浙江 Zhejiang	54	466	54	466	0	0	0	0	
安徽 Anhui	50	353	24	180	26	173	2	0	
福建 Fujian	16	74	16	74	0	0	0	0	
江西 Jiangxi	39	296	24	165	15	131	0	3	
湖北 Hubei	63	520	36	333	27	187	0	0	
湖南 Hunan	41	281	23	164	18	117	6	0	
广东 Guangdong	14	35	14	35	0	0	0	0	
广西 Guangxi	20	69	20	69	0	0	0	0	
四川 Sichuan	63	477	63	477	0	0	1	0	
云南 Yunnan	18	76	12	43	6	33	1	0	
合计 Total	451	3 197	354	2 525	97	672	12	3	



# History of Schistosomiasis Control in Sichuan Province

- Schistosomiasis in Sichuan province is distributed in 11 cities (prefectures) and 63 counties (cities and districts)
- A total of 1.27 million historical patients, more than 30,000 advanced schistosomiasis patients, and more than 200,000 sick cattle were documented. The area of snail habitats is 294 million square meters.
- In 2023, 63 counties have met the elimination standards.



Sichuan

# History of Schistosomiasis Control in Sichuan Province



**Since 2018**

Comprehensive measures for infection source control  
+Comprehensive surveillance

**2004-2017**

Comprehensive measures for infection source control  
2008-Transmission Control  
2017-Transmission Interruption

**1985-2003**

Human and animal chemotherapy

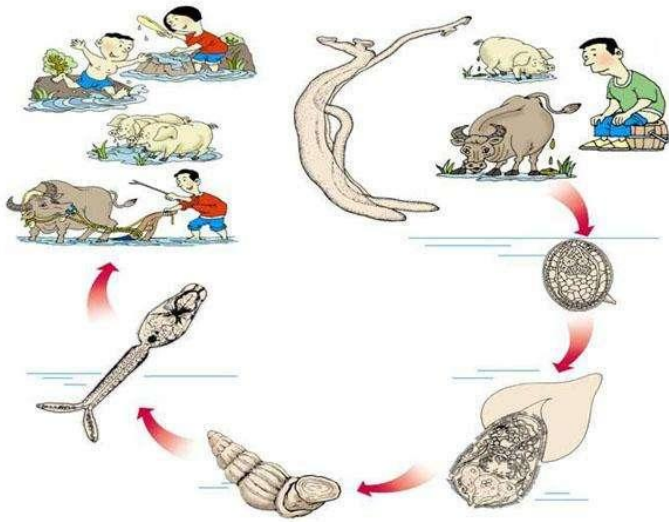
**1957-1984**

Eradication of snails

**1949-1956**

Investigation





## 生物因素

终末宿主种类众多

中间宿主分布广泛

生活史复杂

## 自然因素

洪涝灾害

气温

降雨量

海拔

植被

## 社会因素

生产生活方式

人口流动

卫生条件改善

苗木移栽

干预措施

- Biological Factors:
  - Host Diversity , Intermediate Host Distribution , Complex Life Cycle.
- Natural Factors:
  - Flood, Temperature, Precipitation, Altitude, Vegetation.
- Social Factors:
  - Production and Lifestyle, Population Mobility, Improvement of Sanitation, Transplantation, Intervention Measures.



# Study on Prevention and Control Strategy

- Different **Epidemic Characteristic** Areas Implement Different Prevention and Control Strategies:

- The flatland subtype
- The hill subtype
- The high mountain subtype

- Different **Epidemic Severity** Areas Implement Different Prevention and Control Strategies:

- Severe Epidemic Area
- Moderate Epidemic Area
- Mild Epidemic Area

- Different **Socio-Economic and Cultural** Areas Implement Different Preventive Measures

- Implementing region-specific integrated management strategies that consider the unique socio-economic and cultural aspects of the area.

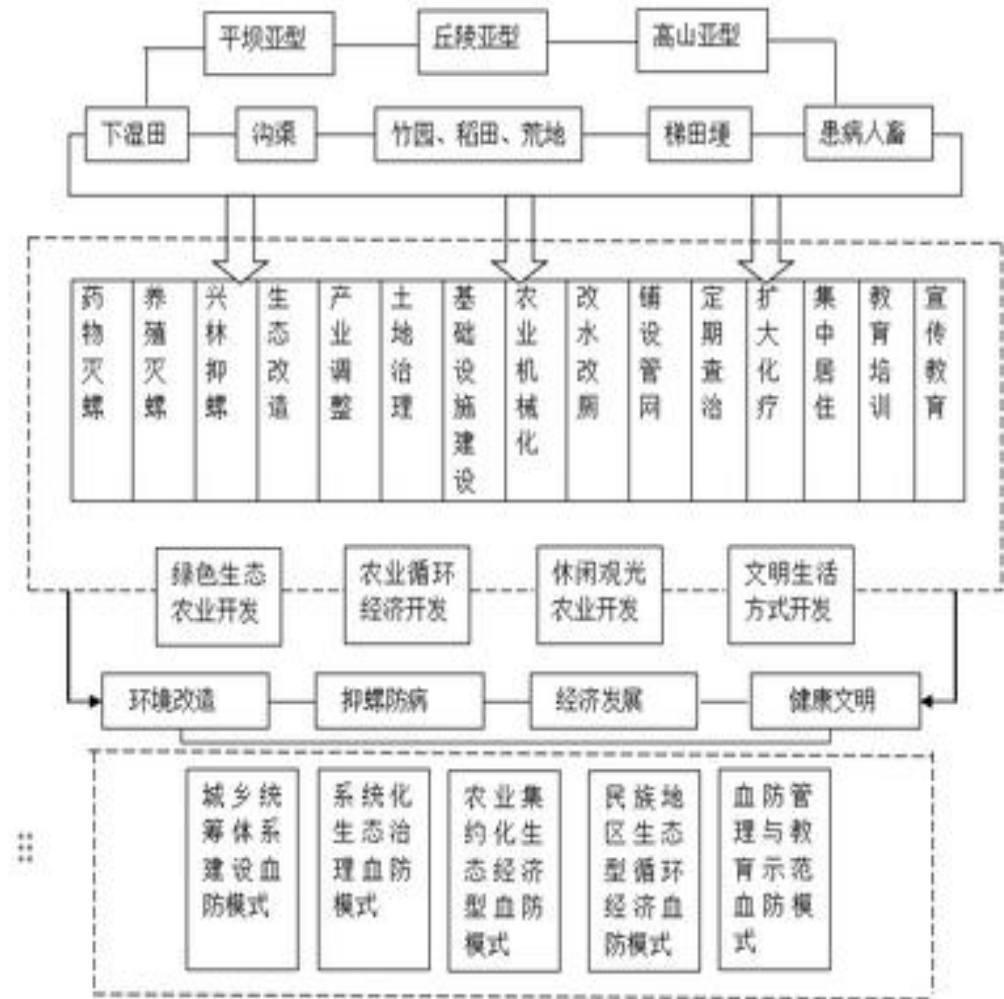


图1 山丘型血吸虫病综合防治示范区建设

Fig.1 Integrated control model of schistosomiasis in mountainous and hilly region

# Study on Snail Control Measures



## **The flatland subtype**

Represented by the Sichuan Basin, the snails are primarily distributed in agricultural and minor irrigation canals, similar to the water network areas.



## **The hill subtype**

The epidemic area exhibits a punctate distribution, with snails located behind the terraced fields and along the mountainous channels.

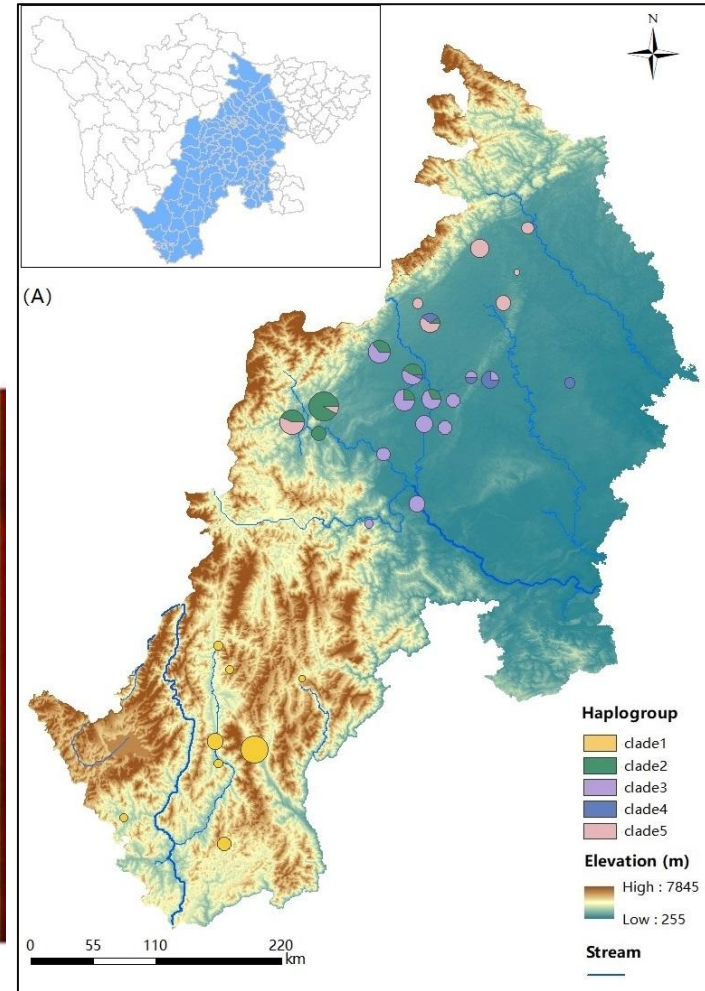
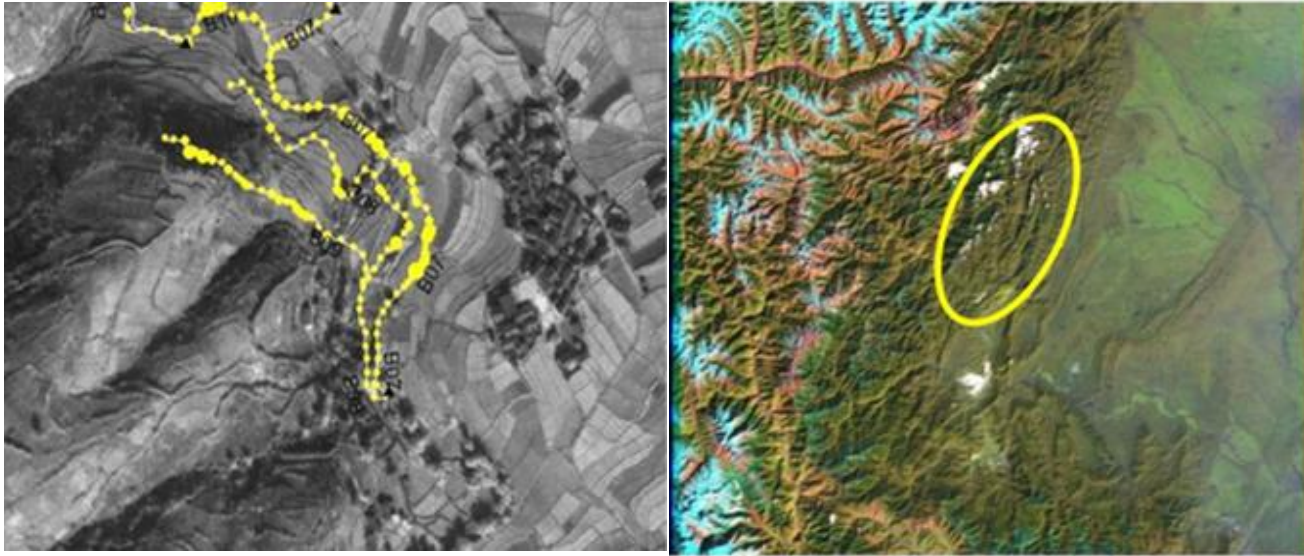


## **The high mountain subtype**

Snails found in the mountain-ringed water systems and intermountain plains, where the number of animal schistosomiasis cases and the infection rate are relatively high.

# Study on Snail Control Measures

By employing remote sensing and on-site measurement methods, the distribution patterns of the snail hosts have been identified, and the factors contributing to the prevalence and transmission of schistosomiasis have been summarized.



An environmental-genetic interaction approach has been developed to explore the issue of snail traceability.

# Study on Snail Control Measures



Biological Snail Control



Soilheaping mixed with Niclosamide



Chemical Spraying



Soil pasting mixed with Niclosamide



Black Plastic Film Mulching



Integrating Rural Economic Development with Environmental Transformation for Snail Control



# Study on Monitoring and Early Warning System

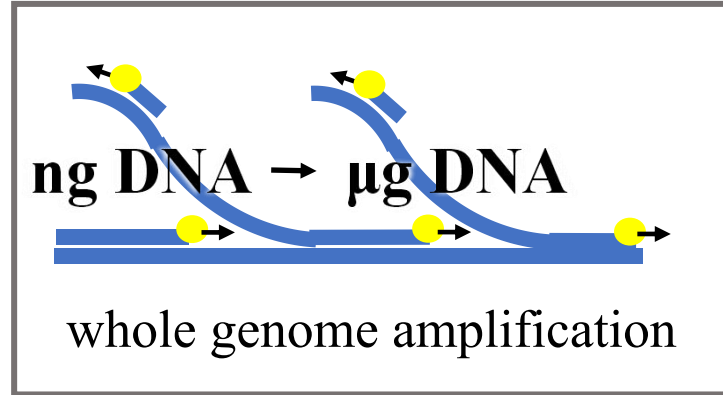
- Establish and improve the provincial schistosomiasis control system.
- Establish and perfect a monitoring and early warning mechanism.
- Strengthen the technical level and capacity building for schistosomiasis prevention in the entire province
- Establish a mechanism for comprehensive factor monitoring and data integration utilization.

# Study on Monitoring and Early Warning System

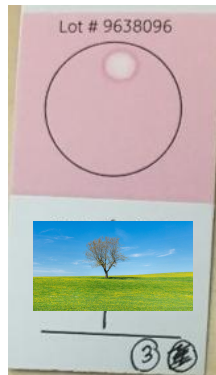
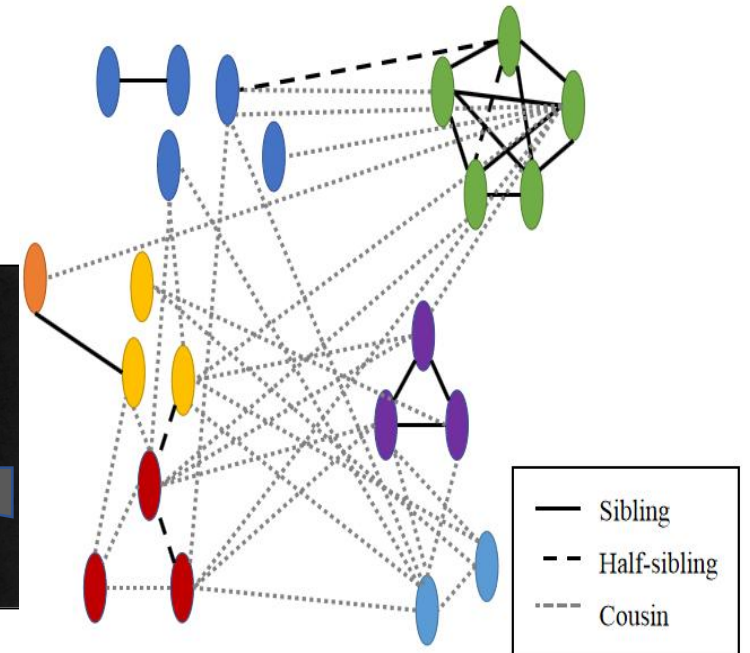


Hatch

Miracidia storage and amplification



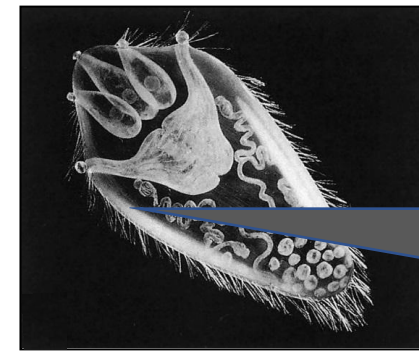
Association with 22 cercaria from 7 infected persons in 1 natural village



Long-term stable storage



DNA



~1-2 ng of DNA

# Challenges

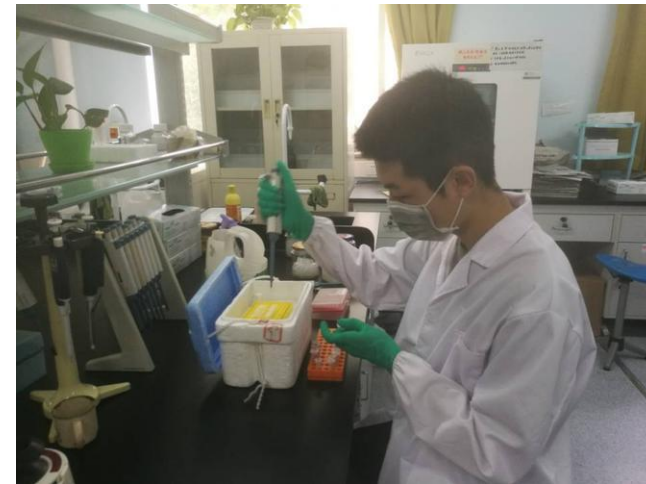
- The mountainous and hilly areas are still the focus and difficulty of current prevention
- Controlling the transmission sources of schistosomiasis in livestock is indeed challenging



# Challenges

- **Infection source control**

- **Technique:** The sensitivity and specificity of serological tests are poor. When the infection rate and infection degree are low, the fecal tests can easily lead to missed detections.
- **Scope:** limited (human, bovine, sheep and other domestic animals, wild animals)
- **Capability:** In the case of low infection, we have higher requirements for the ability of technicians





# Challenges

- **Snail control**
- Snail environment is complicated
- Natural disasters accelerate the spread of snails in disaster areas
- The contradiction between snail control via mollusciciding and environmental protection



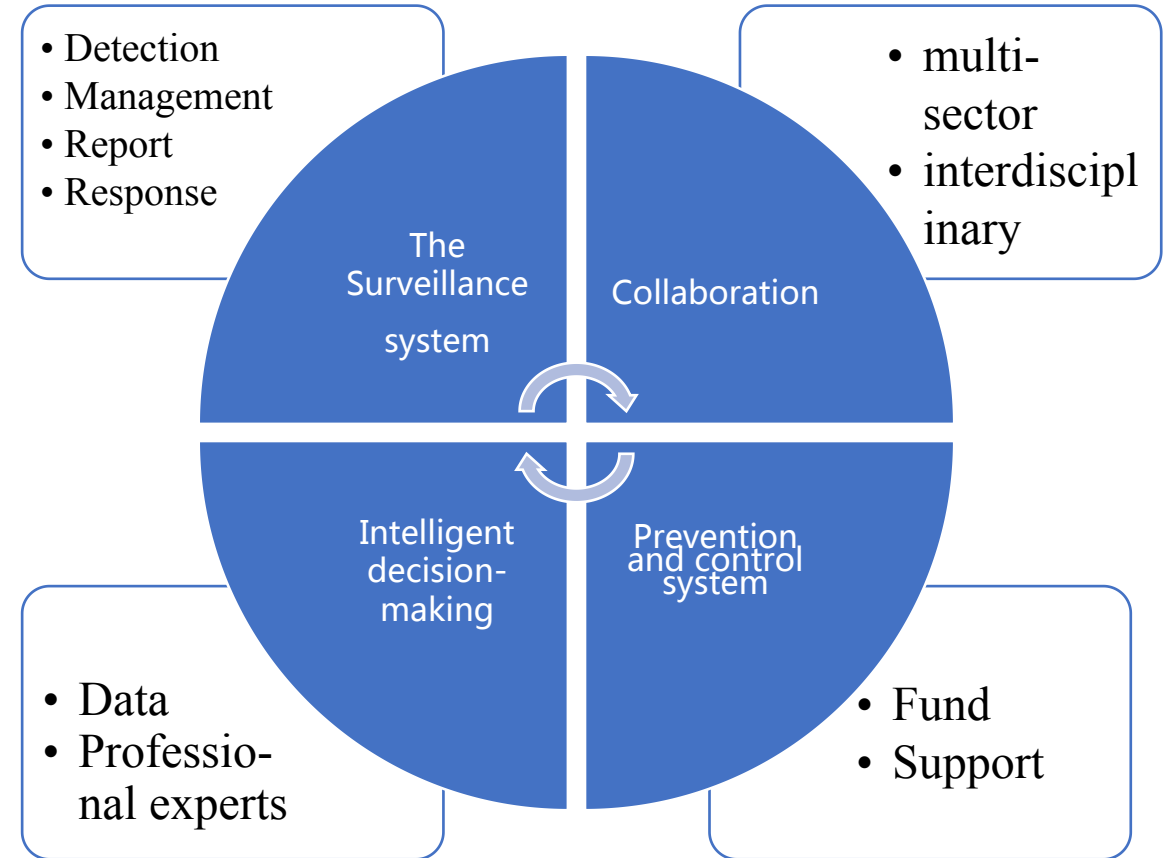
# Challenges

- **Administration and management**
- Population flow
- Coordination and communication
- Budgets
- Merging agencies



# Prospect

- Sensitive and effective monitoring is the basis of scientific and precise control.
- Formulating and adjusting strategies is the basis for scientific and accurate prevention and control .
- A One Health intervention should be adapted to the endemic area characteristics



Thanks for  
your attentions!