Early Rome: Surprises Below the Surface

The history of early Rome and its inhabitants may need drastic revisions as a result of ongoing archaeological work by American and Italian investigators. Their findings, described at the First Joint Archaeological Congress in Baltimore last week, indicate Roman citizens began to develop an urban civilization in the 7th century B.C., well before contacts with other advanced cultures such as the Etruscans and Greeks and much earlier than many scholars have assumed.

Over the past three years, study of the soil at the Roman Forum – a large public marketplace in the center of the ancient city that is lined by monumental architecture – indicates that an area of about 20,000 cubic meters was filled in with earth as part of a "major public works project," says Albert J. Ammerman of Colgate University in Hamilton, N.Y.

"There was a planned transformation of what was a piece of waste real estate into the heart of the city," he says. "This suggests there was a more advanced political and social order in early Rome than is usually thought."

Many researchers who have studied the writings of Classical Roman historians hold that the area around the Forum did not experience urban development until around 575 B.C., and that even then, change came gradually. Before that, in their view, the Forum was a swampy area first used as a burial ground and later attracting scattered huts.

Archaeological evidence is not abundant for the period between 800 B.C. and 500 B.C., when Rome grew into a major city with great temples and other public structures.

Ammerman and his co-workers have dug into ancient layers of earth in and around the Forum and taken out cores of sediment from several sites. Strata from the 7th century B.C. contain a large amount of peat and indeed suggest the site was swampy at the time. Three sources of water bogged down the area, Ammerman notes: spring water percolating through the soil, runoff from nearby hills after rains and periodic flooding from the Tiber River just to the west.

But it is unlikely huts stood on the early Forum, he maintains. Rather, it appears massive amounts of earth were moved to fill in the center of the Forum's boggy basin, probably during summer months when the ground dried out. Once that project was completed, construction of public buildings began.

Near the Forum, Italian investigators led by Andrea Carandini of the University of Pisa are excavating on the slope of the Palatine, the principal of the seven hills of ancient Rome. The dig is near where the Palatine levels off and meets the Via Sacra, the "sacred road" that passes through the Forum and up to the Coliseum. In 1987, the scientists found a large ditch or hole that had been filled in during the 6th century B.C. The remains of several structures lie around and on top of it.

Ammerman used a drill to examine sediment below the ground at this site and concluded that a large, naturally formed gully had once run alongside much of the Via Sacra.

Further digging by Carandini's group last year yielded part of a wall running parallel to the gully and dating to about the 7th century B.C. It appears the gully was altered to form a steep ditch.

A wall built beside a ditch was a common defense for settlements at the time, Ammerman says. A well-organized, communal effort apparently went into the construction of the Palatine wall.

Carandini says the find supports legends that Romulus founded Rome in 753 B.C. and built a wall at the site. Legend also holds that the infant Romulus and his twin brother, Remus, were nursed by a wolf near the site. The interpretation that the wall is a founding structure of Rome is controversial.

Nevertheless, Ammerman says, "environmental studies are opening a new chapter in our knowledge of early Rome."

– B. Bower

Maternal immunity via molecular ferry

Of the many gifts for which newborns owe their mothers thanks, "passive acquired immunity" is perhaps one of the less heralded. But with a mammalian infant's immune system still under construction until weeks or months after birth, it's up to mom to provide the antibodies that will protect her young from the first onslaught of disease-causing microbes outside the womb.

Human infants get some maternal antibodies from mother's milk, but these appear to work locally in the intestines rather than being absorbed into the blood. In a process that scientists know little about, the main transference of "loaner" antibodies in humans takes place before birth through the placenta – the complex filtering organ between mother and child.

Previous work has suggested that maternal antibodies, or immunoglobulins, do not simply diffuse but are actively transported across this membrane. As a first step toward understanding what that transport mechanism may be, researchers have concentrated on a similar but simpler system in rats and mice, which in the first few weeks after birth absorb antibodies from mother's milk through their intestinal linings. This week scientists reported the first detailed characterization of a protein that serves as a cross-membrane ferry for immunoglobulins, and a simple mechanism for how it works.

Neil E. Simister and Keith E. Mostov of the Whitehead Institute for Biomedical Research in Cambridge, Mass., focused their studies on a protein called FcRn. They knew that the protein – a receptor associated with rat intestinal walls – binds specifically to IgG, the immunoglobulin that mother rats provide in their milk. After cloning the FcRn gene, they analyzed the protein's sequence of amino acids.

They report in the Jan. 12 NATURE that FcRn is a close structural relative of a family of proteins called the major histocompatibility complex (MHC). But whereas classical MHC molecules are critical for the initiation of certain immune responses, FcRn serves as an IgG transport molecule.

Simister and Mostov found that in the acidic environment of the intestines, FcRn binds IgG and carries it across the intestinal wall to the bloodstream. Under the slightly basic conditions there, FcRn undergoes a structural change that results in the release of its IgG cargo. The protein then goes back inside the intestines for another load.

"What we'd like to find is a human equivalent of this receptor," says Simister. "And because transmission in humans primarily takes place across the placenta before the child is born, we are beginning to look for an equivalent molecule in [human] placenta."

There's not a well-defined syndrome in humans caused by a failure to transmit maternal IgG, Simister says, "although that may be just because we haven't had a precise way of studying it." Some infants, particularly premature infants, have a high susceptibility to disease – possibly because of IgG shortages, he says. While clinical applications are still far off, he adds, "a better understanding of the process of IgG transmission might help us understand how some of those cases occur and how they can be treated."

– R. Weiss