Open Access Traditional management of ear, nose and throat (ENT) diseases in **Central Kenya** Grace N Njoroge*1 and Rainer W Bussmann²

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Abstract

Diseases of ear, nose and throat (ENT) often have serious consequences including hearing impairment, and emotional strain that lower the quality of life of patients. In Kenya, upper respiratory infections are among the most common infections encountered in outpatient facilities. Some of these infections are becoming difficult to control because some of the causing microorganisms have acquired antibiotic resistance and hence the need to develop new drugs with higher efficacy. Ethnobotanical studies have now been found to be instrumental in improving chances of discovering plants with antimicrobial activity in new drug development. In Kenya the majority of local people are turning to herbal remedies for primary health care needs. In most cases the sources of these remedies are undocumented and the knowledge about them passed orally form generation to generation, hence under threat of disappearing with current rates of modernisation.

This study explored the traditional remedies used in managing various ENT diseases in seven districts of the Central Province of Kenya. The most common ENT conditions managed using traditional therapies include: common cold, cough, tonsillitis, otitis-media, chest pains and asthma. The results indicate that 67 species belonging to 36 plant families were utilized in this region. These plants were of varying habits; herbs (37.3%), shrubs (34.4%), trees (25.4%) as well as some grasses and sedges (3%). The traditional preparations were found to be made mainly from leaves (49%), roots (20.5%) and barks (12.5%). For each of the ENT conditions multiple species are utilized mainly as individual preparations but occasionally as polyherbal concoctions. In the case of common cold for example, 30 different species are used. Plants reported in this survey are important candidates for antimicrobial tests against ENT disease causing micro-organisms, especially those with antibiotic resistance.

Background

Diseases of the ear, nose and throat (ENT) affect the functioning of adults as well as children, often with significant impairment of the daily life of affected patients [1]. It has been envisaged that with increase in global population, infections remain the most important causes of disease, with upper respiratory infections causing hearing loss and learning disability particularly in children [2]. Ear infections such as chronic otitis-media have serious consequences in developing countries, such as retarded language development and progress in school among children [3,4]. Otitis-media, which is now known to be the most common childhood infection, leads annually to the death of over 50,000 children under 5 years [5]. In other cases nasal conditions may be distressing, as in the case of nasal myiasis/maggots in the nose [6].

In most countries in the developing world the number of otolaryngologists is negligible, while the problem is complicated by the fact that there is no training for public health otolaryngology and other ENT-related otolaryngology personnel [2,4]. This lack of trained personnel is of particular concern in African countries because the prevalence rates of some of the ENT disease such as chronic otitis-media is as high as 65% [7]. This problem as well as increased costs of conventional medicine has caused local people in Kenya and in other developing countries to seek treatment from traditional therapies.

Diseases of the ear, nose and throat can be caused by a variety of microorganisms. Rhinoviruses are the leading cause for common cold in all age groups for example, while enteroviruses are frequently associated [8]. Acute phryngitis/nosilitis is mainly associated with respiratory viruses, although bacteria, especially *Streptococus* spp. are found in some patients [9]. It has been shown that the nose is the main ecological niche where some of the drug resistant microorganisms like *Staphylococcus aureus* reside [10]. Although acute otitis-media is caused by bacteria the leading one being *Streptococcus pneumoniae* [11], viral infection are a predisposing factor for its development [8,12]. In communities that use antibiotics, *Streptococcus pneumoniae* rapidly acquire antibiotics resistance, often complicating this disease burden [11].

Tuberculosis is regarded as the oldest disease in man, affecting almost every organ of the body and causing about 2 million deaths annually [13]. Cases of tuberculosis are on the increase globally, with HIV/AIDS leading to re-emergence of extra pulmonary presentations [14]. While initial tuberculosis infections occur in the lungs, forms that occur for example in tonsils and the ear are now known to occur particularly in regions such as Africa where the disease is endemic [15].

Although antibiotics have contributed to the control of ENT infections, their over-use and misuse is now seen to cause an increase in antibiotic resistance [16]. Some of the chronic sinus ENT diseases resistant to current antibiotics include chronic middle ear infections, chronic sinus diseases, chronic coughs and recurrent pharyngo-tonsillitis [17]. Air pollution has been on the increase and is now known to directly affect the nose and the larynx causing inflammation, irritations and eventually infection. Even the ear is affected when the pollutants enter the mucosa of the tuba, causing impairment of the middle ear [18]. With increasing resistance of microorganisms associated with ENT infections and increasing environmental pollution, alternative sources for new drugs are necessary. These might be obtained from plants used in traditional medicines to control or treat these diseases. People in Kenya are now turning to the use of traditional herbal medicines so as to meet their primary healthcare needs [19].

In Kenya diseases of the respiratory tract are among the most common illnesses in outpatient clinics [20]. These diseases, combined with malaria, account for half the diseases reported in outpatient facilities [21]. Since some of the ENT disease causing microorganisms have become resistant to current antibiotics, there is need to investigate means of developing new, efficacious drugs.

Studies have now shown that ethobotanically-derived phytochemicals have greater activity than compounds derived from random screening and therefore a greater potential for products developed [22,23]. One study for example, has shown that 86% of plants species reported in Samoan pharmaceutical ethnopharmacopoeia showed pharmacological activity [24]. Further, many drugs in clinical use today were discovered from the way plants were used in traditional communities. Examples include quinine which, was discovered from the way traditional communities in S. America especially Peru, Columbia and Bolivia used plant species of the genus Cinchona in managing fevers [25]. Digitoxin on the other hand is a popular heart tonic obtained from Digitalis purpurea, a plant that was in use as heart tonic in traditional communities in Europe. Taxol is a modern therapy for ovarian cancer obtained from Taxus brevifolia which was a traditional medicinal plant in British Columbia [26].

This study investigated the diversity of traditional medicines used for the management of ear, nose and throat infections among the Kikuyus in Central Kenya with the aim of documenting plants that have potential for production of improved traditional medicines from local resources, as well as plants to be targeted for antimicrobial activity against microorganisms that cause ear, nose and throat infections especially those known to have developed antibiotic resistance.

Materials and methods

The Central Province of Kenya covers the area around Mount Kenya, where most of the Kikuyus live. The total population is estimated at 3,724,159 inhabitants in an area of 13,191 Km². The Kikuyus are the largest single ethnic group in Kenya and account for 21% of the country's population [27].

This study was part of a larger ethnobotanical survey involving over one hundred respondents, carried out for three years (2001–2004) among the Kikuyus of Central Kenya, comprising seven districts: Thika, Murang'a, Kiambu, Maragwa, Nyandarua, Kirinyaga and Nyeri (Figure 1). This study focuses on results from 64 respondents who used traditional therapies in management of ENT conditions for self medication or in treating others. Initial contacts were made with research assistants in all the districts to explain the aim of the research. These assistants were local people who knew the kikuyu language well, had lived in the area long enough and were familiar with the local people. Prior informed consent was sought with the respondents who were randomly selected in each area.

During the surveys semi-structured questionnaires were used to carry out the interviews, which targeted common ear, nose and throat infections known to the respondents, plant species used, parts used, methods of preparations as well as administration of the drugs. In some cases interviewees were accompanied in their plant collecting duties and observations made of the plants being collected. Where the respondents were uncomfortable with the questionnaires, discussions and informal interviews were employed and in the process information on traditional management of ENT infections obtained. During discussions, information on combination therapy or poly herbal management of ENT conditions were noted and recorded. Any use of none plant remedies for management of ENT infections were recorded.

Plants said to be useful in managing various ENT ailments during the interviews were visually identified in the field by the respondents. Voucher specimens were collected in duplicates using standard taxonomic procedures particularly recording important features for identification in the herbarium. Each specimen included vital parts such as leaves, stems, flowers, and fruits where available. For small herbaceous plants, whole plants were usually collected. For every specimen collected the vernacular names were also recorded. The specimens were dried in the herbarium and then mounted on sheets.

The collected plant material was identified at the Jomo Kenyatta University Herbarium, using the relevant local floras and other taxonomic literature [28-30]. Assistance in identification was sought from an experienced botanist (Mr Simon Mathenge) of the University of Nairobi Herbarium. The collections at Nairobi University Herbarium as well as Jomo Kenyatta University Herbarium were used to make comparisons with the identified specimens. To systematically collect data on management of ENT diseases in this region, questionnaires, semi-structured interviews, informal interviews and discussions with resource people were applied. Interviews were also supplemented by participant observations and consistent field walks to identify the medicinal plants cited and collect ethnotherapeautic specimens.

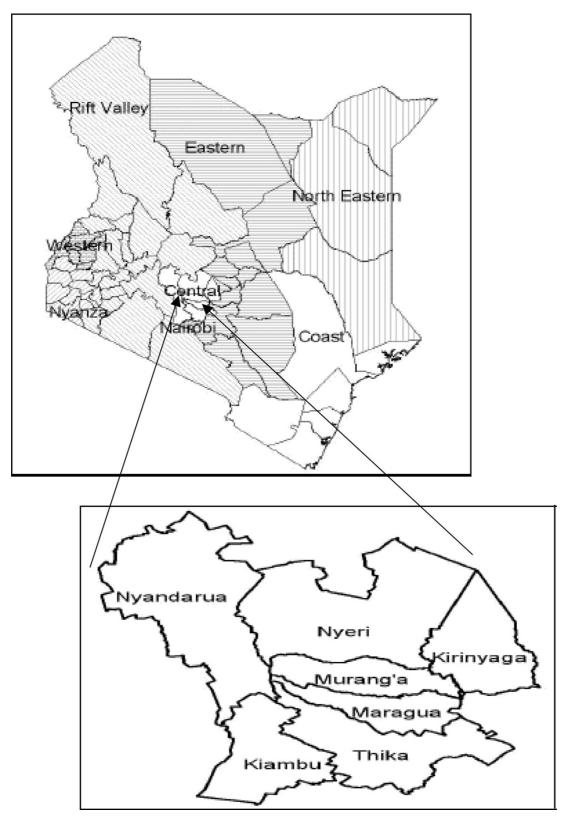
Results and discussion

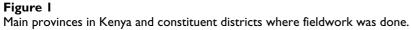
This study found 67 species in 36 plant families as useful in management of ENT conditions in Central Kenya (Table 1) Of these, 24 species were cited three or more times during the field surveys. Some of the species with high frequency of mention included Eucalyptus saligna, Lippia javanica and Ocimum gratissimum (Figure 2). The highest proportion of species used was herbs (37.3%), followed by shrubs (34.3%) and trees (25.4%). Sedges and grasses on the other hand comprised of 3% of the species used in ENT infections management in this region. Whiles one species would have different parts used; this study shows that most of the drug preparations were obtained from leaves (49%) and reasonable amounts from barks (12.5%) and roots (20.5%). Harvesting plant medicines from barks is known to be the most destructive method of harvesting particularly because debarked trees rarely survive [31]. The trees and shrubs from which ENT concoctions are obtained from barks and roots are likely to be in danger of over-exploitation and their conservation status need further investigation.

The most cited ENT disease managed through traditional therapies was found to be the common cold (Figure 3). This condition which has several Kikuyu names (*ikhuti, homa, njoma*) is managed usually by use of individual species which are mainly boiled and administered by inhalation or leaves crushed and directly inhaled. In a few cases polyherbal preparations were noted especially the mixture of leaves of *Ocimum bacilicum, O. gratissimum* and *lippia javanica* which are boiled together and inhaled while the patient is covered with a thick piece of cloth such as a blanket.

Some studies have shown that viruses are associated with about two-thirds of the cases of common cold among children, while bacteria have been associated with about 4% of the cases. Among these viruses the leading ones are Rhinoviruses which cause common cold in all age groups but enteroviruses are also associated [8]. In the study area, about 30 plant species were found to be utilized for management of common cold. Extracts from these plants need to be a priority in testing for antimicrobial activity for further development of local drugs useful in management of colds.

The current study revealed that 13 plant species were used in managing Otitis media (*Njika/bũra*, in Kikuyu) in Central Kenya (Table 1). Extracts from these plants need to be tested for their activity against some of these bacteria but also against viruses because viruses are known to be a pre-





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Lucalyptus saligna SmithMyrtaceaeMûbaûCCLeavesBoilingInLuphorbia joyae Bally & S.EuphorbiaceaeKariariaToStemBoilingCoCarterCupressaceaeMûtarakwaCCBarkBoilingCoLigelia africana (Lam.)BignoniaceaeMûratina wa thûkûrîiCCRhizomeBoilingCoSenth.CyperaceaeNgotheOMBulbBulb crushed toCoKyllinga bulbosa P. Beau.CyperaceaeNyeki/KîgombeToLeavesCrushingCoKyllinga bulbosa P. Beau.CyperaceaeMûthûngaToLeavesDry leaves in shadeCo		•				•	Orally Orally
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Kigelia africana (Lam.) Bignoniaceae Mûratina wa thûkûrîi CC Rhizome Boiling C benth. Kyllinga bulbosa P. Beau. Cyperaceae Ngothe OM Bulb Bulb crushed to D release sap Kyllinga bulbosa P. Beau. Cyperaceae Nyeki/Kîgombe To Leaves Crushing C actuca inermis Forssk. Asteraceae Mûthûnga To Leaves Dry leaves in shade C		Cupressacoao	Mûtarakwa	CC	Bark	Boiling	Orally
yllinga bulbosa P. Beau. Cyperaceae Ngothe OM Bulb Bulb crushed to E release sap yllinga bulbosa P. Beau. Cyperaceae Nyeki/Kîgombe To Leaves Crushing C actuca inermis Forssk. Asteraceae Mûthûnga To Leaves Dry leaves in shade C	Ligelia africana (Lam.)	•				0	Orally
(yllinga bulbosa P. Beau. Cyperaceae Nyeki/Kîgombe To Leaves Crushing . <i>actuca inermis</i> Forssk. Asteraceae Mûthûnga . To Leaves Dry leaves in shade C		Cyperaceae	Ngothe	OM	Bulb		Directly installed
.actuca inermis Forssk. Asteraceae Mûthûnga To Leaves Dry leaves in shade C	ullinga hulboog P. Poor	Cuparacasa	Nuolui/Kigombo	Та	Loovos		Chowing
0 ,	, .		, ,			•	Chewing
			U			and soak in hot water	Orally
leaves						leaves	Inhalation Directly installed

Table I: Diversity of plant species and methods used in management of ENT diseases in Central Kenya

Lippia javanica (Burm.f.) Spreng.	Verbenaceae	Mûthirîti	CC	Leaves	Crushing, steeped in hot water or milk	Orally
Nangifera indica L.	Anacardiaceae	Mwîembe	As	Leaves	Boil	Orally
laytenus senegalensis	Celastraceae	Mûthuthi	То	Sap	Squeezed from stems	Topically
Lam.) Exell	Collisti accae	i latilatili	10	oup		ropically
1elia azadirachta L.	Meliaceae	Mûarubaine	То	Leaves	Boiling	Orally
1elia azadirachta L.	Meliaceae	Mwarumbaine	CC	Leaves	Boiling	Orally
Nomordica foetida	Cucurbitaceae	Karera	To	Leaves	Crushing	Chewing
chumach.	Cucui Ditaceae	Raiera	10	Leaves	Crushing	Cilewing
Dcimum basilicum L.	Lamiaceae	Mûtaa	сс	Leaves	Crushed/Ground, steeped in hot water or milk	Orally
cimum gratissimum L.	Lamiaceae	Mûkandu	OM	Leaves	Crushed	Directly installed
cotea usambarensis Engl.	Lauraceae	Mûthaitî	CP	Bark	Boiling	Orally
cotea usambarensis Engl.	Lauraceae	Mûthaitî	Cg	Bark	Boiling	Orally
syris lanceolata Hocst & tendel.	Santalaceae	Mûthaithi	N/T	Leaves	Boiling	Orally
hysalis peruviana L.	Solanaceae	Mûnathi	As	leaves	Boiling	Orally
iliostigma thonnigii Schumach.) Milne-Redh.	Papilionaceae	Mûkûra-ûtukû	Cg	Inner bark	Pounding	Chewing
per capense L.	Piperaceae	Mûrûngû	СС	Leaves	Boiling	Orally
istacia aethiopica Kokwaro	Anacardiaceae	Mûheheti	CC	Leaves	Boiling	Orally
lectranthus comosus Sims	Lamiaceae	Maigoya	OM	Leaves	Crushing	Directly installed
sidium guajava L.		Mûbera			0	
	Myrtaceae		As	Leaves Dry	Boiling	Orally
sidium guajava L.	Myrtaceae	Mûbera Mûtan damh a sa	CC	Leaves	Boiling	Orally
terolobium stellatum Forssk.) Brenan	Caesalpiniaceae	Mûtandambogo	CC	Roots	Boiling	Orally
hamnus prinoides L'Herit	Rhamnaceae	Mûkarakinga	CP	Roots	Boiling Soup added	Orally
hamnus prinoides L'Herit	Rhamnaceae	Mûkarakinga	CC	Leaves	Boiling	Orally
hamnus prinoides L'Herit	Rhamnaceae	Mûkarakinga	То	Roots/Stem	Boiling	Orally
licinus communis L.	Euphorbiaceae	Mûbarîki	Cg	Seeds	Grinding the seeds and cooking the fatty part	Orally
ubus apetalus Poir	Rosaceae	Mûtare	То	Fruit and leaves	Boiling	Orally
arcostemma viminale (L.) L. Br.	Euphorbiaceae	Ndarû	OM	Stem	Heated, Sap squeezed	Directly installed
chkuhria pinnata (Lam.) Thell.	Asteraceae	Gakuinini	СС	Leaves	Boiling	Orally
chkuhria pinnata (Lam.) Thell.	Asteraceae	Gakuinini	Cg	Roots/Leaves	Boiling	Orally
enna didymobotrya Fresen.) Irwin & Barneby	Caesalpiniaceae	Mwenû	То	Leaves	Boiling	Orally
olanum aculeastrum Dunal	Solanaceae	Gîtûra	То	Root	Boiling	Orally
olanum anguivi Lam.	Solanaceae	Gatongu	OM	Fruits	Juice squeezed	Directly installed
onchus oleraceus L.	Asteraceae	Mahiû	CP	Roots	Boiling Soup added	Orally
onchus oleraceus L.	Asteraceae	Mahiû	То	Roots	Boiling	Orally
philanthes mauritiania Pers.) DC.	Asteraceae	Gatharaita	СС	Flowers	Crushing	Chewing
porobolus pyramidalis P. eauv.	Poaceae	Kagutu	Cg	Root	Boiling	Orally
agetes minuta L.	Asteraceae	Mûbangi	As	Leaves	Boiling	Orally
ithonia diversifolia (Hemsl.) A. Gray	Asteraceae	Marûrû	СС	Leaves	Boiling	Orally
ithonia diversifolia (Hemsl.) A. Gray	Asteraceae	Marûrû	Cg	Leaves/Roots	Boiling	Orally
oddalia asiatica (L.) Lam.	Rutaceae	Mûrûrûwe	CC	Roots	Boiling	Orally
oddalia asiatica (L.) Lam.	Rutaceae	Mûrûrûwe	CC	Roots	Boiling	Inhalation
oddalia asiatica (L.) Lam.	Rutaceae	Mûrûrûwe	Cg	Leaves	Boiling	Orally
Irtica massaica Mildbr.	Urticaceae	Thabai	CC	Leaves	Boiling	Orally
ernonia lasiopus O.Hoffm.	Asteraceae	Mûchatha	CC	Leaves	Boiling	Orally
ernonia lasiopus O.Hoffm.	Asteraceae	Mûchatha	OM	Flowers	Sap squeezed	Directly installed
Varburgia ugandensis	Canellaceae	Mûthîga	CC	Bark and	Boiling	Orally
prague	CarrellaCede	i iuunga		leaves	Doming	

Table 1: Diversity of plant species and methods used in management of ENT	diseases in Central Kenya (Continued)
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, ,	•	0				,
Withania somnifera (L.) Dunal	Solanaceae	Mûrumbae	As	Roots	Boiling	Orally
Withania somnifera (L.) Dunal	Solanaceae	Mûrumbae	СС	Leaves	Boiling	Orally
Zanthoxyllum usambarensis (Engl.) Kokwaro	Rutaceae	Mwikunya	CC	Leaves	Boiling	Orally
Zehneria scabra (L.f.) Sond.	Cucurbitaceae	Rwegethia	CC	Leaves	Boiling	Orally

Table I: Diversity of plant species and methods used in management of ENT diseases in Central Kenya (Continued)

Kikuyu names in brackets

As = Asthma (Githûri kinene, Acima, Gîkorora kia ngûkû)

CC = Common cold (Homa, Kihuti) Cg = Cough (Ruhaya, Gîkorora)

CP = Chest Pains (Githûri)

NB = Nose bleeding

N/T = Neck/throat (Ngingo)

OM = Otitis media (Njika, bûra)

To = Tonsil (Ngaû)

WC = Wooping cough (Gîkoroa thakame)

disposing factor for the development of acute otitis-media [11]. Lubricants from the industries and fat from chicken were also found to be installed into affected ears as a means of managing this condition. Further in some cases the queen stage of the termites were also found to be crushed and the resulting mixture installed in the affected ear(s). In a few cases the tail of the chameleon (alive) is also installed briefly into the affected ear(s). It is not clear whether this has any therapeutic value, but it is worth further investigation.

Otitis-media is known to be the most common bacterial infection especially among children. Sometimes it has severe complications, which have high economic impacts [11]. Studies in Kenya show that this disease causes sensori-neural hearing impairment among pre-school children, in addition to other complications [4]. On a global

scale otitis-media is a major indication for antibiotic use with the consequence that some of the microorganisms associated with this condition have acquired antibiotic resistance as in the case of *Pneumoccoci*, *Staphylococcus aureus*, Hemophilus *influenzae* among others [2,10,11]. The traditional therapies cited in this study need to be screened to authenticate their use in managing this condition.

Sixteen plant species were used in managing tonsillitis in Central Kenya. In some of the cases the plant extracts were applied externally as in the case of the sap from *Datura stramonium* stems and bulb of *Crinum macawanii*. These plants are known to have analgesic properties [25] but their antimicrobial activity and those of the species that are either boiled or chewed need to be established. Respiratory viruses such as Adenoviruses, Epstein-Barr viruses,

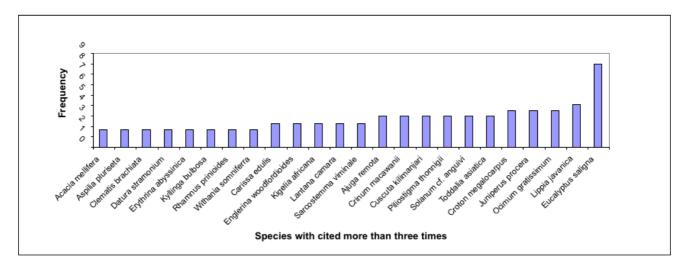


Figure 2 Frequency of plant species used in managing ENT diseases in Central Kenya.

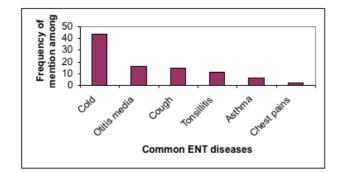


Figure 3

Frequency of ENT diseases managed by traditional herbal preparations.

influenza viruses and enteroviruses as well as bacteria are responsible for acute tonsillitis. Some of these for example, hemolytic *Streptococci* have already developed antibiotic resistance [8]. These microorganisms among others need to be the key targets for antimicrobial tests.

Asthma was one of the ENT allergic conditions traditionally managed using plant extracts in Central Kenya. The plants used in this case may be important sources of antiallergic preparations, which warrant further study.

Conclusion

This study revealed that the commonest ENT diseases managed through traditional therapies were common cold, Otitis media, cough, tonsillitis, asthma and chest pains. This research further revealed that 67 plant species are used in management of ENT infections in Central Kenya, while 24 of these species are mentioned three or more times during the field survey. There are also some none plant remedies such as fat, oils and animal parts cited in this study.

These remedies form an important database for bioassay guided identification and purification of important therapeutic compounds, antimicrobial trials on their efficacy and further development of improved traditional medicines or other new drugs for management of ENT infections. In the case of polyherbal preparations, their synergistic effects need further investigation. The study also reveals plants whose medicines are obtained in destructive manner and hence these species may need their conservation status to be investigated.

Since ethobotanically-derived phytochemicals have greater activity than compounds derived from random screening and therefore a greater potential for new drug products developed, it is expected that the results of this study will lead to pharmacological investigations with the plants showing reasonable antimicrobial activity.

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